
ABB DRIVES

Drive modules

Cabinet design and construction instructions

Drive modules

Cabinet design and construction instructions

Table of contents



Table of contents

1 Introduction to the manual

Contents of this chapter	7
Applicability	7
Target audience	7
Purpose of this manual	7
Related documents	7
Terms	8

2 Generic cabinet planning instructions

Contents of this chapter	9
Limitation of liability	9
Cabinet construction	9
Planning the layout of the cabinet	10
Grounding of mounting structures	10
Busbar material and joints	10
Shrouds	10
Tightening torques	10
Electrical connections	10
Mechanical connections	10
Insulation supports	11
Cable lugs	11
Cooling and degrees of protection	11
Planning the cooling	11
Air-cooled drive systems	11
Air inlets and outlets	11
Preventing the recirculation of hot air	13
Liquid-cooled drive systems	14
EMC requirements	14
Attaching the cabinet	16
Cabinet placement on a cable duct	16
Cabinet heating elements	17
Attaching the control panel on the cabinet door	17

3 Cabinet system specific instructions

Contents of this chapter	19
ACS880 multidrive modules and Rittal VX25 enclosure	19
Order of construction	19
Baying	20
Dividing (partitioning) enclosures	20
PE busbar installation	21
AC/DC busbars	21
Component installation	21
Vibration damping	22
ACS880, ACS580, ACH580 and ACQ580 drive modules and Rittal VX25 enclosure ..	23



6 Table of contents

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
- ACS380, ACH480 and ACS480 drives.

Target audience

This manual is intended for people who plan the installation of a drive module in a user-defined cabinet.

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

You can find manuals and other product documents in PDF format on the Internet at www.abb.com/drives/documents.

Terms

For drive and power modules, we use the 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
 - 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 (air-cooled drive systems).
-

■ Planning the layout of the cabinet

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

Place the control unit(s) away from:

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

■ 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 attaching 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 bare copper and aluminum can also be used.

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.

■ Tightening torques

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

Electrical connections

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

Mechanical connections

Size	Max. torque	Strength class
M5	6 N·m (53 lbf·in)	8.8
M6	10 N·m (7.4 lbf·ft)	8.8

