
ABB DRIVES

Drive modules

Cabinet design and construction instructions

Drive modules

Cabinet design and construction instructions

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Further information



1

Introduction to the manual

Contents of this chapter

This chapter describes the manual.

Applicability

This manual applies to the installation of these products:

- ACS880 power modules (ie. converter or supply modules and auxiliary components such as filters)
- ACS880 drive modules
- ACS580, ACH580 and ACQ580 drive modules.

Target audience

This manual is intended for people who plan the installation, install, start up and service 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.

The manual is written for readers worldwide. Both SI and imperial units are shown.

Purpose of this manual

The purpose of this manual is to give generic guidelines for planning the installation of power and drive modules into a user-defined cabinet. For the power and drive module specific instructions, see their hardware and cabinet installation manuals.

Related documents

■ ACS880-01, ACS880-11 and ACS880-31

Name	Code
Drive hardware manuals and guides	
Drive/converter/inverter safety instructions	Multilingual code: 3AXD50000037978
ACS880...+P940 and +P944 drive modules supplement	3AUA0000145446
Drive modules cabinet design and construction instructions	3AUA0000107668
ACS880-01 hardware manual	3AUA0000078093
ACS880-01 quick installation guide for frames R1 to R3	3AUA0000085966
ACS880-01 quick installation guide for frames R4 and R5	3AUA0000099663
ACS880-01 quick installation guide for frames R6 to R9	3AUA0000099689
ACS880-01 assembly drawings for cable entry boxes of IP21 frames R5 to R9	3AUA0000119627
Vibration dampers for ACS880-01 drives (frames R4 and R5, option +C131) installation guide	3AXD50000010497
Vibration dampers for ACS880-01 drives (frames R6 to R9, option +C131) installation guide	3AXD50000013389
ACS880-01...+C132 marine type-approved drives supplement	3AXD50000010521
ACS880-01...+C135 drives with flange mounting kit supplement	3AXD50000349814
ACS880-01...+C135 frames R1 to R3 flange mounting kit quick installation guide	3AXD50000026158
ACS880-01...+C135 frames R4 to R5 flange mounting kit quick installation guide	3AXD50000026159
ACS880-01...+C135 frames R6 to R9 flange mounting kit quick installation guide	3AXD50000019099
ACS880-01...+H358 UK gland plate installation guide	3AXD50000034735
ACS880-11 hardware manual	3AXD50000045932
ACS880-11 quick installation guide	3AXD50000048138
ACS880-31 hardware manual	3AXD50000045933
ACS880-31 quick installation guide	3AXD50000048171
ACS880-11..., ACS880-31..., ACH580-31... and ACQ580-31...+C135 drives with flange mounting kit supplement	3AXD50000349838
ACS880-11..., ACS880-31..., ACH580-31... and ACQ580-31...+C135 frame R3 flange mounting kit quick installation guide	3AXD50000181506
ACS880-11..., ACS880-31..., ACH580-31... and ACQ580-31...+C135 frames R6 and R8 flange mounting kit quick installation guide	3AXD50000133611
ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 UK gland plate (+H358) installation guide	3AXD50000110711
Common mode filter kit for frames R7 and R8 (option +E208) installation guide	3AXD50000015179
ACx-AP-x Assistant control panels user's manual	3AUA0000085685
Drive firmware manuals and guides	
ACS880 primary control program firmware manual	3AUA0000085967
Quick start-up guide for ACS880 drives with primary control program	3AUA0000098062
Option manuals and guides	
Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	
DPMP-01 mounting platform for control panels installation guide	3AUA0000100140
DPMP-02/03 mounting platform for control panels installation guide	3AUA0000136205

Name	Code
<i>DPMP-04/05 mounting platform for control panels installation guide</i>	3AXD50000308484

See www.abb.com/drives/documents for all manuals on the Internet.

■ **ACS580-01, ACH580-01/31 and ACQ580-01/31**

Name	Code
Drive hardware manuals and guides	
<i>ACS580, ACH580 and ACQ580...+P940 and +P944 drive modules supplement</i>	3AXD50000210305
<i>Flange mounting kit quick installation guide for ACS880-01 and ACS580-01 frames R6 to R9</i>	3AXD50000019099
<i>ACS580-01 hardware manual</i>	3AXD50000044794
<i>ACS580-01 quick installation and start-up guide for frames R1 to R5</i>	3AXD50000044838
<i>ACS580-01 quick installation and start-up guide for frames R6 to R9</i>	3AXD50000009286
<i>ACH580-01 hardware manual</i>	3AUA0000076331
<i>ACH580-01 quick installation and start-up guide for frames R0 to R5</i>	3AUA0000076330
<i>ACH580-01 quick installation and start-up guide for frames R6 to R9</i>	3AXD50000036602
<i>ACQ580-01 hardware manual</i>	3AXD50000035866
<i>ACQ580-01 quick installation and start-up guide for frames R0 to R5</i>	3AXD50000035755
<i>ACQ580-01 quick installation and start-up guide for frames R6 to R9</i>	3AXD50000037301
<i>ACH580-31 hardware manual</i>	3AXD50000037066
<i>ACH580-31 quick installation guide</i>	3AXD50000048001
<i>ACQ580-31 hardware manual</i>	3AXD50000045935
<i>Flange mounting kit installation supplement</i>	3AXD50000019100
<i>Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frame R3</i>	3AXD50000181506
<i>Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frames R6 and R8</i>	3AXD50000133611
<i>Common mode filter kit for frames R7 and R8 (option +E208) installation guide</i>	3AXD50000015179
<i>UK gland plate (+H358) installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31</i>	3AXD50000110711
<i>ACX-AP-x Assistant control panels user's manual</i>	3AUA0000085685
Drive firmware manuals and guides	
<i>ACS580 standard control program firmware manual</i>	3AXD50000016097
<i>ACS580 drives with standard control program quick start-up guide</i>	3AXD50000048035
<i>ACH580 HVAC control program firmware manual</i>	3AUA0000027537
<i>Quick start-up guide for ACH580 HVAC control program</i>	3AXD50000047658
<i>ACQ580 pump control program firmware manual</i>	3AXD50000035867
<i>Quick start-up guide for ACQ580 pump control program</i>	3AXD50000048773
Option manuals and guides	
<i>Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.</i>	
<i>DPMP-01 mounting platform for control panels installation guide</i>	3AUA0000100140
<i>DPMP-02/03 mounting platform for control panels installation guide</i>	3AUA0000136205

