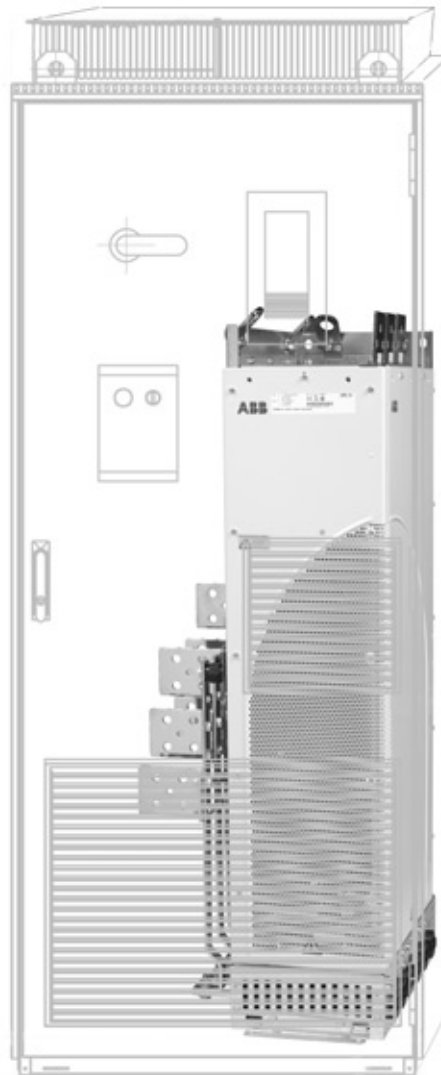


# ACS800

## Cabinet Installation

ACS800-04 and ACS800-04M Drive Modules (45 to 560 kW)

ACS800-U4 Drive Modules (60 to 600 HP)



The ABB logo, consisting of the letters 'A', 'B', and 'B' in a bold, stylized font. The 'A' is formed by two overlapping shapes, and the 'B's are also formed by overlapping shapes, creating a distinctive geometric look.

# ACS800 Single Drive Manuals

**HARDWARE MANUALS** (appropriate manual is included in the delivery)

---

ACS800-01/U1 Hardware Manual 0.55 to 160 kW (0.75 to 200 HP)  
3AFE64382101 (English)

ACS800-01/U1/04 Marine Supplement 0.55 to 160 kW (0.75 to 200 HP)  
3AFE64291275 (English)

ACS800-11/U11 Hardware Manual 5.5 to 110 kW (7.5 to 125 HP)  
3AFE68367883 (English)

ACS800-31/U31 Hardware Manual 5.5 to 110 kW (7.5 to 125 HP)  
3AFE68599954 (English)

ACS800-02/U2 Hardware Manual 90 to 500 kW (125 to 600 HP)  
3AFE64567373 (English)

ACS800-04/U4 Hardware Manual 0.55 to 160 kW (0.75 to 200 HP)  
3AFE68372984 (English)

ACS800-04/04M/U4 Hardware Manual 45 to 560 kW (60 to 600 HP)  
3AFE64671006 (English)

ACS800-04/04M/U4 Cabinet Installation 45 to 560 kW (60 to 600 HP)  
3AFE68360323 (English)

ACS800-07/U7 Hardware Manual 45 to 560 kW (50 to 600 HP)  
3AFE64702165 (English)

ACS800-07/U7 Dimensional Drawings 45 to 560 kW (50 to 600 HP)  
3AFE64775421

ACS800-07 Hardware Manual 500 to 2800 kW  
3AFE64731165 (English)

ACS800-17 Hardware Manual 55 to 2500 kW (75 to 2800 HP)  
3AFE68397260 (English)

ACS800-37 Hardware Manual 55 to 2700 kW (75 to 3000 HP)  
3AFE68557925 (English)

- Safety instructions
- Electrical installation planning
- Mechanical and electrical installation
- Motor control and I/O board (RMIO)
- Maintenance
- Technical data
- Dimensional drawings
- Resistor braking

## **FIRMWARE MANUALS, SUPPLEMENTS AND GUIDES**

(appropriate documents are included in the delivery)

---

Standard Control Program Firmware Manual  
3AFE64527592 (English)

System Control Program Firmware Manual  
3AFE64670646 (English)

Control Program Template Firmware Manual  
3AFE64616340 (English)

Master/Follower 3AFE64590430 (English)

Pump Control Program Firmware Manual  
3AFE68478952 (English)

Extruder Control Program Supplement 3AFE64648543 (English)

Centrifuge Control Program Supplement 3AFE64667246 (English)

Traverse Control Program Supplement 3AFE64618334 (English)

Crane Control Program Firmware Manual 3BSE11179 (English)

Adaptive Programming Application Guide  
3AFE64527274 (English)

## **OPTION MANUALS** (delivered with optional equipment)

---

Fieldbus Adapters, I/O Extension Modules etc.

ACS800-04 and ACS800-04M Drive Modules  
45 to 560 kW  
ACS800-U4 Drive Modules  
60 to 600 HP

## **Cabinet Installation**

3AFE68360323 Rev B EN  
EFFECTIVE: 14.2.2008



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# About this manual

---

## What this chapter contains

This chapter describes the intended audience and contents of the manual. It contains a flowchart of steps in checking the delivery, installing and commissioning the drive. The flowchart refers to chapters/sections in this manual and other manuals.

