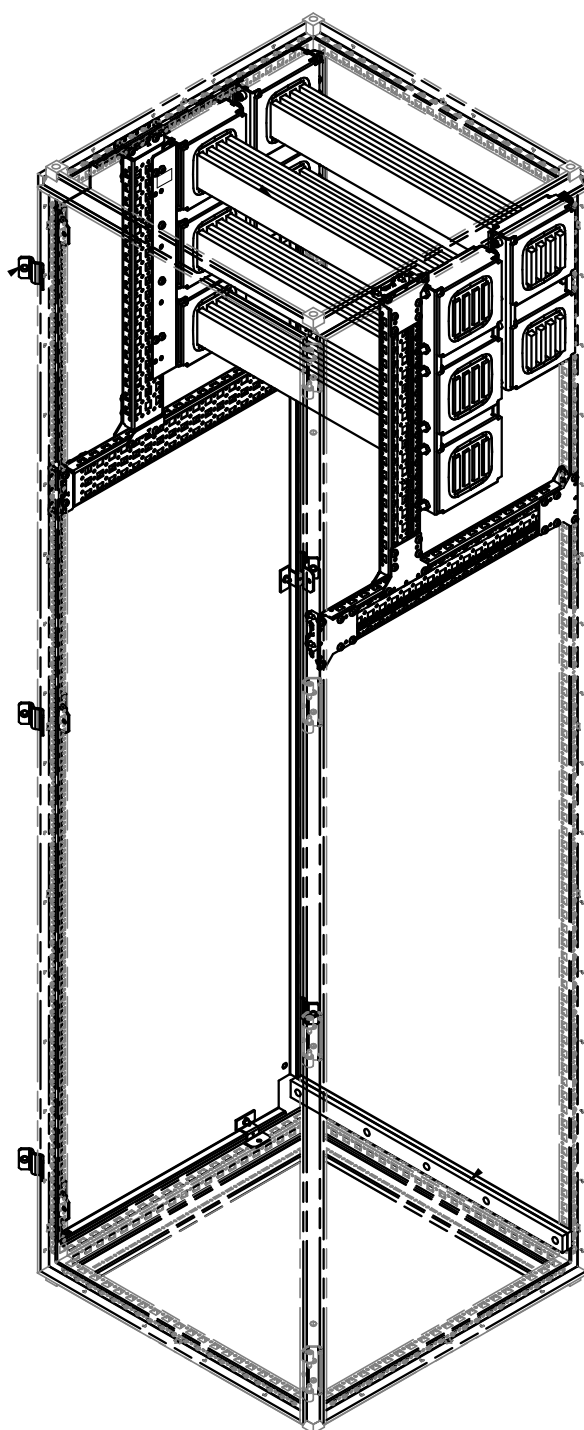


ABB DRIVES

Drive and multidrive modules

Cabinet design and construction instructions



Drive and multidrive 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.....	8
Use of terms.....	8
Module and power module.....	8
Generic enclosure or cabinet.....	8
Document code, kit code and kit ordering code.....	8

2 Design guidelines for any cabinet installation

Contents of this chapter.....	11
Limitation of liability.....	11
North America.....	11
Cabinet construction.....	11
Planning the layout of the cabinet.....	12
Grounding of mounting structures.....	12
Busbar material and joints.....	12
Shrouds.....	12
Tightening torques.....	12
Electrical connections.....	12
Mechanical connections.....	13
Insulation supports.....	13
Cable lugs.....	13
Cooling and degrees of protection.....	13
Planning the cooling.....	13
Air-cooled drive systems.....	14
Air inlets and outlets.....	14
Preventing the recirculation of hot air.....	15
Liquid-cooled drive systems.....	17
EMC requirements.....	17
Attaching the cabinet.....	19
Cabinet placement on a cable duct.....	19
Cabinet heating elements.....	19
Attaching the control panel on the cabinet door.....	20

3 Design guidelines for a Rittal VX25 cabinet installation

Contents of this chapter.....	21
Overview.....	21
Components and kits available from ABB and from another suppliers.....	21
Scope of the ABB documentation.....	22
Order of construction.....	22
Dividing (partitioning) enclosures.....	23
Baying.....	23



6 Table of contents

PE busbar installation..... 24

AC and DC busbars..... 24

Component installation..... 25

Vibration damping..... 25

Modifications to Rittal parts..... 26

Further information



1

Introduction to the manual

Contents of this chapter

This chapter describes the manual.

Applicability

This manual applies to these products:

- ACS880 drive modules
- ACS880 multidrive modules, air- and liquid-cooled (for example: supply modules, inverter modules, brake modules, etc.)
- ACS580, ACH580 and ACQ580 drive modules
- ACS380, ACH480 and ACS480 drive modules.