Name	Code
DPMP-04/05 mounting platform for control panels installation guide	3AXD50000308484

See www.abb.com/drives/documents for all manuals on the Internet.

■ ACS880 multidrive modules

Manual	Code
General manuals	
ACS880 multidrive cabinets and modules safety instructions	3AUA0000102301
ACS880 liquid-cooled multidrive cabinets and modules safety instructions	3AXD50000048633
ACS880 multidrive cabinets and modules electrical planning instructions	3AUA0000102324
ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions	3AXD50000048634
Drive modules cabinet design and construction instructions	3AUA0000107668
BCU-02/12/22 control units hardware manual	3AUA0000113605
CIO-01 I/O module for distributed I/O bus control user's manual	3AXD50000126880
Supply module manuals	
ACS880-204 IGBT supply modules hardware manual	3AUA0000131525
ACS880-204LC IGBT supply modules hardware manual	3AXD50000284436
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-304 +A003 diode supply modules hardware manual	3AUA0000102452
ACS880-304...+A018 diode supply modules hardware manual	3AXD50000010104
ACS880-304LC+A019 diode supply modules hardware manual	3AXD50000045157
ACS880 diode supply control program firmware manual	3AUA0000103295
ACS880-904 regenerative rectifier modules hardware manual	3AXD50000020457
ACS880 regenerative rectifier control program firmware manual	3AXD50000020827
Inverter module manuals and guides	
ACS880-104 inverter modules hardware manual	3AUA0000104271
ACS880-104LC inverter modules hardware manual	3AXD50000045610
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Brake module and DC/DC converter module manuals	
ACS880-604 1-phase brake chopper modules hardware manual	3AUA0000106244
ACS880-604LC 1-phase brake chopper modules hardware manual	3AXD50000184378
ACS880-604 3-phase brake modules hardware manual	3AXD50000022033
ACS880 (3-phase) brake control program firmware manual	3AXD50000020967
ACS880-1604 DC/DC converter modules hardware manual	3AXD50000023642
ACS880-1604LC DC/DC converter modules hardware manual	3AXD500000371631
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
Module package hardware manuals	
ACS880-04 module packages hardware manual	3AUA0000138495
ACS880-14 and -34 module packages hardware manual	3AXD50000022021
Option manuals	
ACS880-1007LC liquid cooling unit user's manual	3AXD50000129607

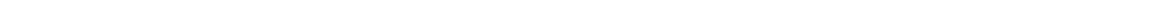
Manual	Code
<i>ACX-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>BAMU-12C auxiliary measurement unit hardware manual</i>	3AXD50000117840
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Drive application programming (IEC 61131-3) manual</i>	3AUA0000127808
<i>Installation frames for ACS880 multidrive modules hardware manual</i>	3AXD50000010531
Manuals and quick guides for I/O extension modules, fieldbus adapters, safety functions modules, etc.	

See www.abb.com/drives/documents for all manuals on the Internet.

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

Terms

For drive and power modules, we use term module later on in this manual.



2

Generic cabinet planning instructions

Contents of this chapter

This chapter contains generic cabinet planning instructions applicable to any user-defined cabinet system. The topics discussed are essential for the safe and trouble-free use of the drive system.

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.

Cabinet construction

Basic requirements for the cabinet construction are listed below. Make sure that:

- the cabinet frame is sturdy enough to carry the weight of the components, control circuitry and other equipment installed in it
- the cabinet protects the modules against contact and agrees with the requirements for dust and humidity. See the technical data in the respective module hardware manual.
- the cabinet frame and doors are strong enough to provide adequate protection against flames or pressure blast originating from inside the cabinet in case of arc flash or similar failure
- the cabinet has air inlet and outlet gratings that allow free flow of cooling air through the modules inside the cabinet.

■ Mounting orientation of the modules

Mount the modules upright unless other orientations are allowed in the respective hardware manual.

■ Disposition of the devices

Plan a spacious layout to ensure easy installation and maintenance. Sufficient cooling air flow, obligatory clearances, cables and cable support structures all require space.

Place the control board(s) away from:

- main circuit components such as contactors, switches and power cables
- hot parts (heatsink, air outlet of the drive module).

See the module hardware and cabinet installation manual for layout examples.

■ Grounding of mounting structures

Arrange the grounding of the module by leaving the contact surfaces of the fastening points unpainted (bare metal-to-metal contact). The module frame is grounded to the PE busbar of the cabinet via the fastening surfaces, screws and the cabinet frame. Alternatively, use a separate grounding conductor between the PE terminal of the module and the PE busbar of the cabinet.

Ground also the other components in the cabinet according to the principle above.

■ Busbar material and joints

ABB recommends tin-plated copper but aluminum can also be used.

Note: Before joining aluminum busbars, remove the oxide layer and apply suitable anti-oxidant joint compound.