## Target audience

This manual is intended for people who plan the installation, and install the drive module into a user-defined cabinet. Read the manual before the installation work. The reader is 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. Special US instructions for installations within the United States that must be installed per the National Electrical Code and local codes are marked with (US).

## Safety



---

**WARNING!** Follow the safety instructions given in *ACS800-04/04M/U4 Hardware Manual* [3AFE64671006 (English)] when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive, the motor or driven equipment. Read the safety instructions before you work on the unit.

---

## Other related manuals

See *ACS800-04/04M/U4 Hardware Manual* [3AFE64671006 (English)] for information concerning the drive module such as

- safety
- planning the electrical installation
- electrical installation
- motor control and I/O board (RMIO)
- maintenance
- technical data
- resistor braking.

For installation instructions of optional equipment, see their manuals.

For example installations in Rittal TS 8 cabinet, refer to *ACS800-04/U4 Rittal TS 8 Cabinet Installation* [3AFE68372330 (English)].

## Categorization according to the frame size

The instructions, technical data and dimensional drawings which concern only certain frame sizes are marked with the symbol of the frame size R7 or R8. The frame size is not marked on the drive designation label. To identify the frame size of your drive, see the rating tables in chapter *Technical data* in *ACS800-04/04M/U4 Hardware Manual* [3AFE64671006 (English)].

## Categorization according to the plus code

The instructions, technical data and dimensional drawings which concern only certain optional selections are marked with plus codes, e.g. +E210 or +H354. The options included in the drive can be identified from the plus codes visible on the type designation label of the drive. The plus code selections are listed in chapter *The ACS800-04/U4 and ACS800-04M* under *Type code*.

## Contents

The chapters of this manual are briefly described below.

*About this manual* introduces this manual.

*The ACS800-04/U4 and ACS800-04M* describes the drive module.

*Planning the cabinet installation* instructs on general cabinet design, gives layout examples, free space requirements around the drive module for cooling and cabinet cooling data.

*Mechanical installation of pre-assembled units (ACS800-04/U4)* instructs how to mount a pre-assembled drive module into a cabinet.

*Mechanical installation of non-pre-assembled units (ACS800-04M)* instructs how to assemble the drive from the assembly kits.

*Checking the installation* helps in checking the mechanical and electrical installation of the drive.

*Dimensional drawings* contains the dimensional drawings of the drive modules.

*Circuit diagrams* shows an example circuit diagram for employing the Prevention of Unexpected Start function (+Q950).

*Assembly drawings* contains a few step-by-step assembly drawings.

## Installation, commissioning and operating flowchart

Task	Chapters in this manual	Chapters in ACS800-04/04M/U4 Hardware Manual [3AFE64671006 (English)]
Identify the frame size of your drive, R7 or R8.	-	<i>Technical data / IEC ratings or NEMA ratings</i>
Plan the installation. Check the ambient conditions, ratings, required cooling air flow, input power connection, compatibility of the motor, motor connection, and other technical data.	<i>Planning the cabinet installation</i> If optional equipment is included, see its manuals.	<i>Technical data</i> <i>Planning the electrical installation</i>
Unpack and check the units. Check that all necessary optional modules and equipment are present and correct. Only intact units may be started up.	<i>Mechanical installation of pre-assembled units (ACS800-04/U4) or Mechanical installation of non-pre-assembled units (ACS800-04M)</i> If the converter has been non-operational for more than one year, the converter DC link capacitors need to be reformed. Ask ABB for instructions.	-
Assemble and install the drive module into the cabinet.	<i>Mechanical installation of pre-assembled units (ACS800-04/U4) or Mechanical installation of non-pre-assembled units (ACS800-04M)</i>	
Install the RDCU drive control unit.	-	See <i>RDCU Drive Control Unit Hardware Manual</i> [3AFE64636324 (English)]
Check the installation.	<i>Checking the installation</i>	-
Electrical installation	-	<i>Safety, Planning the electrical installation, Electrical installation, Maintenance, Technical Data, Resistor braking</i>
Commissioning and operating the drive	-	See the appropriate firmware manual.

## **Product and service inquiries**

Address any inquiries about the product to your local ABB representative, quoting the type code 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/drives](http://www.abb.com/drives) and selecting *Drives – World wide service contacts* on the right pane.

## **Product training**

For information on ABB product training, navigate to [www.abb.com/drives](http://www.abb.com/drives) and select *Drives – Training courses* on the right pane.

## **Providing feedback on ABB Drives manuals**

Your comments on our manuals are welcome. Go to [www.abb.com/drives](http://www.abb.com/drives), then select successively *Drives – Document Library – Manuals feedback form* on the right pane.

