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Further information
Introduction to the manual

Contents of this chapter
This chapter describes the manual. It gives information on the markings and component designations, and also the terms and abbreviations that are used in the manual. This chapter also includes a list of related manuals.

Applicability
The manual is applicable to liquid-cooled ACS880-304LC+A019 diode supply modules for user-defined cabinet installations.

Safety instructions
Follow all safety instructions delivered with the drive.

- Read the complete safety instructions before you install, commission, use or service the drive. The complete safety instructions are given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]).
- Read the software-function-specific warnings and notes before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the task-specific safety instructions before starting the task. See the section describing the task.

Target audience
This manual is intended for people who plan the installation, install, start up, use and service the drive. Read the manual before working on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.
The manual is written for readers worldwide. Both SI and imperial units are shown.

**Categorization by frame size and option code**

Some descriptions, instructions, technical data and dimensional drawings which concern only a certain group of units are marked with the symbol of the frame size (such as “D8D”, “2×D8D” etc.). The marking derives from the quantity and basic construction of the modules that form a supply unit. For example, frame size “2×D8D” indicates that the supply unit consists of two frame size D8D modules connected in parallel.

The frame size is marked on the type designation labels. The frame size of each module is also shown in the rating tables of chapter Technical data.

The instructions and technical data which concern only certain optional selections are marked with option codes (such as +A019). The options included in the drive can be identified from the option codes visible on the type designation label.

**Use of component designations**

Some device names in the manual include the item designation in brackets, for example [Q20], to make it possible to identify the components in the circuit diagrams of the drive.

**Terms and abbreviations**

<table>
<thead>
<tr>
<th>Term/ Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>DI</td>
<td>Digital input</td>
</tr>
<tr>
<td>Diode supply module</td>
<td>Diode rectifier and related components enclosed in a metal frame or enclosure. Intended for cabinet installation.</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>External charging</td>
<td>In this manual, external charging stands for drive charging circuit outside the supply unit cubicle.</td>
</tr>
<tr>
<td>FDCO</td>
<td>DDCS communication module</td>
</tr>
<tr>
<td>FDPI</td>
<td>Diagnostics and panel interface</td>
</tr>
<tr>
<td>Flat-PLS</td>
<td>Rittal Flat-PLS, a busbar system for standard, commercially available flat bars</td>
</tr>
<tr>
<td>Frame (size)</td>
<td>Physical size of the drive or power module</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>Intermediate circuit</td>
<td>DC link</td>
</tr>
<tr>
<td>Internal charging</td>
<td>In this manual, internal charging stands for ABB charging kit inside the supply unit cubicle.</td>
</tr>
<tr>
<td>INU</td>
<td>Inverter unit</td>
</tr>
<tr>
<td>Inverter</td>
<td>Converts direct current and voltage to alternating current and voltage.</td>
</tr>
<tr>
<td>Inverter unit</td>
<td>Inverter module(s) under control of one control board, and related components. One inverter unit typically controls one motor.</td>
</tr>
</tbody>
</table>
### Related manuals

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General manuals</strong></td>
<td></td>
</tr>
<tr>
<td>Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules</td>
<td>3AXD50000048633</td>
</tr>
<tr>
<td>Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules</td>
<td>3AXD50000048634</td>
</tr>
<tr>
<td>Cabinet design and construction instructions for ACS880 air-cooled and liquid-cooled</td>
<td>3AUA0000107668</td>
</tr>
<tr>
<td>multidrive modules</td>
<td></td>
</tr>
<tr>
<td><strong>Supply module manuals</strong></td>
<td></td>
</tr>
<tr>
<td>ACS880-304LC+A019 diode supply modules hardware manual</td>
<td>3AXD50000045157</td>
</tr>
<tr>
<td>ACS880 diode supply control program firmware manual</td>
<td>3AUA0000103295</td>
</tr>
<tr>
<td><strong>Inverter module manuals and guides</strong></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>Manuals for application programs (Crane, Winder, etc)</td>
<td></td>
</tr>
<tr>
<td><strong>Option manuals</strong></td>
<td></td>
</tr>
<tr>
<td>ACX-AP-x assistant control panels user’s manual</td>
<td>3AUA0000085685</td>
</tr>
<tr>
<td>Drive composer start-up and maintenance PC tool user’s manual</td>
<td>3AUA0000094606</td>
</tr>
<tr>
<td>ACS880-1007LC liquid cooling unit user's manual</td>
<td>3AXD50000129607</td>
</tr>
<tr>
<td>Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.</td>
<td></td>
</tr>
</tbody>
</table>


You can find all documentation related to the multidrive modules on the Internet at [https://sites-apps.abb.com/sites/lvacdrivesengineeringssupport/content](https://sites-apps.abb.com/sites/lvacdrivesengineeringssupport/content).
Operation principle and hardware description

Contents of this chapter

This chapter describes how the diode supply unit works and the hardware of the diode supply module.

Operation principle

The heart of the diode supply unit is a diode bridge. It rectifies three-phase AC current to direct current for the intermediate DC link of the drive. The intermediate DC link supplies the inverters that run the motors. There can be one inverter unit only (single drives) or several inverter units (multidrives) connected to the intermediate circuit.

The rectifier bridge in the supply module is uncontrolled: it cannot control the DC link voltage or limit the charging current of the DC link capacitors at the power up. Therefore you can only use the bridge with inverters that have charging circuits, or you must equip the supply unit with a separate charging circuit.

Note:

- The supply module does not have means to control, limit or cut off the load current.
- The customer must arrange the overload and short-circuit protection of each supply cable (typically with fuses).
- The supply unit does not have AC or DC chokes. Therefore, the customer must arrange a sufficient inductance at the AC side of each supply module with suitable cabling. The minimum length of the supply cable per each supply module is 5 meters (16.4 feet). The inductances between the parallel-connected supply modules must be identical, ie, the cabling to each module must be identical in regard to cable type and length. For selecting the supply transformer, see Selecting the supply transformer (page 75).


### Main circuit diagram

The figure shows a simplified main circuit diagram of the rectifier bridge.

![Main circuit diagram]

1. AC fuses
2. Diodes

### Implementing DC voltage measurement

The control program needs a measured voltage value:
- for the control of the charging circuit at the power up
- for overvoltage and undervoltage monitoring and protection.

The supply unit does not have DC voltage measurement as standard. The cabinet installer must implement it separately. The cabinet installer can, for example:

1. connect the DC voltage measurement of the inverter unit to the supply unit via a fiber optic link. For more information, see *Start-up (page 91), Example circuit diagrams (page 177)* and the relevant firmware manuals.

2. connect the DC voltage measurement of the inverter unit to the supply unit via the analog output of the inverter unit and analogue input AI2 or AI1 of the supply unit. For more information, see *Start-up (page 91), Example circuit diagrams (page 177)* and the relevant firmware manuals.

3. use a separate voltage measurement device (transducer), and connect it between the drive DC link and analogue input AI2 or AI1 of the supply unit.

You can use alternatives 1, 2, or 3 for a single drive, in other words, for a drive that consist of one supply unit and one inverter unit. For multidrives (one supply unit feeds several inverters), use alternative 3.

### Charging

A charging circuit powers up the DC link capacitors of the drive system smoothly. Discharged capacitors cannot be directly connected to the full supply voltage. The charging current must be limited until the capacitors are charged and ready for normal use.

If the diode supply unit is equipped with a charging circuit, the DC voltage level must be signaled to the control unit either through analog input AI2 (AI1) or fiber optic connection.
between the supply unit and inverter unit (requires FDCO-01 DDCS communication module). The charging function and DC voltage measurement source must be defined by parameters. For more information, see the firmware manual.

<table>
<thead>
<tr>
<th>Supply unit</th>
<th>Inverter unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDCO-01 in ZCU control unit</td>
<td>RDCO-04 in BCU control unit</td>
</tr>
</tbody>
</table>

- **DC overvoltage and undervoltage protection**

  The supply unit control program monitors the measured DC voltage value. If it detects an overvoltage or undervoltage, it trips the main contactor and generates a fault. For more information, see the firmware manual.

  **Note:**

  There is no DC voltage measurement in the supply unit as standard. See section *Implementing DC voltage measurement (page 16).*

- **Short-circuit protection**

  AC fuses protect the supply unit against short circuit. The cabinet installer must acquire and install the fuses.

  Note that the supply unit designs presented in this manual do not contain DC fuses. The cabinet installer must arrange for appropriate short circuit protection on the DC side.

- **Module temperature supervision**

  Thermal switch [F6.1] supervises the temperature inside the supply module. Wire the switch to a digital input (DI1) of the supply control unit (1 = OK, 0 = overtemperature). In case of overtemperature, the switch opens and the control program generates first a warning, and then, if the overtemperature indication remains over a predefined delay, trips the supply unit on a fault. You can adjust the delay time by parameters.

  For the example wirings, see *Example circuit diagrams (page 177).*

  For cabinet temperature supervision, see *Cabinet temperature supervision (page 42).*

- **6-, 12- and 24-pulse supply units**

  The supply units can be connected either to 6-pulse, 12-pulse or 24-pulse connection. If 12-pulse or 24-pulse supply transformer is used, there can be a maximum of 8 diode supply modules in one drive system. The figure illustrates the difference between 6-pulse and 12-pulse AC supply connections. The 6-pulse connection is standard.

  The 12-pulse supply connection eliminates the fifth and seventh harmonics, which remarkably reduces the harmonic distortion of the line current and the conducted emissions. The 12-pulse connection requires a three-winding transformer, or two separate transformers. There is a 30-degree phase shift between the two 6-pulse supply lines.
18 Operation principle and hardware description

1. Supply transformer
2. Switching equipment and fuses
3. Fuses for protecting input cabling
4. AC fuses for protecting supply unit against short circuit
5. Diode supply modules

The diagram shows a 6-pulse connection.
The diagram shows a 12-pulse connection.

Kummankin kuvan alle sama taulukko.
Overview diagrams

This section contains examples of main circuit overview diagrams. The diagrams show the power line connection, and the connections between the components. The supply unit overview diagrams also show examples of division of components in cubicles, and indicate which components you can order from ABB and which you need to acquire separately.

- **Overview diagram of a drive**

This diagram shows a simplified diagram of a drive with one diode supply unit and one inverter unit.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AC supply</td>
</tr>
<tr>
<td>2.</td>
<td>Input (AC) fuses</td>
</tr>
<tr>
<td>3.</td>
<td>Supply module</td>
</tr>
<tr>
<td>4.</td>
<td>DC bus (-, +)</td>
</tr>
<tr>
<td>5.</td>
<td>Inverter DC fuses</td>
</tr>
<tr>
<td>6.</td>
<td>Inverter module</td>
</tr>
<tr>
<td>7.</td>
<td>Motor</td>
</tr>
</tbody>
</table>
Overview diagram – 1x D8D, 6-pulse, internal charging

The diagram shows a supply unit with one D8D module and internal charging in a 6-pulse connection. In this manual, internal charging stands for ABB charging kit inside the supply unit cubicle.

<table>
<thead>
<tr>
<th>Cubicle</th>
<th>No.</th>
<th>Description</th>
<th>Available through</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.</td>
<td>Medium voltage/low voltage switchboard</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>Supply transformer</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>Charging switchgear including:</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disconnecting device</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>Dedicated supply unit switchgear including:</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disconnecting device</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Breaker/contactor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overcurrent and short-circuit protection of input cabling</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5.</td>
<td>AC fuses for protecting supply unit against short circuit</td>
<td>ABB or third party</td>
</tr>
<tr>
<td></td>
<td>6.</td>
<td>Internal charging kit</td>
<td>ABB</td>
</tr>
<tr>
<td></td>
<td>7.</td>
<td>Diode supply module</td>
<td>ABB</td>
</tr>
<tr>
<td></td>
<td>8.</td>
<td>DC link</td>
<td>-</td>
</tr>
</tbody>
</table>

Note:

*) Minimum length of the cables is 5 meters.
**Overview diagram – 2×D8D, 6-pulse, internal charging**

The diagram shows a supply unit with two D8D modules and internal charging in a 6-pulse connection.

### Cubicle

<table>
<thead>
<tr>
<th>Cubicle</th>
<th>No.</th>
<th>Description</th>
<th>Available through</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Medium voltage/low voltage switchboard</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Supply transformer</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Charging switchgear including: • Disconnecting device</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Dedicated supply unit switchgear including: • Disconnecting device • Breaker/contactor</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>Overcurrent and short-circuit protection of input cabling</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>AC fuses for protecting supply unit against short circuit</td>
<td>ABB or third party</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
<td>Internal charging kit</td>
<td>ABB</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>Diode supply modules</td>
<td>ABB</td>
</tr>
<tr>
<td>B</td>
<td>9</td>
<td>DC link</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:**

*) Each module must have its own input AC cable with the minimum length of 5 meters. Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges.
Overview diagram – 2×D8D, 12-pulse, internal charging

The diagram shows a supply unit with two D8D modules and internal charging in a 12-pulse connection.

<table>
<thead>
<tr>
<th>Cubicle</th>
<th>No.</th>
<th>Description</th>
<th>Available through</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.</td>
<td>Medium voltage/low voltage switchboard</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>2.</td>
<td>Supply transformer</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>3.</td>
<td>Charging switchgear including: • Disconnecting device</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>4.</td>
<td>Interlocked dedicated supply unit switchgear including: • Disconnecting device • Breaker/contactor • Overcurrent and short-circuit protection of input cabling</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>5.</td>
<td>AC fuses for protecting supply unit against short circuit</td>
<td>ABB or third party</td>
</tr>
<tr>
<td>B</td>
<td>6.</td>
<td>Internal charging kit</td>
<td>ABB</td>
</tr>
<tr>
<td>B</td>
<td>7.</td>
<td>Diode supply modules</td>
<td>ABB</td>
</tr>
<tr>
<td>B</td>
<td>8.</td>
<td>DC link</td>
<td></td>
</tr>
</tbody>
</table>

Note: 
*) Each module must have its own input AC cable with the minimum length of 5 meters. Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges.
Overview diagram – 2×D8D, 6-pulse, external charging and pre-magnetizing

The diagram shows a supply unit with two D8D modules in a 6-pulse connection. The system has an external charging circuit combined with a transformer pre-magnetization circuit.

<table>
<thead>
<tr>
<th>Cubicle</th>
<th>No.</th>
<th>Description</th>
<th>Available through</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Medium voltage/low voltage switchboard</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Switchgear including:</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disconnecting device</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Breaker/contactor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Combined transformer pre-magnetizing circuit and drive charging circuit</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Supply transformer</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Overcurrent and short-circuit protection of input cabling</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>AC fuses for protecting supply unit against short circuit</td>
<td>ABB or third party</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Diode supply modules</td>
<td>ABB</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>DC link</td>
<td>-</td>
</tr>
</tbody>
</table>

Note:
*) Each module must have its own input AC cable with the minimum length of 5 meters. Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges.
24 **Operation principle and hardware description**

- **Overview diagram – 2×D8D, 12-pulse, external charging and pre-magnetizing**

The diagram shows a supply unit with two D8D modules in a 12-pulse connection. The system has an external charging circuit combined with a transformer pre-magnetization circuit.

<table>
<thead>
<tr>
<th>Cubicle</th>
<th>No.</th>
<th>Description</th>
<th>Available through</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.</td>
<td>Medium voltage/low voltage switchboard</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>2.</td>
<td>Switchgear including: • Disconnecting device • Breaker/contactor</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>3.</td>
<td>Combined transformer pre-magnetizing circuit and drive charging circuit</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>4.</td>
<td>Supply transformer</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>5.</td>
<td>Overcurrent and short-circuit protection of input cabling</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>6.</td>
<td>AC fuses for protecting supply unit against short circuit</td>
<td>ABB or third party</td>
</tr>
<tr>
<td>B</td>
<td>7.</td>
<td>Diode supply modules</td>
<td>ABB</td>
</tr>
<tr>
<td>B</td>
<td>8.</td>
<td>DC link</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:**

*) Each module must have its own input AC cable with the minimum length of 5 meters.
Hardware of the supply modules

- **Layout drawing of the D8D module**

This figure shows the layout of the D8D module.

1. External main supply connections U1, V1 and W1
2. Coolant connectors
3. Unpainted grounding point (PE)
4. Thermal switch [F6.1]
5. DC+ and DC- connections
6. Heatsink
7. Type designation label is on the back of the module (on the mounting plate of the module)
8. Label with the serial number of the supply module
Overview of control connections of the control unit

It is possible to:

- control the unit through the control panel and the fieldbus
- read the status information of the supply unit through the control panel, fieldbus and relay output.

The diagram shows the control connections and interfaces of the ZCU control unit.

Supply unit control devices

Run enable is the main control signal of the supply unit. The control program reads it from digital input DI2. You can control the signal, for example, with an operating switch installed on the supply module cubicle door, and wired to DI2. When the digital input DI2 is on, it is also possible to control the Run enable signal from a control panel, through fieldbus interface, or from the inverter unit.