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

Insulation supports

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

Cable lugs

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

■ Air-cooled drive systems

Air inlets and outlets

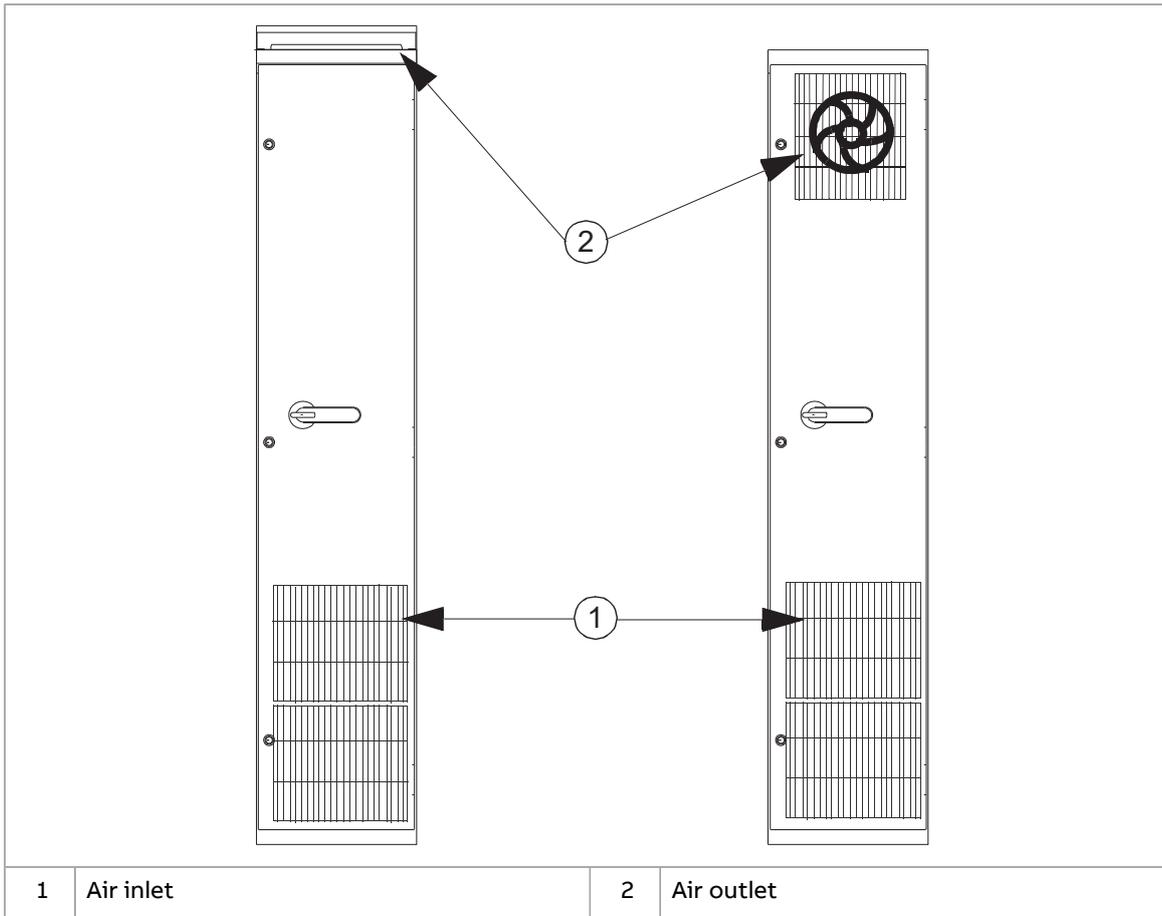
Equip the air inlets and outlets with gratings that:

- 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.

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

12 Generic cabinet planning instructions



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

- cooling air flow
 - Note:** The values stated for each component 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. For higher degrees of protection, or if the air outlet is in the cabinet door, extra fans can be necessary. 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.