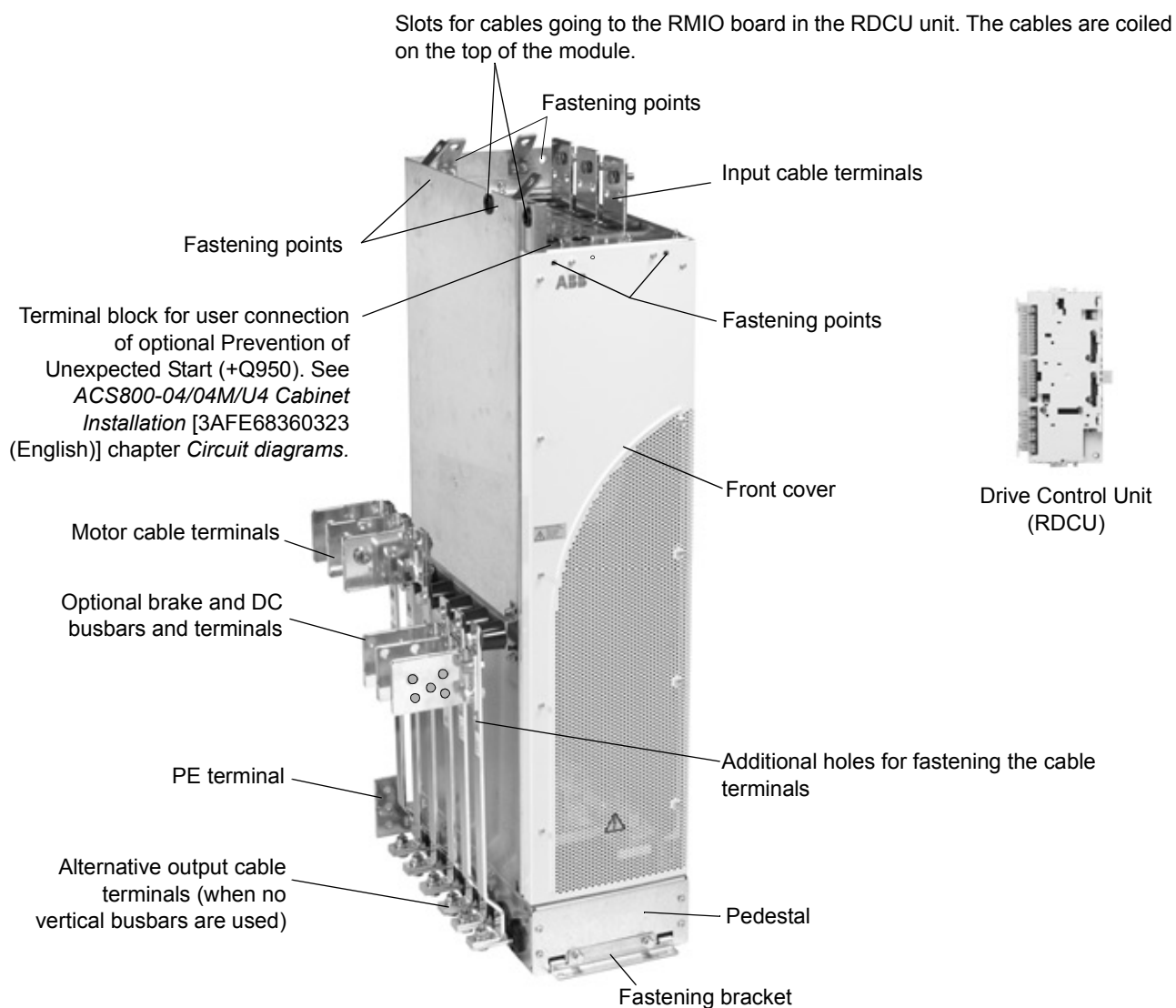
# The ACS800-04/U4 and ACS800-04M

## What this chapter contains

This chapter describes the construction and operating principle of the drive in short.

## The ACS800-04/U4

The ACS800-04/U4 is an IP 00 drive module for controlling AC motors. It is to be installed into a cabinet by the customer with base or wall fastening. The input cable terminals are located at the top of the unit whereas the motor cable terminals are located at the left- or right-hand side of the unit. The unit is delivered pre-assembled with mounting pedestal and output busbars.

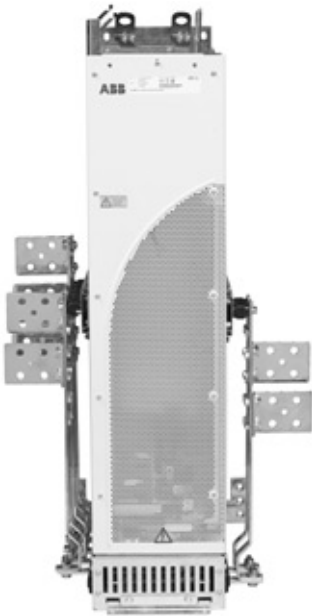


## The ACS800-04M

The ACS800-04M is delivered as non-pre-assembled kits, which provide more alternatives in assembling the units than the basic ACS800-04.

