
ABB INDUSTRIAL DRIVES

ACS880-7407LC semiconductor switch units

Hardware manual



ACS880-7407LC semiconductor switch units

Hardware manual

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Further information



1

Introduction to the manual

Contents of this manual

This chapter gives basic information on the manual.

Applicability

This manual is applicable with ACS880-7407LC semiconductor switch units.

Safety instructions

Obey 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 *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (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 and do maintenance work on the drive, or create instructions for the end user of the drive concerning the installation and maintenance of 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.

Categorization by option code

The option code (option +A123) identifies information which concerns only a certain optional selection. The options included in the unit are listed 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

Term	Description
Inverter unit	Inverter module(s) under control of one control unit, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Semiconductor switch unit	Unit equipped with a DC breaker switch for the drive DC bus short circuit protection
Supply unit	Supply module(s) under control of one control unit, and related components.

Related manuals

■ Related drive manuals

Manual	Code
General manuals	
<i>ACS880 liquid-cooled multidrive cabinets and modules safety instructions</i>	3AXD50000048633
<i>ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions</i>	3AXD50000048634
<i>ACS880 liquid-cooled multidrive cabinets mechanical installation instructions</i>	3AXD50000048635
<i>CIO-01 I/O module for distributed I/O bus control user's manual</i>	3AXD50000126880
Supply unit manuals	
<i>ACS880-207LC IGBT supply units hardware manual</i>	3AXD50000174782
<i>ACS880 IGBT supply control program firmware manual</i>	3AUA0000131562
<i>ACS880-307LC...+A018 diode supply units hardware manual</i>	3AXD50000579662
<i>ACS880 diode supply control program firmware manual</i>	3AUA0000103295
Inverter unit manuals	
<i>ACS880-107LC inverter units hardware manual</i>	3AXD50000196111
<i>ACS880 primary control program firmware manual</i>	3AUA0000085967
<i>ACS880 primary control program quick start-up guide</i>	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and other DC unit manuals	
<i>ACS880-607LC 1-phase brake units hardware manual</i>	3AXD50000481491
<i>ACS880-607LC 3-phase dynamic brake units hardware manual</i>	3AXD50000581627
<i>ACS880 (3-phase) brake control program firmware manual</i>	3AXD50000020967
<i>ACS880-1607LC DC/DC converter units hardware manual</i>	3AXD50000431342
<i>ACS880 DC/DC converter control program firmware manual</i>	3AXD50000024671

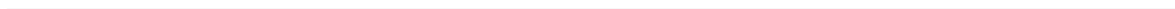
Manual	Code
<i>ACS880-7107LC DC feeder unit hardware manual</i>	3AXD50000752423
<i>ACS880-7207LC and -7307LC DC incoming units hardware manual</i>	3AXD50000752430
<i>ACS880-7407LC semiconductor switch unit hardware manual</i>	3AXD50000738984
Option manuals	
<i>ACS880-1007LC liquid cooling unit user's manual</i>	3AXD50000129607
<i>ACS-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Converter module lifting device for drive cabinets hardware manual</i>	3AXD50000210268
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

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

■ **Related DC breaker switch manuals**

The related DC breaker switch manuals are available from Astrol Electronics AG www.astrol.ch:

- User's manual (AD-10811-020)
- Astrol Maintenance Plan (AD-10811-041).



2

Operation principle and hardware description

Contents of this chapter

This chapter describes the intended use and construction of the semiconductor switch unit ACS880-7407LC. The chapter also presents the type designation label and the type code.

Operation principle

The semiconductor switch unit protects the drive DC bus in a short-circuit situation. The main component is a semiconductor DC breaker switch. The DC breaker switch breaks the DC bus when it detects a fault current. This limits the current efficiently and rapidly due to semiconductor technology. The DC breaker switch can be connected either to the DC+ or DC- busbar.

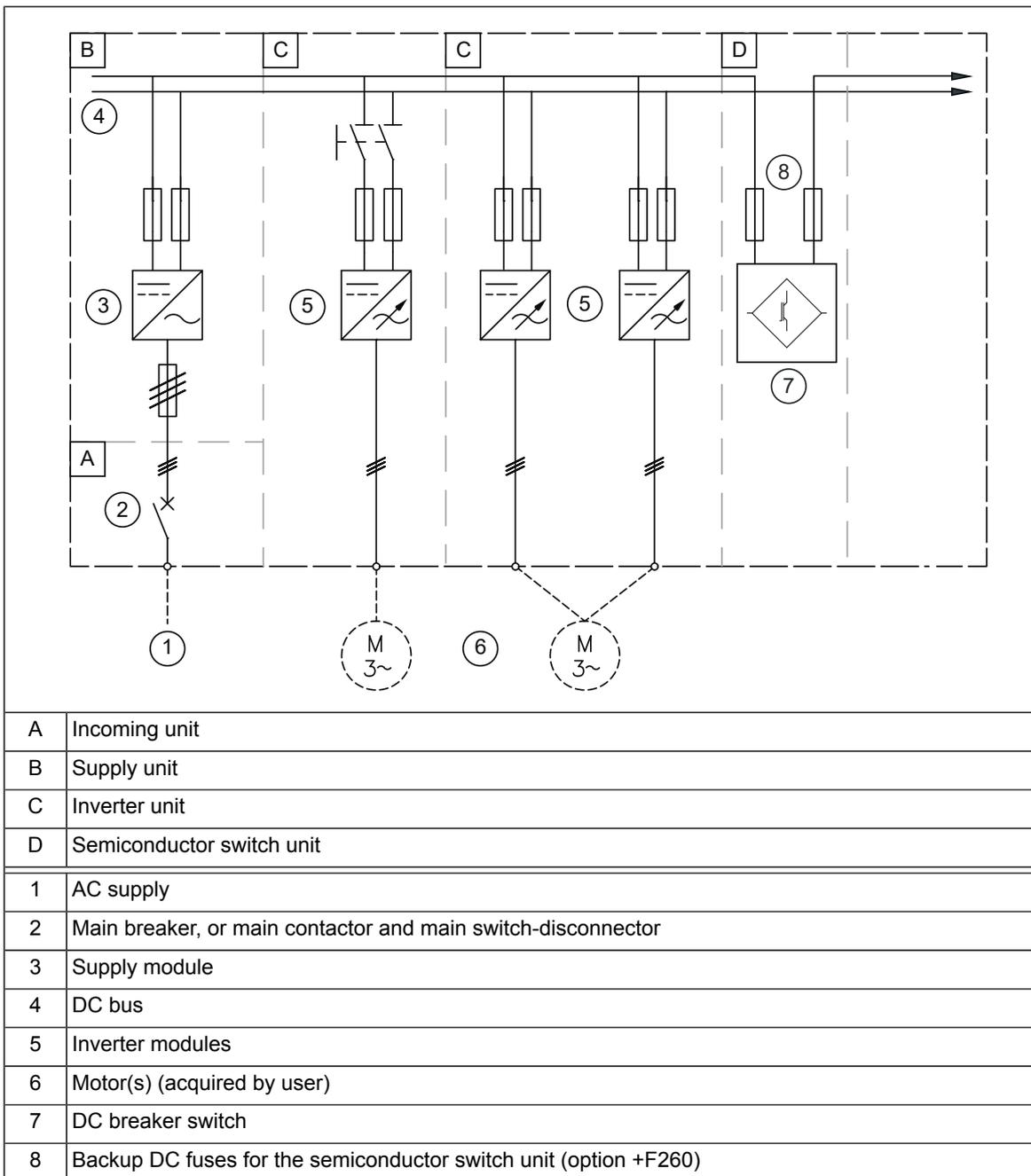
- If it is necessary to break the fault current in both poles, it is possible to add two units (and DC breaker switches) into the system, one connected to DC+ busbar and the other to DC- busbar.
 - Liquid-cooled
 - Bidirectional functionality
 - Three sizes
 - When necessary, the unit can be equipped with fuses for backup protection (option +F260). Refer to the appropriate requirements, such as, for example, the rule requirements of the relevant classification society in case of marine projects.
 - If isolation is required in addition to the short circuit and overload protection, it is possible to combine the semiconductor switch unit with the DC incoming unit (ACS880-7207LC or ACS880-7307LC).
-

14 Operation principle and hardware description

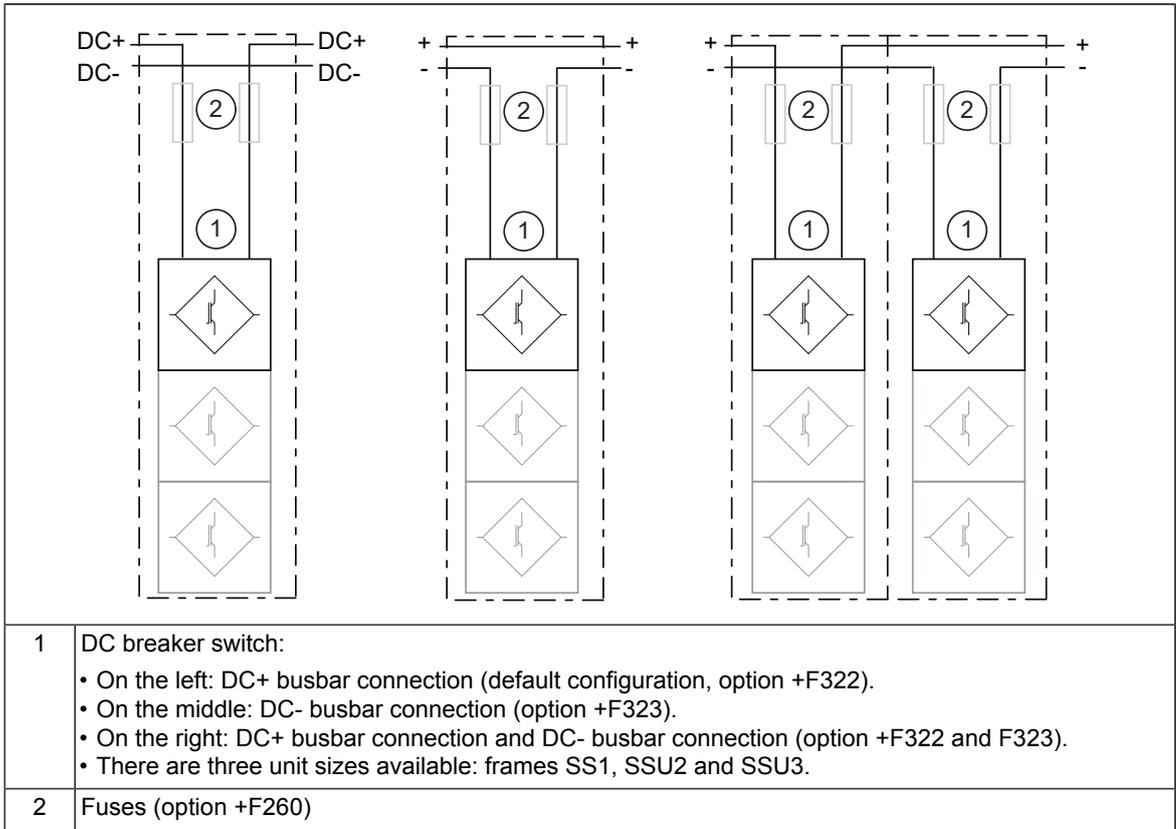
- The unit operates independently and does not require any external control system.
- The unit provides interfaces to external control systems for monitoring, interlocking/trigerring and configuration purposes.

Overview diagram of the drive system

This diagram shows an example multidrive. The supply unit connects the drive to the AC supply network, and converts the voltage to DC. The DC bus distributes DC voltage to the inverter units and other units that are optionally included in the delivery, such as a semiconductor switch unit.