Target audience

This manual is intended for people who plan the cabinet installation of a drive module or multidrive modules.

Purpose of this manual

This manual contains generic planning guidelines for the cabinet installation of a drive module or multidrive modules. For the module specific instructions, refer to its hardware manual or cabinet installation manual.

Related documents

For more product manuals, go to www.abb.com/drives/documents.

For the ACS880 multidrive modules, ABB also provides cabinet installation documents on an engineering support site. You need an ABB-granted user account for the site. To access, go to:

<https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content>

The engineering support site contains:

- selection guides and product manuals
- documents on the mechanical installation such as:
 - dimension drawings and 3D models of components
 - kit assembly drawings that show the assembly of individual kits, such as DC busbar kit, quick connector kit, etc.
 - assembly drawings and 3D models that show the assembly of the power module cubicle.
- documents on the electrical installation such as:
 - example circuit diagrams that show the internal connections of drives or multidrive units
 - connection diagrams of the electrical kits
 - content listings of the electrical kits.

Use of terms

■ Module and power module

The terms module and power module refer to both drive modules and multidrive modules.

■ Generic enclosure or cabinet

The module hardware manuals and other documents present kits or parts that are suitable for a generic enclosure or cabinet. These parts are not designed for any specific enclosure system. They are intended as a basis for further engineering and can require additional parts to be fully usable.

Installation accessories for generic enclosures are in fact designed for an inside width of 50 mm less than the nominal width of the enclosure. For example, a mechanical kit intended for 800 mm wide generic enclosure is designed for an inside width of 750 mm, and will not fit an 800 mm wide Rittal VX25 enclosure.

Document code, kit code and kit ordering code

The module hardware manuals and other documentation refer to document codes, kit codes and kit ordering codes. If you want to see the document or find more information on the kit, go to the [ABB engineering support site](#) and search with the code. The table below shows examples that clarify the difference between the code types.

Kit name	Instruction code (document code)	Kit code	Kit ordering code
Quick connector	3AUA0000118667	A-468-8-100	3AUA0000119227

Kit name	Instruction code (document code)	Kit code	Kit ordering code
Quick connector busbars and shrouds	3AXD50000343492	A-4-8-132-VX	3AXD50000337477

2

Design guidelines for any cabinet installation

Contents of this chapter

This chapter contains design guidelines that are applicable to any cabinet system. The topics discussed are essential for the safe and correct 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 that 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.

■ North America

Installations must be compliant with NFPA 70 (NEC)¹⁾ and/or Canadian Electrical Code (CE code), along with state and local codes for your location and application.

¹⁾ National Fire Protection Association 70 (National Electric Code).

Cabinet construction

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

- The cabinet frame is strong enough to carry the weight of the components, control circuitry and other equipment installed in it.
 - The cabinet protects the modules from contact and complies with the requirements for dust and humidity.
-

12 Design guidelines for any cabinet installation

- The cabinet is strong enough to provide adequate protection against flames or pressure blasts 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). Then, 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 nickel-plated copper, but bare copper and aluminum can also be used.

Before joining aluminum busbars, remove the oxide layer and apply suitable antioxidant joint compound.

ABB does not offer main AC or DC busbar kits for generic cabinets. The customer must design and acquire these busbars and also design the connections between the ABB kits and the busbars.

■ Shrouds

It is the responsibility of the drive system builder to install shrouds (touch protection) when required by safety regulations.

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, these torques can be used.

For Rittal components, use the torques given in the Rittal assembly documentation.

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

Size	Torque	Strength class
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
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 (A2-70 or A4-70)
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

Obey the ABB recommendations, and use the ABB specified cooling parts and cabinet designs to make sure that the drive cools correctly at its nominal load.

When you plan the cooling of the cabinet:

- Air-cooled drives: 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 manuals.
 - Liquid-cooled drives: Make sure that you meet the ABB specifications for the cooling system.
 - 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:

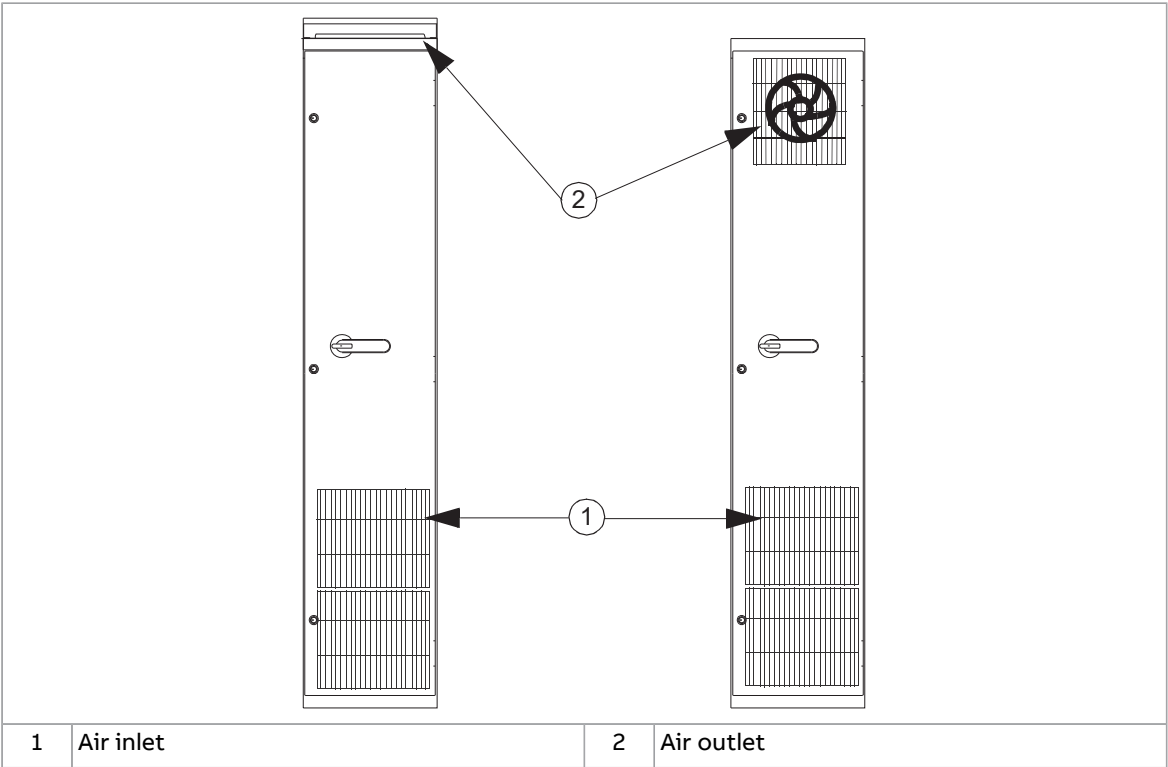
- are large enough to allow sufficient air flow in and out of the cabinet (critical for correct cooling of the module).
- guide the air flow
- protect against contact
- prevent water splashes from entering the cabinet
- comply with the EMC requirements (radiated emissions)
- ensure adequate protection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

You can meet all these requirements with the inlet and outlet kits that ABB provides. If you use other components, make sure that they comply with all requirements.

Make sure that unfiltered air cannot flow into the cabinet or cubicle. Add tight divider panels between cubicles, use sealing in doors, and when necessary, also in cable entries, etc.

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.



Arrange the cooling of the components according to the technical data in the applicable hardware manual. Refer to the specifications for:

- cooling air flow
- power loss
- air inlet and outlet sizes required for cooling and recommended filter material (if used).

Note: The ventilation system must also remove heat dissipated by cables and additional equipment.