### Example configurations

Frame size R7



Motor and brake busbars on the left-hand long side of the module and DC busbars on the right-hand side



Motor and brake busbars on the right-hand long side of the module and DC busbars on the left-hand side



Output busbars on the short side of the module

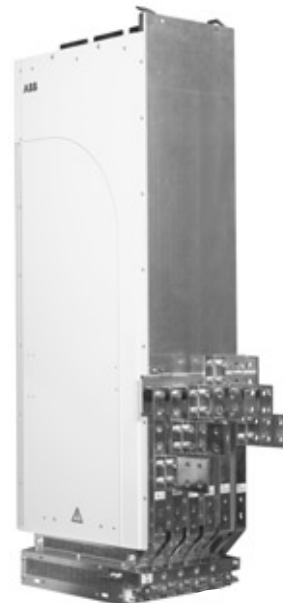


Frame size R7 with bottom exit (optional top entry busbar shroud and bottom exit shroud included). Output busbars are located at the base of the module.



Drive Control Unit (RDCU)

Frame size R8



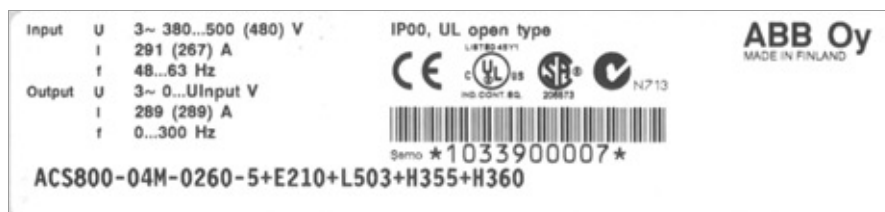
Output busbars on the short side of the module



## Type designation label

The type designation label includes an IEC and NEMA rating, C-UL US, and CSA markings, a type code and a serial number, which allow individual recognition of each unit. 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 serial number.

The type designation label is located on the front cover and the serial number label inside the unit. Example labels are shown below.



## Type code

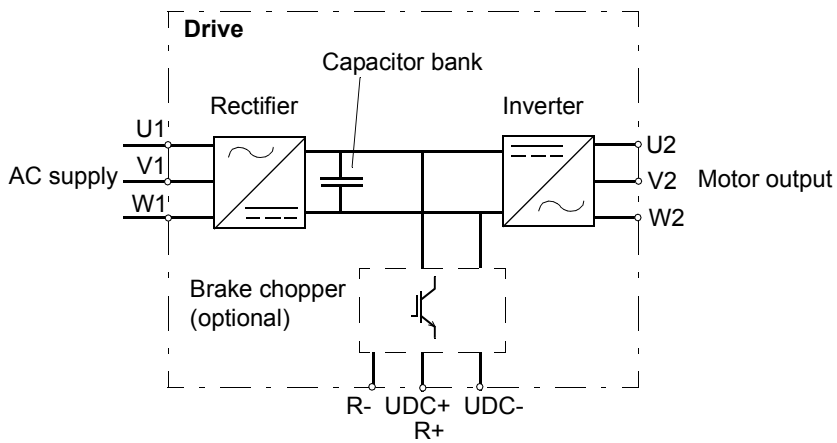
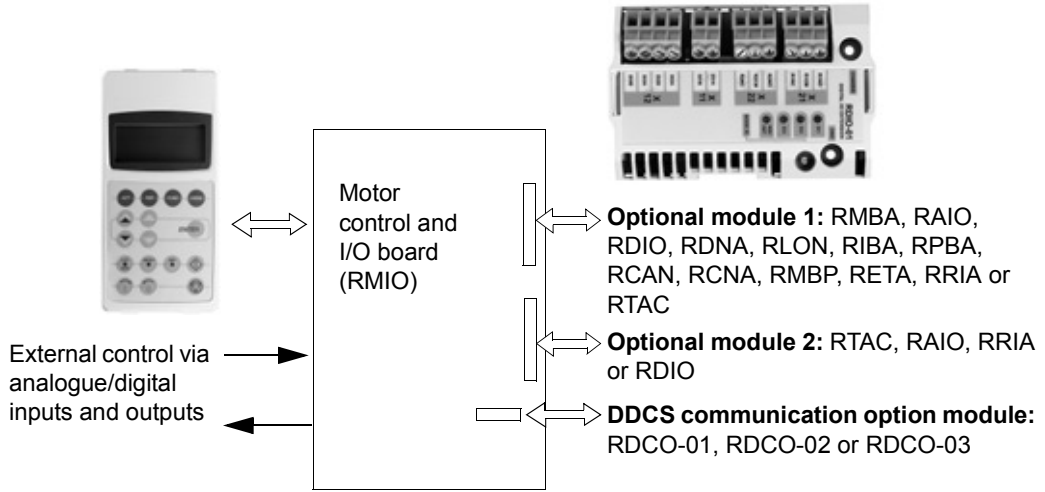
The type code contains information on the specifications and configuration of the drive. The first digits from left express the basic configuration (e.g. ACS800-04-0170-5). The optional selections are given thereafter, separated by plus signs (e.g. +E202). The main selections are described below. Not all selections are available for all types. For more information, refer to *ACS800 Ordering Information* (EN code: 64556568, available on request).