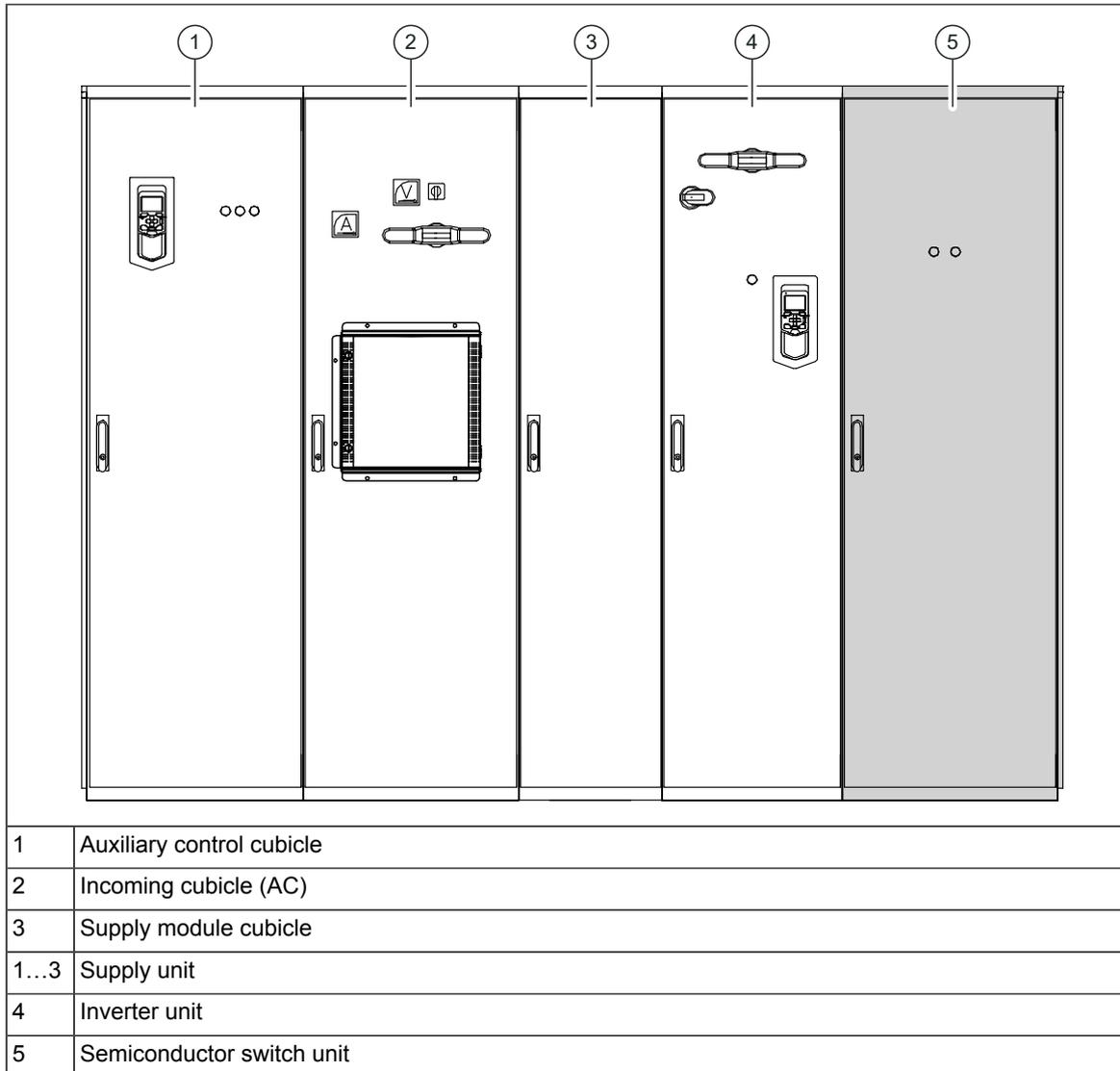


Overview diagram of the semiconductor switch unit

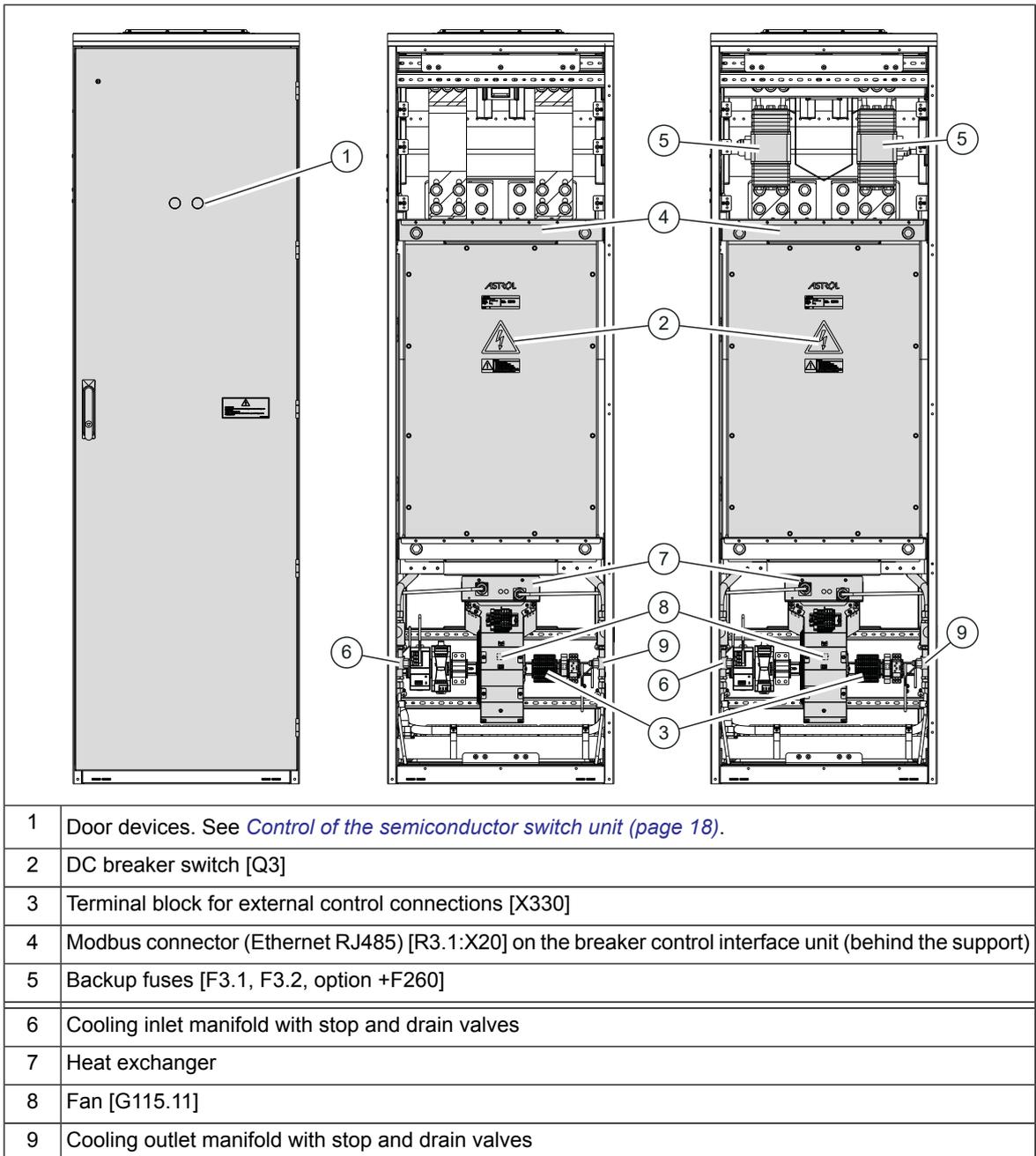


Layout drawings

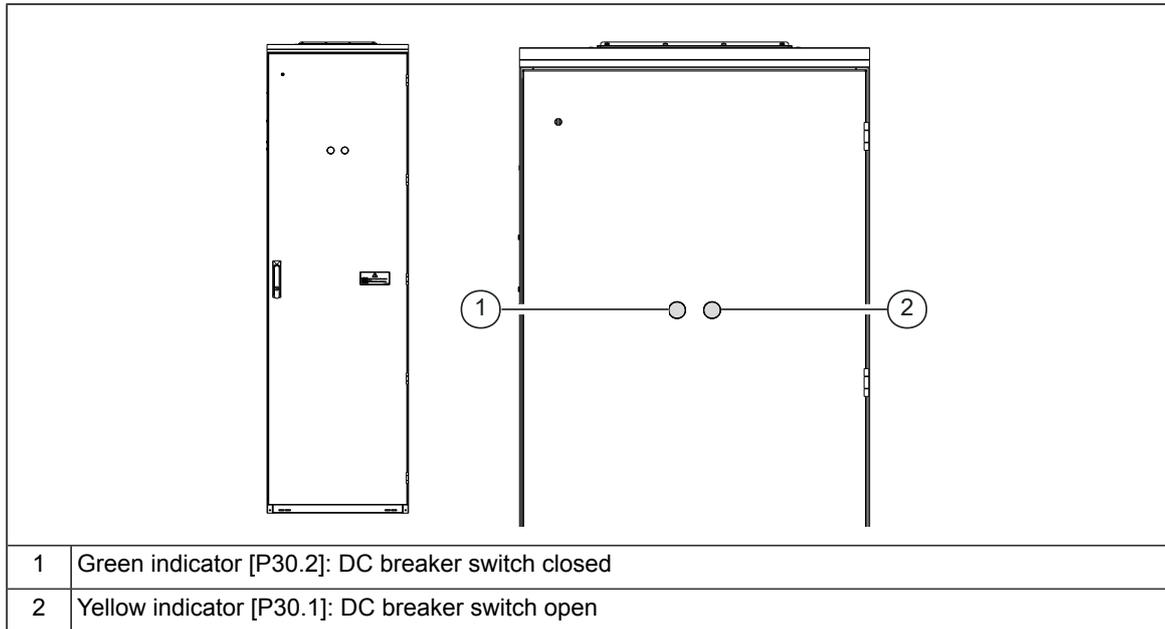
■ Layout of a drive system with a semiconductor switch unit



■ Layout of a semiconductor switch unit



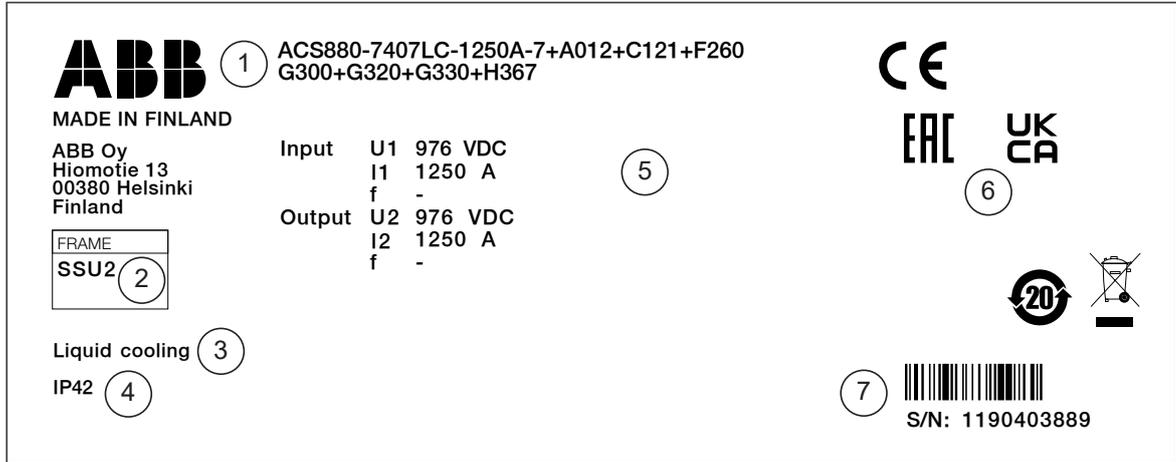
Control of the semiconductor switch unit



See [Default control connection diagram \(page 26\)](#) for information on the control signal interface.

Type designation label(s)

Each unit has a type designation label attached onto the inside of the cubicle door. The type designation label includes the ratings, appropriate markings, a type designation and a serial number of the unit. An example is shown below.



1	Type designation
2	Frame size
3	Cooling system and other additional data
4	Degree of protection
5	Ratings
6	Valid markings. See <i>ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions</i> (3AXD50000048634 [English]).
7	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.

Type designation key

Type designation describes the composition of the unit in short. The complete designation code is divided in subcodes:

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

■ Basic code

The basic code is described in the table below for an example code ACS880-7407LC-3000A-7.

Code	Description
ACS880	Product series
7407LC	Product type. Liquid-cooled semiconductor switch unit.
3000A	Size. See technical data
7	Voltage rating. 976 V DC. This is indicated in the type designation label as typical input voltage levels 976 V DC.

■ Option codes

The table below lists the option codes.