■ Shrouds

The installation of shrouds (touch protection) to fulfill applicable safety regulations is the responsibility of the drive system builder.

Ready-made shrouding parts are available from ABB for some cabinet designs. See the ordering information in the module hardware manuals.

■ Tightening torques

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

Electrical connections

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

Mechanical connections

Size	Max. torque	Note
M5	6 N·m (53 lbf·in)	Strength class 8.8

Size	Max. torque	Note
M6	10 N·m (7.4 lbf·ft)	Strength class 8.8
M8	24 N·m (17.7 lbf·ft)	Strength class 8.8

Insulation supports

Size	Max. torque	Note
M6	5 N·m (44 lbf·in)	Strength class 8.8
M8	9 N·m (6.6 lbf·ft)	Strength class 8.8
M10	18 N·m (13.3 lbf·ft)	Strength class 8.8
M12	31 N·m (23 lbf·ft)	Strength class 8.8

Cable lugs

Size	Max. torque	Note
M8	15 N·m (11 lbf·ft)	Strength class 8.8
M10	32 N·m (23.5 lbf·ft)	Strength class 8.8
M12	50 N·m (37 lbf·ft)	Strength class 8.8

Cooling and degrees of protection

■ Planning the cooling

When you plan the cooling of the cabinet:

- make sure that the ventilation of the installation site is sufficient so that the cooling air flow and ambient temperature requirements of the module are met (see the hardware manual)
- leave enough free space around the components to ensure sufficient cooling. Observe the minimum clearances given for each component. For the module specific free space requirements, see the respective hardware and cabinet installation manuals.

■ Air-cooled drive systems

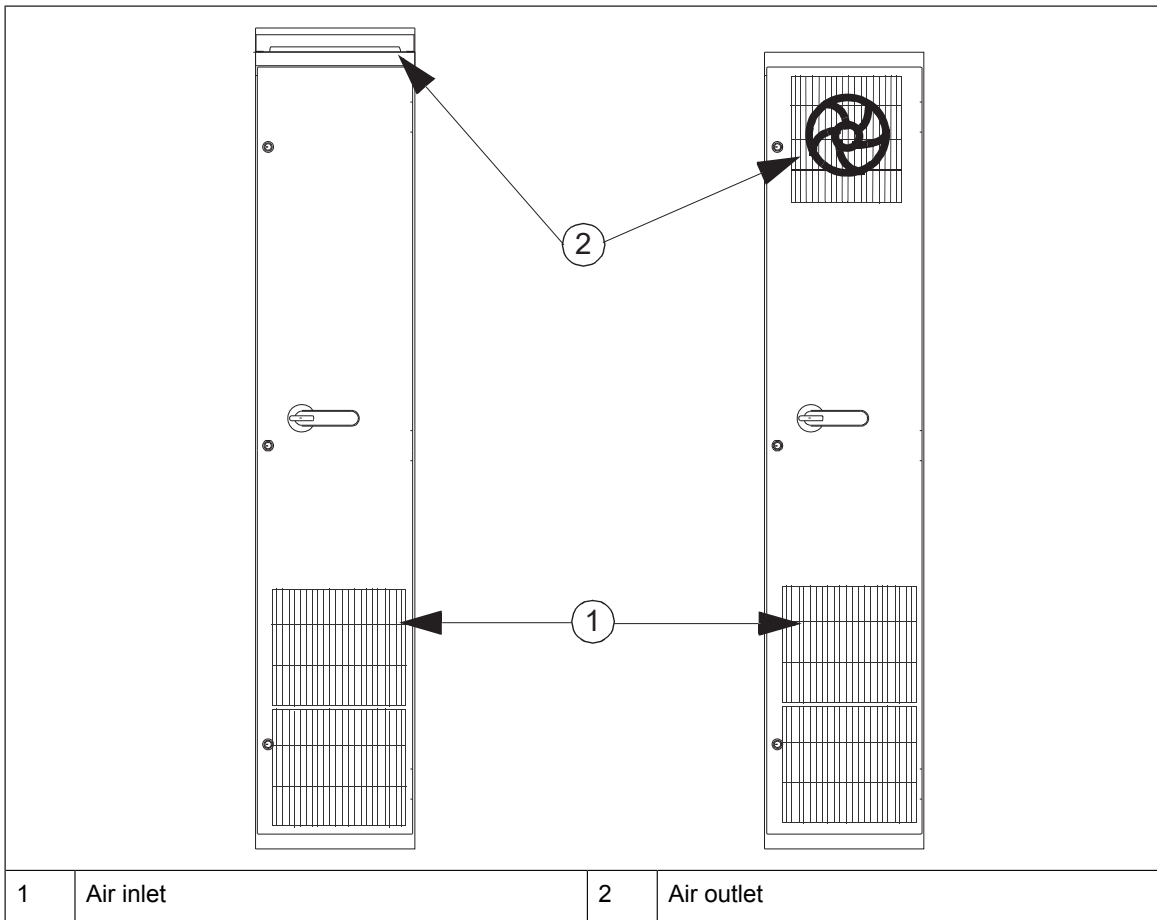
Air inlets and outlets

Equip the air inlets and outlets with gratings that:

- are large enough to allow sufficient air flow in and out of the cabinet (critical for correct cooling of the module)
- guide the air flow
- protect against contact
- prevent water splashes from entering the cabinet
- ensure adequate protection against flames or pressure blast originating from inside the cabinet in case of arc flash or similar failure.

The drawing below shows two typical cabinet cooling solutions. The air inlet is at the bottom of the cabinet. The outlet is on the roof or on the upper part of the door if room height is limited.

Note: Use an extra exhaust fan if the air outlet is on the cabinet door.