For other control signals, see the firmware manual and the I/O connections diagram in ZCU-14 default I/O connection diagram (page 159).
- **Auxiliary voltage switch**

You can equip the supply unit with an auxiliary voltage switch [Q20, Q22]. With the switch, you can disconnect the auxiliary voltage circuit from the power line.

We recommend to equip the auxiliary voltage supply with disconnecting device(s), to be able to disconnect also auxiliary voltages from the supply module cubicles for maintenance work.

- **Operating switch**

You can equip the supply unit with an operating switch [S21].

By default, the operating switch controls the unit as follows:

- The ENABLE/RUN position: If the supply unit has an internal or external charging circuit, the control program charges first the DC link. Then the main contactor closes and the supply module starts to rectify. If the supply unit has no charging circuit, the switch closes the main contactor.

- The OFF position: The control program opens the main contactor and the supply module stops rectifying.

- **ACX-AP-x control panel**

You can equip the supply unit with an optional control panel.

With the control panel, you can:

- control the Run enable signal of the supply unit with the start and stop keys of the panel (in local control mode of the panel)
- view and reset the fault and warning messages, and view the fault history
- view actual signals
- change parameter settings
- change between local and external control.

The Run enable command at digital input DI2 must be on (1) so that the DSU can be started and stopped with the control panel.

To change between local and remote control mode, press the Loc/Rem key of the control panel. For the instructions on the use of the panel, see *ACX-AP-x Assistant control panels user's manual* (3UA0000085685 [English]). For the parameter settings, see the firmware manual.

- **PC connection**

There is a USB connector on the front of the control panel that can be used to connect a PC to the drive. When a PC is connected to the control panel, the control panel keypad is disabled. See also section *Connecting a PC (page 88).*

- **Fieldbus control**

You can control the supply unit through a fieldbus interface if the unit is equipped with an optional fieldbus adapter, and when you have configured the control program for fieldbus control with the parameters. For information on the parameters, see the firmware manual.

**Note:**

To be able to switch the main contactor or breaker and the supply unit on and off (Run enable signal) through fieldbus, the Run enable command at digital input DI2 must be on (1).
Type designation labels

- Type designation labels of the supply module

Each supply module has type designation labels attached to it. The type designation stated on the labels contains information on the specifications and configuration of the unit.

Quote the complete type designation and serial number when contacting technical support on the subject of individual supply modules.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type designation. See section Type designation key (page 29).</td>
</tr>
<tr>
<td>2.</td>
<td>Ratings. See also section Ratings (page 147), Electrical power network specification (page 152) and DC connection data (page 152).</td>
</tr>
<tr>
<td>3.</td>
<td>Frame size</td>
</tr>
<tr>
<td>4.</td>
<td>Cooling system and additional information</td>
</tr>
<tr>
<td>5.</td>
<td>Degree of protection</td>
</tr>
<tr>
<td>6.</td>
<td>Short-circuit withstand strength, see section Electrical power network specification (page 152).</td>
</tr>
<tr>
<td>7.</td>
<td>UL/CSA data. See section Electrical power network specification (page 152).</td>
</tr>
<tr>
<td>8.</td>
<td>Valid markings. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules [3AXD50000048634 (English)].</td>
</tr>
<tr>
<td>9.</td>
<td>Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.</td>
</tr>
</tbody>
</table>
## Type designation key

The type designation describes the composition of the module in short. The complete designation code is divided in subcodes:

- The first 1…18 digits form the basic code. It describes the basic construction of the unit. The fields in the basic code are separated by hyphens.
- The option codes follow the basic code. Each option code starts with an identifying letter (common for the whole product series), followed by descriptive digits. The option codes are separated by plus signs.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic codes</strong></td>
<td></td>
</tr>
<tr>
<td>ACS880</td>
<td>Product series</td>
</tr>
<tr>
<td>304LC</td>
<td>Construction: Diode supply module, liquid-cooled.</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td></td>
</tr>
<tr>
<td>0820A</td>
<td>Refer to the <em>Ratings (page 147)</em>.</td>
</tr>
<tr>
<td><strong>Voltage range</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>525…690 V (525…600 V AC for UL/CSA) 3-phase ± 10%. This is indicated in the type designation label as typical input voltage levels 3~525/600/690 V AC (600 V AC for UL/CSA).</td>
</tr>
<tr>
<td><strong>Plus codes</strong></td>
<td></td>
</tr>
<tr>
<td>A019</td>
<td>Direct uncontrolled diode-diode bridge (as standard)</td>
</tr>
</tbody>
</table>
Moving and unpacking the module

Contents of this chapter

This chapter gives basic information on unpacking and moving the module.

Moving the module

WARNING!
Wear protective gloves and long sleeves! Some parts have sharp edges.

Move the transport package by pallet truck to the installation site.

Unpacking and examining the delivery

1. Cut off the plastic straps or undo the screws of the box.
2. Lift off the box cover and sides.
3. Cut open the plastic wrapping of the module.
4. Undo the four screws with which the module is attached to the plywood support.
5. Lift off the module.
6. Check that there are no signs of damage.
7. Dispose of or recycle the packaging according to the local regulations.

This illustration shows the layout of the transport package. Examine that all items are present and there are no signs of damage. Read the data on the type designation label of the module to make sure that the module is of the correct type.

1. VCI sheet
2. Screws
3. Plywood support
4. Plywood box
5. Plywood cover
Cabinet construction

Contents of this chapter

This chapter instructs in placing the modules and additional equipment into a cabinet. For general instructions, see Cabinet design and construction instructions for ACS880 air-cooled and liquid-cooled multidrive modules (3AUA0000107668 [English]).

Limitation of liability

The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

Switching, disconnecting and protecting solution

To arrange the switching, disconnection and protection of the supply module, you can use the following solution:

1. Equip the main circuit with a disconnecting device which meets the local safety regulations.
2. The disconnecting device must separate the whole drive cabinet from the AC power line, including the AC fuses which are placed inside the drive cabinet.
3. Equip the drive with AC fuses to protect the unit against short circuit. Protect each input terminal of the supply module with a fuse of its own.
4. Protect the input cable with fuses or circuit breaker which meet the local safety regulations.

For more information, see Connecting the power cables and busbars (page 77). See also Electrical safety precautions (page 74) and Example circuit diagrams (page 177).
Cabinet configuration overview

This section shows configuration examples of the supply module cubicles. The 6-pulse and 12-pulse connections use the same mechanics. The cubicles have direct AC cabling to the supply module through the bottom plate of the cubicle.

You can use either a 600 mm wide or a 400 mm wide design.

The 600 mm wide design:
• uses Rittal TS 8 enclosures
• can have 1×D8D, 2×D8D, 3×D8D or 4×D8D modules
• can have internal charging kit inside the supply unit cubicle
• has a swing-out frame for installing the control unit and other electrical equipment
• has an adapter kit that acts as side plates of the enclosure and as a mounting base for the module guides.

The 400 mm wide simplified design:
• uses Rittal TS 8 enclosure or generic enclosures
• can have 1×D8D or 2×D8D modules
• does not have space reserved for internal charging circuit components
• does not require Rittal TS 8 adapter plate kit
• does not have a swing-out frame for installing the control unit and other electrical equipment.
600 mm wide Rittal TS 8 enclosures

These figures show 1×D8D, 2×D8D, 3×D8D and 4×D8D modules in 600 mm wide Rittal TS 8 enclosures. The figures show also pipe routing overviews.

### Markings

<table>
<thead>
<tr>
<th>Lines</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue lines</td>
<td>Incoming pipes</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Red lines</td>
<td>Outgoing pipes</td>
</tr>
<tr>
<td></td>
<td>R</td>
</tr>
<tr>
<td>Lilac lines</td>
<td>Intermediate pipes</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>Black lines</td>
<td>Electrical connections</td>
</tr>
</tbody>
</table>
Markings

<table>
<thead>
<tr>
<th>Blue lines</th>
<th>Incoming pipes</th>
<th>B</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Lilac lines</td>
<td>Intermediate pipes</td>
<td>L</td>
</tr>
<tr>
<td>Black lines</td>
<td>Electrical connections</td>
<td></td>
</tr>
</tbody>
</table>
400 mm wide Rittal TS 8 and generic enclosures (simplified design)

These figures show 1×D8D and 2×D8D modules in 400 mm wide Rittal TS 8 and generic enclosures. The figures show also pipe routing overviews.

<table>
<thead>
<tr>
<th>Markings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue lines</td>
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<td></td>
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</tr>
<tr>
<td>Lilac lines</td>
<td>Intermediate pipes</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>Black lines</td>
<td>Electrical connections</td>
</tr>
</tbody>
</table>
Cabinet layout drawings

The cabinet layout drawings show examples of the supply units in the Rittal TS 8 enclosure with external charging. The unit includes a D8D supply module/supply modules and bottom entries for cabling. The figures show also the cooling circuit inlet, outlet and the cooling circuit valves. The swing-out frame has space for installing the control unit and other electrical equipment.

- **Layout drawing of 1×D8D unit in 600 mm wide Rittal TS 8 enclosure**

![Diagram of cabinet layout](ACS880-304LC A019_1xD8D cabinet layout.pdf)

Cabinet construction

Cabinet layout drawings

The cabinet layout drawings show examples of the supply units in the Rittal TS 8 enclosure with external charging. The unit includes a D8D supply module/supply modules and bottom entries for cabling. The figures show also the cooling circuit inlet, outlet and the cooling circuit valves. The swing-out frame has space for installing the control unit and other electrical equipment.

- **Layout drawing of 1×D8D unit in 600 mm wide Rittal TS 8 enclosure**

![Diagram of cabinet layout](ACS880-304LC A019_1xD8D cabinet layout.pdf)
Layout drawing of 2×D8D unit in 600 mm wide Rittal TS 8 enclosure

Cubicle including:
1. Swing-out frame (charging circuit components are behind the swing-out frame; see 4×D8D with swing-out frame open (page 41))
2. Control unit
3. Cabinet fan and heat exchanger are behind this plate
4. Common DC busbars
5. Two D8D modules (one module is behind the other)
6. AC fuses
7. AC input cable terminals
8. Inlet stop valve and drain valve behind the inlet valve
9. Outlet stop valve and drain valve behind the outlet valve
10. Cable entries
Cabinet construction

- Layout drawing of 3×D8D and 4×D8D units in 600 mm wide Rittal TS 8 enclosure

3×D8D and 4×D8D with swing-out frame closed

Cubicle including:
1. 3xD8D unit
2. 4xD8D unit
3. One D8D module
4. Two D8D modules (one module is behind the other)
5. AC input cable terminals
Cubicle including:
1. Heat exchanger is behind this mounting plate
2. Cabinet fan is behind this louver plate
3. 2×D8D modules (one module is behind the other)
4. AC fuses
5. AC input cable terminals
6. Inlet stop valve and drain valve behind the inlet valve
7. Outlet stop valve and drain valve behind the outlet valve
8. Cable entries
Cabinet temperature supervision

In liquid-cooled drive systems, the cabinet can be totally sealed from the ambient air. The air inside the cabinet must be able to circulate freely. You can install a fan inside the cabinet to push air through a heat exchanger.

You can use thermal switches [F6.11…14] to supervise the temperature inside the cabinet. Install the thermal switches on the hottest element of the cabinet. In this example, the thermal switches are on the DC busbar above the supply module (two thermal switches for 1×D8D and 2×D8D modules on the DC+ and DC- busbars; four thermal switches for 3×D8D and 4×D8D modules on both DC+ and DC- busbars). ABB recommends to use thermal switches with 100 °C temperature limit.

Wire the switch to a digital input (DI) of the supply control unit (1 = OK, 0 = overtemperature). In case of overtemperature, the switch opens and the control program generates first a warning, and then, if the overtemperature indication remains over a predefined delay, trips the supply unit on a fault. You can adjust the delay time by parameters. For the example wirings, see Example circuit diagrams (page 177).

Note:
If you install the switches on the busbars, make sure there is proper insulation between the busbars and thermal switches.

A temperature sensor integrated into the control unit supervises the board operating temperature. In case of overtemperature, the control program generates a warning or trips the supply unit on a fault.

The module has its own thermal switch for temperature supervision. See Module temperature supervision (page 17).
Pipe routing

This section includes pipe routing examples for the supply unit cabinets. See also section *Internal cooling circuit* (page 139). It describes cooling-systems for cabinet-built ACS880 liquid-cooled multidrives. Pipe routing example drawings show also the drain pipes. For the liquid-cooling component offering for D8D supply unit cabinets, see chapter *Ordering information*.

- **Pipe routing example of 1×D8D unit in 600 mm wide Rittal TS 8 enclosure**

![Pipe routing example of 1×D8D unit in 600 mm wide Rittal TS 8 enclosure](ACS880-304LC A019_1xD8D pipe route.pdf)

1. Heat exchanger
2. Inlet manifold with stop and drain valves
3. Outlet manifold with stop and drain valves
4. Incoming pipes
5. Outgoing pipes
6. Intermediate pipes
7. Drain pipes
Pipe routing example of 2×D8D unit in 600 mm wide Rittal TS 8 enclosure

1. Heat exchanger
2. Inlet manifold with stop and drain valves
3. Outlet manifold with stop and drain valves
4. Incoming pipes
5. Outgoing pipes
6. Intermediate pipes
Pipe routing example of 3×D8D unit in 600 mm wide Rittal TS 8 enclosure

1. Heat exchanger
2. Inlet manifold with stop and drain valves
3. Outlet manifold with stop and drain valves
4. Incoming pipes
5. Outgoing pipes
6. Intermediate pipes
Pipe routing example of 4×D8D unit in 600 mm wide Rittal TS 8 enclosure

1. Heat exchanger
2. Inlet manifold with stop and drain valves
3. Outlet manifold with stop and drain valves
4. Incoming pipes
5. Outgoing pipes
6. Intermediate pipes
Installation examples

WARNING!
The code labels attached to mechanical parts such as busbars, shrouds and sheet metal parts must be removed before installation as they may cause bad electrical connections, or, after peeling off and collecting dust in time, cause arcing or block the cooling air flow.

This section instructs in placing the modules and additional equipment into a cabinet.
Each example includes a table that lists:
- installation stages of different equipment in the order in which the installation into the cabinet should be performed
- code of the step-by-step instructions
- equipment kit code
- kit ordering code.

You can find the kit-specific assembly drawings, step-by-step instructions and kit information on the Internet. Go to https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. If needed, contact your local ABB representative.

The example includes also cabinet assembly drawings that show each stage listed in the table. More detailed steps of each stage are described in the kit-specific assembly drawings.

For general instructions, see Cabinet design and construction instructions for ACS880 air-cooled and liquid-cooled multidrive modules (3AUA0000107668 [English]).

D8D modules in a 600 mm wide Rittal TS 8 enclosure

- Installation stages

For more information on the 600 mm design and how it differs from the 400 mm design, see Cabinet configuration overview (page 34).

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Kits for D8D supply modules in 600 mm Rittal TS 8 enclosure
Note! See Cabinet design and construction instructions for ACS880 multidiive modules (3AUA0000107668 [English])

STAGE 1: Common assembly installations (Baying parts, Lead-through kit, Common DC).
See assembly drawings for details

Cabinet construction 51
Stage 2: Rittal adapter plates
STAGE 3: DSU COOLING COMPONENTS KIT installation

See assembly drawings for details and required additional Rittal and standard parts.

DSU COOLING COMPONENTS KITS

For 1 DSU module:
KIT L-465-8-441
Ordering code: 3AXD500000440664
Drawing code: 3AXD500000482117

For 2-3 DSU modules:
KIT L-468-8-442
Ordering code: 3AXD50000044162
Drawing code: 3AXD50000048258

For 4 DSU modules:
KIT L-468-8-443
Ordering code: 3AXD50000048136
Drawing code: 3AXD50000048283

Note: No PE busbars are included in the kits.
Stage 4a,b: Module installation, 1 supply module and additional parts for 2 modules

STAGE 4: KITS REQUIRED FOR 1-4 DSU MODULES
See assembly drawings listed below for details and required additional Rittal and standard parts.

IN ADDITION TO ALL PREVIOUS KITS, FOLLOWING KITS ARE REQUIRED FOR 2 DSU MODULE ASSEMBLY:

KITS REQUIRED FOR 1 DSU MODULE ASSEMBLY:

DSU MOUNTING MECHANICS
KIT L-468-8-364
Ordering code: 3AXD5000044060
Drawing code: 3AXD5000044681

DSU DC BUSBARS AND SUPPORT W600
KIT L-6-8-205
Ordering code: 3AXD5000044095
Drawing code: 3AXD5000045236

IN ADDITION TO ALL PREVIOUS KITS:

DSU DC CONNECTION KIT
KIT L-468-8-233
Ordering code: 3AXD5000044093
Drawing code: 3AXD5000045417

DSU AC CONNECTION KIT WIDE
KIT L-468-8-144
Ordering code: 3AXD5000044088
Drawing code: 3AXD5000044961
Stage 4 c,d: Module installation, additional parts for 3 and 4 modules
Stage 5: Kits for AC Busbar Support

See assembly drawings listed below for details and required additional Rittal and standard parts.