Code	Description
A012	50 Hz supply frequency
A013	60 Hz supply frequency
B054	IP42 (UL Type 1 Filtered)
B055	IP54 (UL Type 12)
C121	Marine construction
C164	Plinth height 100 mm
C176	Door hinges on left
C179	Plinth height 200 mm
C205	Marine product certification issued by DNV GL
C206	Marine product certification issued by the American Bureau of Shipping (ABS)
C207	Marine product certification issued by Lloyd's Register (LR)
C209	Marine product certification issued by Bureau Veritas
C228	Marine product certification issued by China Classification Society (CCS)
C229	Marine product certification issued by Russian Maritime Register of Shipping (RS)
E210	EMC/RFI filter for 2nd environment TN (grounded) or IT (ungrounded) system, category C3
F276	Capability of ride-through in voltage break max. 3 s. without tripping
F322	DC breaker switch connected to DC+ busbar
F323	DC breaker switch connected to DC- busbar
F260	Unit is equipped with back up fuses

Code	Description
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting
G304	Control (auxiliary) voltage 115 V AC
G315	Tin-plated copper DC busbars
G320	Control (auxiliary) voltage 230 V AC
G330	Halogen-free wiring and materials
G338	Wire marking class A1
G339	Wire marking class A2
G340	Wire marking class A3
G341	Wire marking class B1
G342	Wire marking class C1
H358	Cable gland plates (3 mm steel, undrilled)
H364	Cable gland plates (3 mm aluminum, undrilled)
H365	Cable gland plates (6 mm brass, undrilled)
H367	Control cabling through floor of cabinet
H368	Control cabling through roof of cabinet
P913	Special color (RAL Classic)
P966	Special color (other than RAL Classic)
R700	Documentation/manuals in English



3

Electrical installation

Contents of this chapter

This chapter contains the electrical safety precautions, and the instructions for connecting the external control cabling to the semiconductor switch unit ACS880-7407LC.



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 electrical professional, do not do installation or maintenance work.

Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location and equipment.
2. Disconnect all possible voltage sources. Make sure that re-connection is not possible. Lock out and tag out.
 - Open the main disconnecting device of the drive.
 - Open the charging switch if present.
 - Open the disconnecter of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
 - If the drive is equipped with a DC/DC converter unit (optional) or a DC feeder unit (optional): Open the DC switch-disconnector ([Q11], option +F286 or +F290) of the unit. Open the disconnecting device of the energy storage connected to the unit (outside the drive cabinet).
 - 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 switch-disconnector 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.
 - Disconnect all dangerous external voltages from the control circuits.
 - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized. Use a quality voltage tester. 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).
 - Before and after measuring the installation, verify the operation of the voltage tester on a known voltage source.
 - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is zero.
 - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is zero.

Important! Repeat the measurement also with the DC voltage setting of the tester. Measure between each phase and ground. There is a risk of dangerous DC voltage charging due to leakage capacitances of the motor circuit. This voltage can remain charged even long time after the drive power off. The measurement discharges the voltage.

- Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding (PE) terminal is zero. In cabinet-built drives, measure between the drive DC busbars (+ and -) and the grounding (PE) busbar.



WARNING!

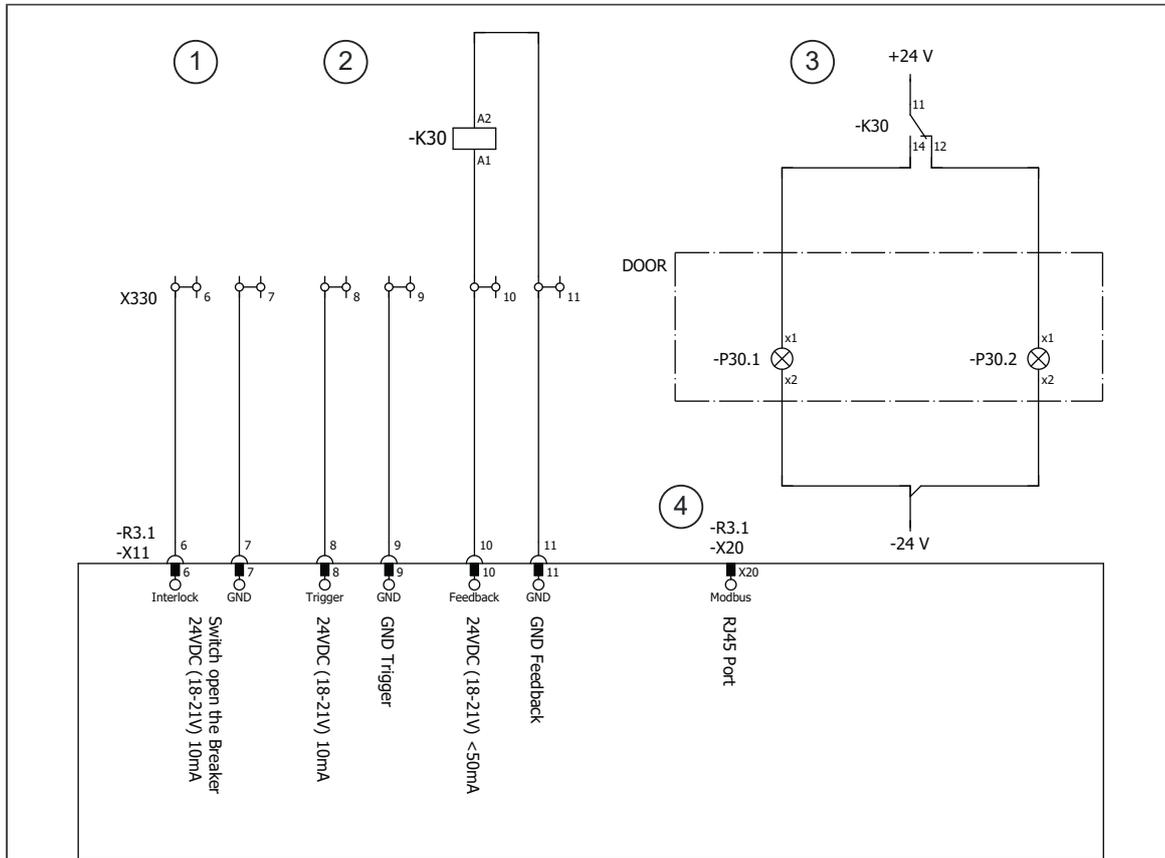
The busbars inside the cabinet of liquid-cooled drives are partially coated. Measurements made through the coating are potentially unreliable, so only measure at uncoated portions. Note that the coating does not constitute a safe or touch-proof insulation.

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



Connecting the control cables

■ Default control connection diagram



1	<p>By default non-functional (not activated by a parameter). See the delivery-specific circuit diagrams for the delivery-specific use.</p> <p>External interlock signal. Open control circuit between X330:6 and X330:7: DC breaker switch is disabled (not in operation). Closed control circuit: DC breaker switch is enabled (in operation).</p>
2	<p>External trigger input signal (open/close command).</p> <ul style="list-style-type: none"> • Open control circuit between X330:8 and X330:9: Open command. • Closed control circuit: Close command. <p>After the power up, the control circuit must be kept open a while until the DC breaker switch is ready for operation.</p>
3	<p>Status indicators on the cabinet door. See <i>Indicators</i> (page 35).</p>
4	<p>Modbus TCP/IP connector (Ethernet RJ45): Access to the settings of the DC breaker switch and/or control and monitoring the status. For more information, see the DC breaker switch user's manual (AD-10811-020) by Astrol Electronics AG (www.astrol.ch).</p>

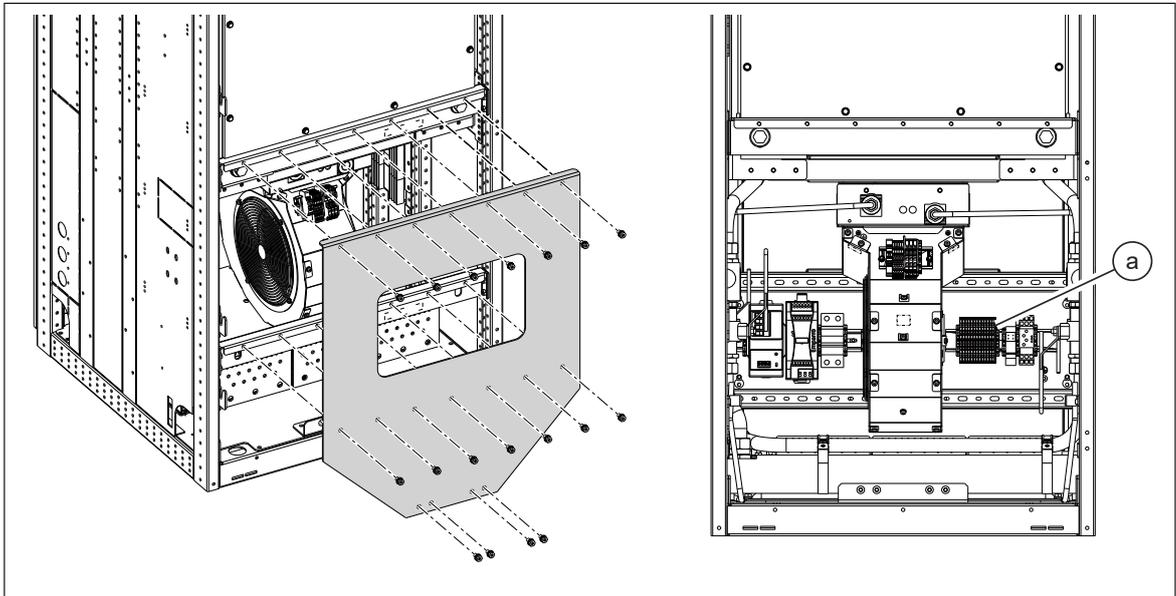
■ Connection procedure



WARNING!

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

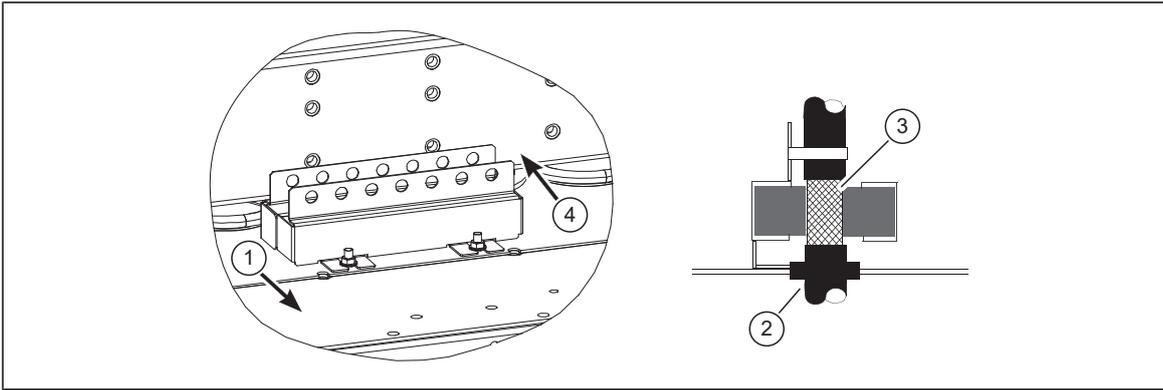
1. Stop the drive and do the steps in section [Electrical safety precautions \(page 24\)](#) before you start the work.
2. Open the door of the semiconductor DC switch unit. Remove the shrouding at the bottom if any (option +C121 only).
3. Run the control cables inside the cubicle. Ground the cable shields 360° at the cable entry. See subsection [Grounding the outer shields of the control cables at the cabinet entry \(page 27\)](#).
4. Run the cables to the terminal block [X330] (a) and connect. See section [Default I/O connection diagram](#).