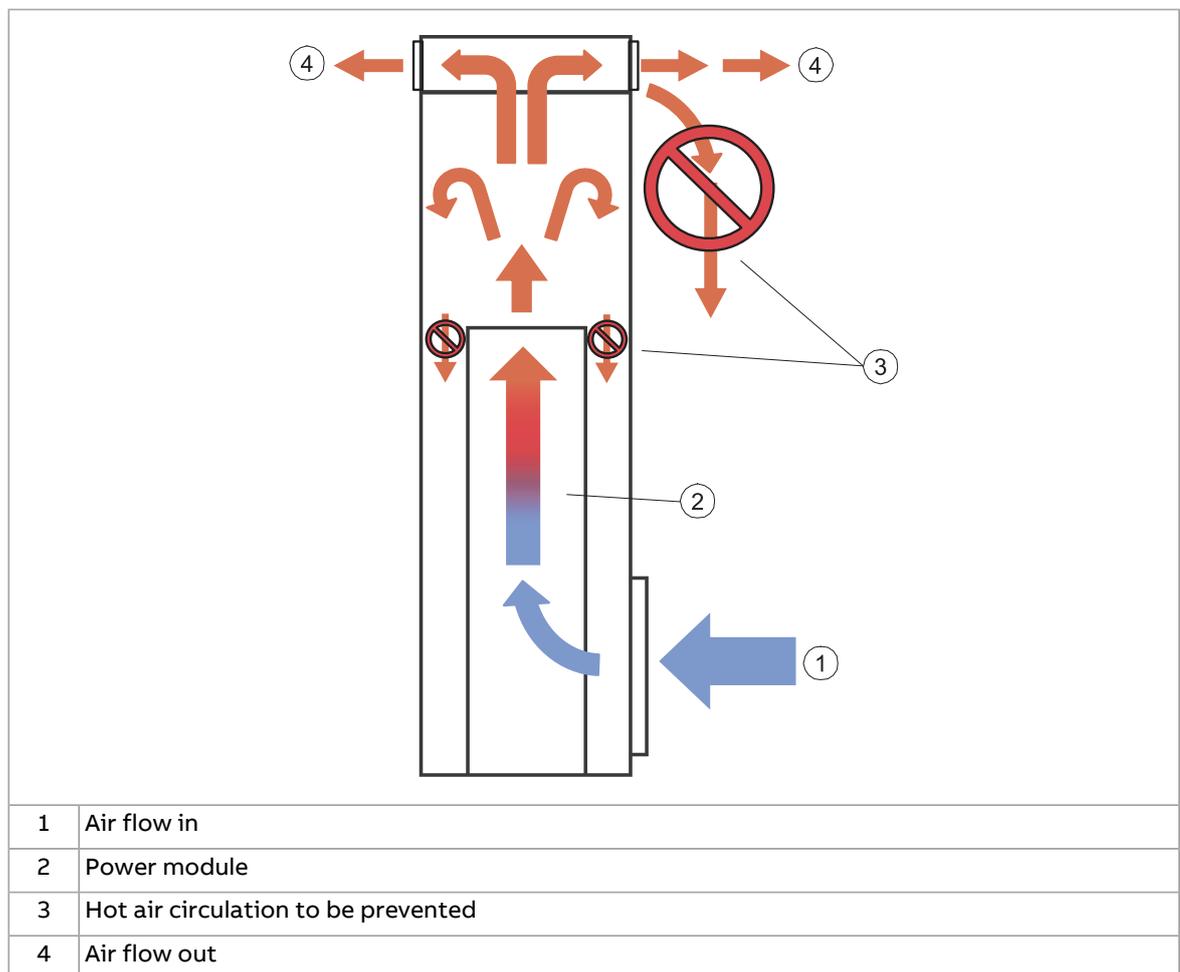
Preventing the recirculation of hot air

Prevent hot air circulation outside the cabinet by leading the outgoing 