Arrange the cooling air flow through the components according to the technical data in the respective hardware manual. See the specifications for:

- cooling air flow
 - Note:** The values stated for each component in their respective manuals apply to continuous nominal load. If the load is cyclic or less than nominal, less cooling air is required.
- allowed ambient temperature and temperature rise inside the cabinet
- allowed pressure drop over the cabinet that the cooling fan can overcome
- air inlet and outlet sizes required for cooling and recommended filter material (if used).

Note: The heat dissipated by cables and other additional equipment must also be ventilated.

The internal cooling fans of the converter modules and filters are usually sufficient to keep the component temperatures low enough in IP20 and IP42 cabinets. Additional fans are present in the example designs as needed. If you install additional heat-generating components to the cabinet, make sure to upgrade the cooling system accordingly.

In IP54 cabinets, thick filter mats are used to prevent water splashes from entering the cabinet. This requires the installation of additional cooling equipment, such as a hot air exhaust fan.

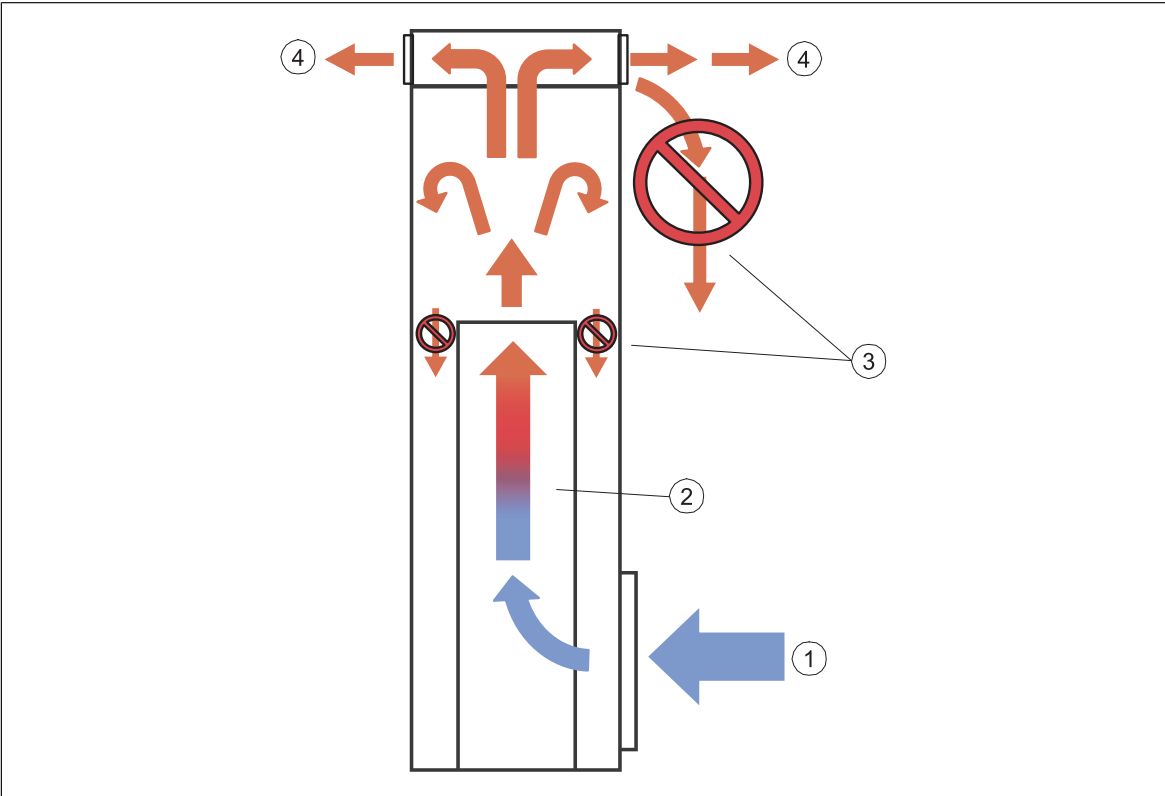
Preventing the recirculation of hot air

Prevent hot air circulation outside the cabinet by leading the out coming hot air away from the area where the inlet air to the cabinet is taken. Possible solutions are listed below:

- gratings that guide air flow at the air inlet and outlet
- air inlet and outlet at different sides of the cabinet
- cool air inlet in the lower part of the front door, and an extra exhaust fan on the roof of the cabinet.

Prevent hot air circulation inside the cabinet with, for example, leak-proof air baffles. No gaskets are usually required.

The drawing below shows the air flow inside and outside the cabinet.