Type code for ACS800-04 and ACS800-U4 pre-assembled units									
Selection	Alternatives								
<b>Product series</b>	ACS800 product series								
<b>Type</b>	<table border="1"> <tr> <td>04</td> <td>Drive module. When no options are selected: 6-pulse diode input bridge, IP 00, top entry, side exit, RDCU drive control unit, no control panel, no EMC filter, Standard Control Program, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.</td> </tr> <tr> <td>U4</td> <td>Drive module (USA). When no options are selected: 6-pulse diode bridge, open chassis, top entry, side exit, no control panel, no EMC filter, US version of the Standard Control Program (three-wire start/stop as default setting), common mode filter in frame size R8, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.</td> </tr> </table>	04	Drive module. When no options are selected: 6-pulse diode input bridge, IP 00, top entry, side exit, RDCU drive control unit, no control panel, no EMC filter, Standard Control Program, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.	U4	Drive module (USA). When no options are selected: 6-pulse diode bridge, open chassis, top entry, side exit, no control panel, no EMC filter, US version of the Standard Control Program (three-wire start/stop as default setting), common mode filter in frame size R8, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.				
04	Drive module. When no options are selected: 6-pulse diode input bridge, IP 00, top entry, side exit, RDCU drive control unit, no control panel, no EMC filter, Standard Control Program, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.								
U4	Drive module (USA). When no options are selected: 6-pulse diode bridge, open chassis, top entry, side exit, no control panel, no EMC filter, US version of the Standard Control Program (three-wire start/stop as default setting), common mode filter in frame size R8, boards without coating, pedestal with output on the long side, output busbar set for motor, base and wall mounting brackets, one set of manuals. Pre-assembled unit.								
<b>Size</b>	Refer to <i>Technical data: IEC ratings or NEMA ratings in Hardware Manual</i> [3AFE64671006 (English)].								
<b>Voltage range (nominal rating in bold)</b>	<table border="1"> <tr> <td>2</td> <td>208/220/<b>230</b>/240 VAC</td> </tr> <tr> <td>3</td> <td>380/<b>400</b>/415 VAC</td> </tr> <tr> <td>5</td> <td>380/400/415/440/460/480/<b>500</b> VAC</td> </tr> <tr> <td>7</td> <td>525/575/600/<b>690</b> VAC</td> </tr> </table>	2	208/220/ <b>230</b> /240 VAC	3	380/ <b>400</b> /415 VAC	5	380/400/415/440/460/480/ <b>500</b> VAC	7	525/575/600/ <b>690</b> VAC
2	208/220/ <b>230</b> /240 VAC								
3	380/ <b>400</b> /415 VAC								
5	380/400/415/440/460/480/ <b>500</b> VAC								
7	525/575/600/ <b>690</b> VAC								
+ options									
<b>Resistor braking</b>	D150 brake chopper and busbars for brake resistor and DC connection								
<b>Filter</b>	E210 EMC/RFI filter for second environment TN/IT (grounded/ungrounded) system E208 common mode filter								
<b>Pedestal and output busbars</b>	0H354 no pedestal								
<b>Control panel</b>	J400 control panel including a 3-metre panel connection cable J410 RPMP-11 control panel mounting platform kit including a 3-metre panel connection cable but no control panel J413 RPMP-21 control panel holder								
<b>Fieldbus</b>	K... Refer to <i>ACS800 Ordering Information</i> (EN code: 64556568).								
<b>I/O</b>	L...								
<b>Control program</b>	N...								
<b>Language of manual</b>	R...								
<b>Specialities</b>	P901 coated boards								
<b>Safety features</b>	Q950 Prevention of Unexpected Start, 500 mm (19.68 in.) cable outside the drive module in frame size R7, 600 mm (23.62 in.) cable outside the drive module in frame size R8.								