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. Usually, no gaskets are required.

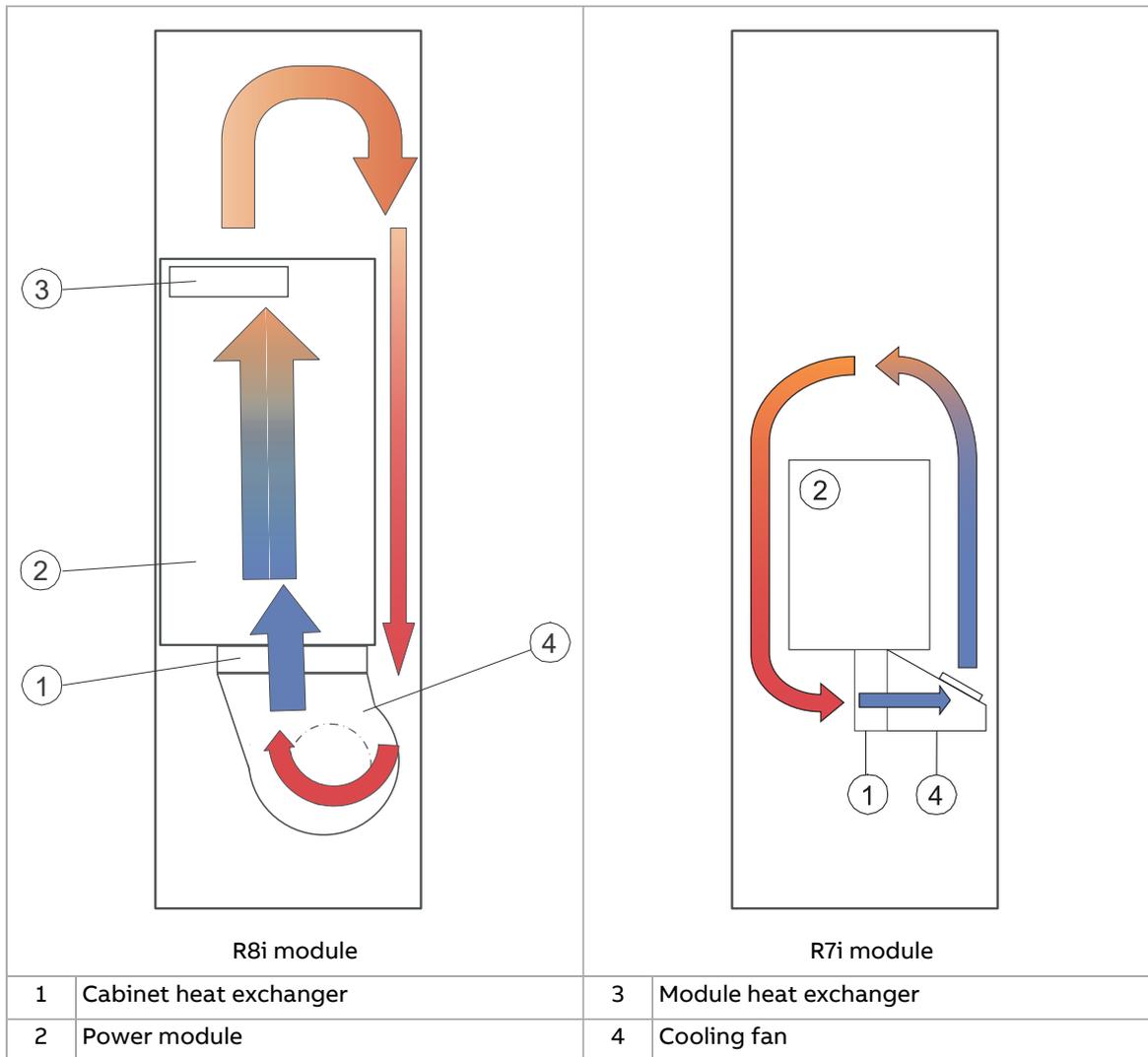
The drawing below shows the air flow inside and outside the cabinet.