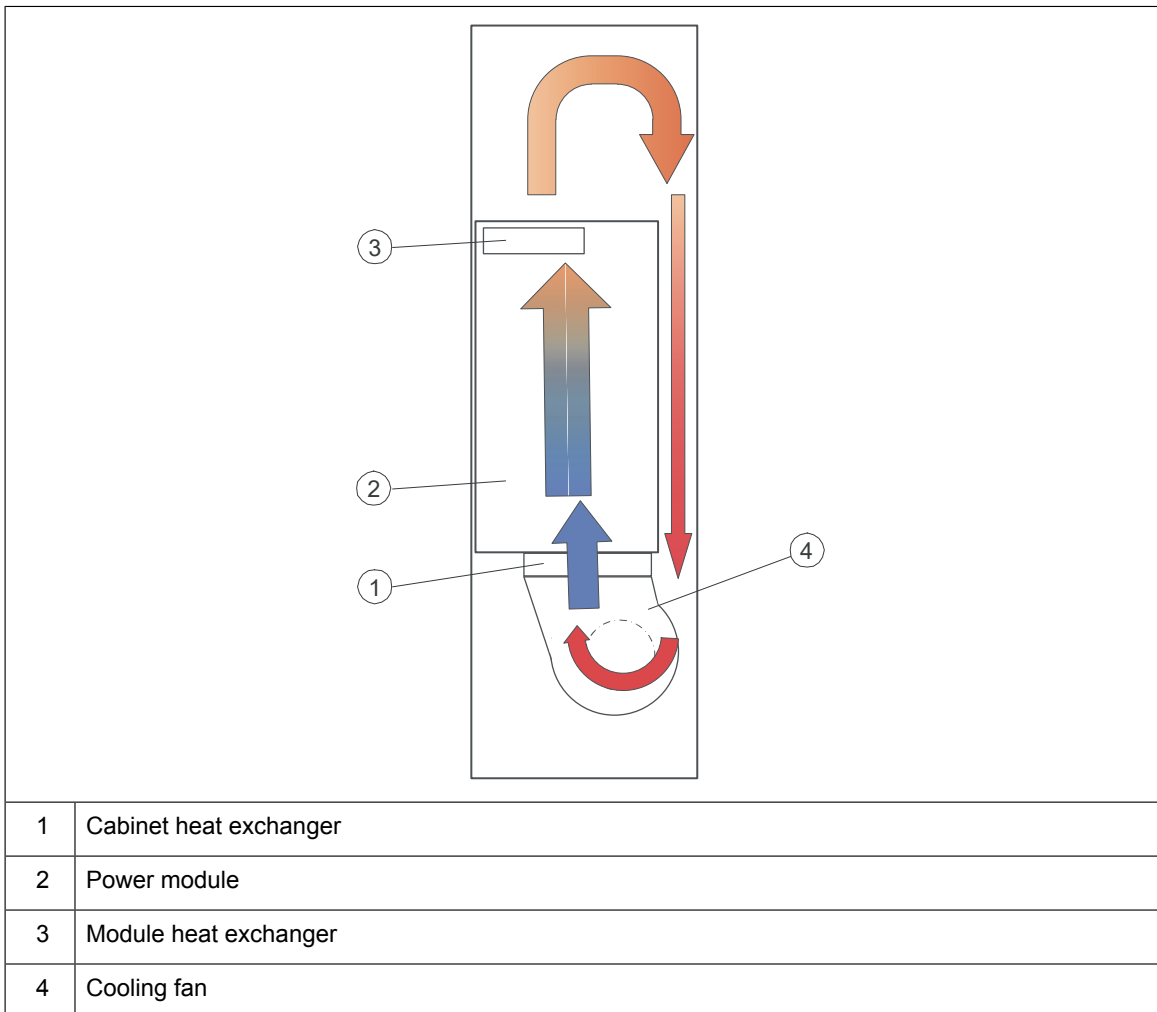


1	Air flow in
2	Power module
3	Hot air circulation to be prevented
4	Air flow out

■ Liquid-cooled drive systems

The cabinet can be sealed from the ambient air. The air inside the cabinet must be able to circulate freely. The power module in the cabinet can have a dedicated fan to push air through an air-to-liquid heat exchanger and the module. The returning air flow from the upper part of the cubicle must not be obstructed. A cabinet with diverse components can have a common fan/heat exchanger combination.

The drawing below shows the air flow inside the cabinet.



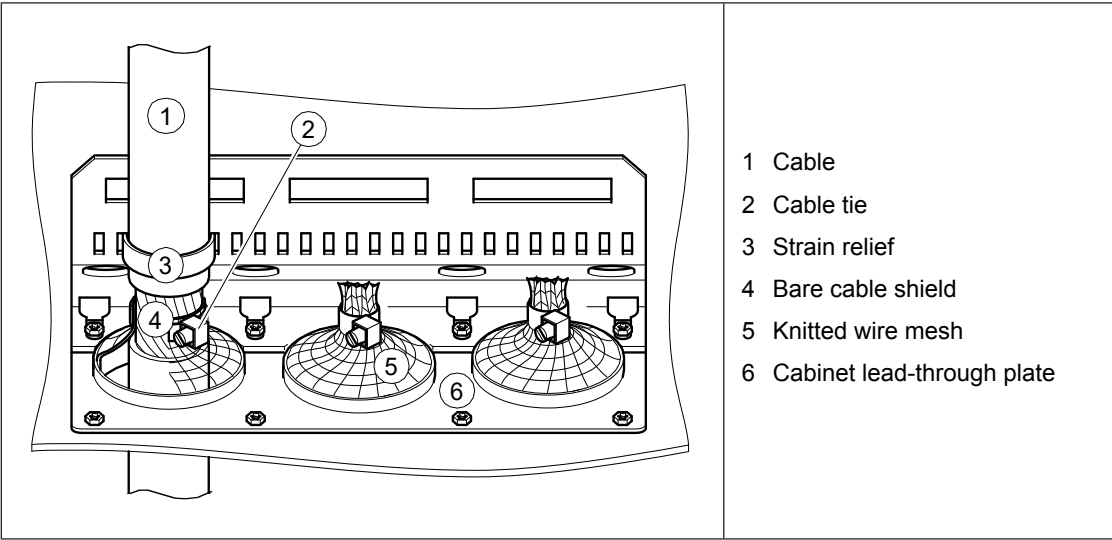
EMC requirements

Note the following when you plan the electromagnetic compatibility of the cabinet:

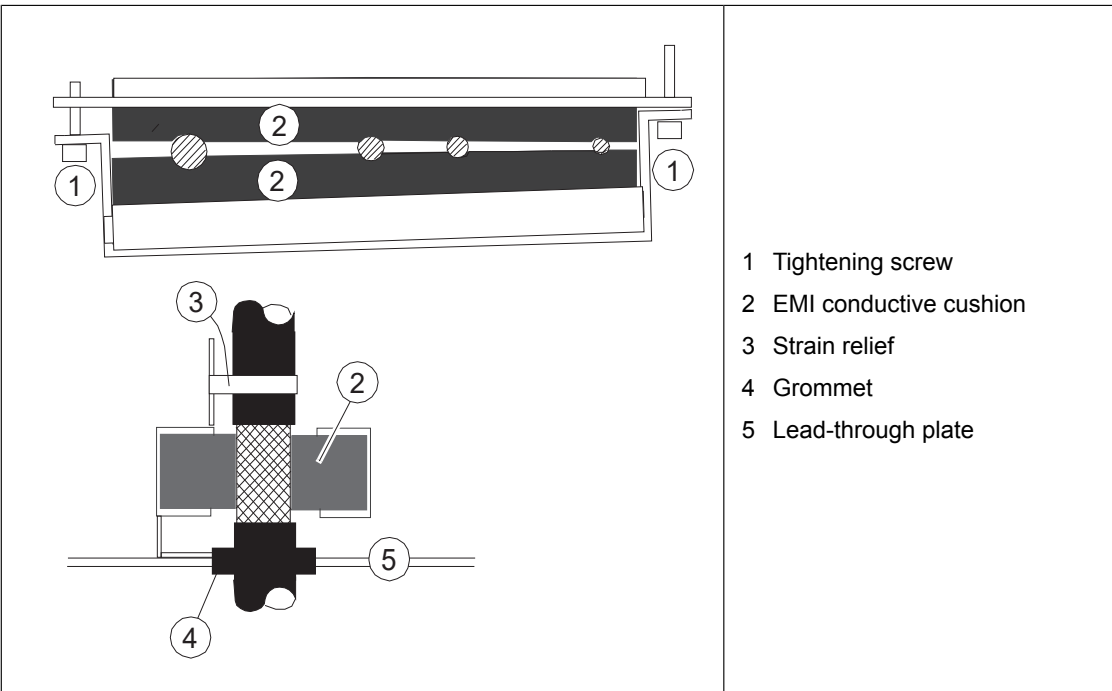
- Generally, the fewer and smaller the holes in the cabinet, the better the interference attenuation. The maximum recommended diameter of a hole in galvanic metal contact in the covering cabinet structure is 100 mm (3.94 in). Pay special attention to the cooling air inlet and outlet gratings.
- The best galvanic connection between the steel panels is achieved by welding them together as no holes are necessary. If welding is not possible, ABB recommends to leave the seams between the panels **unpainted** and equipped with special conductive EMC strips to provide adequate galvanic connection. Usually, reliable strips are made of flexible silicon mass covered with a metal mesh. The non-tightened touch-contact of the metal surfaces is not sufficient, so a conductive gasket between the surfaces is

required. The maximum recommended distance between assembly screws is 100 mm (3.94 in).

- Construct sufficient high-frequency grounding network in the cabinet to avoid voltage differences and forming of high-impedance radiator structures. A good high-frequency grounding is made with short flat copper braids for low inductance. One-point high-frequency grounding cannot be used due to the long distances inside the cabinet.
- 360° high-frequency grounding of the cable shields at the cable entries improves the EMC shielding of the cabinet.
- ABB recommends 360° high-frequency grounding of the motor cable shields at their entries. The grounding can be implemented by a knitted wire mesh screening as shown below.



- ABB recommends 360° high-frequency grounding of the control cable shields at their entries. The shields can be grounded by means of conductive shielding cushions pressed against the cable shield from both directions as shown below.



Fastening the cabinet



WARNING!

Do not fasten the cabinet by electric welding. ABB does not assume any liability for damages caused by electric welding as the welding circuit can damage electronic circuits in the cabinet.

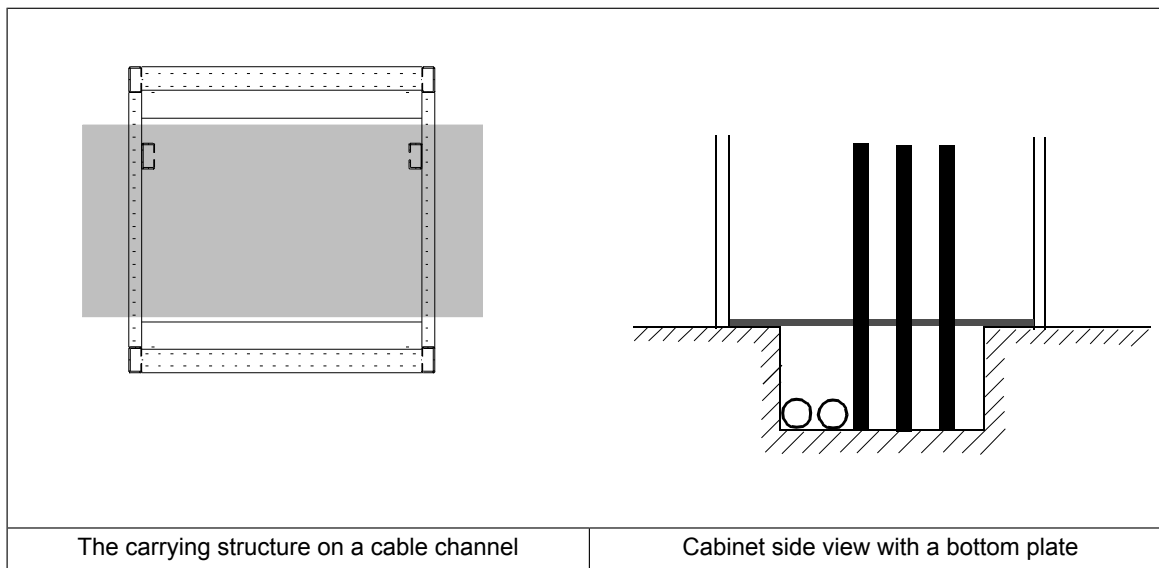
Cabinet placement on a cable channel

Note the following when you plan to place the cabinet on a cable channel:

- The cabinet structure must be sturdy enough. If the whole cabinet base is not supported from below, the cabinet weight will lie on the sections that the floor carries.
- Equip the cabinet with a sealed bottom plate and cable entries to ensure the degree of protection and to prevent the cooling air flow from the cable channel into the cabinet.