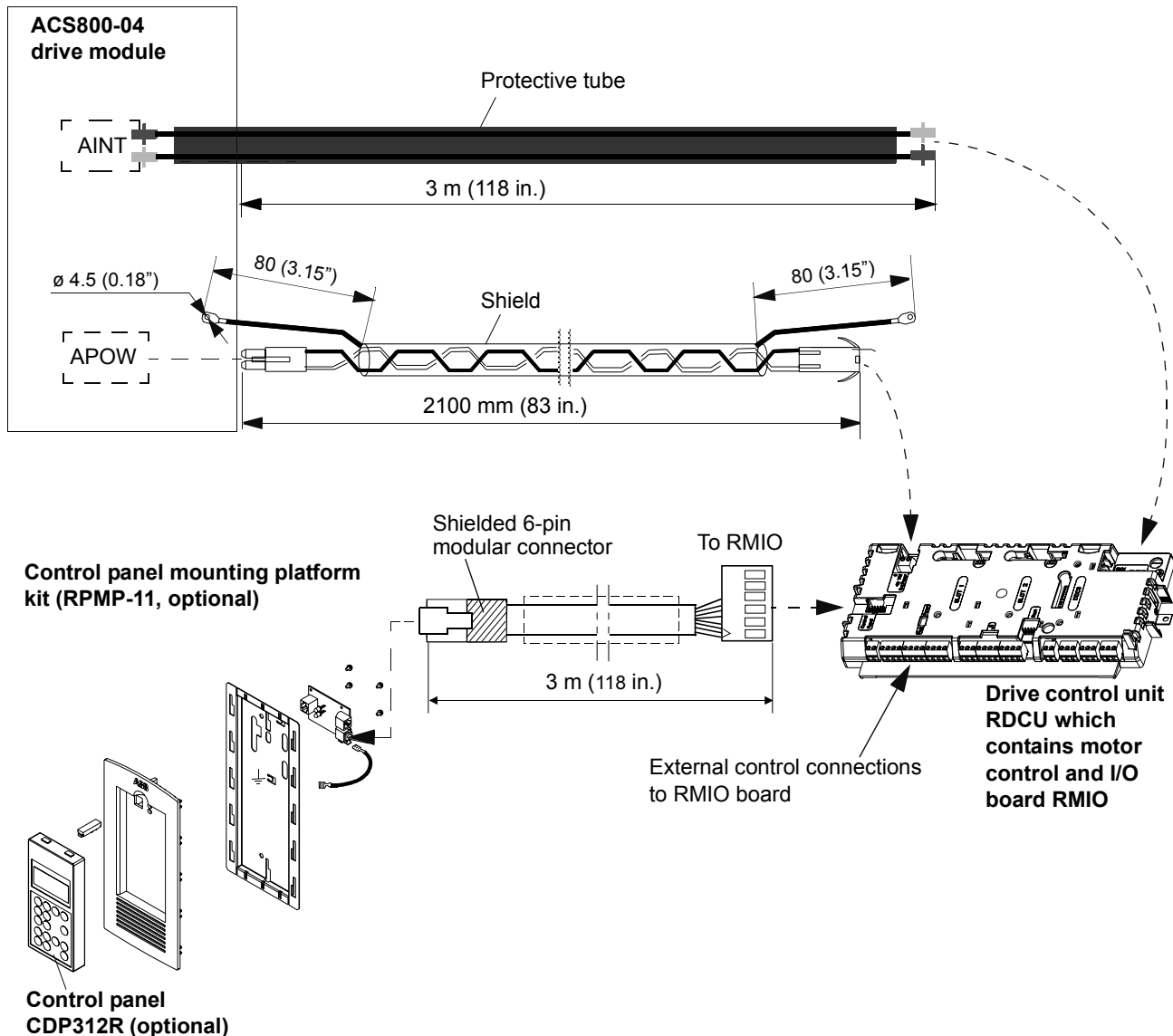
Type code for ACS800-04M non-pre-assembled units (delivered as kits)		
Selection	Alternatives	
Product series	ACS800 product series	
Type	04M	Drive module. When no options are selected: 6-pulse diode input bridge, IP 00, top entry, RDCU drive control unit, Standard Control Program, boards without coating, one set of manuals. No pedestal, no output busbars, no control panel, no EMC filter. Delivered as kits.
Size	Refer to <i>Technical data: IEC ratings in Hardware Manual</i> [3AFE64671006 (English)].	
Voltage range (nominal rating in bold)	2	208/220/ <b>230</b> /240 VAC
	3	380/ <b>400</b> /415 VAC
	5	380/400/415/440/460/480/ <b>500</b> VAC
	7	525/575/600/ <b>690</b> VAC
+ options		
Shrouds	B060	<u>Frame size R7</u> : clear plastic shrouds for bottom exit kit (+H352) and input terminals. <u>Frame size R8</u> : clear plastic shrouds for vertical busbars and input terminals in bookshelf mounting (+H354)
Resistor braking	D150	brake chopper
Filter	E202	EMC/RFI filter for first environment TN (grounded) system, restricted (the A limits)
	E210	EMC/RFI filter for second environment TN/IT (grounded/ungrounded) system
	E208	common mode filter
Pedestal and output busbars	H352	bottom exit kit for frame size R7
	H354	pedestal with output on the long side (bookshelf)
	H355	vertical busbars and support brackets for AC output connection
	H356	pedestal (and adapter with +H360) busbar kit for brake resistor and DC connection
	H360	pedestal with output on the short side (flat)
	H362	vertical busbars (and support brackets with +H360) for DC output connection
	H363	busbar kit for DC and brake outputs on different long sides of the pedestal (+H356 required, not available for +H360)
Control panel	J400	control panel including a 3-metre panel connection cable
	J410	RPMP-11 control panel mounting platform kit including a 3-metre panel connection cable but no control panel
	J413	RPMP-21 control panel holder
Fieldbus	K...	Refer to <i>ACS800 Ordering Information</i> (EN code: 64556568).
I/O	L...	
Control program	N...	
Language of manual	R...	
Specialities	P901	coated boards
Safety features	Q950	Prevention of Unexpected Start, 500 mm (19.68 in.) cable outside the drive module in frame size R7, 600 mm (23.62 in.) cable outside the drive module in frame size R8.

## Main circuit and control interfaces

This diagram shows the control interfaces and the main circuit of the drive.



**Connections of the Drive Control Unit (RDCU) in frame sizes R7 and R8**



**Operation**

This table describes the operation of the main circuit in short.