■ **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.



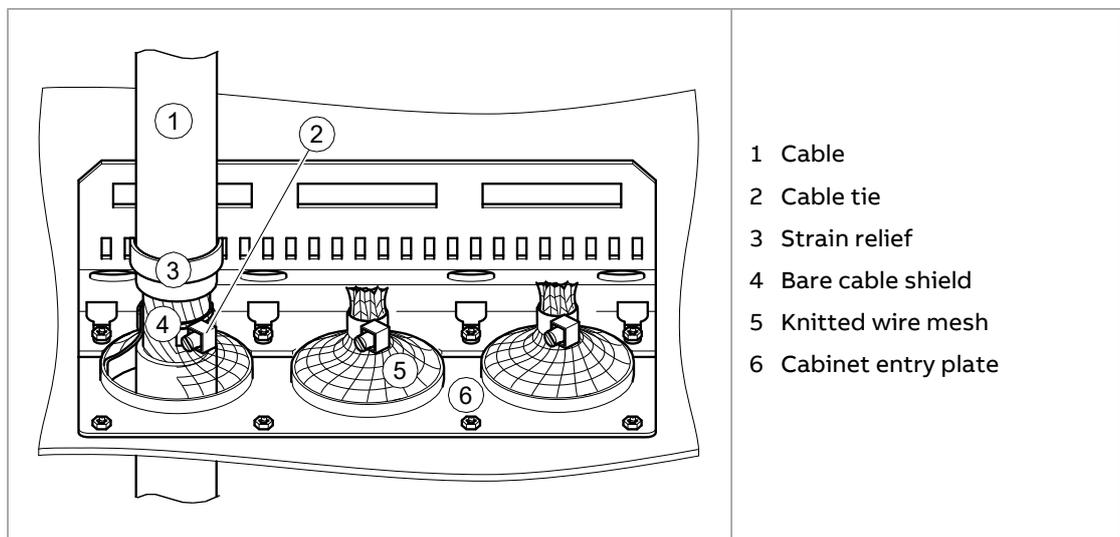
EMC requirements

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

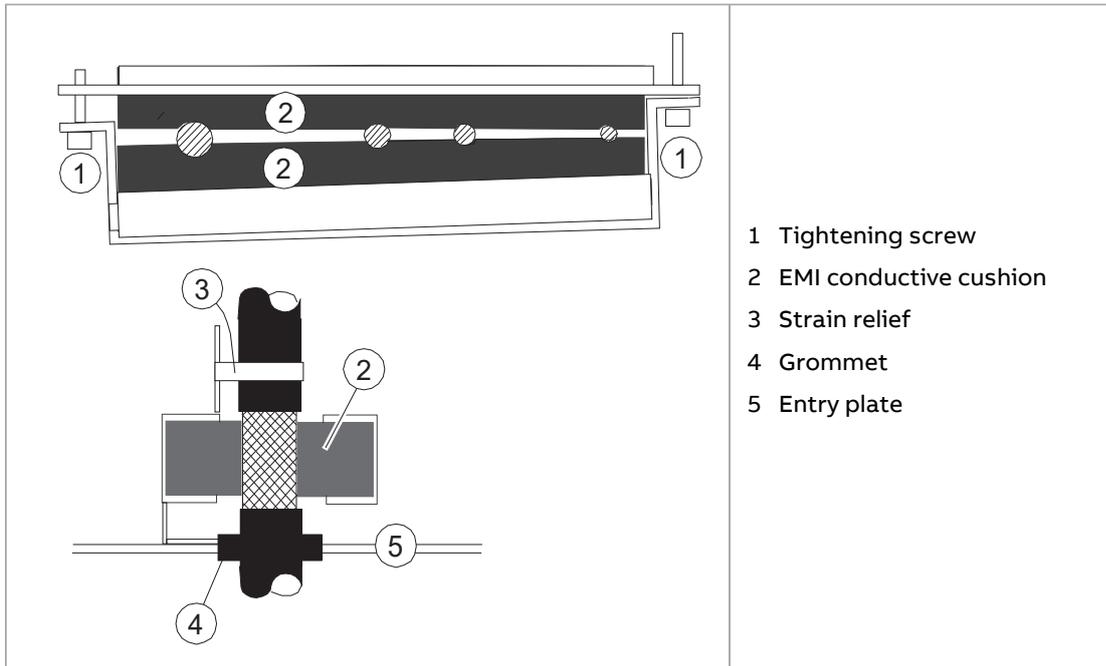
- Generally, the fewer and smaller the holes in the cabinet, the better the interference attenuation. The maximum recommended diameter of a hole in galvanic metal contact in the covering cabinet structure is 100 mm (3.94 in). Pay special attention to the cooling air inlet and outlet gratings.
- The best 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.



Attaching the cabinet

Refer to the cabinet manufacturer's instructions.



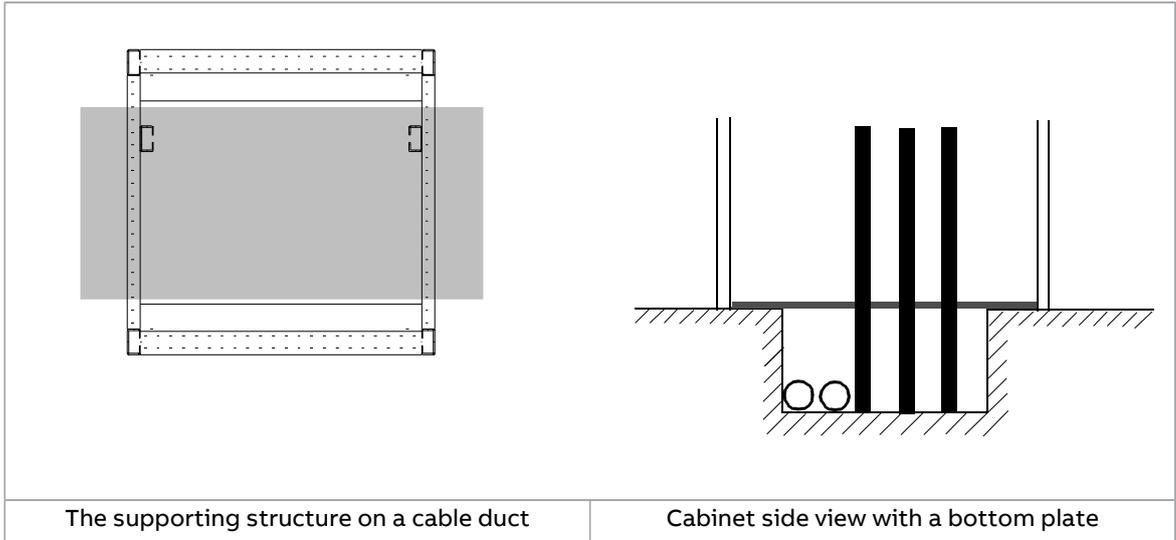
WARNING!