KITS REQUIRED FOR ONLY FOR 1 DSU MODULE ASSEMBLY:

DSU BUSBAR SUPPORT 1xDSB
KIT L-6-0-151
Ordering code: 3AXD50000132058
Drawing code: 3AXD50000132218

KITS REQUIRED FOR 2-4 DSU MODULE ASSEMBLY:

DSU BUSBAR SUPPORT KIT
KIT L-6-0-152
Ordering code: 3AXD50000132065
Drawing code: 3AXD50000132218
STAGE 6: DSU FAN MECHANICS AND ACS880LC HEAT EXCHANGER KITS installation
See assembly drawing 3AXD5000045841
for details and required additional Rittal and standard parts.

DSU FAN SUPPORT MECHANICS H800
KIT L-8-8-401
Ordering code: 3AXD5000044094

ACS880LC HEAT EXCHANGER KIT
KIT L-468-8-448
Ordering code: 3AXD5000041265

DSU FAN KIT
230V
Ordering code: 3AXD50000043885

115V
Ordering code: 3AXD5000045413
Stage 7: Shroud installation parts
Stage 8: Charging mechanics
Stage 9: Swing-out frame mechanics

See assembly drawing 3A/V0000004580 for details and required additional Rittal and standard parts.
Stage 10: Door, covers and explosion exhaust kit
D8D modules in a 400 mm Rittal TS 8 or generic enclosure, simplified design

For more information on the 400 mm simplified design and how it differs from the 600 mm design, see *Cabinet configuration overview* (page 34).

### Installation stages

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KITS FOR ACS880-304LC+AO19 IN RITTAL TS8 2000x600x400 OR GENERIC CABINET

Kits for D&D supply modules in 400 mm Rittal TS 8 or generic enclosure

Note: Only parts included in ABB kits are shown here.
See kit assembly drawings for required Rittal and/or other standard parts.
Stage 1: Installation of common parts

Note: See Cabinet Design and Construction Instructions for ACS800 Multidrive modules (3AW0000106680 English). See assembly drawings for details.
STAGE 2: DSU MOUNTING MECHANICS and BUSBAR SUPPORT installations

See assembly drawings 3AX050000163861 and 3AX050000169221 for details.
STAGE 3: COOLING COMPONENTS KIT installation
See assembly drawings 3AX050000048217 and 3AX050000048258
for details
Stage 4: AC and DC busbar installation

See assembly drawings 3X00000616905 and 3X00000616904 for details.
STAGE 5: AC AND DC BUSBAR INSTALLATION FOR 2 DSU MODULE ASSEMBLY

See assembly drawings 3AXD50000167616 and 3AXD50000165070 for details.

Note!
These kits are only required when 2 DSU modules are installed to the cabinet.
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Stage 6: Cabinet fan and heat exchanger

STAGE 6: FAN AND HEAT EXCHANGER INSTALLATION

See assembly drawing 3AXD50000166480 for details

3SU FAN R/H
Ordering code: 3AXD50000043885

AC80RGC HEAT EXCHANGER R/H
Ordering code: 3AXD50000043895

3SU FAN SUPPORT HEAT EXHANGER WOOD
Ordering code: 3AXD50000044885
Stage 7: Shroud installation parts
Stage 8: Door, covers and explosion exhaust kit

See Pillar documentation and assembly drawing 6884341 for details.

Explosion Exhaust Kit
Ordering code: 68791560
Electrical installation

Contents of this chapter

This chapter describes the electrical installation of the modules.

The wiring diagrams in this chapter are simplified presentations. For details, see the example circuit diagrams included in the manual.

Note:
The instructions do not cover all possible cabinet constructions.

For more information on electrical installation, see Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules [3AXD50000048634 (English)].

Safety and liability

WARNING!

Only qualified electricians are allowed to do the work described in this chapter. Read the complete safety instructions before you install, commission, use or service the drive. The complete safety instructions are given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]).

Note:
The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive system may experience problems that the warranty does not cover.
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.

**WARNING!**
The charging switch is not necessarily located within or nearby the drive cubicle.

   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - In the liquid cooling unit (if present), open the motor protective circuit breaker(s) of the cooling pumps.
   - 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.

**General notes**

- **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.

- **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").

**Checking the insulation of the assembly**

- **Supply unit**
  
  Do not make any voltage tolerance or insulation resistance tests on the supply modules as this may cause damage. Every module has been tested for insulation between the main circuit and the chassis at the factory.

  Also, there may be voltage-limiting circuits inside the modules which cut down the testing voltage automatically.

- **Supply cable**
  
  Check the insulation of the supply (input) cable according to local regulations before connecting to the drive.

**Selecting the supply transformer**

The supply modules do not have input chokes. For this reason the supply transformer has to be dimensioned according to the supply unit apparent power ($S_n$) and the supply transformer impedance must suit the rectifier. The transformer reactance $X_k$ has to be at least 4% and the transformer nominal apparent power ($S_n$) must not be more than 2 times the nominal apparent power ($S_n$) of the supply unit in question.
Selecting the power cables

- **Input AC cabling**

The input AC cabling has to be identical (length and cross-sectional area) between all the parallel-connected supply modules. Each module must have its own shielded 3-conductor input AC cable with the minimum length of 5 m (16.4 ft). This ensures uniform loading of all the three input phases. Single-conductor cables cannot be used.

- **Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. The shield must agree with the requirements of IEC 61800-5-1.** Check with local / state / country electrical codes for allowance.

- **Symmetrical shielded cable with three phase conductors and symmetrically constructed PE conductor, and a shield. The PE conductor must agree with the requirements of IEC 61800-5-1.**

- **Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. A separate PE conductor is required if the shield does not agree with the requirements of IEC 61800-5-1.**

- **Typical power cable sizes**

This table gives aluminum and copper cable types. The cable sizing is based on max. 9 cables laid on the cable trays side by side, three ladder type trays one on top of the other, ambient temperature 30 °C (EN 60204-1 and IEC 60364-5-52). A correction factor $K = 0.70$ is used.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Aluminum cable</th>
<th>Copper cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PVC insulation</td>
<td>XLPE insulation</td>
</tr>
<tr>
<td></td>
<td>Conductor temperature $T=70$ °C</td>
<td>Conductor temperature $T=90$ °C</td>
</tr>
<tr>
<td>Size mm²</td>
<td>Size mm²</td>
<td>Size mm²</td>
</tr>
<tr>
<td>$U_N = 690$ V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1×D8D</td>
<td>4×(3×240+72 Cu)</td>
<td>4×(3×150+41 Cu)</td>
</tr>
<tr>
<td>2×D8D</td>
<td>2×4×(3×240+72 Cu)</td>
<td>2×4×(3×150+41 Cu)</td>
</tr>
<tr>
<td>3×D8D</td>
<td>3×4×(3×240+72 Cu)</td>
<td>3×4×(3×150+41 Cu)</td>
</tr>
<tr>
<td>4×D8D</td>
<td>4×4×(3×240+72 Cu)</td>
<td>4×4×(3×150+41 Cu)</td>
</tr>
</tbody>
</table>
Connecting the power cables and busbars

- **Connection diagrams**

The following connection diagrams show how connection and grounding of the supply modules and their switchgear can be arranged.

The switchgear and modules are typically grounded to the frame of the cabinet via the fixing screws. If good enough electrical contact for grounding is not possible via the fastening screws and cabinet frame, the cabinet installer must use a separate grounding.

The diagrams show also a separate charging circuit and supply transformer. For more information on them, see section *Selecting the supply transformer (page 75).*

The connection diagrams in this section are simplified. They do not contain all details, such as terminal markings, and are not suitable for the installation work as such. The designer of the cabinet must:

- prepare the final circuit diagrams
- provide the final circuit diagrams to the installer(s).

The electricians that do the connections must use the final circuit diagrams.
Connection diagram – 2×D8D, 6-pulse, internal charging

The diagram shows 2×D8D modules in a 6-pulse connection with internal charging. In this manual, internal charging stands for ABB charging kit inside the supply unit cubicle.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>External installation (outside supply module cubicle)</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>Medium voltage/low voltage switchboard</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Supply transformer</td>
<td>7</td>
</tr>
</tbody>
</table>
| 3 | Charging switchgear including:  
• Disconnecting device  
8 | Internal charging kit. For the connections, see Example circuit diagrams. |
| 4 | Dedicated supply unit switchgear including:  
• Disconnecting device  
• Breaker/contactor  
9 | AC fuses for protecting supply unit against short circuit |
| 5 | Overcurrent and short-circuit protection of input cabling | 10 | 360 degrees grounding |

Note:

*) Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges. Required minimum length of the cables is 5 meters. See section Electrical installation (page 73).

**) Internal charging kit can be used with 525…690 V AC supply voltage only.

***) Breaker/contactor is mandatory with internal charging.

Ground the cable shield 360 degrees at the cable entry (recommendation). For grounding instructions, see section Connection procedure (page 82).

Use a separate PE conductor in addition if the conductivity of the shield does not meet the requirement for the PE conductor. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]).

For cable selection instructions, see Selecting the power cables (page 76).
Connection diagram – 2×D8D, 12-pulse, internal charging

The diagram shows 2×D8D modules in a 12-pulse connection with internal charging. In this manual, internal charging stands for ABB charging kit inside the supply unit cubicle.

### Notes:

*) Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges. Required minimum length of the cables is 5 meters. See section Electrical installation (page 73).

**) Internal charging kit can be used with 525…690 V AC supply voltage only.

***) Breaker/contactor is mandatory with internal charging.

Ground the cable shield 360 degrees at the cable entry (recommendation). For grounding instructions, see section Connection procedure (page 82).

Use a separate PE conductor in addition if the conductivity of the shield does not meet the requirement for the PE conductor. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]).

For cable selection instructions, see Selecting the power cables (page 76).
Connection diagram – 2×D8D, 6-pulse, external charging and pre-magnetizing

The diagram shows 2×D8D modules in a 6-pulse connection with external charging of the drive. The external charging circuit is combined with the transformer pre-magnetization circuit. For more information, contact ABB.

In this manual, external charging stands for drive charging circuit outside the supply unit cubicle.

Note:
*) Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges. Required minimum length of the cables is 5 meters. See section Electrical installation (page 73). Ground the cable shield 360 degrees at the cable entry (recommendation). For grounding instructions, see section Connection procedure (page 82).

Use a separate PE conductor in addition if the conductivity of the shield does not meet the requirement for the PE conductor. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]). For cable selection instructions, see Selecting the power cables (page 76).
Connection diagram – 2×D8D, 12-pulse, external charging and pre-magnetizing

The diagram shows 2×D8D modules in a 12-pulse connection with external charging of the drive. The external charging circuit is combined with the transformer pre-magnetization circuit. For more information, contact ABB.

In this manual, external charging stands for drive charging circuit outside the supply unit cubicle.

<table>
<thead>
<tr>
<th>A</th>
<th>External installation (outside supply module cubicle)</th>
<th>B</th>
<th>Supply unit cubicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medium voltage/low voltage switchboard</td>
<td>6</td>
<td>DC link</td>
</tr>
</tbody>
</table>
| 2 | Switchgear including:  
  • Disconnecting device  
  • Breaker/contactor | 7 | Supply modules |
| 3 | Combined transformer pre-magnetizing circuit  
  and drive charging circuit | 8 | AC fuses for protecting supply unit against short circuit |
| 4 | Supply transformer | 9 | 360 degrees grounding. See section Selecting the supply transformer (page 75). |
| 5 | Overcurrent and short-circuit protection of input cabling | | |

**Note:**
*) Use symmetrical supply cabling to ensure equal current sharing between parallel diode bridges. Required minimum length of the cables is 5 meters. See section Electrical installation (page 73). Ground the cable shield 360 degrees at the cable entry (recommendation). For grounding instructions, see section Connection procedure (page 82).

Use a separate PE conductor in addition if the conductivity of the shield does not meet the requirement for the PE conductor. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]).

For cable selection instructions, see Selecting the power cables (page 76).
Connection procedure

Note:
The instructions below are based on the cabinet construction where the charging circuit is in the same cabinet with the supply module/s. The instructions are not applicable to all possible solutions but only clarify the principles.

WARNING!
Read and follow the instructions given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

1. Make sure that you have the following components installed in the cabinet:
   - AC fuses for protecting the module
   - input power cable busbars
   - DC busbars of the drive cabinet
   - supply module(s)
   - charging circuit components.

2. Make the interconnections (if not made yet) between:
   - AC fuses for protecting the module
   - input power cable busbars
   - DC busbars of the drive cabinet
   - supply module(s)
   - charging circuit components. The connections of the ABB-defined charging circuit with the terminal markings are shown in chapter Example circuit diagrams.

3. Ground the module (if not made yet). If the grounding via the module fixing screws is not good enough, connect a separate cable between the module grounding point and the cabinet PE busbar. The grounding point is marked on the module.

   Note:
   If the cabinet frame is painted (such as with Rittal TS8 enclosures), it is important to make sure that a good galvanic connection to ground (PE busbar) is achieved. You can, for example, remove the paint from the connection points and use star washers.

   Note:
   The connection to ground through fixing screws and the cabinet chassis is not always good enough. To ensure the continuity of the protective bonding circuit, you can connect the modules to the cabinet PE busbar with a copper busbar or cable. The inductance and impedance of the PE conductor must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs).

4. Lead the input power cables into the cabinet. 360° grounding of the cable shield at the entry is recommended to suppress interference.

5. Twist the input power cable shields to bundles and connect to cabinet PE (ground) busbar. Connect the separate ground conductors/cables to cabinet PE (ground) busbar.

6. Connect the phase conductors to the input power cable busbars. For tightening torques, see section Tightening torques (page 151).
7. Lead the charging circuit supply cable into the cabinet. 360° grounding of the cable shield at the entry is recommended to suppress interference (not shown in the figure).
8. Twist the cable shield of the charging circuit cable to a bundle and connect to the cabinet PE (ground) busbar (not shown in the figure). Connect the separate ground conductors/cables to cabinet PE (ground) busbar.
9. Connect the phase conductors of the charging circuit supply cable to the charging circuit. The connections of the ABB-defined charging circuit with the terminal markings are shown in chapter Example circuit diagrams. For tightening torques, see section Tightening torques (page 151).

### Charging circuit wire recommendations

If the charging circuit is needed, the cabinet builder must install and connect it. For the connections, see chapter Example circuit diagrams.

The charging components are dimensioned according to the DC link capacitances. For more information on the charging kits, see Charging kits (page 132). If the total DC link capacitance exceeds these limits, the components must be re-dimensionalized. Contact your local ABB representative for more information.

<table>
<thead>
<tr>
<th>DC link with...</th>
<th>Copper cable, PVC insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conductor temperature T=70 °C</td>
</tr>
<tr>
<td></td>
<td>Size mm²</td>
</tr>
<tr>
<td>1×R8i...3×R8i</td>
<td>3×4+4</td>
</tr>
<tr>
<td>4×R8i</td>
<td>3×6+6</td>
</tr>
</tbody>
</table>
Connecting the external power supply cable for the auxiliary circuit

The cabinet builder must arrange 230/115 V AC auxiliary power supply for the auxiliary circuit and cabinet fan.

See also section Auxiliary circuit current consumption (page 150).

- Connection diagram

See the final circuit diagrams for details. The ABB-defined installation example is shown in chapter Example circuit diagrams (page 177).

Connecting power supply for the control unit

The cabinet builder must connect 24 V DC auxiliary power supply for the ZCU control unit.

See also chapter Supply control unit (page 157) and section Auxiliary circuit current consumption (page 150).

- Connection diagram

See the final circuit diagrams for details. The ABB-defined example installation is shown in chapter Example circuit diagrams. It also contains a 24 V power supply and a battery that further supplies the supply unit control unit. The customer must acquire the 24 V power supply and the battery.
Connecting the control cables

- Default I/O connection diagram

See chapter Supply control unit.

- Connection procedure

Note:
The instructions below are based on an example cabinet construction. They are not applicable to all possible solutions but only clarify the principles.

The following procedure instructs how to connect the external control cables of a supply unit. In the example, the control cables are routed to the cabinet through the bottom. Note that the figures in the procedure are examples.

**WARNING!**

Read and follow the instructions given in Safety instructions for ACS880 liquid-cooled multivaried cabinets and modules (3AXD50000048633 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

1. Open the cubicle door.
2. Remove the shrouds (if any) from the cubicle.
3. Run the cables into the cubicle. If possible, arrange for a 360° grounding of the cable shield at the cable entry.
   