Component	Description
six-pulse rectifier	converts the three-phase AC voltage to DC voltage
capacitor bank	energy storage which stabilizes the intermediate circuit DC voltage
six-pulse IGBT inverter	converts the DC voltage to AC voltage and vice versa. The motor operation is controlled by switching the IGBTs.

**Printed circuit boards**

The drive contains the following printed circuit boards as standard:

- main circuit board (AINT)
- motor control and I/O board (RMIO) with a fibre optic link to the AINT board
- input bridge control board (AINP)
- input bridge protection board (AIBP) which includes snubbers for the thyristors and varistors
- power supply board (APOW)
- gate driver control board (AGDR)
- diagnostics and panel interface board (ADPI)
- brake chopper control board (ABRC) with option +D150

**Motor control**

The motor control is based on the Direct Torque Control (DTC) method. Two phase currents and DC link voltage are measured and used for the control. The third phase current is measured for earth fault protection.

# Planning the cabinet installation

---

## What this chapter contains

This chapter guides in planning the installation of a converter module into a user-defined cabinet. The chapter gives free space requirements around the module for cooling, cabinet cooling data and layout examples. The issues discussed are essential for the safe and trouble-free use of the drive system.

---

**Note:** The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations.

---

## Cabinet construction

The cabinet frame must be sturdy enough to carry the weight of the drive components, control circuitry and other equipment installed in it.

The cabinet must protect the converter module against contact and meet the requirements for dust and humidity, see chapter *Technical data* in *ACS800-04/04M/U4 Hardware Manual* [3AFE64671006 (English)].

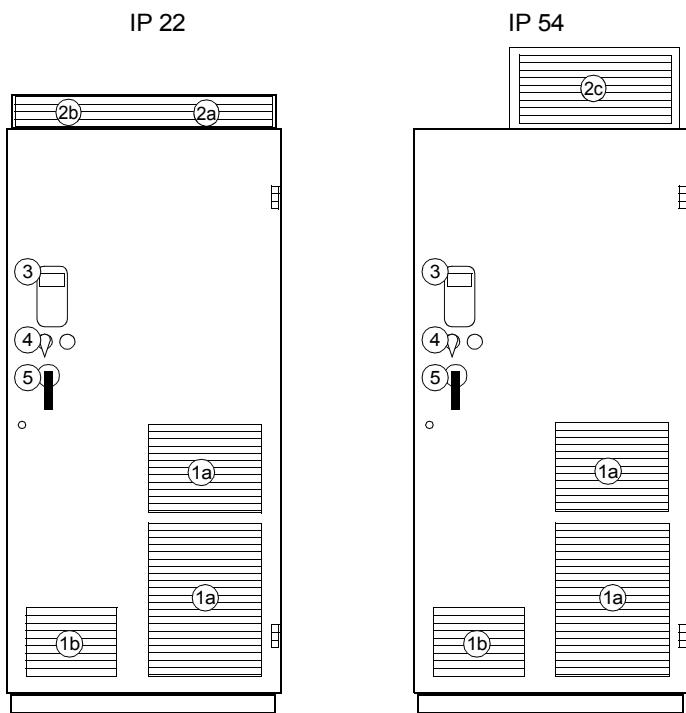
### Disposition of the devices

For easy installation and maintenance, a spacious layout is recommended. Sufficient cooling air flow, obligatory clearances, cables and cable support structures all require space.

The control boards must not be installed near main circuits or hot parts.

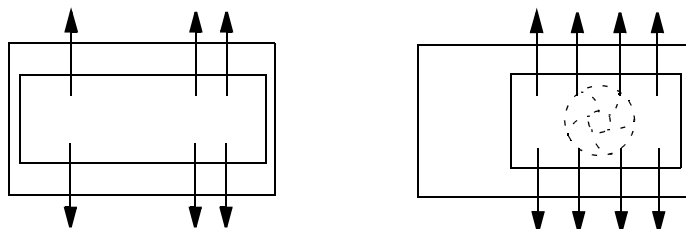
The following sections show a few layout examples. For example layouts in Rittal TS 8 cabinet, refer to *ACS800-04/U4 Rittal TS 8 Cabinet Installation* [3AFE68372330 (English)].