Note: Note for option +B051

When the bottom grille and clear plastic shrouds around the motor cables are installed, the degree of protection of the drive module from bottom side is IP20.



Cubicle heaters

Use a cubicle heater if there is a risk of condensation in the cabinet. Although the primary function of the heater is to keep the air dry, it may also be required for heating at low temperatures.

3

Cabinet system specific instructions

Contents of this chapter

This chapter contains cabinet system specific instructions.

ACS880 multidrive modules and Rittal VX25 enclosure

ACS880 series drive installations into Rittal VX25 enclosures are designed as complete mechanical solutions. The complete documentation including parts lists, installation instructions and videos is available at <https://sites-apps.abb.com/sites/lvacdrivesengineeringssupport/content>. However, instructions for cabling are not included because of different customer-specific demands.

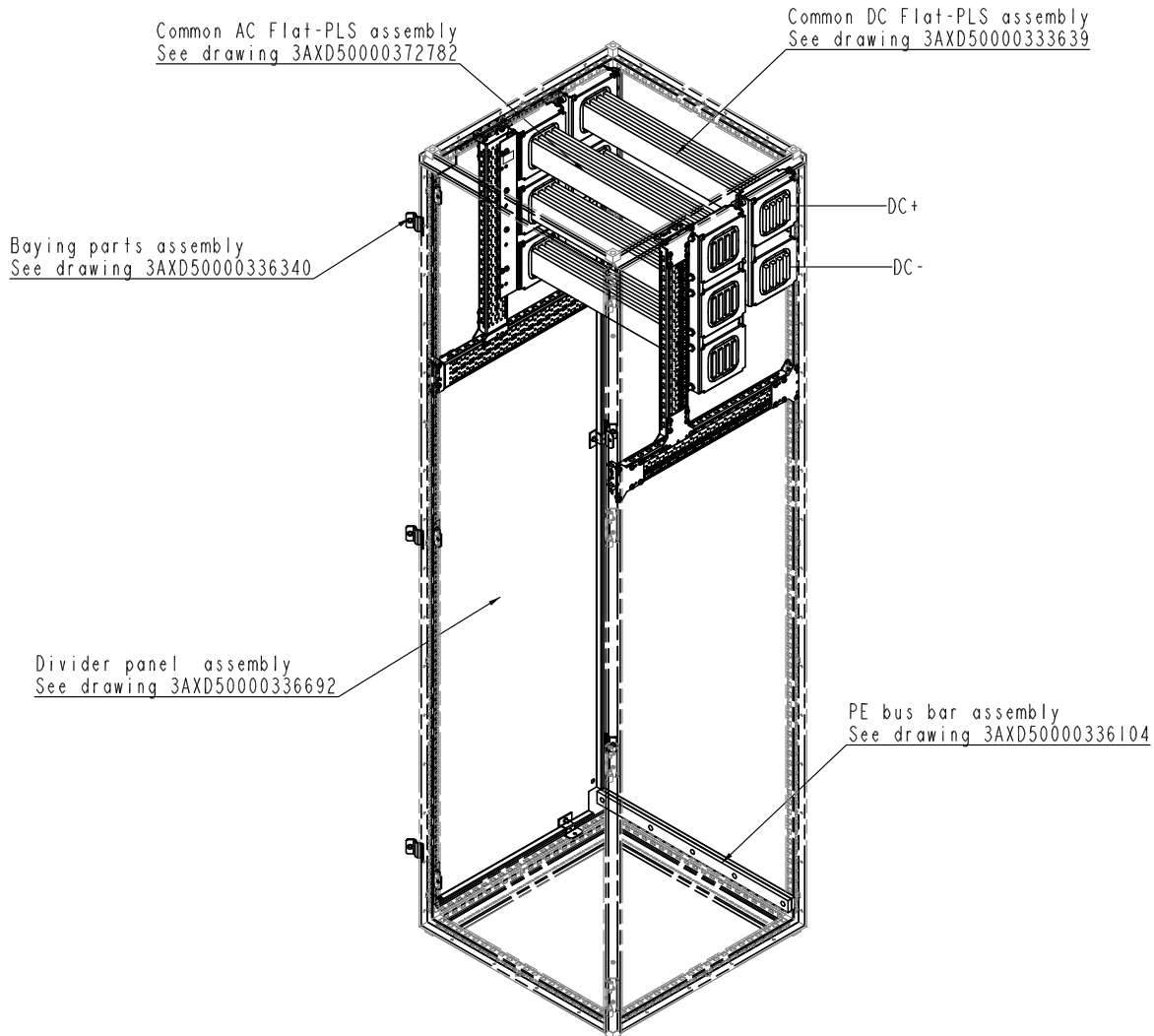
In general, the designs follow those of cabinet-built ACS880 multidrives and take module specific requirements into account. Note that even though the same VX25 frames and the same design principles are used for both air-cooled and liquid-cooled modules, the designs still differ in many ways. See the module hardware manuals for details.