■ Grounding the outer shields of the control cables at the cabinet entry

Ground the outer shields of all control cables 360 degrees at the EMI conductive cushions as follows (example constructions are shown below, the actual hardware may vary):

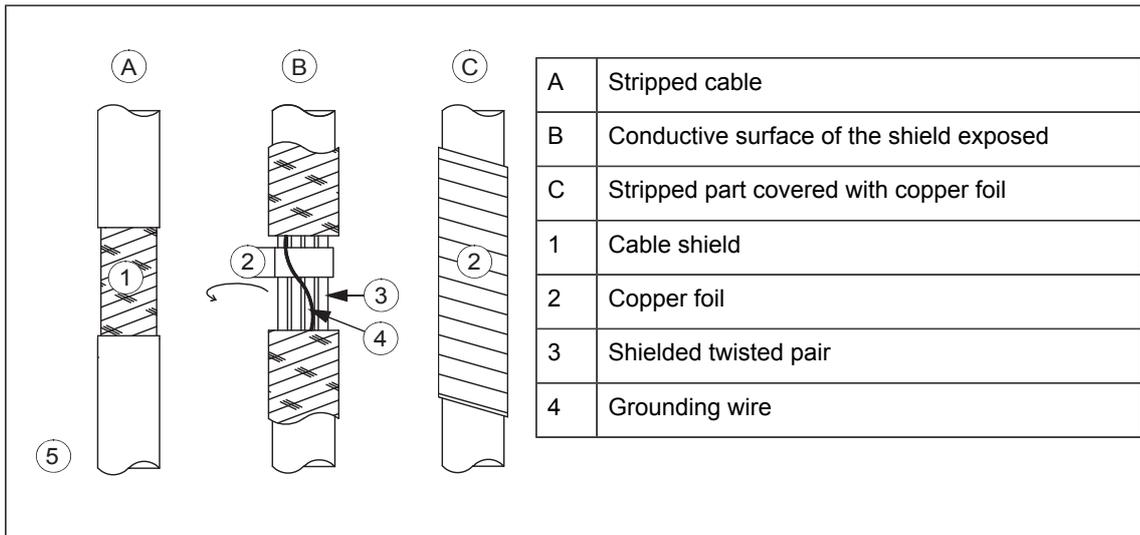
1. Loosen the tightening screws of the EMI conductive cushions and pull the cushions apart.
2. Cut adequate holes to the rubber grommets in the entry plate and put the cables through the grommets and the cushions.
3. Strip off the cable plastic sheath above the entry plate just enough to ensure proper connection of the bare shield and the EMI conductive cushions.
4. Tighten the two tightening screws so that the EMI conductive cushions press tightly round the bare shield.



Note 1: Keep the shields continuous as close to the connection terminals as possible. Secure the cables mechanically at the entry strain relief.

Note 2: If the outer surface of the shield is non-conductive:

- Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
- Turn the shield inside out to expose its conductive surface.
- Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.

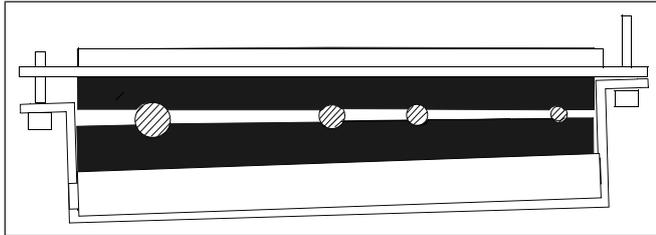


Note for top entry of cables: When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if there is more than one cable per grommet, plan the installation beforehand as follows:

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.

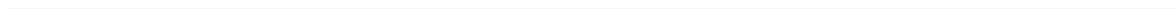
Cable diameter in mm	Max. number of cables per grommet
≤ 13	4
≤ 17	3
< 25	2
≥ 25	1

5. Arrange the bunches according to size from thickest to the thinnest between the EMI conductive cushions.



6. If more than one cable go through a grommet, seal the grommet by applying Loctite 5221 (or equivalent adhesive sealant) inside the grommet.





4

Start-up

Contents of this chapter

This chapter contains the start up instructions for the semiconductor switch unit ACS880-7407LC.



Start-up procedure

Tasks	<input checked="" type="checkbox"/>
Safety	
 WARNING! Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation or maintenance work.	<input type="checkbox"/>
Checks/Settings with no voltage connected	
Make sure that the disconnecter of the supply transformer is locked to the off (0) position, that means no voltage is, or cannot be connected to drive inadvertently.	<input type="checkbox"/>
Make sure that all external auxiliary circuits are switched off and disconnected. See the start-up instructions in the supply unit hardware manual.	<input type="checkbox"/>
Make sure that the supply unit is switched off, and the drive system has been isolated from the supply network. Open the main disconnecting device of the drive: Crank in the main breaker ([Q1], option +F255), or open the main switch/disconnector (option +F253).	<input type="checkbox"/>
Make sure that the DC switch/disconnectors [Q11] in inverter units and other units of the drive are open and locked. Open and lock also the charging switches [Q10] (if any).	<input type="checkbox"/>
<u>If the drive is equipped with a unit for an external energy storage connection (ACS880-1607LC or ACS880-7107LC):</u> Make sure that the disconnecting device of the energy storage (outside the drive) is open and locked.	<input type="checkbox"/>

Tasks	<input checked="" type="checkbox"/>
<p>Make sure that the other units of the drive are ready for the power up:</p> <ul style="list-style-type: none"> • The supply and inverter units (and other units, if any) have been installed according to the instructions given in their hardware manuals. • The supply and inverter units (and other units, if any) have been commissioned and are ready for use. See the appropriate unit-specific manuals. 	<input type="checkbox"/>
Close the auxiliary voltage circuit breaker [F22] of the semiconductor switch unit. Close also other circuit breakers of auxiliary circuit of the semiconductor switch unit, for example circuit breaker [F115.10] for the cooling fan. See the circuit diagrams delivered with the drive.	<input type="checkbox"/>
Make sure that it is safe to start the work. Do the steps in section <i>Electrical safety precautions (page 24)</i> .	<input type="checkbox"/>
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See <i>ACS880-107LC inverter units hardware manual (3AXD50000196111 (English))</i> and <i>ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 (English))</i> .	<input type="checkbox"/>
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.	<input type="checkbox"/>
Make sure that the coolant can flow freely in all cubicles.	<input type="checkbox"/>
Closing the cabinet doors	
Close all cabinet doors.	<input type="checkbox"/>
Connecting voltage to the drive and its auxiliary circuits	
Connect main AC voltage to the input terminals of the drive supply unit. (Close the main breaker of the supply transformer.)	<input type="checkbox"/>
Close the main disconnecting device of the drive: Crank-in the main breaker ([Q1], option +F255), or close the main switch/disconnector (option +F253).	<input type="checkbox"/>
Close the auxiliary voltage switch [Q21] of the drive supply unit.	<input type="checkbox"/>
Tuning the settings of the DC breaker switch in the semiconductor switch unit	
The parameter settings are adjusted by ABB for each delivery on basis of the project specification. The user does not need to change these settings typically. If you need to adjust the settings, see the <i>DC breaker switch user's manual (AD-10811-020)</i> by Astrol Electronics AG: www.astrol.ch	<input type="checkbox"/>
Energizing the drive and the semiconductor switch unit	
 <p>WARNING! When you start the supply unit, the drive DC bus will be energized, as will all the units connected to the DC bus. If you want to prevent this for any of the units, open its DC switch/disconnector (if available), or remove its DC fuses.</p> <p>Start the drive supply unit and energize the drive. See the delivery-specific circuit diagrams, and the supply unit hardware manual.</p> <p>If the drive is equipped with main breaker ([Q1], option +F255) or contactor ([Q2], option +F250), the operating switch [S21] on the door of the drive incoming cubicle starts the supply unit and triggers the drive power up sequence.</p>	<input type="checkbox"/>
Closing the DC breaker switch	
Close the control circuit for the External trigger input signal (terminals X330:8 and X330:9). See also <i>Opening and closing the DC breaker switch (page 33)</i> and <i>Default control connection diagram (page 26)</i> .	<input type="checkbox"/>



5

Operating instructions

Contents of this chapter

This chapter contains the operating instructions for the semiconductor switch unit ACS880-7407LC.

Opening and closing the DC breaker switch

Close the DC breaker switch with the External trigger input signal (closed control circuit). See [Default control connection diagram \(page 26\)](#).

If necessary, you can also open the DC breaker switch with the External trigger input signal (open control circuit).

During the normal operation of the drive, the DC breaker switch is closed and it monitors the system status. If the DC breaker switch detects a fault situation, it goes to the Fault mode and trips (opens). See [Fault mode of the DC breaker switch \(page 35\)](#).

Adjusting the settings of the DC breaker switch

The parameter settings of the DC breaker switch are adjusted by ABB for each delivery on basis of the project specification. The user does not need to change these settings typically. For more information on the parameter settings, see [DC breaker switch user's manual \(AD-10811-020\)](#) available from Astrol Electronics AG.



Fault tracing

Contents of this chapter

This chapter contains descriptions of status indicators of the semiconductor switch unit ACS880-7407LC. It also contains a description of the Fault mode of the DC breaker switch, and related instructions.

Indicators

Desig.	Name	Description (when illuminated)
P30.1	Yellow indicator	DC breaker switch is open.
P30.2	Green indicator	DC breaker switch is closed.

Fault mode of the DC breaker switch

The DC breaker switch goes into a Fault mode when the DC breaker detects:

- that an environment sensor is out of range
- an overload, and the External trigger input signal is still high (closed circuit)
- an overcurrent, and the External trigger input signal is still high (closed circuit)
- an internal fault.

When the DC breaker switch goes into the Fault mode, it trips (opens). It is not possible to close the DC breaker switch. To go back to normal operation mode:

1. Eliminate the cause for the fault trip.
 2. Close the DC breaker switch with the External trigger input signal: Open the control circuit and close it again. See [Default control connection diagram \(page 26\)](#).
-





Maintenance

Contents of this chapter

This chapter specifies the user maintenance tasks and their intervals for the semiconductor switch unit ACS880-7407LC. It also contains instructions for maintenance tasks.

Maintenance intervals

The tables below show the maintenance tasks which can be done by the end user. The complete maintenance schedule is available on the Internet (www.abb.com/driveservices). For more information, consult your local ABB Service representative (www.abb.com/searchchannels).

■ Description of symbols

Action	Description
I	Inspection (visual inspection and maintenance action if needed)
P	Performance of on/off-site work (commissioning, tests, measurements or other work)
R	Replacement

■ Recommended maintenance intervals after start-up

Recommended annual actions by the user	
Connections and environment	
Quality of supply voltage	P
Spare parts	
Spare parts	I
Inspections by user	
Tightness of terminals	I
Dustiness, corrosion and temperature	I
Cooling liquid pipe connections	I
Coolant antifreeze concentration	P

Recommended every 2nd year actions by the user	
Inspection of coolant quality	P

	Years from start-up						
	3	6	9	12	15	18	21
Coolant							
Coolant draining and refill		R		R		R	
Cabinet fans and fan control board, DC breaker switch							
Cooling fans 230 VAC 50/60Hz			R			R	
Cooling fans 115 VAC 50/60Hz		R		R		R	
DC Breaker switch (Astrol)*	I	I	I	I	I	I	I
*See <i>Astrol Maintenance Plan</i> (AD-10811-041) www.astrol.ch							
Aging							
Cabinet auxiliary power supplies				R			

Note:

- 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.
- 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.

Cabinet

■ Cleaning the exterior of the drive

**WARNING!**

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 24\)](#) before you start the work.
 2. Clean the exterior of the drive. Use:
 - vacuum cleaner with an antistatic hose and nozzle
 - soft brush
 - dry or damp (not wet) cleaning cloth. Moisten with clean water, or mild detergent (pH 5-9 for metal, pH 5-7 for plastic).
-

**WARNING!**

Prevent water from entering the drive. Never use excessive amount of water, a hose, steam, etc.

Fans

■ Replacing the cooling fan



WARNING!