   If the outer surface of the shield is non-conductive, turn the shield inside out as shown below and wrap copper foil around the cable to keep the shielding continuous. Do not cut the grounding wire (if present).

   ![Diagram of cable connection](image)

   **Note for top entry of cables:**
   
   When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if very many control cables come to one cabinet, plan the installation beforehand as follows:
   
   1. Make a list of the cables coming to the cabinet.
   2. Sort the cables going to the left into one group and the cables going to the right into another group to avoid unnecessary crossing of cables inside the cabinet.
   3. Sort the cables in each group according to size.
   4. Group the cables for each grommet as follows ensuring that each cable has a proper contact to the cushions on both sides.

<table>
<thead>
<tr>
<th>Cable diameter in mm</th>
<th>Max. number of cables per grommet</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 13</td>
<td>4</td>
</tr>
<tr>
<td>&lt; 17</td>
<td>3</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>1</td>
</tr>
</tbody>
</table>

4. Run the cables to the appropriate terminals. Wherever possible:
   - Use the existing cable trunking in the cabinet.
   - Use sleeving wherever the cables are laid against sharp edges.
• Tie the cables to provide strain relief.

5. Cut the cables to suitable length.

6. Strip the cable ends and conductors. When connecting to the drive I/O, also remove the shield along with the outer sheathing, and use electrical tape or shrink tubing to contain the strands. Elsewhere, twist the outer shield strands into a bundle, crimp a lug onto it and connect it to the nearest chassis grounding point.

7. Connect the conductors to appropriate terminals (see the circuit diagrams delivered with the unit).

8. Fasten the shrouds (if any).

9. Close the doors.
## Installing optional modules

### WARNING!

Read the safety instructions given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

1. Repeat the steps described in section *Electrical safety precautions (page 74).*
2. Ensure by measuring that the I/O terminals of the control unit (especially the relay output terminals) are safe.
3. Insert the module into a free option module slot on the control unit.
4. Fasten the module. For instructions, see the documentation of the optional module.
5. Connect the necessary wiring to the module following the instructions given in the documentation of the module.
6. Check the installation and that it is safe to reconnect power.
7. Configure the module. Refer to the instructions given in the documentation of the module as well as the appropriate firmware manual.
Connecting a PC

A PC (with eg. the Drive composer PC tool) can be connected as follows:

1. Connect an ACS-AP-W or ACS-AP-I control panel to the unit either
   - by inserting the control panel into the panel holder or platform (if present), or
   - by using an Ethernet (eg. CAT5E) networking cable.

2. Remove the USB connector cover on the front of the control panel.

3. Connect an USB cable (Type A to Type Mini-B) between the USB connector on the control panel (3a) and a free USB port on the PC (3b).

4. The panel will display an indication whenever the connection is active.

5. See the documentation of the PC tool for setup instructions.
Installation checklist

Contents of this chapter
This chapter contains an installation checklist which you must complete before you start up the drive.

Warnings

**WARNING!**
Obey the safety instructions for the drive. See *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur. Only a qualified electrician is allowed to work on the installation.
Checklist

Do the steps in section *Electrical safety precautions (page 74)* before you start the work. Check the mechanical and electrical installation of the drive before start-up. Go through the checklist together with another person.

<table>
<thead>
<tr>
<th>Make sure that …</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ambient operating conditions meet the specifications given in chapter Technical data.</td>
<td></td>
</tr>
<tr>
<td>The drive cabinet has been fixed to floor, and if necessary due to vibration etc, also by its top to the wall or roof.</td>
<td></td>
</tr>
<tr>
<td>There is an adequately sized protective earth (ground) conductor between the drive and the switchboard, and the conductor has been connected to appropriate terminal. Connection is tight: Pull the conductors to check. Proper grounding has also been measured according to the regulations.</td>
<td></td>
</tr>
<tr>
<td>The main circuit connections inside the drive cabinet correspond to the circuit diagrams.</td>
<td></td>
</tr>
<tr>
<td>The supply voltage matches the nominal input voltage of the drive. Check the type designation label.</td>
<td></td>
</tr>
<tr>
<td>The input power cable has been connected to the appropriate terminals, the phase order is right, and the terminals have been tightened. (Pull the conductors to check.)</td>
<td></td>
</tr>
<tr>
<td>Appropriate AC fuses and the disconnecting device of the main circuit have been installed.</td>
<td></td>
</tr>
<tr>
<td>The control unit has been connected to the power module.</td>
<td></td>
</tr>
<tr>
<td>The control cables (if any) have been connected to the appropriate terminals, and the terminals have been tightened. (Pull the conductors to check.).</td>
<td></td>
</tr>
<tr>
<td>There are no tools, foreign objects or dust from drilling inside the drive.</td>
<td></td>
</tr>
<tr>
<td>All shrouds are in place. Cabinet doors have been closed.</td>
<td></td>
</tr>
</tbody>
</table>
Start-up

Contents of this chapter

This chapter describes the start-up procedure of the supply unit. The information is valid for the example in Connection diagram – 2×D8D, 6-pulse, internal charging (page 78).

Note:
The instructions do not cover all possible cabinet constructions and connections. Do the start-up tasks instructed by the cabinet-installer of the drive modules.

The default device designations (if any) are given in square brackets, for example, circuit breakers supplying the auxiliary circuits [F20, F22.x]. The same device designations are used in Example circuit diagrams.

WARNING!

Only qualified electricians are allowed to do the work described in this chapter. Obey all safety instructions in Safety instructions for ACS880 liquid-cooled multdrive cabinets and modules (3AXD50000048633 [English]) and section Electrical safety precautions (page 74). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.
## Start-up procedure

<table>
<thead>
<tr>
<th>Tasks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Example description</td>
<td></td>
</tr>
</tbody>
</table>

This start-up example is valid for the example in *Connection diagram – 2×D8D, 6-pulse, internal charging (page 78)*. The example has 2×D8D ACS880-304LC+A019 modules in a 6-pulse connection with internal charging, that is, the charging components are installed in the supply unit cubicle. The charging switchgear has a disconnecting device that is outside the supply unit cubicle. The drive switchgear is also outside the supply unit cubicle. The switchgear includes a main disconnector and main contactor or breaker.

### Safety

**WARNING!**

Obey the safety instructions during the start-up procedure. See *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [English]) and *Electrical safety precautions (page 74)*. If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

### Checks/Settings with no voltage connected

- Make sure that the charging disconnector is open.
- Make sure that the main disconnecting device of the supply unit is open and locked.
- Make sure that the installation has been checked. See *Installation checklist (page 89)*.
- Check the settings of breakers switches in the auxiliary circuits. See the final circuit diagrams by the designer of the cabinet-installed drive.
- Disconnect any unfinished or unchecked 230 / 115 V AC cables that lead to the terminal blocks of the supply module cubicle from outside.
- Make sure that both circuits of XSTO connector of the control unit are closed as shown in *ZCU-14 default I/O connection diagram (page 159)* (IN1 and IN2 must be connected to OUT). The control program enables the start/stop control only with both circuits closed.

### Starting and checking the cooling system

- Fill up and bleed the internal cooling circuit. Start the cooling unit up. See *Filling up and bleeding the internal cooling circuit (page 141)*.
- Check the cooling system for leaks. Make sure that cooling circuit joints at the shipping split joining cubicles are tight and that all drain valves have been closed.
- Make sure that the coolant can flow freely in all cubicles. Make sure that drive system cools down.
- Install all shrouds (if removed) and close the cabinet doors.

### Connecting voltage to the auxiliary circuit

- Make sure that it is safe to connect voltage. Make sure that:
  - nobody is working on the unit or circuits that are wired from outside into the cabinets.
  - cabinet doors are closed.
- Connect the auxiliary voltage to the supply unit. Close the circuit breakers supplying the auxiliary circuits [F20, F22.x] and auxiliary voltage switch-disconnectors [Q20, Q22].
<table>
<thead>
<tr>
<th>Tasks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting the parameters</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> These parameter settings are valid for the example in <em>Example circuit diagrams (page 177)</em>. For the power connection examples with external charging and pre-magnetizing, contact ABB. For more information on the parameter settings, see the firmware manual.</td>
<td></td>
</tr>
</tbody>
</table>
| To activate communication between the inverter and supply units: | □
  * Set bit 11 of **supply unit** parameter 195.20 *HW options word 1* to 1.
  * Set bit 11 of **inverter unit** parameter 95.20 *HW options word 1* to 1 and parameter 61.152 *INU-LSU data set 10 data 2 sel* to 01.11 *DC voltage*. |
| For the DC voltage measurement: | □
  * set parameter 162.52 *Data set 10 data in 2 selection* to *External DC meas signal*.
  * set parameter 195.40 *DC voltage source* to *External measurement signal*.
  * activate the DC link voltage monitoring function and define the DC overvoltage and undervoltage limits by selecting the supply voltage class by parameter 195.01 *Supply voltage*. |
| **Note:** You can alternatively set analog inputs AI1 and AI2 as the source of the DC measurement signal by parameter 195.40 *DC voltage source*. |  |
| For charging: | □
  * set parameter 110.24 *RO1 source* to *Charging*.
  * set parameter 120.30 *External charge enable* to *Yes*. |
| **Note:** The charging function uses the DC voltage measurement signal. Set also the DC voltage measurement parameters for charging. |  |
| To define the fuse trip fault source: | □
  * set parameter 111.09 *DIO2 function* to *Input*.
  * set parameter 131.38 *Fuse trip fault source* to *DIO2*. |
| Set parameter 131.32 *Aux circuit breaker fault source* to *DI4*. | □
| Switch the Run enable signal at digital input DI2 on (1) to start the operation of the supply unit. |  |
| **Closing the disconnecting devices** |  |
| Close the disconnecting device of the supply unit. | □
| Close the charging disconnector. | □
| Close also other possible disconnectors outside the supply module cubicle. | □
| **Power up and starting** |  |
| Make sure that the control panel [A51] is in the remote mode (Loc/Rem key of the panel). | □
| Switch the Run enable signal at digital input DI2 on (1). | □
| If the system is identical with the example installation (see *Example circuit diagrams (page 177)*), turn the operating switch [S21] to position 1 (on). Run enable starts the supply unit power up sequence. After the program has stepped through it (approximately 3 seconds), the drive DC link is charged, the main contactor (breaker) is closed and the supply unit is in operation and ready to supply inverters. | □
|  |  |
### Start-up

<table>
<thead>
<tr>
<th>Tasks</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching the supply unit off</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Turn the operating switch [S21] to position 0 (off).  
or  
Switch the Run enable signal at digital input DI2 off (0) to stop the operation of the supply unit and open the main contactor [Q2]. |   |
| **On-load checks**             |   |
| Validate the operation of safety functions if any (for example, emergency stop). See the final circuit diagrams by the designer of the cabinet-installed drive. |   |
Maintenance

Contents of this chapter
This chapter instructs how to maintain the modules and how to interpret their fault indications. The information is valid for ACS880-304LC+A019 supply modules and example cabinet installations of the modules.

Note:
The instructions do not cover all possible cabinet constructions.

WARNING!
Only qualified electricians are allowed to do the work described in this chapter. Read the complete safety instructions before you install, commission, use or service the converter. The complete safety instructions are given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]).

Maintenance intervals
The table below shows the maintenance tasks which can be done by the end user. The complete maintenance schedule is available on the Internet (www.abb.com/drivesservices). For more information, consult your local ABB Service representative (www.abb.com/searchchannels).
<table>
<thead>
<tr>
<th>Maintenance task/object</th>
<th>Years from start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 1 2 3 4 5 6 7 8 9 10 11 12 ...</td>
</tr>
<tr>
<td>Coolant</td>
<td></td>
</tr>
<tr>
<td>Coolant draining and replacement</td>
<td>R R</td>
</tr>
<tr>
<td>Checking coolant quality</td>
<td>P P P P P P P</td>
</tr>
<tr>
<td>Checking coolant antifreeze concentration</td>
<td>P P P P P P P P P P</td>
</tr>
<tr>
<td>Cooling fan</td>
<td></td>
</tr>
<tr>
<td>Main cooling fan 230 V</td>
<td>R R R R R R R R R</td>
</tr>
<tr>
<td>Main cooling fan 115 V</td>
<td>R R R R R R R R</td>
</tr>
<tr>
<td>Batteries</td>
<td></td>
</tr>
<tr>
<td>Control panel battery</td>
<td>R R R R R R R R R</td>
</tr>
<tr>
<td>Control unit battery</td>
<td>R R R R R R R R R</td>
</tr>
<tr>
<td>Connections and environment</td>
<td></td>
</tr>
<tr>
<td>Quality of supply voltage</td>
<td>P P P P P P P P P P P P P P P P</td>
</tr>
<tr>
<td>Spare parts</td>
<td></td>
</tr>
<tr>
<td>Spare parts</td>
<td>I I I I I I I I I I I I</td>
</tr>
<tr>
<td>Inspections</td>
<td></td>
</tr>
<tr>
<td>Checking tightness of cable and busbar terminals. Tightening if needed.</td>
<td>I I I I I I I I I I I I I</td>
</tr>
<tr>
<td>Checking ambient conditions (dustiness, corrosion, temperature)</td>
<td>I I I I I I I I I I I I I</td>
</tr>
<tr>
<td>Checking cooling liquid pipe connections</td>
<td>I I I I I I I I I I I I I</td>
</tr>
</tbody>
</table>

**Symbols**

I Inspection (visual inspection and maintenance action if needed)

P Performance of on/off-site work (commissioning, tests, measurements or other work)

R Replacement

Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.

**Note:** Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service representative for additional maintenance recommendations.

**Maintenance timers and counters**

The control program has maintenance timers and counters that can be configured to generate a warning when a pre-defined limit is reached. Each timer/counter can be set to monitor...
any parameter. This feature is especially useful as a service reminder. For more information, see the firmware manual.

**Internal liquid-cooling system**

For instructions on coolant replacement and checking the liquid-cooling system, see chapter *Internal cooling circuit*.

**Cabinet**

- **Cleaning the interior of the cabinet**

  **WARNING!**

  Read the safety instructions given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* ([English]). If you ignore them, injury or death, or damage to the equipment can occur.

  **WARNING!**

  Use a vacuum cleaner with an antistatic hose and nozzle, nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which may damage circuit boards.

  1. Repeat the steps described in section *Electrical safety precautions (page 74)* before you start the work.
  2. Clean the interior of the cabinet. Use a vacuum cleaner and a soft brush.

**Cleaning the heat exchanger**

For cleaning the heat exchanger, remove the fan. See *Replacing the cabinet fan (page 103)*.

**Power connections**

- **Retightening the power connections**

  **WARNING!**

  Read the safety instructions given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* ([English]). If you ignore them, injury or death, or damage to the equipment can occur.

  1. Repeat the steps described in section *Electrical safety precautions (page 74)*.
  2. Check the tightness of the cable connections. Use the tightening torques given in chapter *Technical data*. 
Fuses

Checking and replacing the module AC fuses

WARNING!
Read the safety instructions given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

WARNING!
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Repeat the steps described in section Electrical safety precautions (page 74).
2. Undo the six screws of the shroud in the middle and remove the shroud.
   
   Note:
   
   Steps 3 and 4 are not necessary if you wish to replace only the fuses of the modules in the front.

3. Undo the four screws of the horizontal shroud and remove the shroud. Note that two of the screws are below the shroud.
4. Undo the four screws of the shroud in the middle in the back (see the figure) and remove the shroud.
5. Slacken the nuts of the headless screws of the fuses so that you can slide out the fuse blocks. Make note of the order of the washers on the screws.
6. Remove the screws, nuts and washers from the old fuses and attach them to the new fuses. Make sure to keep the washers in the original order.
7. Install the new fuses in reverse order.
Fans

The lifespan of the cooling fan depends on the running time of the fan, ambient temperature and dust concentration. Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

Replacing the cabinet fan

WARNING!
Read the safety instructions given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

WARNING!
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Repeat the steps described in section Electrical safety precautions (page 74).
2. Undo the locking screws of the swing-out frame and open the swing-out frame.
3. Disconnect the fan wiring.
4. Undo the four fastening screws of the fan.
5. Pull the fan out.
6. Replace the fan and install in reverse order.

Note:
Insert the fan box into its place so that the side with the extension in the front is down. See the figure.
Note: This side down!
Supply module

Replacing the supply module

![WARNING!]

Read the safety instructions given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

![WARNING!]

Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Repeat the steps described in section Electrical safety precautions (page 74).
2. Undo the locking screws of the swing-out frame and open the swing-out frame.
3. Undo the six screws of the shroud in the middle and remove the shroud.
4. Undo the four screws of the horizontal shroud and remove the shroud.
5. Undo the four screws of the shroud in the middle in the back (see the figure) and remove the shroud.
6. To remove the fuses connected to the modules that will be replaced: Slacken the nuts of the headless screws of the fuses so that you can slide out the fuse blocks.
7. Undo the two DC connection screws of the module that is located in the front.
8. Undo the screws of the lower shroud and remove the shroud.
9. Close the inlet and outlet valves.
10. Attach hoses to the drain valves and lead the hoses (a) into a suitable container. For more information, see Filling up and bleeding the internal cooling circuit (page 141).
11. Open the drain valves located behind the inlet and outlet valves. Make sure the ends of the hoses are not immersed at any point of the draining so that air can displace the coolant in the system. Wait until all coolant has drained.
12. Disconnect the coolant pipes of the module to be removed. The quick connectors are above and below each module. Disconnect the wiring of the thermal switch. For the location, see also Layout drawing of the D8D module (page 25).
13. Undo the four screws of the module that is located in the front and remove the module.
14. If you wish to replace the module that is behind the first module, remove the shroud above the modules.
15. Undo the two screws of the shroud that is between the modules and remove the shroud.
16. Undo the four DC connection screws and remove the DC connection busbars.
17. Repeat steps 12 and 13 for the module(s) to be removed.
18. Install the new module in reverse order:
   - **For the module that was located behind the first module,** put the module back in its place and tighten the module’s screws (no. 13 in the figures). Put the DC connection busbars in their places and tighten also their screws. Attach the shrouds between and above the modules (nos. 14, 15 and 16 in the figures).
   - **For the module in the front:** Put the module back in its place and tighten the module’s screws (no. 13 in the figures). Tighten also the DC connection screws (no. 7 in the figure). For the tightening torque, see Tightening torques (page 151).
• Connect the coolant pipes (no. 12 in the figures). Fill in the coolant. For the instructions, see *Filling up and bleeding the internal cooling circuit (page 141).*

**WARNING!**

For a reliable connection, the end of the pipe entering the connector must be completely intact for a length of at least 5 cm (2"). Make sure that the pipe is perfectly round where it enters the connector, and not deformed eg. by any bends nearby. The piping must not exert any tension or torque on the connector.

• Attach the lower shroud (no. 8 in the figures).
• Slide the fuse blocks back in their places. Tighten the nuts of the fuses (no 6. in the figures).
• Attach the shroud at the back (no. 5 in the figures).
• Attach the horizontal shroud (no. 4 in the figures).
• Attach the shroud in the middle (no. 3 in the figures).
• Close the swing-out frame and tighten its screws (no. 2 in the figures).
• Connect the voltage sources. See *Electrical safety precautions (page 74).*
Control panel

- **Replacing the control panel battery**
  1. Turn the lid on the back of the panel counter-clockwise until the lid opens.
  2. Replace the battery with a new CR2032 battery.
  3. Put the lid back and tighten it by turning it clockwise.
  4. Dispose of the old battery according to local disposal rules or applicable laws.

- **Cleaning the control panel**
  See *ACX-AP-x assistant control panels user’s manual* (3UA0000085685 [English]).
Control unit

- Replacing the memory unit

After replacing a control unit, you can retain 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 (page 74) before you start the work.
2. Make sure that the control unit is not powered.
3. Undo the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.

- Replacing the control unit battery

1. Repeat the steps described in Electrical safety precautions (page 74).
2. Remove the M4×8 [T20] screws at the ends of the control unit.
3. To see the battery, remove the XD2D terminal block.
4. Carefully lift the edge of the control unit cover on the side with the I/O terminal blocks.
5. Carefully pull the battery out of the battery holder.
6. Carefully put a new CR2032 battery into the battery holder.
7. Close the control unit cover.
8. Tighten the M4×8 [T20] screws.
9. Install the XD2D terminal block.
Replacing the control unit battery

WARNING! Read the safety instructions given in Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048633 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the steps described in section Electrical safety precautions on page 66.
2. Remove the M4x8 [T20] screws at the ends of the control unit.
3. To see the battery, remove the XD2D terminal block.
4. Carefully lift the edge of the control unit cover on the side with the I/O terminal blocks.
5. Carefully pull the battery out of the battery holder.
6. Carefully put a new CR2032 battery into the battery holder.
7. Close the control unit cover.
8. Tighten the M4×8 [T20] screws.
9. Install the XD2D terminal block.

LEDs and other status indicators

Warnings and faults reported by the control program are displayed on the control panel or in the Drive composer PC tool. For further information, see the firmware manual.

- Control panel LEDs

The ACX-AP-x control panel has a status LED. The control panel mounting platform or holder has two status LEDs. For their indications, see the following table.

<table>
<thead>
<tr>
<th>Location</th>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACX-AP-x control panel (status LED)</td>
<td>Continuous green</td>
<td>The drive/converter/inverter is functioning normally.</td>
</tr>
<tr>
<td></td>
<td>Flickering green</td>
<td>Data is transferred between the PC and drive/converter/inverter through the USB connection of the control panel.</td>
</tr>
<tr>
<td></td>
<td>Blinking green</td>
<td>There is an active warning in the drive/converter/inverter.</td>
</tr>
<tr>
<td></td>
<td>Continuous red</td>
<td>There is an active fault in the drive/converter/inverter.</td>
</tr>
<tr>
<td></td>
<td>Blinking red</td>
<td>There is a fault that requires the stopping and restarting of the drive/converter/inverter.</td>
</tr>
<tr>
<td></td>
<td>Blinking blue</td>
<td>The Bluetooth interface is enabled, in discoverable mode, and ready for pairing.</td>
</tr>
<tr>
<td>(ACS-AP-W only)</td>
<td>Flickering blue</td>
<td>Data is being transferred through the Bluetooth interface of the control panel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control panel mounting platform or holder (with the control panel removed)</td>
<td>Red</td>
<td>There is an active fault in the drive/converter/inverter.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Power supply for the drive/converter/inverter control unit is OK.</td>
</tr>
</tbody>
</table>
Ordering information

Contents of this chapter

This chapter lists the types and ordering codes of the unit components.

You can find the kit-specific assembly drawings, step-by-step instructions and detailed kit information on the Internet. Go to https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. If needed, contact your local ABB representative.

Note:

• This chapter only lists the installation accessories available from ABB. All other parts must be sourced from a third party (such as Rittal) by the system integrator. For a listing, refer to the kit-specific installation instructions available at https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. For access, contact your local ABB representative.

• Parts that are labeled suitable for generic enclosures are not designed for any specific enclosure system. These parts are intended as a basis for further engineering, and may require additional parts to be fully usable.

Installation accessories designed for generic enclosures are in fact designed for an inside width of 50 mm less than the nominal width of the enclosure. For example, a mechanical kit intended for 800 mm wide generic enclosure is designed for an inside width of 750 mm, and will not fit a 800 mm wide Rittal TS 8 enclosure.

Kit code key

The kit codes shown in this chapter break down as follows.

The format of the kit code is x-w-s-yyy, for example, L-6-8-401 where:

• x = cooling method
  • A = air-cooled (some of these kits are also used with liquid-cooled drives)
  • L = liquid-cooled
120 Ordering information

- \( w = \) cabinet width
  - 4 = 400 mm
  - 6 = 600 mm
  - 8 = 800 mm
- \( s = \) module frame size / sizes
  - 1 = R1i
  - 2 = R2i
  - 3 = R3i
  - 4 = R4i
  - 5 = R5i
  - 6 = R6i/D6D
  - 7 = R7i/D7D/D7T
  - 8 = R8i/D8D/D8T
  - \( X = \) any, or not defined.
- \( yyy = \) consecutive numbering
  - 001…099 = Kits related to cabinets, for example, adapter plates
    - 001…019 Common AC- and DC-related kits
    - 020…049 Cabinet mechanics kits
    - 050…059 Swing frame kits
  - 100…199 = Kits related to AC connection, for example, busbars
    - 100…129 Kits with connection to AC
    - 130…149 Kits with connection to module
    - 150…199 Other kits related to AC connection
  - 200…299 = Kits related to DC connection, for example, busbars
    - 200…229 Kits with connection to common DC
    - 230…249 Kits with connection to module
    - 250…299 Other kits related to DC connection
  - 300…399 = Kits related to module installation, for example, mechanical supports
    - 300…330 Module supporting kits, basic mechanical support
    - 350…379 Shroud kits
  - 400…499 = Other kits
    - 400…419 Fan kits
    - 420…439 Air guides
    - 440…459 Cooling circuit kits

---
Frame D8D

Diode supply modules

Delivery of the supply module includes the following items:

<table>
<thead>
<tr>
<th>Ordering code</th>
<th>Frame size</th>
<th>Qty</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880-304LC-0820A-7+A019</td>
<td>1×D8D</td>
<td>1</td>
<td>Liquid-cooled diode supply module (+A019) with uncontrolled diode bridge</td>
</tr>
<tr>
<td>ACS880-304LC-1540A-7+A019</td>
<td>2×D8D</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>ACS880-304LC-2290A-7+A019</td>
<td>3×D8D</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACS880-304LC-3040A-7+A019</td>
<td>4×D8D</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Note:

The following components are always required to construct a working unit and must be ordered separately (the amounts given here are for one diode supply module):

- ZCU kit. For the contents of the kit, see ZCU kit (page 123).
- Cabinet cooling system. For examples, see Cooling system parts (page 135).

The other parts listed

- may be required by the application, or
- make the installation or use of the module easier.

For the module dimensions, see Liquid-cooled D8D module (page 166).
Control panel

The control panel is not included with the module but must be ordered separately. One control panel is required for the commissioning of an ACS880 drive system, even if the Drive composer PC tool is used.

The control panel can be flush mounted on the cabinet door with the help of a door mounting kit. For more information on the control panel, see ACX-AP-x assistant control panels user’s manual (3AUA0000085685 [English]).

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS-AP-W</td>
<td>Control panel with Bluetooth</td>
<td>3AXD50000025965</td>
<td><img src="3AXD50000025965.png" alt="ACS-AP-W control panel with Bluetooth" /></td>
</tr>
<tr>
<td>DPMP-01</td>
<td>Door mounting kit (IP55)</td>
<td>3AUA0000108878</td>
<td><img src="3AUA0000108878.png" alt="Door mounting kit (IP55)" /></td>
</tr>
</tbody>
</table>
The kit contains:
- front cover
- flat cable (between DDPI-01 board and the panel)
- DDPI-01 board, cover and M4×8 combi screw for the cover
- EMC shield
- control panel mounting platform
- grounding wire
- Ethernet cable (3 m).

*DPMP-01* mounting platform for ACS-AP control panel installation guide [3AUA0000100140 (English)].

### Control electronics

The customer must organize cabling of the electronics outside the module, for example, 24 V DC power supply for the control unit.

**ZCU kit**

Each diode supply unit requires a control unit.

<table>
<thead>
<tr>
<th>Module type</th>
<th>Control unit</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>ZCU kit</td>
<td>1</td>
<td>3AXD50000000933</td>
<td><img src="Kit%20ZCU-14%20kit%20with%20support%20plate.pdf" alt="Illustration" /></td>
</tr>
</tbody>
</table>

The ZCU kit contains:
- ZCU-14 control unit (1)
- ZMU-02 memory unit with ACS880 diode supply control program (2)
- support plate for ZCU-14 (3).

For the dimension drawings, see sections **ZCU-14 control unit (page 168)** and **Support plate for ZCU-14 (page 169)**.

**Note:**

Fiber optic communication between the supply unit and inverter unit requires an FDCO-01 DDCS communication module.
# Mechanical installation accessories

These kits include parts that are used for installing the module in the enclosure.

## Adapter kit (for Rittal TS 8 enclosures)

These parts attach to the left-hand and right-hand sides of the TS 8 enclosure frame and act as a mounting base for the module guides.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000044065</td>
<td>L-468-8-021</td>
<td>![Illustration](Kit L-468-8-021.pdf)</td>
</tr>
</tbody>
</table>

Instruction code: 3AXD50000044568
Module installation mechanics kit

Module installation mechanics kit includes parts for installing the D8D modules and the AC connection kits.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per 1×D8D and 2×D8D; 2 kits per 3×D8D and 4×D8D</td>
<td>3AXD50000044090</td>
<td>L-468-8-304</td>
<td>![Illustration](Kit L-468-8-021.pdf)</td>
</tr>
<tr>
<td>400 mm Rittal TS 8 and generic enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000169252</td>
<td>L-4-8-153</td>
<td>![Illustration](Kit L-468-8-304.pdf)</td>
</tr>
<tr>
<td>400 mm Rittal TS 8 and generic enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000163229</td>
<td>L-468-8-305</td>
<td>![Illustration](Kit L-468-8-305.pdf)</td>
</tr>
</tbody>
</table>
Shrouding (for Rittal TS 8 enclosures)

The shroud kit contains plastic air guides and shrouds with the necessary brackets and screws. For details on the shroud kit, see the instructions available at https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000046769</td>
<td>L-6-8-025</td>
<td>![Image](Kit L-6-8-025.pdf)</td>
</tr>
<tr>
<td>400 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD5000163618</td>
<td>L-4-8-026</td>
<td>![Image](Kit L-4-8-026.pdf)</td>
</tr>
</tbody>
</table>
Charging mechanics kit (for Rittal TS 8 enclosures)

Charging mechanics kit is used for installing the L-6-8-025 into the cubicle.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000044078</td>
<td>L-6-8-044</td>
<td></td>
</tr>
</tbody>
</table>

Swing-out frame (for Rittal TS 8 enclosures)

The swing-out frame is a hinged compartment for installing the control unit and other electrical equipment.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000045870</td>
<td>L-6-8-056</td>
<td></td>
</tr>
</tbody>
</table>

Instruction code: 3AXD50000045519

Instruction code: 3AXD50000045580
**Explosion exhaust kit (for Rittal TS 8 enclosures)**

The explosion exhaust plate acts as a pressure relief vent in case of arcing inside the cubicle. This part is installed on the roof of the cabinet.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>400/600/800 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>68797560</td>
<td>-</td>
<td>![Illustration](Kit explosion exhaust kit.pdf)</td>
</tr>
</tbody>
</table>

Instruction code: 68834341
AC-side components

Cable entry kit

Cable entry kit, to be installed on the bottom plate of the enclosure, contains four 60 mm diameter inlets for cables with grommets, wire meshing for 360° grounding, and a strain relief bracket.

Note:
In 600 mm Rittal TS 8 cabinets, the maximum number of the cable entries of the supply unit is 16. If you need all 16 cable entries for power supply cables, you cannot use standard Rittal TS 8 bottom plates for entering charging and control cables.

<table>
<thead>
<tr>
<th>Used with …</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>All enclosure types</td>
<td>1 (minimum) kit for a module</td>
<td>3AXD50000004385</td>
<td>A-468-8-441</td>
<td></td>
</tr>
</tbody>
</table>

AC connection kits

AC connection kits are used for connecting supply units to AC.

<table>
<thead>
<tr>
<th>Used with …</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm Rittal TS 8 enclosure</td>
<td>1 kit per 1×D8D, 2×D8D and 3×D8D; 2 kits per 4×D8D</td>
<td>3AXD50000044092</td>
<td>L-468-8-145</td>
<td></td>
</tr>
</tbody>
</table>
### AC connection kits

AC connection kits are used for connecting supply units to AC.

### AC fuses

The AC fuses protect the input cables and the module against short circuits. For the dimension drawing, see section [AC fuse 170M6467](#) on page [158](#).

### Frame size

<table>
<thead>
<tr>
<th>Used with …</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm Rittal TS 8 enclosure</td>
<td>1 kit per 2×D8D; 2 kits per 3×D8D and 4×D8D</td>
<td>3AXD50000044088</td>
<td>L-468-8-144</td>
<td><img src="#" alt="Frame 1" /></td>
</tr>
<tr>
<td>400 mm Rittal TS 8 and generic enclosure</td>
<td>1 kit per 1×D8D and 2×D8D</td>
<td>3AXD50000163274</td>
<td>L-468-8-146</td>
<td><img src="#" alt="Frame 2" /></td>
</tr>
<tr>
<td>400 mm Rittal TS 8 and generic enclosure</td>
<td>1 kit per 2×D8D in addition to kit L-468-8-147</td>
<td>3AXD50000163281</td>
<td>L-468-8-147</td>
<td><img src="#" alt="Frame 3" /></td>
</tr>
<tr>
<td>600 mm Rittal TS 8 enclosure</td>
<td>1 kit per 1×D8D</td>
<td>3AXD50000132058</td>
<td>L-6-8-151</td>
<td><img src="#" alt="Frame 4" /></td>
</tr>
</tbody>
</table>
**AC fuses**

The AC fuses protect the input cables and the module against short circuits.