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

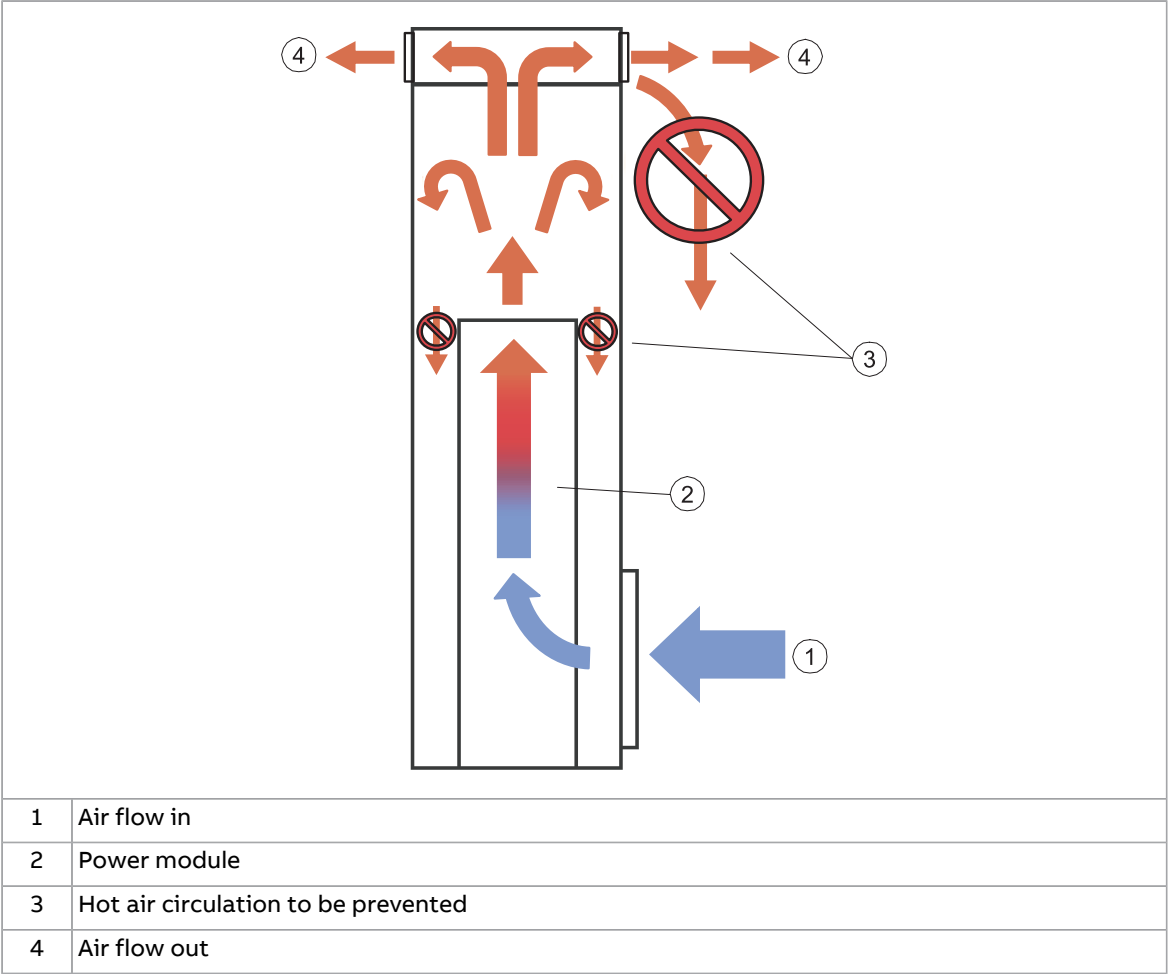
To prevent hot air circulation outside the cabinet, make sure that the hot exhaust air does not flow into the air inlet. Possible solutions:

- gratings that guide airflow at the air inlet and air outlet
- air inlet and air 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. Gaskets are typically not required.

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

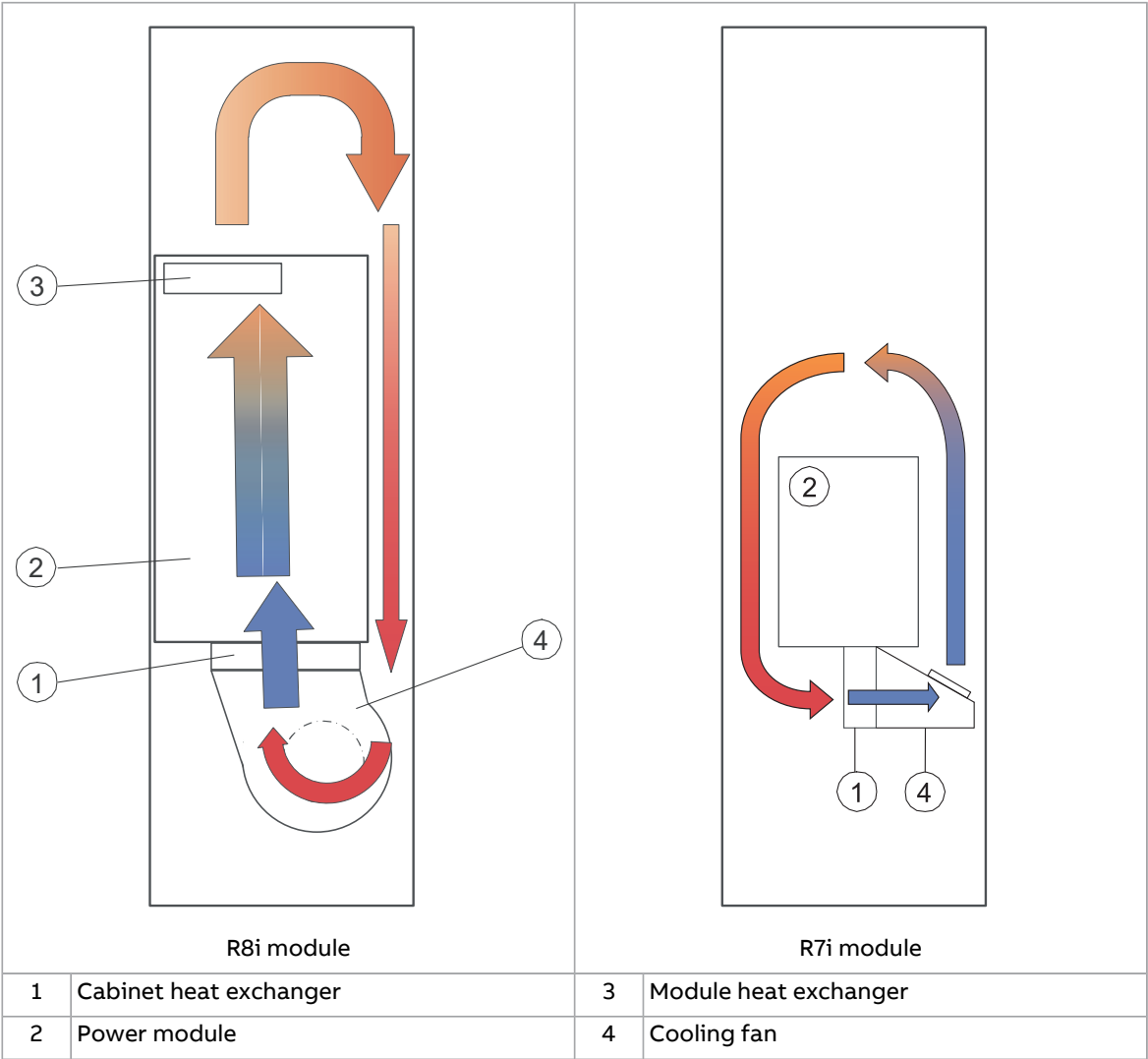
16 Design guidelines for any cabinet installation