Do not attach 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 duct

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

- 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 duct into the cabinet.



Cabinet heating elements

Use a 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.

Attaching the control panel on the cabinet door

You can use a mounting platform to attach the control panel on the cabinet door. Mounting platforms for control panels are available as options from ABB. For more information, see:

Manual	Code (English)
DPMP-01 mounting platform for control panels installation guide	3AUA0000100140
DPMP-02/03 mounting platform for control panels installation guide	3AUA0000136205
DPMP-04/05 mounting platform for control panels installation guide	3AXD50000308484



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 the Engineering Support site <https://sites-apps.abb.com/sites/lvacdrivesengineeringssupport/content>. However, instructions for cabling are not included because of different customer-specific demands.

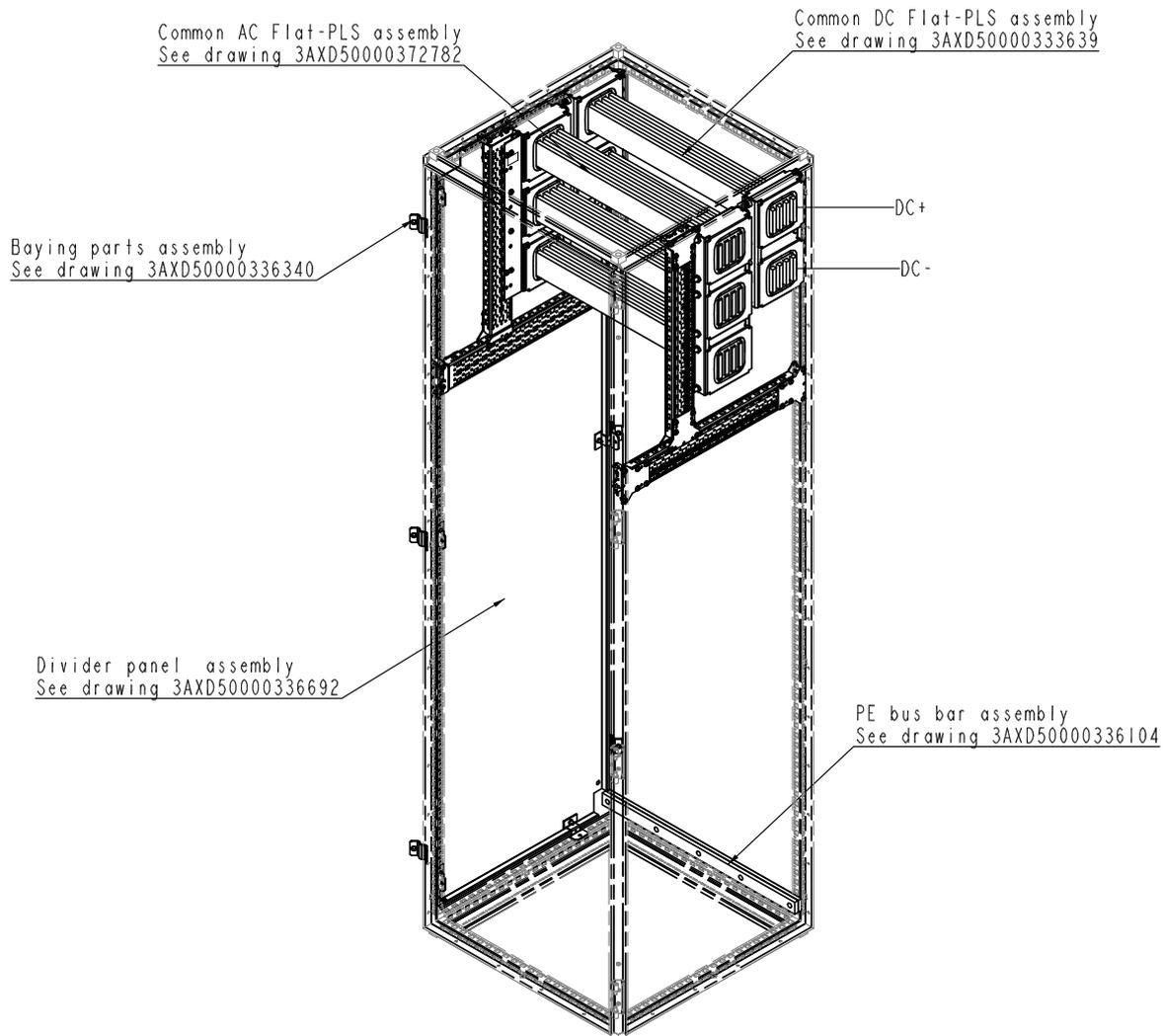
In general, the designs follow those of cabinet-built ACS880 multidrives and take module specific requirements into account. Note that even though the same VX25 frames and the same design principles are used for both air-cooled and liquid-cooled modules, the designs still differ in many ways. See the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