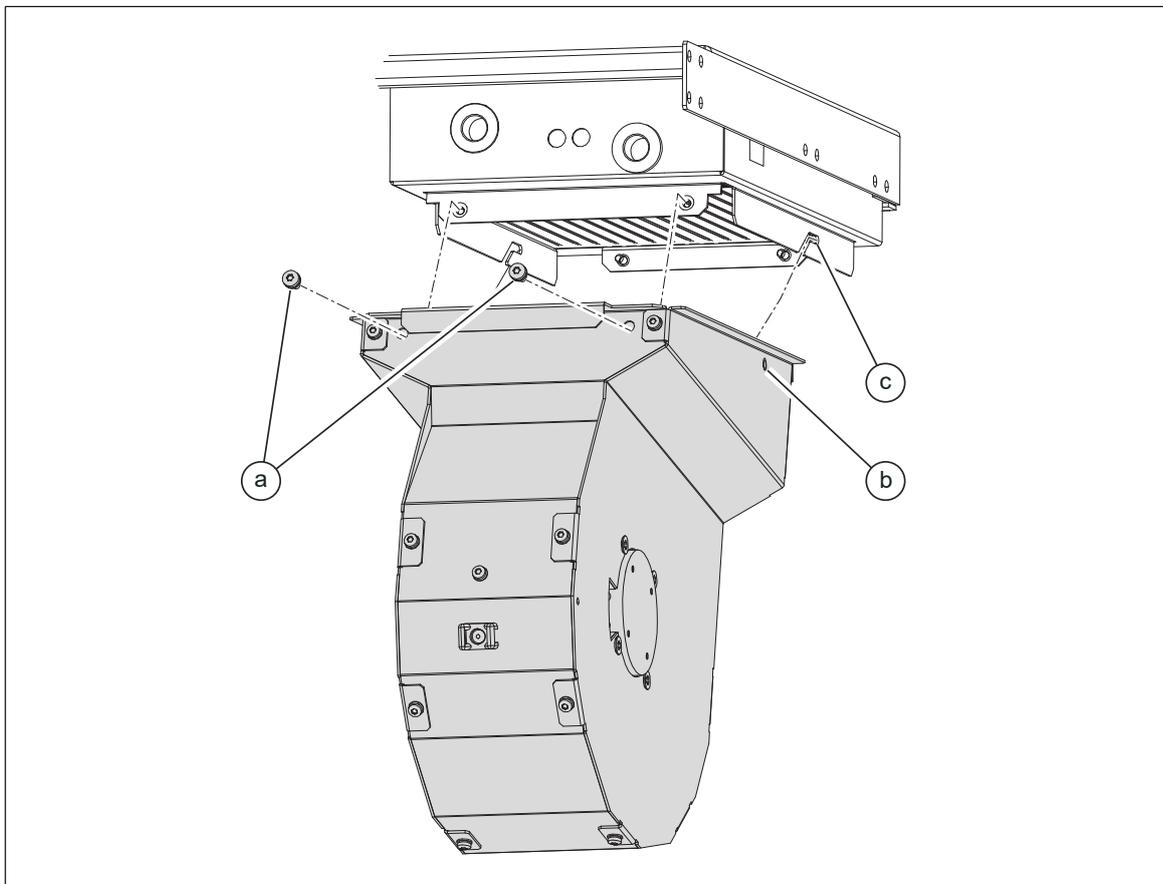
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation or maintenance work.



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 \(page 24\)](#).
2. Remove any shrouding in front of the cooling fan in case of marine construction (+C121).
3. Disconnect the fan wiring.
4. Undo the two retaining screws (a).
5. Pull the fan outwards to separate it from the heat exchanger housing.
6. Install new fan in reverse order. Align the guide pins (b) at the rear of the fan cowling with the slots (c) in the module bottom guide, then reinstall the retaining screws (a).

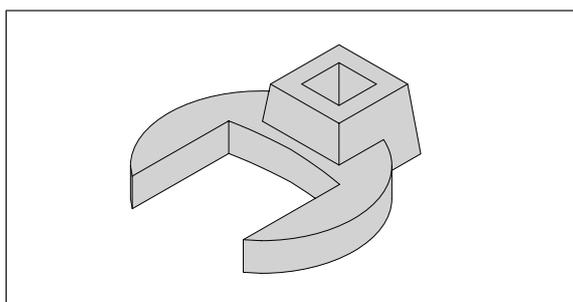


DC breaker switch

■ Replacing the DC breaker switch

Tools:

- Wrenches, socket set, screw drivers etc. standard installation tools. Recommendation: A 24 mm and a 34 mm open-jaw crowfoot wrench and an extension bar for opening and removing of the cooling pipe connectors below the module.



- A torque wrench
- New gasket for the pipe connector. Recommendation: REINZ-AFM-34 flat gasket.
- A lift or a hoist for removing and replacing the DC breaker switch, including lifting beam(s) and slings if needed. Make sure that you can attach the hoist to all four lifting eyes and align the lifting slings as vertical as possible. The DC breaker switch is heavy. Depending on the size, it weighs 65 to 145 kg.
- Lifting eyes for the DC breaker switch (loose objects inside the cabinet).
- Heat gun for warming up pipe ends for easier removal.
- An empty pallet for removing the old DC breaker switch out of the site.



WARNING!

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



WARNING!

Beware of hot coolant. Do not work on the liquid cooling system until the pressure is lowered down by stopping the pumps and draining the coolant. High-pressure warm coolant (6 bar, max. 50 °C) is present in the internal cooling circuit when it is in operation.



WARNING!

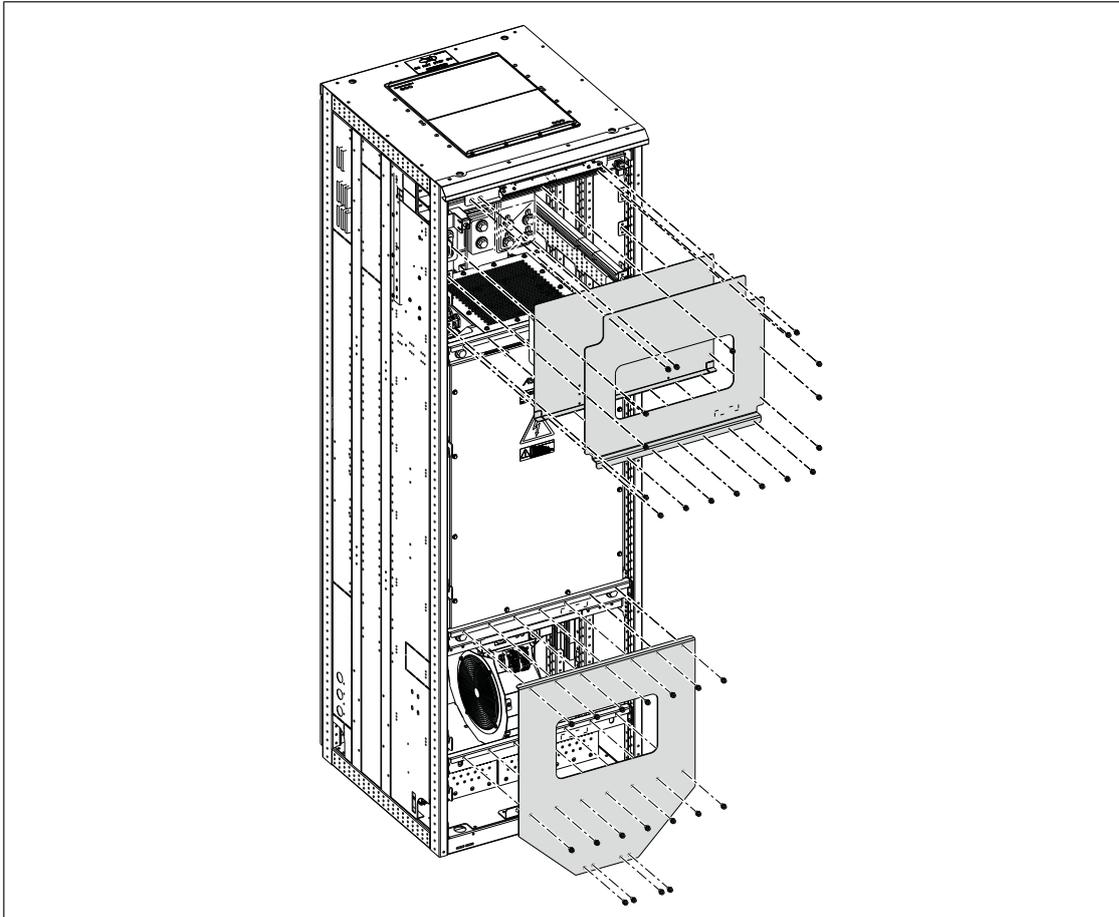
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.



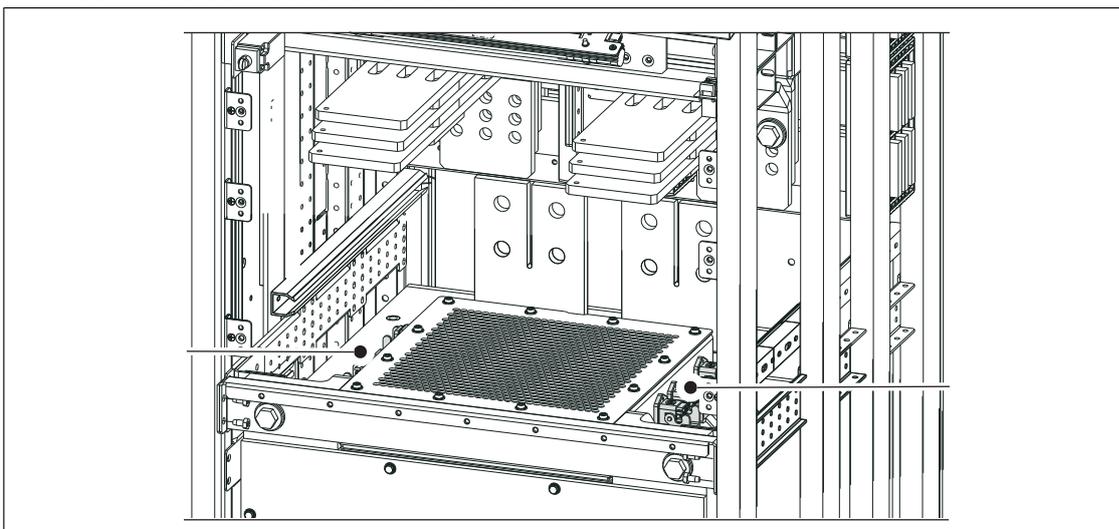
WARNING!

Be very careful when you remove bolts and screws. Do not drop anything inside the cabinet. It can cause severe damage at the power up: short circuit or arc blast.

1. Stop the drive and do the steps in section *Electrical safety precautions* (page 24).
2. Open the door of the cubicle.
3. Remove the shrouds at the top and bottom of the cubicle (option +C121).



4. Disconnect any cabling from the control interface of the DC breaker switch (on top). Mark down the connections for later use.

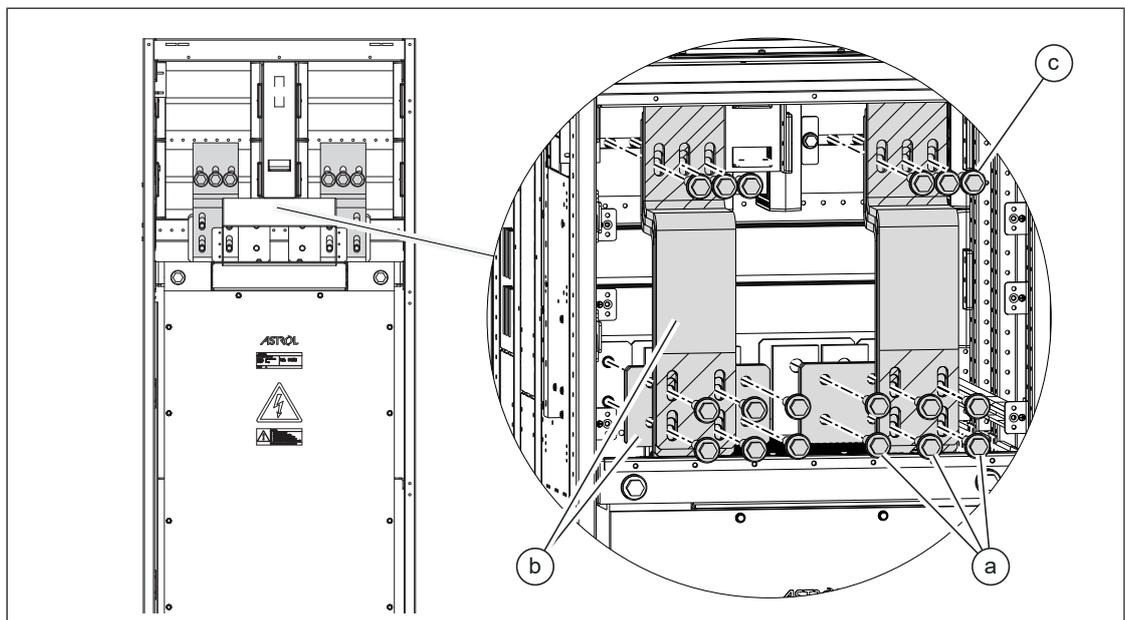


5. A) If the semiconductor unit is not equipped with fuses (without option +F260): Remove the DC busbar assemblies.

**WARNING!**

Be very careful when you remove bolts and screws. Do not drop anything inside the cabinet. Pay extra attention to the horizontal rear busbar plates. When you remove the bolts, hold the plate to prevent it from falling behind the DC breaker switch.