■ **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.



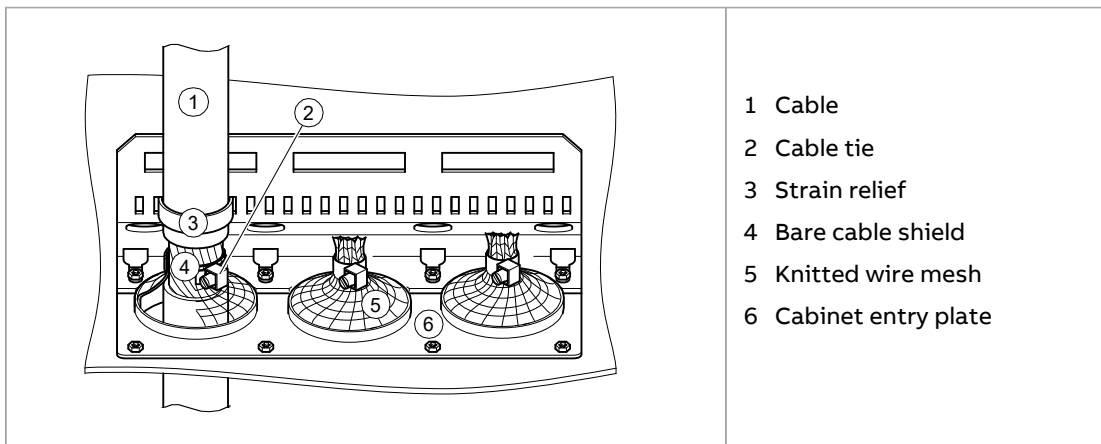
EMC requirements

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

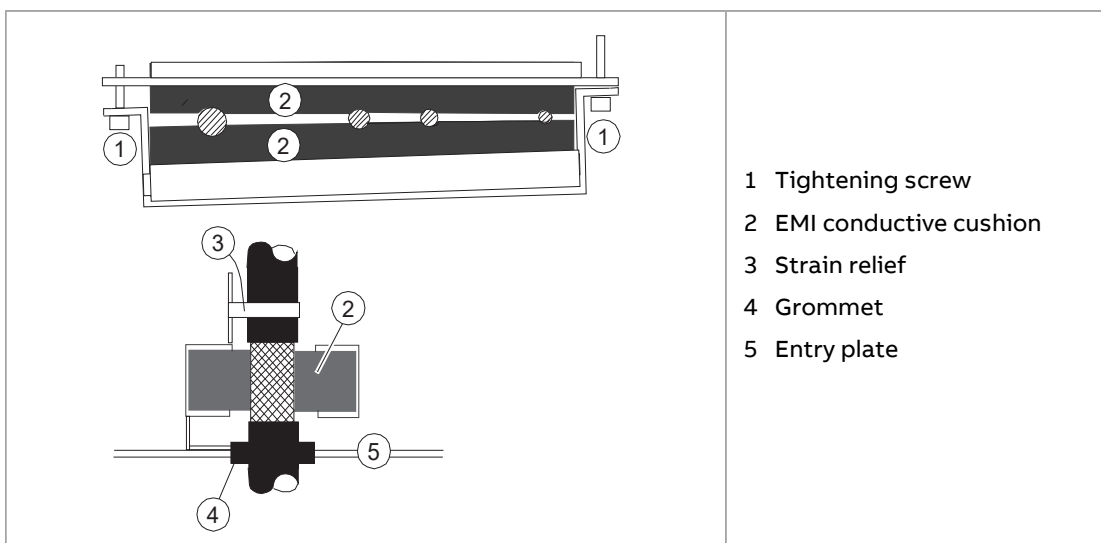
- Generally, the fewer and smaller the holes in the cabinet, the better the interference attenuation. The maximum recommended diameter of a hole in galvanic metal contact in the covering cabinet structure is 100 mm (3.94 in). Pay special attention to the cooling air inlet and outlet gratings.
- A reliable galvanic connection between the steel panels and the frame improves EMC performance. Consult the cabinet manufacturer to confirm the available galvanic connection solutions and determine the suitable methods for you. Generally speaking, you can apply these measures to improve the galvanic connection:

18 Design guidelines for any cabinet installation

- Keep the contact surfaces unpainted.
- Install conductive EMC strips between the contact surfaces.
- Place the assembly screws close to each other, with a maximum spacing of 100 mm (3.94 in).
- For metal surfaces that are not tightened by screws (for example, doors), use a conductive EMC gasket between the surfaces.
- Construct sufficient high-frequency grounding network in the cabinet to avoid voltage differences and forming of high-impedance radiator structures. 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.



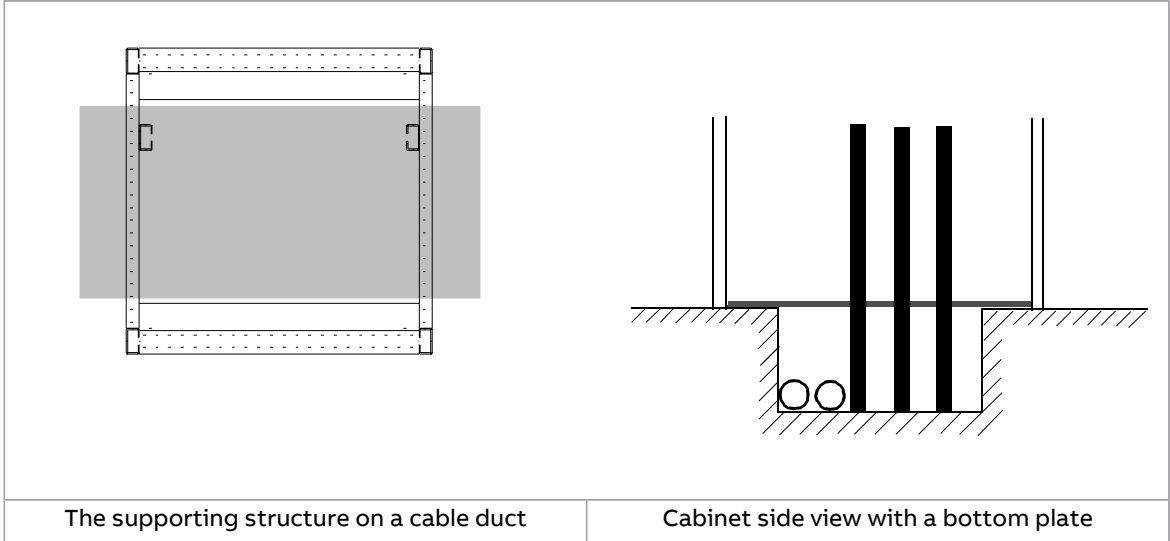
Attaching the cabinet

Refer to the cabinet manufacturer's instructions.

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 to the cabinet door. Mounting platforms for control panels are available as options from ABB. For more information, refer to:

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

		
DPMP-01	DPMP-02	DPMP-04/05

3

Design guidelines for a Rittal VX25 cabinet installation

Contents of this chapter

This chapter contains design guidelines for the installations of ACS880 multidrive modules in Rittal VX25 cabinet.

Overview

The installations of ACS880 multidrive modules in Rittal VX25 cabinet are designed as complete mechanical solutions. The documentation that includes parts lists, installation instructions and videos is available at the engineering support site <https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content>.

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.

Components and kits available from ABB and from another suppliers

Refer to the applicable module hardware manual and documents on the ABB engineering support site for components and kits for the drive cabinet installation. If a component or kit is available from ABB, the hardware manual and documents define its ABB ordering code. If they do not, the component or kit is not available from ABB, but you must order it from another supplier. For example, the Rittal VX25 cabinet has no ABB ordering code. You must order it from Rittal or from a Rittal retailer.