20 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 make sure 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 11).

Drawing 3AXD50000336692 details divider panel installation.

Instead of standard Rittal divider panels, liquid-cooled designs use ABB-designed side 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, a 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.

When you design and install the busbar system, make sure that:

- the current carrying capability of the busbars is not exceeded at any point of the drive system
- the short circuit withstand strength of the busbars fulfil the requirements of the installation.

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 installing the busbar system. If necessary, contact ABB for support with short circuit resistance values, short circuit calculations or simulations.

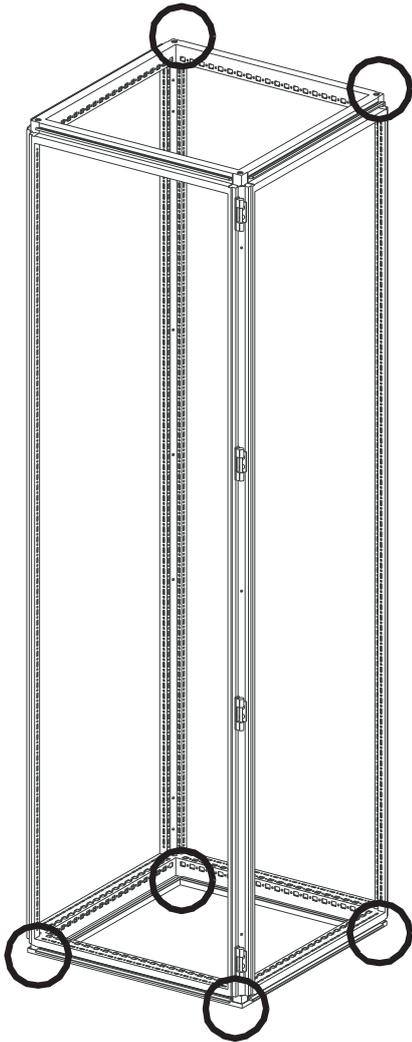
■ Component installation

Stage-by-stage installation instructions are available 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 of air-cooled multidrive modules, as well as other environments with strong vibrations. Liquid-cooled multidrive modules are designed to withstand marine vibrations without isolators.

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

Refer to 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]).
-



Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

Providing feedback on ABB manuals

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

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet at www.abb.com/drives/documents.



www.abb.com/drives



3AUA0000107668E