- Remove the bolts (a) that attach the busbar assemblies (b) to the busbars of the DC breaker switch. Pull the bolts and rear busbar plates out of the cabinet.
- Remove the bolts (c) at the top of the busbar assemblies and remove the busbars assemblies completely.

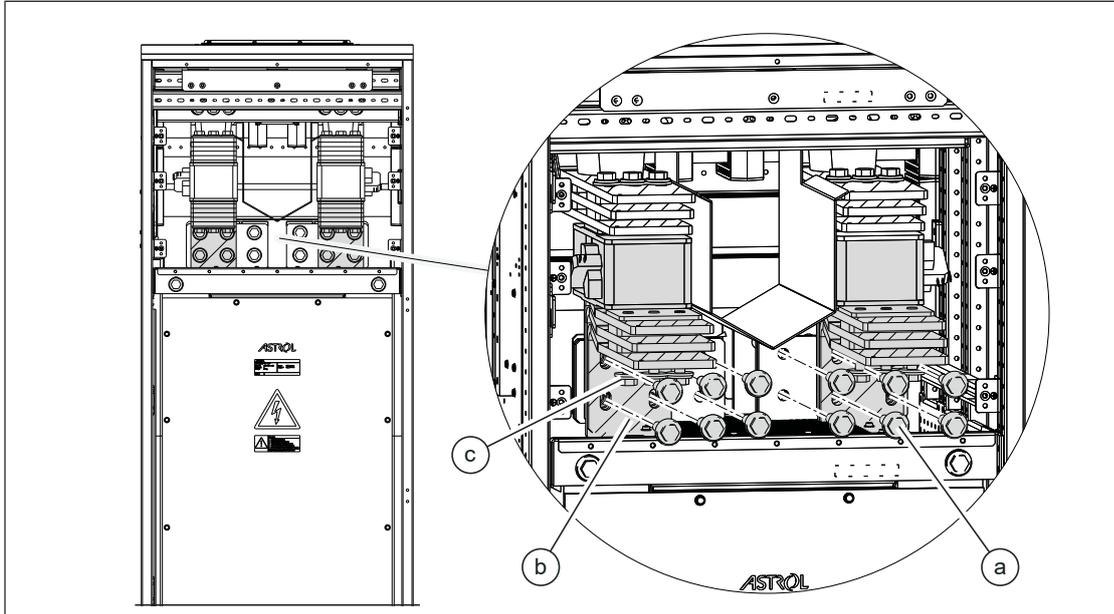


- B) If the semiconductor unit is equipped with fuses (with option +F260): Remove the lower fuse busbars.

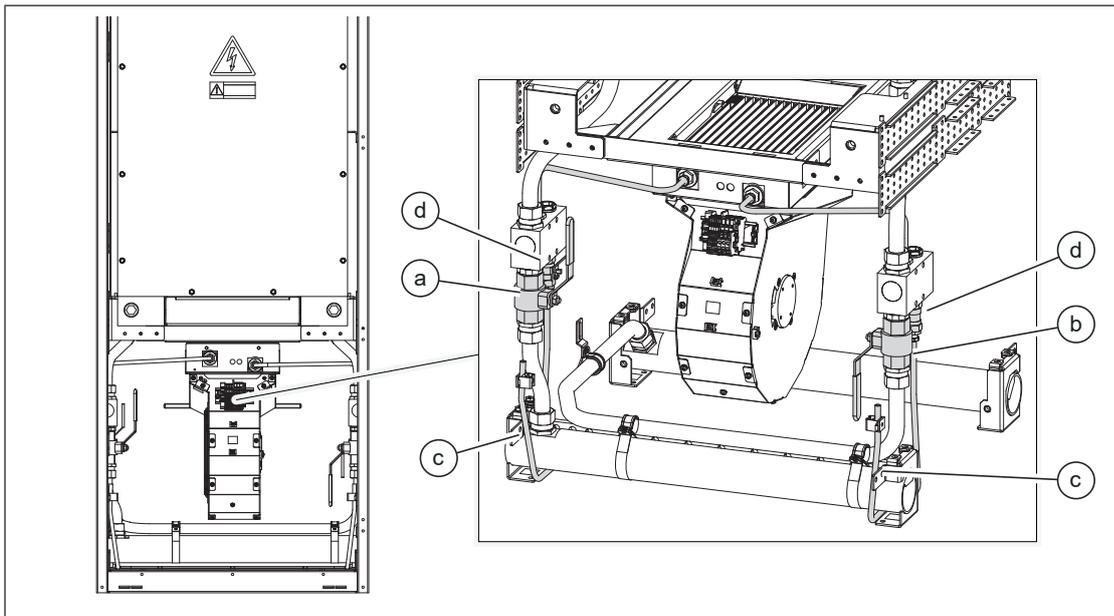
**WARNING!**

Be very careful when you loosen the screws. Do not drop anything inside the cabinet. Pay extra attention to the loose busbar plates behind the breaker busbars.

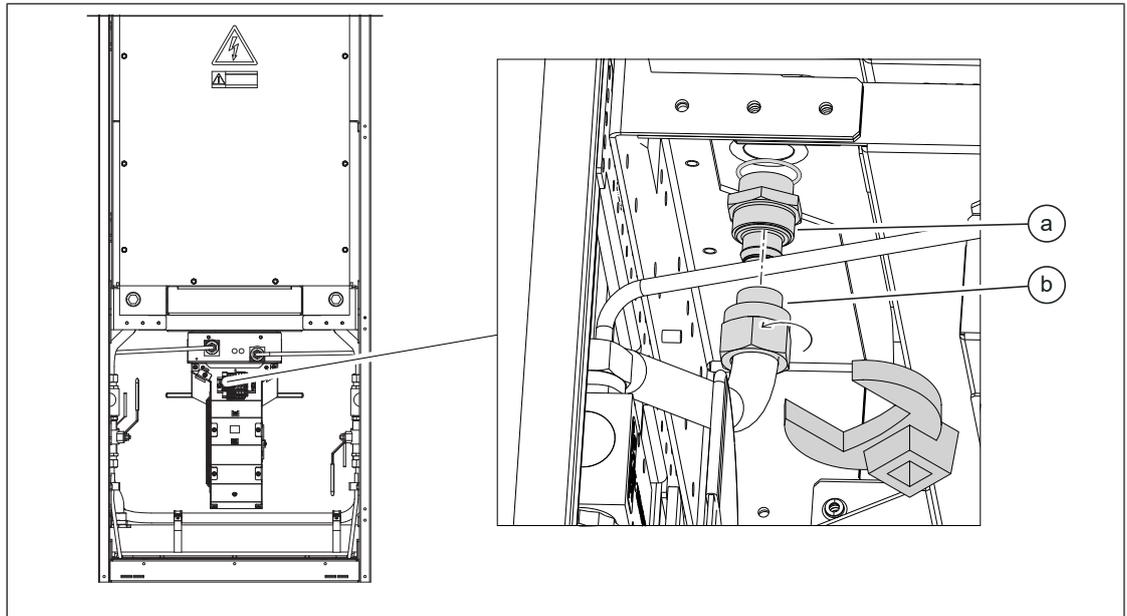
- Remove the bolts (a) that attach the lower fuse busbars (b) to the busbars of the DC breaker switch. There are 6 bolts on the right and 6 on the left.
- Remove the bolts (c) that attach the the lower fuse busbars to the fuses from below.
- Pull out the lower fuse busbars.



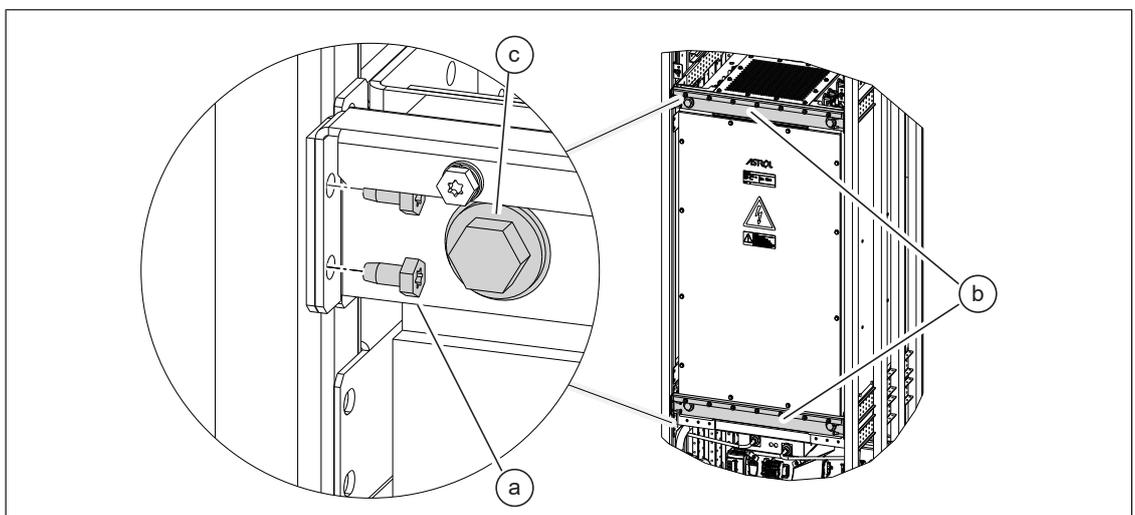
6. Disconnect the cooling circuit of the DC breaker switch from the drive cooling system. Drain the cooling circuit.
- Close the inlet stop valve (a) and outlet stop valve (b).
 - Lead the drain hoses (c, on both side of the cubicle) into a suitable container.
 - Open the drain valves (d, on both side of the cubicle) and drain the cooling circuit of the DC breaker switch.



7. Disconnect the inlet and outlet pipes from the DC breaker switch, and remove the inlet and outlet connectors.
- Disconnect the outer nut (a) that attaches the pipe onto the connector. Slide it down the pipe as low as possible. Recommendation: Use a 24 mm open-jaw crowfoot wrench with extension bar.
 - Pull the pipe out of the connector.
 - Remove the pipe connector (b). Recommendation: Use a 34 mm open-jaw crowfoot wrench with extension bar.



8. Remove the upper and lower supports of the DC breaker switch.
- Remove the screws (a) that attach the upper and lower supports (b) to the cabinet side frames.
 - Remove the bolts (c) that attach the upper and lower supports to the DC breaker switch and to the cabinet frame via brackets.
 - Remove the upper and lower supports.