Note: If the Rittal cabinet installation of an ABB kit also requires parts from Rittal, there is a note in the kit assembly drawing.

Scope of the ABB documentation

ABB provides documents for the mechanical and electrical installation of complete drive cabinet line ups. However, assembly drawings are only available for those cubicles that contain power modules. A complete drive cabinet also has other cubicles for components such as the main disconnecting device, the main contactor or main breaker, etc. The system integrator is in charge of the mechanical design and the assembly drawings for these other cubicles.

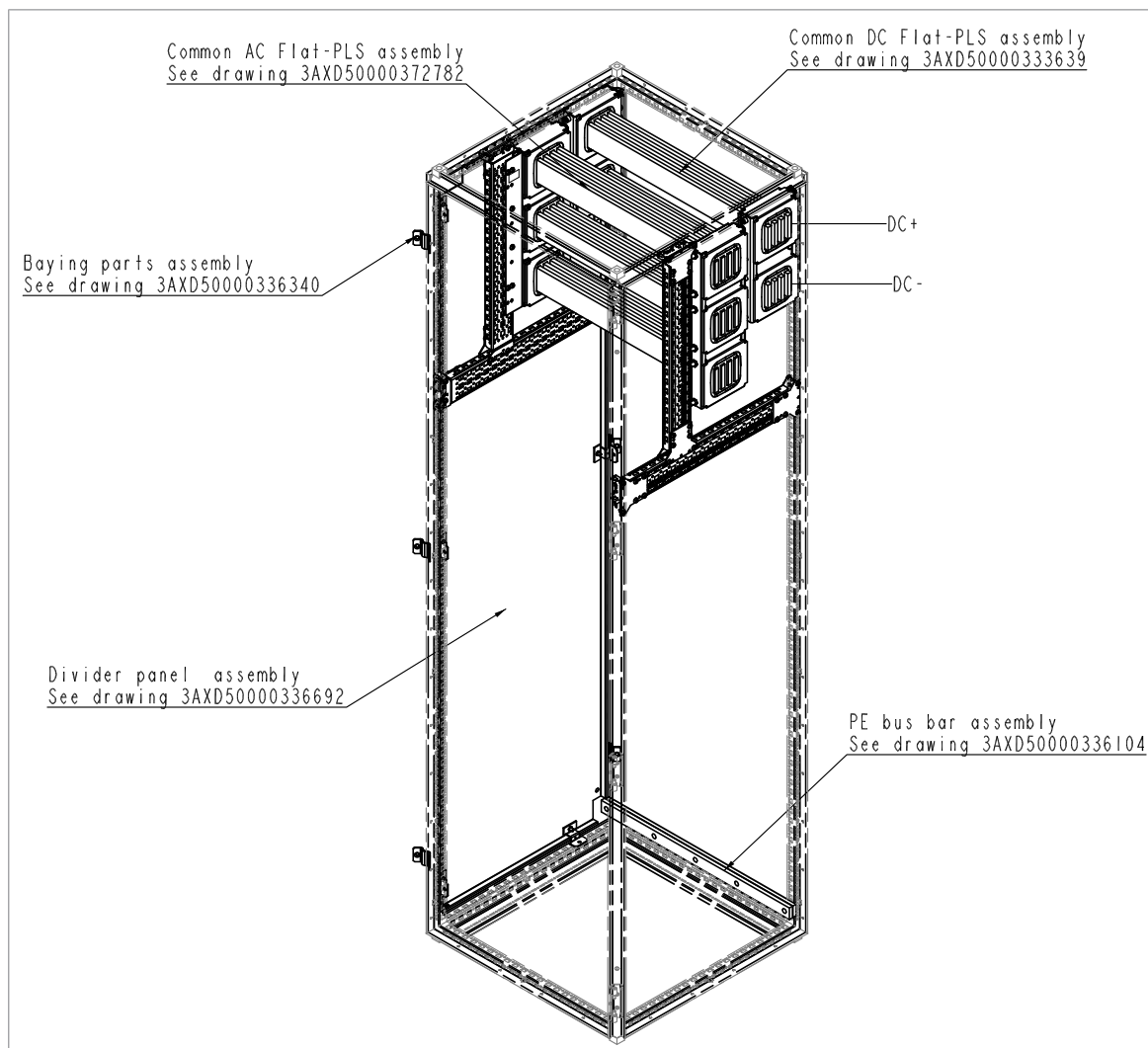
Order of construction

The list below shows a generic construction order for a cabinet line-up.

1. Dividing (partitioning) of enclosures
2. Baying of enclosures, that is, joining the cubicles of a cabinet line-up together
3. PE busbar installation
4. Common AC and DC bus installation
5. Component installation.