<table>
<thead>
<tr>
<th>Fuse kit</th>
<th>Qty</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse 170M6467, 1400 A, 690 V, SIZE 3, TYPE K Microswitch 170H0069, 2 A, 250 V AC</td>
<td>3</td>
<td>3AXD50000040007</td>
</tr>
</tbody>
</table>

**Ordering information**

<table>
<thead>
<tr>
<th>Used with …</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm Rittal TS 8 enclosure</td>
<td>1 kit per 2×D8D; 2 kits per 3×D8D and 4×D8D</td>
<td>3AXD50000132065</td>
<td>L-6-8-152</td>
<td><img src="image" alt="Illustration" /></td>
</tr>
</tbody>
</table>

Instruction code: 3AXD50000132270
Charging kits

The capacitor banks of the ACS880 inverter modules connected to the DC bus together with the diode supply unit need to be charged with a low charging current during the start-up.

Note:
The charging components are dimensioned for DC link capacitances equal to:

- 1...3×ACS880-104LC-0850A-7 (R8i) DC capacitance (< 29 mF) and
- 4×ACS880-104LC-0850A-7 (R8i) DC capacitance (< 58 mF).

If the total DC link capacitance exceeds these limits, the components must be re-dimensionalized. Contact your local ABB representative for more information.

The charging kit contains the main parts of the charging circuit. The following table shows the IEC charging kits available for each module type.

<table>
<thead>
<tr>
<th>ACS880-304LC …</th>
<th>Frame size</th>
<th>Ordering code (IEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1…3×R8i</td>
</tr>
<tr>
<td>U_N = 690 V</td>
<td></td>
<td>1×D8D</td>
</tr>
<tr>
<td>-0820A-7+A019</td>
<td></td>
<td>2×D8D</td>
</tr>
<tr>
<td>-1540A-7+A019</td>
<td></td>
<td>3×D8D</td>
</tr>
<tr>
<td>-2290A-7+A019</td>
<td></td>
<td>4×D8D</td>
</tr>
<tr>
<td>-3040A-7+A019</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Charging kit contents

The charging kit contains:

- switch disconnector unit (switch fuse type) OS40FD12000
- shaft (6×150 mm)
- handle OHB65J6
- charging contactor AF16-30-10-13*, AF26-30-00-13**
- fuse links OFAA000GG16*, OFAA000GG25** (3 pcs) and 170M4831*, ** (2 pcs)
- fuse holders 170H1007 (2 pcs)
- normally-open auxiliary contact OA1G10
- mounting frame for auxiliary contacts OSZ4
- diode bridges SKKD 81/22H4 (3 pcs)
- connection busbars (2 pcs)
- terminal blocks DBL80 80A (6 pcs)
- resistors CBH 165 C H 414 5R0 4500 J (3 pcs*, 6 pcs**)
- list of kit contents.

For charging component dimensions, see Charging circuit components (page 171).
DC-side components

DC bus installation parts (for Rittal TS 8 enclosures)

The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

Note:
The designs presented in this manual for Rittal TS 8 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>400/600/800 mm TS 8 enclosure</td>
<td>1 kit per cubic</td>
<td>3AU0000115906</td>
<td>A-468-X-001</td>
<td></td>
</tr>
</tbody>
</table>

DC busbars (for Rittal TS 8 enclosures)

DC busbars provide connection from the module DC output to the common DC bus.

Note:
The bolts that connect the DC busbars to the DC link are not included in the kits.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per 3×D8D and 4×D8D</td>
<td>3AXD50000044097</td>
<td>L-6-8-204</td>
<td></td>
</tr>
</tbody>
</table>

Instruction code: 3AXD50000045238
### Ordering Information

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 enclosure</td>
<td>1 kit per cubicle</td>
<td>3AXD50000044095</td>
<td>L-6-8-205</td>
<td>![Illustration](Kit A-468-X-001.pdf)</td>
</tr>
</tbody>
</table>

Instruction code: 3AXD5000045236

| 400 mm TS 8 enclosure | 1 kit per cubicle | 3AXD5000044184 | L-4-8-206 | ![Illustration](Kit L-6-8-204.pdf) |

Instruction code: 3AXD5000045236
DC connection kit
The DC connection kit connects two adjacent modules and has a shroud to be installed between the modules.

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm Rittal TS 8 enclosure</td>
<td>1 kit per 2×D8D, 3×D8D; 2 kits per 4×D8D</td>
<td>3AXD50000044093</td>
<td>L-468-8-231</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>400 mm Rittal TS 8 and generic enclosure</td>
<td>1 kit per 2×D8D</td>
<td>3AXD50000163625</td>
<td>L-468-8-232</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Cooling system parts
Coolant distribution manifold kits

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>400/600/800 mm TS 8 and generic enclosure</td>
<td>1 kit for 1 D8D module</td>
<td>3AXD50000044084</td>
<td>L-468-8-441</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>
The manifold kits contain:

- Inlet and outlet manifolds
- Inlet and outlet valves
- Drain valves
- Nipples for connecting the valves to manifolds
- Push-in connectors for PA piping
- Plugs for unused piping connectors
- Chokes for flow limitation.

**Note:**
The inlet and outlet valves have an R3/4" internal thread. The drain valves have an R3/8" internal thread. The connectors to fit the valves are not included.

**Piping**
The PA (polyamide) pipe can be used for all piping inside the cubicle between the manifolds.

<table>
<thead>
<tr>
<th>Component</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Data</td>
</tr>
<tr>
<td>PA pipe</td>
<td>50 m, PA12P40, 16/13 mm</td>
</tr>
</tbody>
</table>
**Note:**
The piping between the manifolds and main pipes (1), and drain pipes (2) are not part of the offering.

### Heat exchanger

<table>
<thead>
<tr>
<th>Used with ...</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>All enclosure types</td>
<td>1 kit per cubicle</td>
<td>3AXD50000041265</td>
<td>L-468-8-440</td>
<td>Kit L-468-8-440.pd</td>
</tr>
</tbody>
</table>

### Cabinet fan support

**Note:**
Fans are not included in the kit.
### Cooling fans

The cubicle fan is needed for circulating the air inside the cubicle.

Select the fan according to the auxiliary voltage.

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Qty</th>
<th>Ordering code</th>
<th>Kit code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 mm TS 8 and 400 mm generic enclosure</td>
<td>1 fan (230 V) per cubicle</td>
<td>3AXD50000043885</td>
<td>-</td>
<td>Instruction code: 3AXD50000045841</td>
</tr>
<tr>
<td>600 mm TS 8 and 400 mm generic enclosure</td>
<td>1 fan (115 V) per cubicle</td>
<td>3AXD50000045413</td>
<td>-</td>
<td>Instruction code: 3AXD50000166480</td>
</tr>
</tbody>
</table>
Internal cooling circuit

Contents of this chapter

The cooling system of a liquid-cooled drive consists of two circuits: the internal cooling circuit and the external cooling circuit. The internal cooling circuit covers the heat-generating electrical components of the drive and transfers the heat to the cooling unit. In the cooling unit, the heat is transferred to the external cooling circuit which is usually part of a larger external cooling system. This chapter deals with the internal cooling circuit.

Applicability

The information in this chapter is applicable to cabinet-built ACS880 liquid-cooled multidrive. Except where otherwise indicated, the information is also applicable to drives built out of ACS880 liquid-cooled multidrive modules.

Internal cooling system

Note: This section describes cabinet-built, liquid-cooled ACS880 drives. The information in this section can be used as guidelines for building a drive system out of ACS880 liquid-cooled modules.

Each cubicle has an inlet and an outlet manifold, fitted with a stop valve and a drain valve. The stop valves can be closed to isolate all modules in the cubicle from the main cooling circuit.

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit.
The coolant used with ACS880 liquid-cooled drive systems is Antifrogen® L by Clariant International Ltd (www.clariant.com), mixed with water. See section Coolant specification (page 143).

**Connection to a cooling unit**

- **Connection to an ACS880-1007LC cooling unit**

Refer to the ACS880-1007LC liquid cooling unit user’s manual (3AXD50000129607 [English]).
Connection to a custom cooling unit

General requirements

Equip the system with an expansion tank to damp pressure rise due to volume changes when the temperature varies. Equip the system with a pump that provides a nominal flow and pressure. Keep the pressure within the limits specified in Technical data (page 143). Install a pressure regulator to make sure that the maximum permissible operating pressure is not exceeded.

Install a bleed valve at the highest point of the cooling circuit, and a drain valve at the lowest point.

The materials that can be used are listed in section Cooling circuit materials (page 145).

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in Technical data (page 143). Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

Note: This section is applicable to cabinet-built ACS880 liquid-cooled multdrives. It is also applicable to drives built out of ACS880 liquid-cooled multidrive modules that follow the design shown in section Internal cooling system (page 139).

Both the drive and coolant must be at room temperature before filling in the cooling circuit.

WARNING!

Make sure that the maximum permissible operating pressure is not exceeded. When necessary regulate the pressure to appropriate level by draining excess coolant out of the system.

WARNING!

Bleeding of the cooling circuit is very important and has to be done with great care. Air bubbles in the cooling circuit may reduce or completely block coolant flow and lead to overheating. Let the air out of the cooling system while filling in coolant and, eg. after any power module replacements.

Drive line-ups with an ACS880-1007LC cooling unit

Follow the filling up and bleeding instructions in ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]).

Drive line-ups with a custom cooling unit

Note:

• In filling up the system, the drain valves in the line-up are used only to vent the air from the circuit so that it can be displaced by the coolant. The actual bleeding of the circuit must be done via an external bleed valve installed at the highest point of the cooling circuit. The most practical location for the valve is usually near or at the cooling unit.
• Observe the instructions given by the manufacturer of the cooling unit. Pay special attention to filling up and bleeding the pumps properly as they may be damaged if operated when dry.
• Draining coolant into the sewer system is not allowed.

1. Open the bleed valve at the cooling unit.
2. Open the inlet valve and the outlet-side drain valve of one cubicle. Keep the outlet valve and the inlet-side drain valve closed.
3. Attach a hose to the outlet-side drain valve and lead it into a suitable container.
4. Fill the circuit with coolant. For coolant specification, see Coolant specification (page 143).
5. As the piping and modules in the cubicle fills up, coolant starts to flow from the hose. Let some coolant flow out, then close the drain valve.
6. Close the inlet valve.
7. Repeat steps 2 to 6 for all cubicles in the line-up.
8. Open the inlet and outlet valves in all cubicles. Let any air remaining in the system out through the bleed valve at the cooling unit.
9. Close the bleed valve at the cooling unit.
10. Continue to fill in coolant until a base pressure of 100…150 kPa is achieved.
11. Open the bleed valve of the pump to let out any air.
12. Re-check the pressure and add coolant if necessary.
13. Start the coolant pump. Let any air remaining in the system out through the bleed valve at the cooling unit.
14. After one to two minutes, stop the pump or block the coolant flow with a valve.
15. Re-check the pressure and add coolant if necessary.
16. Repeat steps 13 to 15 a few times until all air is let out of the cooling circuit. Listen for a hummin sound and/or feel the piping for vibration to find out if there is still air left in the circuit.

Draining the internal cooling circuit

Note: This section is applicable to cabinet-built, liquid-cooled ACS880 drives. It is also applicable to drives built out of ACS880 liquid-cooled multidrive modules that follow the designs shown in their respective hardware manuals.

The modules in each cubicle can be drained through the drain valves without draining the whole internal cooling circuit.

WARNING!
Hot, pressurized coolant can be present in the cooling circuit. Do not work on the cooling circuit before the pressure is released by stopping the pumps and draining coolant.

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.

Note: Draining coolant into the sewer system is not allowed.
3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
   • dry the cooling circuit with air,
   • fill the cooling circuit with coolant specified under Coolant specification (page 143).
   • drain the cooling circuit again.

Maintenance intervals
As a general rule, the quality of the coolant should be checked at intervals of two years. This can be done by distributors of Antifrogen® L (see www.clariant.com) if a 250 milliliter sample is provided.

Technical data

Coolant specification

Coolant type
Antifrogen® L (by Clariant International Ltd, www.clariant.com), mixed with water.

Ready-mixed coolant is available from Clariant distributors and ABB Service representatives. The standard Antifrogen® L / water solution of 25/75% (volume) is usable down to a storage temperature of -16 °C (3.2 °F). 50/50% coolant is optionally available for storage temperatures down to -40 °C (-40 °F). Note that operation below 0 °C (32 °F) is not allowed regardless of the freezing point of the coolant.

WARNING!
The warranty does not cover damage occurring from use of improper coolant.

Temperature limits

Freeze protection: The freezing point of the coolant is determined by the concentration of heat transfer fluid in the mixture.

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. An operating pressure of more than 150 kPa is required for sufficient flow.

The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). For derating with other ratios, contact your local ABB representative.

Incoming coolant temperature:
• 4…40 °C (39…104 °F): no drive output current derating required
• 40…45 °C (104…113 °F): drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (a).
• 45…50 °C (113…122 °F):
  • If components with a maximum operating temperature of 55 °C (131 °F) are installed in the same space as the drive modules, drive output current must be derated by 6 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (c).
  • If there are no components with a maximum operating temperature of 55 °C (131 °F) installed in the same space as the drive modules, drive output current must be
derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (b).

The drawing below shows the derating factor \( k \) in relation to coolant temperature.

Condensation is not allowed. The minimum coolant temperature to avoid condensation (at an atmospheric pressure of 1 bar) is shown below as a function of relative humidity (RH) and ambient temperature \( T_{\text{air}} \).

<table>
<thead>
<tr>
<th>( T_{\text{air}} ) (°C)</th>
<th>Min. ( T_{\text{coolant}} ) (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RH = 95%</td>
</tr>
<tr>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>10</td>
<td>9.2</td>
</tr>
<tr>
<td>15</td>
<td>14.2</td>
</tr>
<tr>
<td>20</td>
<td>19.2</td>
</tr>
<tr>
<td>25</td>
<td>24.1</td>
</tr>
<tr>
<td>30</td>
<td>29.1</td>
</tr>
<tr>
<td>35</td>
<td>34.1</td>
</tr>
<tr>
<td>40</td>
<td>39.0</td>
</tr>
<tr>
<td>45</td>
<td>44.0</td>
</tr>
<tr>
<td>50</td>
<td>49.0</td>
</tr>
<tr>
<td>55</td>
<td>53.9</td>
</tr>
</tbody>
</table>

= Not allowed as standard but the coolant temperature must be 4 °C (39 °F) or above. Consult an ABB representative if operation below coolant temperature 4 °C is required.

Example: At an air temperature of 45 °C and relative humidity of 65% the coolant temperature may not be below +36.8 °C

**Maximum temperature rise:** Depends on heat losses and mass flow. Typically 10 °C (18 °F) with nominal losses and flow.
### Pressure limits

**Base pressure**: 100…150 kPa (recommended); 200 kPa (maximum). “Base pressure” denotes the pressure of the system compared with the atmospheric pressure when the cooling circuit is filled with coolant.

**Air counterpressure in the expansion tank**: 40 kPa

**Design pressure (PS)**: 600 kPa

**Nominal pressure difference** (between main in/out lines): 120 kPa

**Maximum pressure difference** (between main in/out lines): 200 kPa

### Cooling circuit materials

Materials used in the internal cooling circuit are listed below. These are also the only materials that can be used in the external cooling circuit.

- stainless steel AISI 316L (UNS 31603)
- heavy gauge aluminum
- plastic materials such as PA, PEX and PTFE

**Note**: PVC hoses are not suitable for use with antifreeze.

- rubber gasketing NBR (nitrile rubber).

---

**WARNING!**

If connecting external piping to the internal cooling circuit, use only materials that are specified above. Copper, brass or bronze must not be used under any circumstances. Even minor dissolution of copper can cause copper precipitation on aluminum and subsequent galvanic corrosion. The liquid cooling system must not contain any zinc (eg. galvanized pipes).

---

If the plant incorporates normal iron pipes or cast iron accessories (eg. motor housings), a liquid cooling unit with a heat exchanger (such as the ACS880-1007LC) must be used to separate the systems.

---
**Technical data**

**Contents of this chapter**

This chapter contains the technical data for the supply modules.