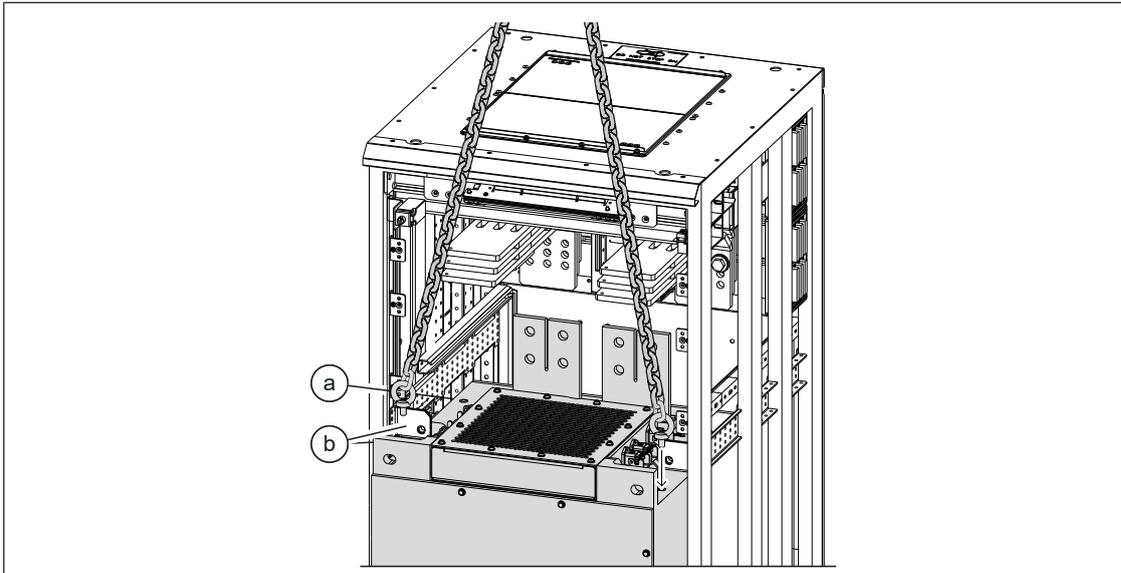


9. Install the front lifting eyes and attach the hoist.



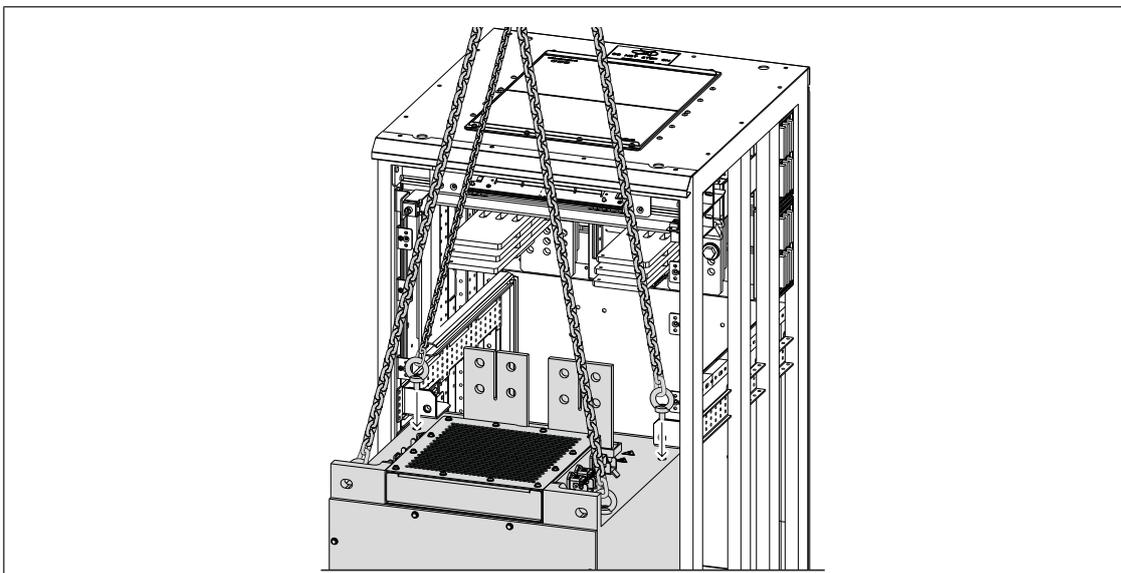
WARNING! Align lifting slings as upright as possible ($\sim 0^\circ$ lifting angle). The lifting angle must never exceed 60° . It can cause danger, and damage to the DC breaker switch. Use lifting beams if necessary.

- Carefully pull the DC breaker switch out for approximately 10 centimeters.
- Install the front lifting eyes (a) when the screw holes for the front lifting eyes are on the front side of the brackets (b) of the cabinet frame.
- Attach the front lifting slings to the front lifting eyes.



10. Install the rear lifting eyes and attach the hoist.

- Pull the DC breaker switch outwards a little more until the screw holes for the rear lifting eyes are on the front side of the brackets of the cabinet frame.
- Install the two rear lifting eyes.
- Attach the lifting slings also to the rear lifting eyes. Keep constant tension on the lifting slings.



11. Pull the DC breaker switch out of the cubicle. At the same time, keep constant tension on the lifting slings to transfer the whole weight of the DC breaker switch onto the hoist gradually.
 12. Lift the DC breaker switch on a pallet.
 13. Protect the connectors and interface unit on top of the DC breaker switch. Attach the DC breaker switch onto the pallet to prevent it from falling.
 14. Install a new DC breaker switch in reverse order. Tighten the busbars to 70 N·m and pipe connector to 60 N·m. Install a new gasket for the pipe connector. Recommended gasket type: See [Tools: \(page 41\)](#).
-

Fuses (option +F260)

■ Replacing the fuses



WARNING!

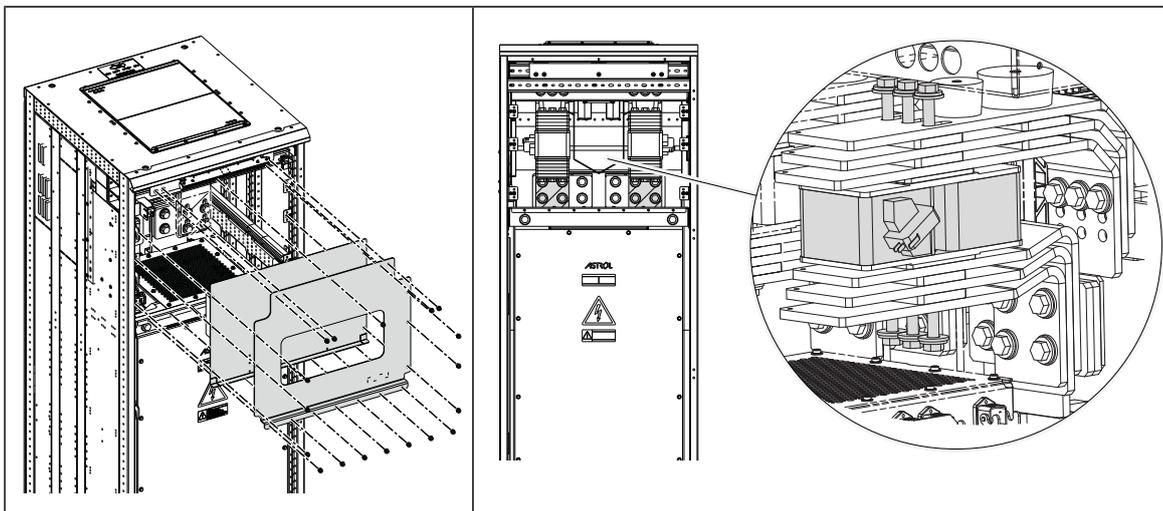
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

Be very careful when you remove bolts and screws. Do not drop anything inside the cabinet.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 24)*.
2. Open the door of the cubicle.
3. Remove the shroud(s) in front of the fuses (option +C121).
4. Loosen the screws on top and on bottom of the fuses and carefully remove the screws and the washers from the cabinet. Make note of the correct order of the washers on the screws.
5. Pull the fuse blocks out.
6. Insert new fuse blocks and install the screws and washers. Make sure to keep the washers in the original order. Pre-tighten the screws first by hand.
7. Tighten the screws to 50 N·m (37 lbf·ft).
8. Attach the shroud(s) and close the door.





Ordering information

Contents of this chapter

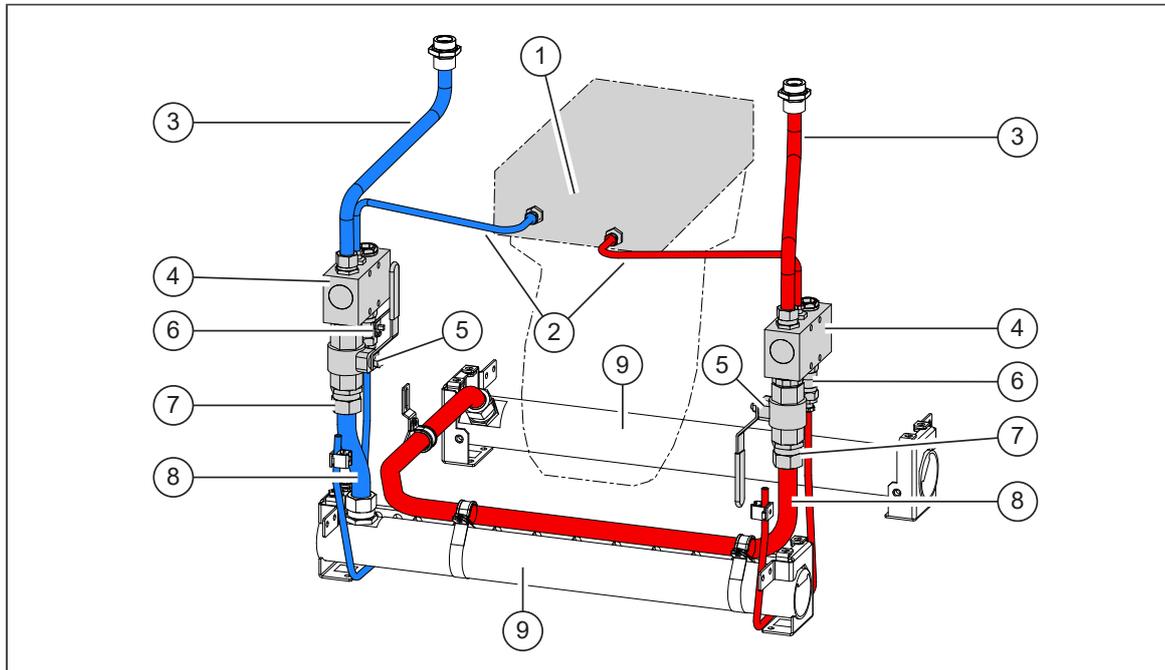
This chapter contains the ordering information for the main components of the DC semiconductor switch unit. The information is intended for system integrators and panel builders who construct the unit out of components and need to acquire them separately. The information is not relevant for the cabinets-installed semiconductor switch units (ACS880-7407LC). The cabinet-installed units include all components as standard.

DC breaker switch

Refer to *Technical data (page 57)* for the DC breaker switch types. DC breaker switches are available from Astrol (www.astrol.ch).

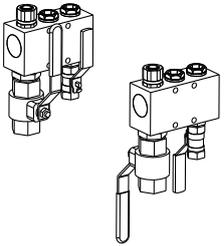
Cooling system parts

■ Cooling circuit overview



No.	Description	Ordering information
1	Cabinet heat exchanger and cooling fan. Pipe connectors: Included in the heat exchanger kit.	Heat exchanger (page 52) , Cooling fan (page 53)
2	Inlet and outlet pipes (polyamide, PA) for the cabinet heat exchanger. Size: 8/6 mm. Pipe connectors: Included in the heat exchanger and manifold kits.	Piping (page 52)
3	Inlet and outlet pipes (PA) for the DC breaker switch. Size: 16/13 mm. Pipe connectors: Included in the manifold kit. To be ordered separately for the DC breaker switch (ABB kit available).	Piping (page 52) , Pipe connector for the DC breaker/switch (page 53)
4	Inlet or outlet manifolds	Coolant distribution manifold kits (page 51)
5	Inlet or outlet stop valves (part of the manifold kits). Pipe connectors: See no. 7.	Coolant distribution manifold kits (page 51)
6	Inlet or outlet drain valves (part of the manifold kits)	Coolant distribution manifold kits (page 51)
	Drain pipe connector: There is an internal GR3/8" thread in the valve for the pipe connector.	Coolant distribution manifold kits (page 51)
7	Pipe connectors for inlet and outlet valves. There is an internal GR3/4" thread in each valve for the pipe connector.	Coolant distribution manifold kits (page 51)
8	Pipes between the main pipes and inlet and outlet valves. Size: 22/18 mm.	Coolant distribution manifold kits (page 51)
9	Main pipes	Coolant distribution manifold kits (page 51)

■ **Coolant distribution manifold kits**

Enclosure	Qty	Ordering code	Kit code	Illustration
400/600/800 mm VX25 and generic enclosure (1 module)	1	3AXD5000044084	L-468-8-441	 <p>Instruction code: 3AXD5000048217</p>

The manifold kits contain:



Inlet and outlet manifolds



Inlet and outlet valves



Drain valves



Nipples for connecting the valves to manifolds



Connectors for PA piping



Plugs for unused piping connectors



Chokes for flow limitation – not used with the ACS880-7407LC.

You must order the following parts separately as they are not included in the manifold kits:

- Connectors to attach to inlet, outlet and drain valves
- Connectors to attach to main pipes
- Pipes between main pipe and inlet/outlet valves
- Main pipes
- Drain pipes.