Note:

- Depending on the power module type, the correct construction order can differ remarkably from the list below. Always refer to the power module hardware manual for the construction order of the power module cubicle.
 - You must remove and replace some parts of the enclosure during the assembly. Refer to Rittal's documentation for instructions.
-



The drawing shows an example of an air-cooled drive design in a VX25 enclosure. The documents that the drawings refer to contain listings of parts available through ABB and Rittal.

Dividing (partitioning) enclosures

ABB recommends that you use divider panels to partition the cabinet line-up. This is because different components have different cooling characteristics, and correct installation prevents counterflow and other airflow-related problems. Refer to section [Cooling and degrees of protection \(page 13\)](#).

Drawing 3AXD50000336692 specifies divider panel installation.

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

Baying

All cabinet designs use the same baying principle; refer to 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, use spreader-type lifting bars. Refer to instructions from Rittal.

PE busbar installation

The PE busbar can be placed at the bottom rear edge of the line-up. This design employs Rittal captive nuts and a 2 × 10 × 30 mm busbar. The cross-sectional area of the PE busbar should be at least 500 mm². For details, refer to 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 60 × 10 mm busbar is used. For details, refer to drawing 3AXD50001155353.

AC and DC busbars

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

- The Rittal Flat-PLS60 busbar design is an example provided by ABB. You can use other busbar types or sizes if you design the busbar system yourself.
- With the ABB reference cabinet designs, you cannot use Rittal busbar system larger than 4 × 10 × 60 mm per pole. If you need a larger busbar system, you must use a larger cabinet and design the installation yourself.

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 comply with the requirements of the installation.
- The busbar design complies with the ABB recommendations in the hardware manuals. Refer to the cabinet configuration overview drawings in the module hardware manuals. For example: [ACS880-104 hardware manual \(3AUA0000104271 \(English\)\)](#).

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.

For the high-power units, make sure that each common busbar section can carry its expected load. The total current that the common busbars supply to parallel modules must not exceed the maximum busbar load capacity.

- As a rule of thumb, units with four or more parallel modules need a particularly careful check.
- If the total load exceeds the capacity of the largest preselected busbar kit available for the reference cabinet design, divide the total AC and DC currents into two parallel paths.
 - Install the AC incoming cubicle in the center of the cabinet line-up. Install the supply module cubicles on both sides of the incoming cubicle, and make the left and right installations as identical as possible. For details, refer to the cabinet configuration overview drawings in the applicable module hardware manual.
 - Divide the DC load evenly between the left and right sides of the supply unit. Install the inverter module cubicles, and any additional cubicles such as optional DC/DC converter module cubicles, on both sides in a layout that is as identical as possible. For details, refer to the cabinet configuration overview drawings in the applicable hardware manual.
 - Alternatively, you can divide the supply unit into two sections, equip each section with an incoming cubicle, and install one section at each end of the cabinet line-up.
 - Calculate the total current in the common AC busbars and in the DC busbars. Make sure that the load in each busbar section does not exceed its rated capacity. If you still exceed the busbar load capacity, use larger busbars. Contact ABB for further support.

Component installation

Assembly drawings, that is, 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 hardware manuals. 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

In a vibrating environment, secure the cabinet both from the bottom and top.

The ABB kits for VX25 enclosures withstand industrial level vibrations without the use of dampers. The liquid-cooled ABB kits also withstand marine level vibrations. If you install air-cooled ABB kits to a VX25 enclosure in an environment with marine level vibrations, ABB recommends that you use vibration dampers.

The dampers can be placed, for example, under the enclosure and at the top back as shown in the drawing below.



In a cabinet line-up, ABB recommends that you attach the dampers 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 dampers 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 damper.

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

Modifications to Rittal parts

The Rittal cabinet is delivered with removable panels. The side panels, rear panel, roof panel, assembly panel, and door are installed at delivery, but each panel is designed for easy removal. When necessary, you can remove panels to install the components more easily, and then you install the panels again.

If the installation of ABB kit requires modifications to Rittal parts, the kit installation instructions also include those modifications. Refer to the engineering support site. For example:

- Door: ABB provides door-cutting instructions for the kits that you install in the door. For the instructions, refer to the engineering support site. Some optional additions to the kits can require extra holes.
 - Door: If you install an air inlet in the door of an air-cooled cabinet, always remove the door frame and the door earthing screw.
 - Roof panel: ABB provides roof panel cutting instructions for the air outlet kits and pressure relief kits.
 - Divider panel: ABB provides cutting instructions for divider panels that are used to partition the cabinets.
-

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 new.abb.com/contact-centers.

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 forms.abb.com/form-26567.

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



3AUA0000107668F