**Ratings**

<table>
<thead>
<tr>
<th>Module type</th>
<th>No overload use</th>
<th>Light overload use</th>
<th>Heavy-duty use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880-304LC-..</td>
<td>(I_1) A (AC) (I_2) A (DC) (I_{max}) A (DC) (S_n) A (AC) (P_n) kW (DC)</td>
<td>(I_{ld}) A (DC) (P_{ld}) kW (DC)</td>
<td>(I_{hd}) A (DC) (P_{hd}) kW (DC)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(U_N = 690\text{ V})</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-0820A-7+A019</td>
<td>820 1000 1500 980 1225 932</td>
<td>960 895</td>
<td>800 745</td>
</tr>
<tr>
<td>-1540A-7+A019</td>
<td>1540 1880 2820 1840 2303 1752</td>
<td>1805 1682</td>
<td>1504 1401</td>
</tr>
<tr>
<td>-2290A-7+A019</td>
<td>2290 2805 4208 2737 3435 2614</td>
<td>2693 2509</td>
<td>2244 2091</td>
</tr>
<tr>
<td>-3040A-7+A019</td>
<td>3040 3720 5580 3633 4556 3466</td>
<td>3571 3328</td>
<td>2976 2773</td>
</tr>
</tbody>
</table>

**Definitions**

**Nominal ratings**

- **\(U_N\)** Nominal input voltage. For \(U_1\), see *Electrical power network specification (page 152)*. For \(U_2\), see *DC connection data (page 152)*.
- **\(I_1\)** Continuous rms input (AC) current. No overload capability at the coolant temperature of 40 °C (104 °F) and air temperature of 45 °C (113 °F).
- **\(I_2\)** Continuous rms output (DC) current. No overload capability at the coolant temperature of 40 °C (104 °F) and air temperature of 45 °C (113 °F).
- **\(I_{max}\)** Maximum output (DC) current. Available for 10 s at start, otherwise as long as allowed by module temperature.
- **\(S_n\)** Nominal apparent (AC) power
**Technical data**

Maximum input (AC) current

- \( I_{\text{max}} \)

Nominal output (DC) power

- \( P_n \)

Light-overload use (50% overload capability) ratings

- \( I_{Ld} \) Continuous current. 50% overload is allowed for one minute every 5 minutes.
- \( P_{Ld} \) Output power in light-overload use

Heavy-duty use (50% overload capability) ratings

- \( I_{Hd} \) Continuous current. 50% overload is allowed for one minute every 5 minutes.
- \( P_{Hd} \) Output power in heavy-duty use

**Derating**

**Ambient temperature derating**

In the temperature range +45…55 °C (+113…131 °F), the rated output current is derated by 0.5 percentage points for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor \( k \):

![Derating factor graph](image.png)

**Coolant temperature derating**

For the coolant temperature derating, see *Temperature limits (page 143).*

**Antifreeze content derating**

For the antifreeze content derating, see *Temperature limits (page 143).*

**Altitude derating**

At altitudes 0…2000 m (6561.7 ft), no derating. For altitudes over 2000 m (6561.7 ft), contact ABB.

**Type equivalence table and frame sizes**

<table>
<thead>
<tr>
<th>Module type</th>
<th>Basic module type</th>
<th>Frame size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880-304LC-0820A-7+A019</td>
<td>ACS880-304LC-0820A-7-A019</td>
<td>1×D8D</td>
</tr>
<tr>
<td>ACS880-304LC-1540A-7+A019</td>
<td>ACS880-304LC-0820A-7-A019</td>
<td>2×D8D</td>
</tr>
<tr>
<td>ACS880-304LC-2290A-7+A019</td>
<td>ACS880-304LC-0820A-7-A019</td>
<td>3×D8D</td>
</tr>
<tr>
<td>ACS880-304LC-3040A-7+A019</td>
<td>ACS880-304LC-0820A-7-A019</td>
<td>4×D8D</td>
</tr>
</tbody>
</table>
Fuses

■ AC fuses

For the AC fuse types and ordering codes, see section AC fuses (page 131). For the locations of the AC fuses in the main circuit, see section Overview diagrams (page 19).

Dimensions and weights

The dimensions of the supply module are:
• height 242 mm (9.53 in)
• depth 292.0 mm (11.50 in)
• width 170 mm (6.69 in)
• weight 12 kg (26.5 lb).

For the dimensional drawing, see Liquid-cooled D8D module (page 154).

Free space requirements

Leave 20 mm (0.79 in) free space in front of the module for smooth installation and to enable cooling air flow and also 30 mm (1.18 in) above the module for air flow.

Leave also enough space for installing the pipes to the coolant connectors. For a reliable connection, the end of the pipe entering the connector must be completely intact for a length of at least 5 cm (2").

For the free space requirements of the cabinet, see Cabinet design and construction instructions for ACS880 air-cooled and liquid-cooled multidrive modules (3AUA0000107668 [English]).
Losses, cooling circuit data and efficiency

<table>
<thead>
<tr>
<th>Module type</th>
<th>Frame</th>
<th>Power loss</th>
<th>Coolant volume</th>
<th>Coolant flow rate</th>
<th>Pressure loss</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880-304LC-…</td>
<td></td>
<td>kW (kW)</td>
<td>Modules + cabinet</td>
<td>l/min (US gal/min)</td>
<td>kPa</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>I (US qt)</td>
<td>I (US qt)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U_N = 690 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0820A-7+A019</td>
<td>1×D8D</td>
<td>3.5</td>
<td>0.2 (0.2)</td>
<td>0.9 (0.9)</td>
<td>12 (3.2)</td>
<td>120</td>
</tr>
<tr>
<td>-1540A-7+A019</td>
<td>2×D8D</td>
<td>6.6</td>
<td>0.3 (0.4)</td>
<td>1.2 (1.3)</td>
<td>12 (3.2)</td>
<td>120</td>
</tr>
<tr>
<td>-2290A-7+A019</td>
<td>3×D8D</td>
<td>9.8</td>
<td>0.5 (0.5)</td>
<td>1.4 (1.5)</td>
<td>24 (6.3)</td>
<td>120</td>
</tr>
<tr>
<td>-3040A-7+A019</td>
<td>4×D8D</td>
<td>13.0</td>
<td>0.7 (0.7)</td>
<td>1.9 (2.0)</td>
<td>24 (6.3)</td>
<td>120</td>
</tr>
</tbody>
</table>

Definitions

- **Power loss**: Total heat dissipation
- **Mass flow**: Total mass flow of module(s). See section *Cabinet configuration overview (page 34)*.
- **Pressure loss**: Pressure loss with nominal liquid flow

Auxiliary circuit current consumption

<table>
<thead>
<tr>
<th>Device</th>
<th>U_n</th>
<th>U_n</th>
<th>f</th>
<th>I_max</th>
<th>I_n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V DC</td>
<td>V AC</td>
<td>Hz</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Control unit ZCU-14 with options</td>
<td>24</td>
<td>-</td>
<td>-</td>
<td>2.05</td>
<td>-</td>
</tr>
<tr>
<td>Cabinet fan</td>
<td>-</td>
<td>230</td>
<td>50/60</td>
<td>-</td>
<td>1.4</td>
</tr>
<tr>
<td>Cabinet fan</td>
<td>-</td>
<td>115</td>
<td>50/60</td>
<td>-</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Supply frequency

Maximum current consumption

Nominal current consumption

Nominal voltage
Tightening torques

Unless a tightening torque is specified in the text, the following torques can be used.

### Electrical connections

<table>
<thead>
<tr>
<th>Size</th>
<th>Torque</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>0.5 N·m (4.4 lbf·in)</td>
<td>Strength class 4.6...8.8</td>
</tr>
<tr>
<td>M4</td>
<td>1 N·m (9 lbf·in)</td>
<td>Strength class 4.6...8.8</td>
</tr>
<tr>
<td>M5</td>
<td>4 N·m (35 lbf·in)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M6</td>
<td>9 N·m (6.6 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M8</td>
<td>22 N·m (16 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M10</td>
<td>42 N·m (31 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M12</td>
<td>70 N·m (52 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M16</td>
<td>120 N·m (90 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
</tbody>
</table>

### Mechanical connections

<table>
<thead>
<tr>
<th>Size</th>
<th>Max. torque</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5</td>
<td>6 N·m (53 lbf·in)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M6</td>
<td>10 N·m (7.4 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M8</td>
<td>24 N·m (17.7 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
</tbody>
</table>

### Insulation supports

<table>
<thead>
<tr>
<th>Size</th>
<th>Max. torque</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>5 N·m (44 lbf·in)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M8</td>
<td>9 N·m (6.6 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M10</td>
<td>18 N·m (13.3 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M12</td>
<td>31 N·m (23 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
</tbody>
</table>

### Cable lugs

<table>
<thead>
<tr>
<th>Size</th>
<th>Max. torque</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>15 N·m (11 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M10</td>
<td>32 N·m (23.5 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
<tr>
<td>M12</td>
<td>50 N·m (37 lbf·ft)</td>
<td>Strength class 8.8</td>
</tr>
</tbody>
</table>
Electrical power network specification

<table>
<thead>
<tr>
<th>Supply voltage ($U_1$)</th>
<th>6-pulse, 12-pulse and 24-pulse supply modules: ACS880-304LC-xxxx-7+A019: 525 … 690 V AC (525 … 600 V AC for UL/CSA) 3-phase ± 10%. This is indicated in the type designation label as typical input voltage levels 3–525/600/690 V AC (600 V AC for UL/CSA).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50/60 Hz, Variation ± 5% of the nominal frequency</td>
</tr>
<tr>
<td>Imbalance</td>
<td>Maximum 3% of nominal phase-to-phase voltage</td>
</tr>
<tr>
<td>Short-circuit withstand strength (IEC/EN 61439-1)</td>
<td>Short-circuit withstand strength of one DSU cabinet containing from one to four D8D modules with the cabinet construction described in this manual:  • rated peak withstand current ($I_{pk}$) = 143 kA  • rated short-time withstand current ($I_{cw}$) = 65 kA / 1 s. Rated conditional short-circuit current of one D8D module ($I_{cc}$) 65 kA with module’s AC fuses given in this manual.</td>
</tr>
<tr>
<td>Power factor</td>
<td>Fundamental power factor = 0.97…0.98 (at nominal load)</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>OVCIII</td>
</tr>
<tr>
<td>Input terminals</td>
<td>See dimension drawings of Liquid-cooled D8D module.</td>
</tr>
<tr>
<td>Transformer for 12-pulse supply</td>
<td>according to IEC60076-1:2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connection</th>
<th>Dy 11 d0 or Dyn 11 d0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase shift between secondaries</td>
<td>30° electrical</td>
</tr>
<tr>
<td>Voltage difference between secondaries</td>
<td>&lt; 0.5%</td>
</tr>
<tr>
<td>Short-circuit impedance of secondaries</td>
<td>&gt; 5%</td>
</tr>
<tr>
<td>Short-circuit impedance difference between secondaries</td>
<td>&lt;10% of the percentage impedance</td>
</tr>
</tbody>
</table>

No grounding of the secondaries allowed. Static shield recommended.

**DC connection data**

<table>
<thead>
<tr>
<th>Voltage ($U_2$) 6-pulse, 12-pulse and 24-pulse modules</th>
<th>ACS880-304LC-xxxxA-7+A019: 709 … 932 V DC +10% (709 … 810 V DC for UL/CSA). This is indicated in the type designation label as typical output voltage levels 709/810/932 V DC (810 V DC for UL/CSA).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output terminals</td>
<td>See dimension drawings of Liquid-cooled D8D module. M12, torque 70 N·m (52 lbf·ft).</td>
</tr>
</tbody>
</table>

**Coolant connection data**

The coolant connectors are for 16/13 mm PA (polyamide) pipe. For more information on the pipes, see Piping (page 136).

**Power systems**

TN (grounded) and IT (ungrounded) systems

**Control unit connection data**

See chapter Supply control unit (page 157).
**Degree of protection**
Module IP00, UL open type

**Optical components**
The specifications of the optic cable are as follows:
- Storage temperature: -55 … +85 °C
- Installation temperature: -20 … +70 °C
- Maximum short-term tensile force: 50 N
- Minimum short-term bend radius: 25 mm
- Minimum long-term bend radius: 35 mm
- Maximum long-term tensile load: 1 N
- Flexing: Max. 1000 cycles

ABB drive products in general utilize 5 and 10 MBd (megabaud) optical components from Avago Technologies’ Versatile Link range. Note that the optical component type is not directly related to the actual communication speed.

**Note:**
The optical components (transmitter and receiver) on a fiber optic link must be of the same type.

Plastic optical fiber (POF) cables can be used with both 5 MBd and 10 MBd optical components. 10 MBd components also enable the use of Hard Clad Silica (HCS®) cables, which allow longer connection distances thanks to their lower attenuation. HCS® cables cannot be used with 5 MBd optical components.

The maximum lengths of fiber optic links for POF and HCS® cables are 20 and 200 meters respectively.

**Ambient conditions**

<table>
<thead>
<tr>
<th>Altitude above sea level (m)</th>
<th>Operation installed for stationary use</th>
<th>Storage in protective package</th>
<th>Transportation in protective package</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 … 2000 m (0 … 6561.7 ft)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

For altitudes over 2000 m (6561.7 ft), contact ABB.

<table>
<thead>
<tr>
<th>Air temperature (°C)</th>
<th>Operation installed for stationary use</th>
<th>Storage in protective package</th>
<th>Transportation in protective package</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 … +45 °C (32 … +113 °F)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

For altitudes over 2000 m (6561.7 ft), contact ABB.

<table>
<thead>
<tr>
<th>Relative humidity (Max)</th>
<th>Operation installed for stationary use</th>
<th>Storage in protective package</th>
<th>Transportation in protective package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 95%</td>
<td>Maximum 95%, no condensation allowed</td>
<td>Maximum 95%, no condensation allowed</td>
<td></td>
</tr>
</tbody>
</table>

No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.
### Contamination

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3C2</td>
<td>IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations</td>
</tr>
<tr>
<td>Class 2C2</td>
<td>IEC 60721-3-1:1997</td>
</tr>
<tr>
<td>Class 1C2</td>
<td>IEC 60721-3-2:1997</td>
</tr>
</tbody>
</table>

### Chemical gases

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3C2</td>
<td>Contamination</td>
</tr>
<tr>
<td>Class 2C2</td>
<td>Class 2S2</td>
</tr>
<tr>
<td>Class 1S3</td>
<td>Class 1S2</td>
</tr>
</tbody>
</table>

### Solid particles

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3S1</td>
<td>No conductive dust allowed.</td>
</tr>
</tbody>
</table>

### Vibration

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3S1</td>
<td>Class 1S3 (packing must support this, otherwise 1S2)</td>
</tr>
<tr>
<td>Class 2S2</td>
<td>D8D modules in a 600 mm wide Rittal TS 8 enclosure tested in a typical cabinet assembly, marine tested according to:</td>
</tr>
<tr>
<td></td>
<td>Max. 1 mm (0.04 in.) (peak value, 5 ... 13.2 Hz), max. 0.7 g (13.2 ... 100 Hz) sinusoidal</td>
</tr>
</tbody>
</table>

### Shock

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1S3</td>
<td>Not allowed</td>
</tr>
<tr>
<td>Class 2S2</td>
<td>With packing max. 100 m/s² (330 ft./s²) 11 ms</td>
</tr>
<tr>
<td>Class 2S2</td>
<td>With packing max. 100 m/s² (330 ft./s²) 11 ms</td>
</tr>
</tbody>
</table>

## Cooling

Cooling method: Liquid cooling

## Materials

### Module

Busbars are made of tin plated copper sheet.

### Package

The material of the package is: Plywood support, plywood box with metal corners, PET straps or screws.

The package consists of a plywood sleeve, bottom and top element, and of a plywood support. The plywood support is attached onto the box bottom with nails, screws or staples.
The product is screwed onto the support to keep it in position inside the package. Protection against conditions causing corrosion is achieved by wrapping the product in VCI sheet. Packaging is secured with screws or plastic straps.

- **Internal cooling circuit**
  See chapter *Internal cooling circuit (page 139)*.

- **Disposal**
  The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated.

  Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code.

  Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

**Standards**

See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules [3AXD50000048634 (English)]*.

**Markings**

See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules [3AXD50000048634 (English)]*.

**Disclaimer**

- **Generic disclaimer**
  The manufacturer shall have no obligation with respect to any product which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to the manufacturer’s instructions; or (iv) has failed as a result of ordinary wear and tear.

- **Cybersecurity 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.
Supply control unit

Contents of this chapter

This chapter:
• describes the connections of the supply control units used with the supply modules
• contains the specifications of the inputs and outputs of the control units.

ZCU-14 control unit

A ZCU-14 control unit controls the supply unit. The ZCU-14 control unit consists of a ZCON control board contained in a plastic housing.

The control unit of D8D modules is a separate unit and it is always installed in the cabinet (on the cabinet wall etc), NOT on the module. For the connections, see chapter Example circuit diagrams (page 177). ABB does not offer ready cables or cable sets for connecting the control unit.
ZCU-14 layout and connections

The layout and connections of the ZCU-14 are shown below.

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPOW</td>
</tr>
<tr>
<td>XAI</td>
</tr>
<tr>
<td>XAO</td>
</tr>
<tr>
<td>XD2D</td>
</tr>
<tr>
<td>XRO1</td>
</tr>
<tr>
<td>XRO2</td>
</tr>
<tr>
<td>XRO3</td>
</tr>
<tr>
<td>XD24</td>
</tr>
<tr>
<td>XDIO</td>
</tr>
<tr>
<td>XDI</td>
</tr>
<tr>
<td>XSTO</td>
</tr>
<tr>
<td>X12</td>
</tr>
<tr>
<td>X13</td>
</tr>
<tr>
<td>X202</td>
</tr>
<tr>
<td>X203</td>
</tr>
<tr>
<td>X204</td>
</tr>
<tr>
<td>X205</td>
</tr>
<tr>
<td>J1, J2</td>
</tr>
<tr>
<td>J3</td>
</tr>
<tr>
<td>J6</td>
</tr>
</tbody>
</table>
## ZCU-14 default I/O connection diagram

The diagram shows the control connections of the supply unit, and the default meaning or use of the signals in the supply unit control program.