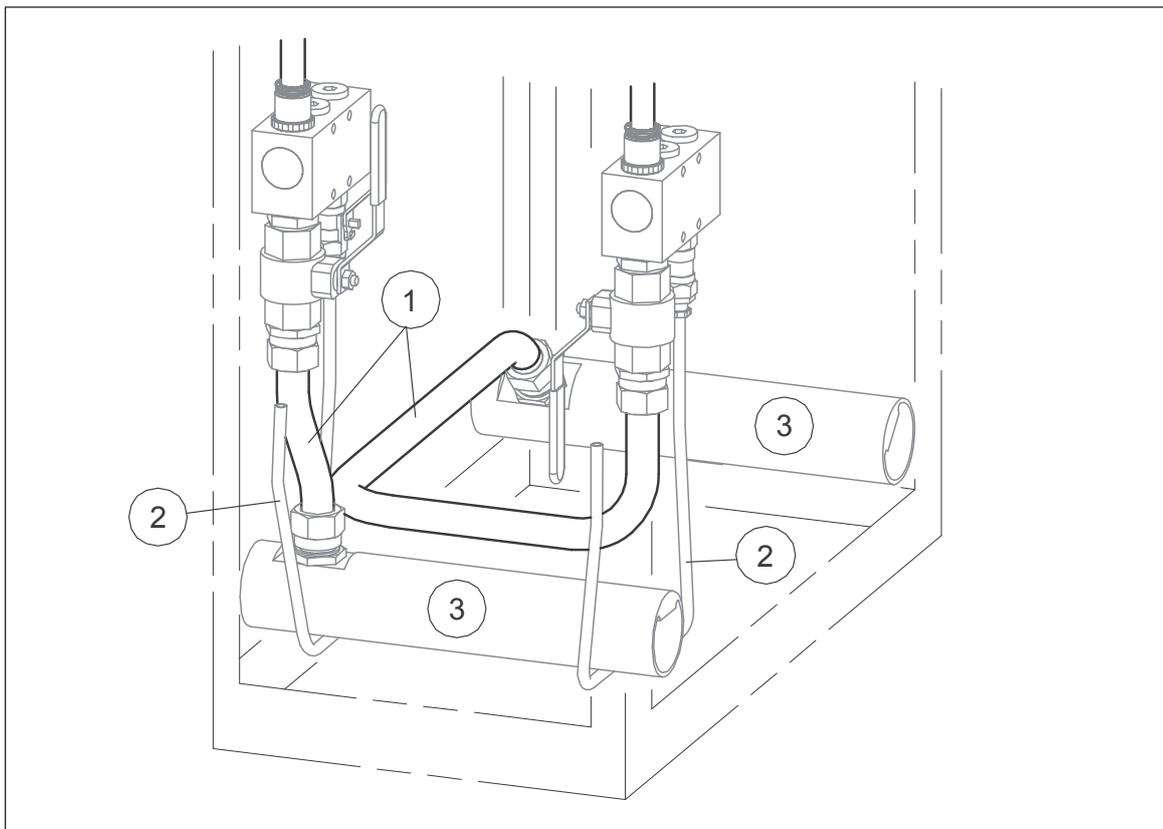
Note: The inlet and outlet valves have an R3/4" internal thread. The drain valves have an R3/8" internal thread.

■ **Piping**

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

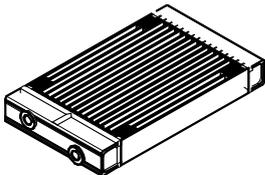
Component		Ordering code
PA pipe	Data	
PA pipe	50 m, PA12P40, 16/13 mm	3AXD50000047488
PA pipe	50 m, PA11P40, 8/6 mm, L50m	3AXD50000419302

Note: The piping between the manifolds and main pipes (1), the drain pipes (2), or the main pipes (3) are not part of the standard offering. Contact ABB for availability.



■ **Heat exchanger**

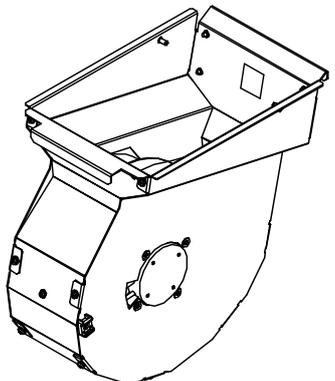
The kits include the heat exchanger and the connectors for piping.

Used with ...	Qty	Ordering code	Kit code	Illustration
All enclosure types	1 per module	3AXD50000041265	L-468-8-440	

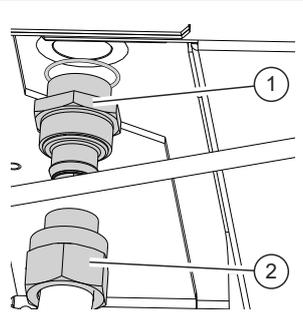
■ Cooling fan

The fan blows air through the heat exchanger, circulating the air inside the cabinet. The kit contains the fan installed into its cowling which mounts to the heat exchanger bottom guide.

The fan is selected according to the auxiliary voltage.

Auxiliary voltage	Qty	Ordering code	Illustration
230 V AC (50/60 Hz)	1 / module	3AXD50000043886	
115 V AC (50/60 Hz)	1 / module	3AXD50000045414	

■ Pipe connector for the DC breaker/switch

Components		Qty	Ordering code	Illustration
1	Connector with gasket	2 pcs / kit	3AXD50000834396	
2	Nut for attaching pipe to connector	2 pcs / kit		

9

Internal cooling circuit

Contents of this chapter

For information on the internal cooling circuit of the drive, refer to *ACS880-107LC inverter units hardware manual* (3AXD50000196111 (English)).

Cooling circuit of the semiconductor switch unit

Refer to [Cooling circuit overview \(page 50\)](#).



10

Technical data

Contents of this chapter

This chapter contains technical data for the semiconductor switch unit ACS880-7407LC.

Electrical ratings

ACS880-7407LC-...	Frame size	DC breaker switch	Nominal ratings		Input data	
			I_n	S_n	U_1	I_1
			A (DC)	kVA	V DC	A DC
0500A-7	SSU1	CBM-0.5-1.5-O3-IB-BN-SC-LD-FN-01	500	488	976	500
1250A-7	SSU2	CBM-1.25-1.5-O3-IB-BN-SC-LD-FN-01	1250	1220	976	1250
3000A-7	SSU3	CBM-3.0-1.5-O3-IB-BN-SC-LD-FN-01	3000	2928	976	3000

The unit allows up to 20% short time overload for a specific time. For more information on this and other rating details, see *User's manual (AD-10811-020)* www.astrol.ch.

Fuses (option +F260)

ACS880-7407LC-...	DC fuses				
	Quantity	A	V	Manufacturer	Type
0500A-7	2	800	1250	Bussmann Eaton	170M6546
1250A-7	2	2000	1000	Bussmann Eaton	170M7608
3000A-7	2	5000	1000	Bussmann Eaton	170M7622

Dimensions and weights

ACS880-7407LC-...	Height	Width	Depth	Weight
	mm	mm	mm	kg
0500A-7	2002	600	644	325
1250A-7	2002	600	644	378
3000A-7	2002	600	644	440

Free space requirements

The values are as required by cooling, maintenance and/or operation of the pressure relief (if present). Also obey the general mechanical installation instructions.

Front		Sides		Above	
mm	in.	mm	in.	mm	in.
1500	59	0	0	250	9.85

Losses, internal cooling circuit data and noise

ACS880-7407LC-...	Losses			Cooling circuit data			Noise (Avg)
	$P_{\text{loss total}}$	$P_{\text{loss coolant}}$	$P_{\text{loss air}}$	Total	Massflow	Pressure loss	
	kW	kW	kW	l	l/min	kPa	dB(A)
0500A-7	3.2	3.0	0.2	5	26	120.0	63
1250A-7	7.9	7.6	0.3	5.5	38	120.0	63
3000A-7	17.9	17.5	0.4	6	48	120.0	63

These losses are not calculated according to IEC 61800-9-2.

Terminal data for the control cables

Nom. voltage / current: 500 V / 17.5 A, connection method: spring-cage connection, cross section: 0.08 mm² - 1.5 mm² (AWG: 28 - 16)

Auxiliary circuit current consumption

Auxiliary circuit current consumption varies depending on the actual drive configuration and options. Contact ABB for the delivery-specific value.

Energy efficiency data (EU ecodesign)

Energy efficiency data is not provided for the drive/unit. The multidrives are not in the scope of the EU ecodesign requirements (Regulation EU/2019/1781) or the UK ecodesign requirements (Regulation SI 2021 No. 745).

Protection classes

Degrees of protection (IEC/EN 60529)	IP42 (standard), IP54 (option +B055)
Enclosure types (UL50)	UL Type 1 (standard), UL Type 12 (option +B055). For indoor use only.
Overvoltage category (IEC/EN 60664-1)	III, except for auxiliary power connections (fan, control, heating, lighting, cooling unit pump etc) which are category II.
Protective class (IEC/EN 61800-5-1)	I

Ambient conditions

Environmental limits for the drive are given below. The drive is to be used in a heated, indoor, controlled environment.

	Operation installed for stationary use	Storage in the protective package	Transportation in the protective package
Installation site altitude	0...2000 m (0...6562 ft) above sea level. For altitudes over 2000 m, contact ABB. Output derated above 1000 m (3281 ft).	-	-
Air temperature	0 ... +45 °C (+32 ... +113 °F), no condensation allowed. Output derated in the range +45 ... +55 °C (+113 ... +131 °F).	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	Max. 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		

	Operation installed for stationary use	Storage in the protective package	Transportation in the protective package
Contamination	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 Chemical gases: Class 3C2 Solid particles: Class 3S2. No conductive dust allowed.	IEC 60721-3-1:1997 Chemical gases: Class 1C2 Solid particles: Class 1S3 (packing must support this, otherwise 1S2)	IEC 60721-3-2:1997 Chemical gases: Class 2C2 Solid particles: Class 2S2
Pollution degree	2		
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing Part 2: Tests –Test Fc: Vibration (sinusoidal)	IEC/EN 60721-3-3:2002 10...57 Hz: max. 0.075 mm amplitude 57...150 Hz: 1 g Units with marine construction (option +C121): Max. 1 mm (0.04 in) (5 ... 13.2 Hz), max. 0.7 g (13.2 ... 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997 10...57 Hz: max. 0.075 mm amplitude 57...150 Hz: 1 g	IEC/EN 60721-3-2:1997 2...9 Hz: max. 3.5 mm amplitude 9...200 Hz: 10 m/s ² (32.8 ft/s ²)
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Not allowed	With packing max. 100 m/s ² (328 ft/s ²) 11 ms	With packing max. 100 m/s ² (328 ft/s ²) 11 ms

Materials

See *ACS880 cabinet-installed drives recycling instructions and environmental information* (3AXD50000153909 [English]).

For material and recycling information of the DC breaker switch, contact the manufacturer Astrol Electronic AG.

<http://www.astrol.ch>

Color

RAL 7035 and RAL 9017.

Package

<p>Standard package (Container package) Vertical</p>	<p>Materials: Wood, PE (VCI film), VCI emitter, clay desiccant, PE sheet, PET strap, metal fixing clamps and screw, packing tape.</p> <p>Transport method: Road and air transport and sea transport in container.</p> <p>Storage conditions (IEC 60721-3-1): Up to 24 months (1K20) in enclosed conditions, up to 3 months in sheltered conditions (1K23, 1K24).</p>
<p>Seaworthy package (option +P912) Vertical</p>	<p>Materials: Wood, plywood, PE (VCI film), VCI emitter, clay desiccant, PE sheet, metal fixing clamps and screw, packing tape.</p> <p>Transport method: Road and air transport and sea transport in container or deck.</p> <p>Storage conditions (IEC 60721-3-1): Up to 24 months (1K20) in enclosed conditions, up to 12 months in sheltered conditions (1K23, 1K24) and up to 3 months in open-air conditions (1K25–1K27).</p>

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. See *ACS880 cabinet-installed drives and multidrive modules recycling instructions and environmental information* (3AXD50000153909 [English]).

Applicable standards

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

Markings

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

Disclaimers

■ **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 can be connected to and to communicate information and data via a network interface. The HTTP protocol, which is used between the commissioning tool (Drive Composer) and the product, is an unsecured protocol. For independent and continuous operation of product such connection via network to commissioning tool is not necessary. However 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, prevention of physical access, 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.

Notwithstanding any other provision to the contrary and regardless whether the contract is terminated or not, ABB and its affiliates are under no circumstances liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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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