■ Order of construction

In general, the cabinet line-up should be built in the following order:

1. Baying of enclosures
 2. Dividing (partitioning) of enclosures
 3. PE busbar installation
 4. Common AC and DC bus installation
 5. Enclosure-specific installation.
-

22 Cabinet system specific instructions



The drawing shows an example of an air-cooled drive design in a VX25 enclosure. The instructions referred to contain listings of parts available through ABB and Rittal.

■ Baying

All cabinet designs use the same baying principle; see drawing 3AXD50000336340.

Other baying parts can be used, but ensure that these parts do not interfere with the subsequent installation of other components.



WARNING!

When lifting line-ups consisting of multiple cubicles, spreader-type lifting bars must be used. Refer to instructions from Rittal.

■ Dividing (partitioning) enclosures

It is recommended to use divider panels to partition the cabinet line-up. This is because various drive equipment have different cooling characteristics, and to avoid counterflow or other airflow-related problems. See section [Cooling and degrees of protection \(page 15\)](#).

Drawing 3AXD50000336692 details divider panel installation.

Instead of standard Rittal divider panels, liquid-cooled designs use ABB-designed adapter panels available as kits.

■ PE busbar installation

The PE busbar can be placed at the bottom rear edge of the line-up. This design employs Rittal busbar supports and a 2 × 10 × 30 mm busbar. The cross-sectional area of the PE busbar should be at least 500 mm². For details, see drawing 3AXD50000336104.

In liquid-cooled designs, the PE busbar is placed at the front part of the cabinet, behind the main coolant pipe. Typically, 50 × 10 mm busbar is used.

■ AC/DC busbars

AC and DC power distribution is handled by Rittal Flat-PLS busbars. Each phase (or pole) can consist of 1 to 4 10 × 60 mm busbars, with the cross-sectional area thus ranging from 600 to 2400 mm².

Note: Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

The ACS880 modules offering contains kits 3AXD50000360772 and 3AXD50000333387 with attachment brackets/plates for optimum AC/DC bus positioning in the VX25 line-up.

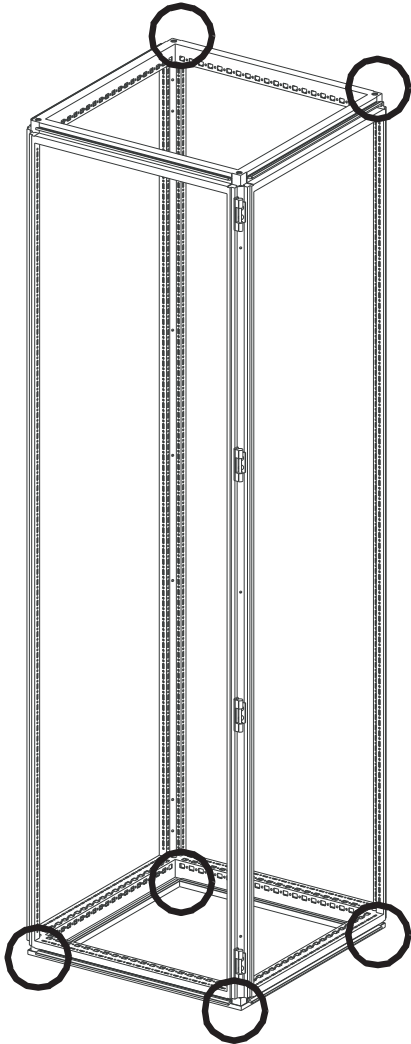
Refer to the instructions provided by Rittal when designing and building the busbar system.

■ Component installation

Detailed stage-by-stage installation instructions can be found at the Engineering Support site (<https://sites-apps.abb.com/sites/lvacdrivesengineeringssupport/content>). An overview is presented in the module-specific manuals. Please note that some designs require that the kits are installed in the correct order. Some kits, such as air inlets and outlets, may require modification of Rittal parts.

■ Vibration damping

Drive installations using ABB kits for VX25 enclosures are designed to withstand industrial level vibrations. The use of vibration isolators is recommended in marine installations, as well as other environments with strong vibrations. The isolators can be placed, for example, under the enclosure and at the top back as shown in the drawing below.



In a cabinet line-up, it is recommended to attach the isolators to a shared common plinth. The plinth should be rigid enough to minimize twisting around the longest dimension of the line-up under uneven mechanical loads.

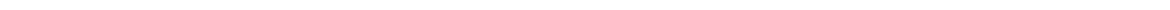
Several types of vibration isolators exist on the market. The cabinet weight, weight distribution, and the type (shock, sinusoidal) and frequency of the expected vibrations are the most important parameters when choosing a vibration isolator.

Vibration isolators allow the cabinet to move related to its surroundings. The cabling and other connections to the cabinet should be made flexible enough to allow for cabinet movement.

ACS880, ACS580, ACH580 and ACQ580 drive modules and Rittal VX25 enclosure

See the drive module type specific instructions:

- *ACS880-04 hardware manual* (3AUA0000128301 [English])
 - *ACS880-14 hardware manual* (3AXD50000035160 [English])
 - *ACS880-34 hardware manual* (3AXD50000035191 [English])
 - *ACH580-04 hardware manual* (3AXD50000048685 [English])
 - *ACH580-34 hardware manual* (3AXD50000419708 [English])
 - *ACQ580-04 hardware manual* (3AXD50000048677 [English])
 - *ACQ580-34 hardware manual* (3AXD50000420025 [English])
 - *ACS580-04 hardware manual* (3AXD50000015497 [English]).
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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.

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