<table>
<thead>
<tr>
<th>Relay outputs</th>
<th>XRO1...XRO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>XRO1: Running</td>
<td>NO 3</td>
</tr>
<tr>
<td></td>
<td>COM 2</td>
</tr>
<tr>
<td></td>
<td>NC 1</td>
</tr>
<tr>
<td>XRO2: Fault-1</td>
<td>NO 3</td>
</tr>
<tr>
<td></td>
<td>COM 2</td>
</tr>
<tr>
<td></td>
<td>NC 1</td>
</tr>
<tr>
<td>XRO3: MCB ctrl</td>
<td>NO 3</td>
</tr>
<tr>
<td></td>
<td>COM 2</td>
</tr>
<tr>
<td></td>
<td>NC 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th>XPOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V DC, 2 A</td>
<td>GND 2</td>
</tr>
<tr>
<td></td>
<td>+24VI 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference voltage and analog inputs</th>
<th>A11/A12 current/voltage selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A11: U</td>
<td>A12- 7</td>
</tr>
<tr>
<td>A12: U</td>
<td>A12+ 6</td>
</tr>
<tr>
<td>A11+: 5</td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>AGND 3</td>
</tr>
<tr>
<td>10 V DC, RL1...10 kohm</td>
<td>+VREF 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog outputs</th>
<th>XAO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero 0...20 mA, RL &lt; 500 ohm</td>
<td>AGND 4</td>
</tr>
<tr>
<td>Zero 0...20 mA, RL &lt; 500 ohm</td>
<td>AGND 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive-to-drive link (not connected by default)</th>
<th>J3, XD2D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive-to-drive link termination</td>
<td>ON OFF</td>
</tr>
<tr>
<td>Drive-to-drive link</td>
<td>Shield 4</td>
</tr>
<tr>
<td></td>
<td>BGN1 3</td>
</tr>
<tr>
<td></td>
<td>A 2</td>
</tr>
<tr>
<td></td>
<td>B 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>XSTO connector</th>
<th>XSTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>XSTO connector. Both circuits (power module, control unit) must be closed for the supply unit to start. (IN1 and IN2 must be connected to OUT).</td>
<td>IN2 4</td>
</tr>
<tr>
<td></td>
<td>IN1 3</td>
</tr>
<tr>
<td></td>
<td>SGND 2</td>
</tr>
<tr>
<td></td>
<td>OUT 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>XDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset (0 -&gt; 1 = fault reset)</td>
<td>D16 6</td>
</tr>
<tr>
<td>Not in use by default.</td>
<td>D15 5</td>
</tr>
<tr>
<td>Auxiliary circuit breaker fault</td>
<td>D14 4</td>
</tr>
<tr>
<td>MCB fb (1 = main breaker/contactor closed)</td>
<td>D13 3</td>
</tr>
<tr>
<td>Run enable (1 = run enable)</td>
<td>D12 2</td>
</tr>
<tr>
<td>Temp fault (0 = overtemperature)</td>
<td>D11 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital input/outputs</th>
<th>XDIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not in use as default</td>
<td>DIO2 2</td>
</tr>
<tr>
<td>Not in use as default</td>
<td>DIO1 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground selection</th>
<th>XD24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary voltage output, digital input interlock</td>
<td>DIOGN1 5</td>
</tr>
<tr>
<td>Digital input/output ground</td>
<td>DIOGN1 5</td>
</tr>
<tr>
<td>Digital input ground (common)</td>
<td>DICOM 3</td>
</tr>
<tr>
<td>+24 V DC 200 mA</td>
<td>+24VD 4</td>
</tr>
<tr>
<td>+24 V DC 200 mA</td>
<td>+24VD 2</td>
</tr>
<tr>
<td>Not in use by default</td>
<td>DIIL 1</td>
</tr>
</tbody>
</table>

Safety functions module connection is not available in the supply units. X12

Control panel connection (connected to control panel by default) X13

Memory unit connection X205
### 160 Supply control unit

**Note:**

Wire sizes and tightening torques: 0.5…2.5 mm² (24…12 AWG) and 0.5 N·m (5 lbf·in) for both stranded and solid wiring.

As the very same control program is in use with different diode supply types, the default connections are not applicable with them all. For example, some units have the DC link charging, some do not have it. The default parameter settings and IO connections are valid for the version without the charging circuit.

1) Use of the signal in the control program. When parameter 120.30 _External charge enable_ has value Yes, the control program reserves this I/O terminal for external charging circuit control and monitoring, and parameters 110.24 _RO1 source_ and 110.30 _RO3 source_ are write-protected. If the value is No, you can use the I/O terminal for other purposes.

2) Current [0(4)…20 mA, \( R_{in} > 100 \) ohm] or voltage [0(2)…10 V, \( R_{in} > 200 \) kohm] input selected by jumper J1. Change of setting requires reboot of control unit.

3) Current [0(4)…20 mA, \( R_{in} > 100 \) ohm] or voltage [0(2)…10 V, \( R_{in} > 200 \) kohm] input selected by jumper J2. Change of setting requires reboot of control unit.

4) Must be set to ON when the unit is the first or last unit on the drive-to-drive (D2D) link.

5) Determines whether DICOM is separated from DIOGND (ie. common reference for digital inputs floats). See also section _ZCU-14 ground isolation diagram (page 163)_.

<table>
<thead>
<tr>
<th>DICOM connected to DIOGND</th>
<th>DICOM and DIOGND separate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

6) Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.

7) The function is only implemented in inverter units, not with the supply units. This input only acts as a true Safe torque off input in control units controlling a motor. In other applications (such as a supply or brake unit), de-energizing the IN1 and/or IN2 terminal will stop the unit but not constitute a true safety function.

- **External power supply for the control unit (XPOW)**

The cabinet builder must arrange an auxiliary voltage of 24 V DC to power up the ZCU control unit. External +24 V (2 A) power supply for the control unit is connected to terminal block XPOW.
ZCU-14 control unit connector data

Power supply (XPOW)
- Connector pitch 5 mm, wire size 2.5 mm²
- 24 V (±10%) DC, 2 A
- External power input.

Relay outputs RO1…RO3 (XRO1…XRO3)
- Connector pitch 5 mm, wire size 2.5 mm²
- 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 2.5 mm²
- 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…DI6 (XDI:1…XDI:6)
- Connector pitch 5 mm, wire size 2.5 mm²
- 24 V logic levels: “0” < 5 V, “1” > 15 V
- $R_{in}$: 2.0 kohm
- Input type: NPN/PNP (DI1…DI5), NPN (DI6)
- Hardware filtering: 0.04 ms, digital filtering up to 8 ms
- DI6 (XDI:6) can alternatively be used as an input for a PTC sensor.
- “0” > 4 kohm, “1” < 1.5 kohm
- $I_{max}$: 15 mA (DI1…DI5), 5 mA (DI6)

Start interlock input DIIL (XD24:1)
- Connector pitch 5 mm, wire size 2.5 mm²
- 24 V logic levels: “0” < 5 V, “1” > 15 V
- $R_{in}$: 2.0 kohm
- Input type: NPN/PNP
- Hardware filtering: 0.04 ms, digital filtering up to 8 ms

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…16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used).
- DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual, parameter group 111.

+24VD

DIOx

$R_L$

DIOGND

Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)
- Connector pitch 5 mm, wire size 2.5 mm²
- Maximum output current: 10 mA
- 10 V ±1% and –10 V ±1%, $R_{load}$ 1…10 kohm
### Analog inputs AI1 and AI2

<table>
<thead>
<tr>
<th>Connector pitch 5 mm, wire size 2.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current input: $-20\ldots20$ mA, $R_\text{in} = 100$ ohm</td>
</tr>
<tr>
<td>Voltage input: $-10\ldots10$ V, $R_\text{in} &gt; 200$ kohm</td>
</tr>
<tr>
<td>Differential inputs, common mode range ±30 V</td>
</tr>
<tr>
<td>Sampling interval per channel: 0.25 ms</td>
</tr>
<tr>
<td>Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms</td>
</tr>
<tr>
<td>Resolution: 11 bit + sign bit</td>
</tr>
<tr>
<td>Inaccuracy: 1% of full scale range</td>
</tr>
</tbody>
</table>

### Analog outputs AO1 and AO2 (XAO)

<table>
<thead>
<tr>
<th>Connector pitch 5 mm, wire size 2.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current: $0\ldots20$ mA, $R_\text{load} &lt; 500$ ohm</td>
</tr>
<tr>
<td>Frequency range: 0…300 Hz</td>
</tr>
<tr>
<td>Resolution: 11 bit + sign bit</td>
</tr>
<tr>
<td>Inaccuracy: 2% of full scale range</td>
</tr>
</tbody>
</table>

### Drive-to-drive link (XD2D)

<table>
<thead>
<tr>
<th>Connector pitch 5 mm, wire size 2.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical layer: RS-485</td>
</tr>
<tr>
<td>Termination by jumper</td>
</tr>
</tbody>
</table>

### Safe torque off connection (XSTO)

<table>
<thead>
<tr>
<th>Connector pitch 5 mm, wire size 2.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage range: -3…30 V DC</td>
</tr>
<tr>
<td>Logic levels: “0” &lt; 5 V, “1” &gt; 17 V For the drive to start, both connections must be closed (OUT1 to IN1 and IN2).</td>
</tr>
<tr>
<td>EMC (immunity) according to IEC 61326-3-1</td>
</tr>
</tbody>
</table>

### Control panel connection (X13)

<table>
<thead>
<tr>
<th>Connector: RJ-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length &lt; 3 m</td>
</tr>
</tbody>
</table>

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.
ZCU-14 ground isolation diagram

* Ground selector (J6) settings

(ZCU-12)  (ZCU-14)

All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.

(ZCU-12)  •  (ZCU-14)

Ground of digital inputs D1…D5 and DIIL (DICOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.
Dimension drawings

Contents of this chapter

This chapter shows dimensions of the supply modules and accessories.
Liquid-cooled D8D module

Dimensions in mm, 1 mm = 0.0394 in
DPMP-01 mounting kit

Cutting in the cabinet door:
109 mm × 223 mm (4.29 in. × 8.78 in.)

Plate thickness:
1.5…2.5 mm (0.059…0.098 in.)
ZCU-14 control unit

Dimensions in mm
1 mm = 0.0394 in
Support plate for ZCU-14

Dimensions in mm
1 mm = 0.0394 in

Drawhole M4 down
AC fuse 170M6467

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>53</td>
<td>92</td>
<td>76</td>
<td>M12</td>
<td>10</td>
<td>(\phi30)</td>
</tr>
</tbody>
</table>

1 mm = 0.0394 in

Microswitch 170H0069

Note: When mounted on fuse adaptor, X is increased by Y = 25 mm.

1 mm = 0.0394 in
Charging circuit components

- Charging switch OS40FD12000

Dimensions in mm
1 mm = 0.0394 in

- Handle OHB65J6

Dimensions in mm
1 mm = 0.0394 in
172 Dimension drawings

- **Contactors**

**AF16-30-10-13**

![Diagram of contactor dimensions](AF16-30-10-13_contactor_dimensions.pdf)

Dimensions:
- **45**: 1.77"
- **80**: 3.15"
- **6**: 0.24"
- **77**: 3.03"
- **71**: 2.80"
- **5.5**: 0.22"
- **35**: 1.38"
- **ø 4.2**: 0.17"
- **2 x M4 8-32 UNC**

Drilling pattern:
- **60**: 2.36"
- **70**: 2.76"
- **5**: 0.20"

www.abb.com
170 H1007

**Fuse holders**

www.cooperindustries.com

<table>
<thead>
<tr>
<th>H</th>
<th>W</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>in</td>
<td>mm</td>
</tr>
<tr>
<td>145</td>
<td>5.71</td>
<td>43</td>
</tr>
</tbody>
</table>

**Auxiliary contact OA1G10**

2×0.75…2.5 mm² (2×18…14 AWG)

0.8 N·m (7 lb.in)

Pozidriv M3.5 Form 2
Diode bridge SKKD 81/22H4

Dimensions in mm
1 mm = 0.0394 in
www.semikron.com
Charging resistor CBH165 C
Example circuit diagrams

Contents of this chapter

This chapter contains two example circuit diagram sets. The diagram sets include:

- ACS880-304LC+A019 frame 1×D8D, analog input AI2 set for charging, no FDCO-01 DDCS communication module in use
- ACS880-304LC+A019 frames 4×D8D, FDCO-01 DDCS communication module (inverter unit – supply unit communication) in use

and with

- internal charging circuit (ABB charging kit inside supply unit cubicle)
- external 115/230 V AC control and fan supply organized by the cabinet builder
- cabinet fan
- customer terminal connections (in the circuit diagrams referring to ABB SACE Emax 2 main breaker)
- ZCU-14 control unit.

Notes:

- The IO diagram in section Default I/O connection diagram shows the default IO settings of the ACS880 diode supply control program. The default parameter settings and IO connections are valid for the supply units without the charging circuit.
- These diagrams do not necessarily match the installation-specific circuit diagrams of a tailor-made cabinet-installed unit.

The purpose of these diagrams is to help in:

- understanding the internal connections and operation of the cabinet-installed drive with a diode supply unit, and
- learning how to wire a (ACS880-304LC+A019) diode supply module when installed in a user-defined cabinet.
Component designations used in the diagrams

The circuit diagrams include:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>A58</td>
<td>DDPI board, included in a DPMP-01 panel mounting platform kit</td>
</tr>
<tr>
<td>A59</td>
<td>ACS-AP-W control panel</td>
</tr>
<tr>
<td>A51</td>
<td>ZCU-14 control unit</td>
</tr>
<tr>
<td>A57</td>
<td>FDPI-02 Diagnostics and panel interface</td>
</tr>
<tr>
<td>A518</td>
<td>FDCO-0x DDCS communication module</td>
</tr>
<tr>
<td>C22</td>
<td>24 V auxiliary voltage buffer (optional)</td>
</tr>
<tr>
<td>F3.11…F3.43</td>
<td>AC fuses for protecting the supply module</td>
</tr>
<tr>
<td>F6.1</td>
<td>Thermal switch for temperature supervision inside the supply module</td>
</tr>
<tr>
<td>F6.11…F6.14</td>
<td>Thermal switches for cabinet temperature supervision</td>
</tr>
<tr>
<td>F20, F22.x</td>
<td>Circuit breakers, auxiliary voltage circuits</td>
</tr>
<tr>
<td>F40.x</td>
<td>Charging DC fuses</td>
</tr>
<tr>
<td>G115</td>
<td>Cabinet fan</td>
</tr>
<tr>
<td>Q3</td>
<td>Charging switch fuse</td>
</tr>
<tr>
<td>Q4</td>
<td>Charging contactor</td>
</tr>
<tr>
<td>Q20, Q22</td>
<td>Auxiliary voltage switch-disconnector</td>
</tr>
<tr>
<td>Q26</td>
<td>Fan contactor</td>
</tr>
<tr>
<td>R4.xx</td>
<td>Charging resistor</td>
</tr>
<tr>
<td>S21</td>
<td>Operating switch</td>
</tr>
<tr>
<td>T01…T04</td>
<td>D8D diode supply module (ACS880-304LC+A0019)</td>
</tr>
<tr>
<td>T22</td>
<td>24 V DC power supply</td>
</tr>
<tr>
<td>T40.x</td>
<td>Charging diode bridge</td>
</tr>
</tbody>
</table>
Frame 1×D8D – Sheet 001a (Main line connections)
3 PHASE EXTERNAL SUPPLY
FOR DC CHARGING

TO INVERTER UNIT

/001a/0F
DCM
/001a/0F
DCP

Example circuit diagrams
Frame 1×D8D – Sheet 021a (115/230 V AC distribution)
Frame 1×D8D – Sheet 022a (24 V DC distribution)
Frame 1xD8D – Sheet 026a (Cabinet fans)
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Frame 1×D8D – Sheet 050c (Supply control board)
Frames 4×D8D – Sheet 001a (Main line connections)
Frames 4xD8D – Sheet 001b (Charging circuit)
Frames 4×D8D – Sheet 021a (115/230 V AC distribution)
Frames 4xD8D – Sheet 022a (24 V DC distribution)
Frames 4xD8D – Sheet 026a (Cabinet fan)
Frames 4×D8D – Sheet 031a (Customer terminals)
196 Example circuit diagrams

Frames 4×D8D – Sheet 050a (Supply control board)
Frames 4×D8D – Sheet 050b (Supply control board)
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Frames 4×D8D – Sheet 050c (Supply control board)
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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