*Layout examples, door closed*



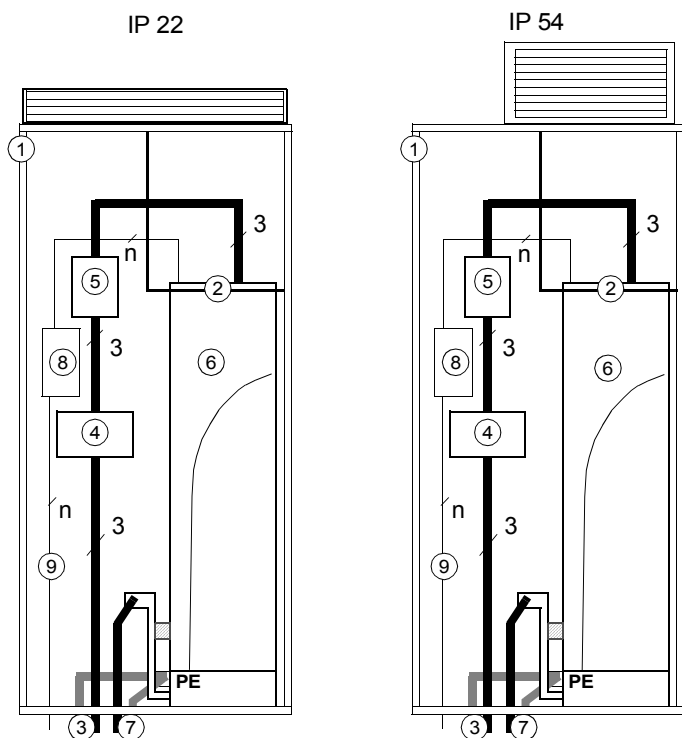
- 1a Air inlet for the converter module
- 1b Air inlet for the other equipment
- 2a Air outlet for the converter module
- 2b Air outlet for the other equipment
- 2c Air outlet for the converter module and the other equipment, an extra exhaust fan
- 3 Converter control panel (connected to the RMIO board in the RDCU unit inside the cabinet)
- 4 Contactor control switch and emergency stop switch (connected to the contactor control circuit inside the cabinet)
- 5 Operating handle of the disconnect

**Roof air flow viewed from top**



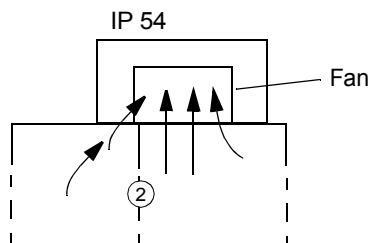
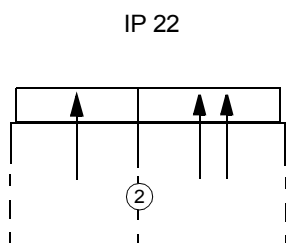


Layout examples, door open

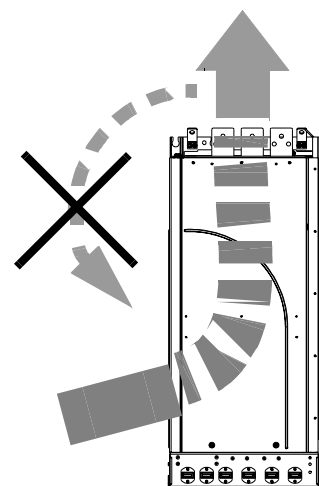


- 1 Supporting frame of the cabinet
- 2 Air baffles that separate the cool and hot areas (leak-proof lead-throughs)
- 3 Input power cable including the protective conductors to cabinet grounding (PE)
- 4 Disconnecter and fuses
- 5 Contactor
- 6 Converter module
- 7 Motor cable including the grounding conductors
- 8 Drive Control Unit RDCU (includes RMIO board)
- 9 External control cables

Air flow to the roof



Air flow through the module



See also section *Required free space around the drive module for cooling.*



**WARNING!** For units without bottom exit kit (+H352), it is not allowed to connect the cables directly to the drive module terminals without the pedestal as the lead-through insulation material is not strong enough to carry the mechanical stress exerted by the cables.

### Grounding of mounting structures

Make sure any cross-members or shelves on which components are mounted are properly grounded and the connecting surfaces left unpainted. The drive module will be grounded to the cabinet frame via its fastening screws.

### Busbar material and joints

Tin-plated copper is recommended but aluminium can also be used.

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

### Tightening torques

The following table applies to grade 8.8 screws (with or without joint compound).

Screw size	Torque
M5	3.5 N·m (2.6 lbf·ft)
M6	9 N·m (6.6 lbf·ft)
M8	20 N·m (14.8 lbf·ft)
M10	40 N·m (29.5 lbf·ft)
M12	70 N·m (52 lbf·ft)
M16	180 N·m (133 lbf·ft)

### Cabinet cooling

The installation site must be sufficiently ventilated.

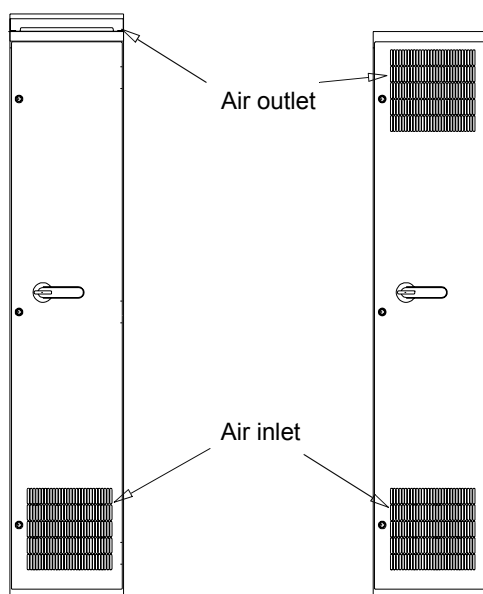
The cabinet must have enough free space for the components to ensure sufficient cooling. Observe the minimum clearances given for each component.

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

The air inlets and outlets must be equipped with gratings that

- guide the air flow
- protect against contact
- prevent water splashes from entering the cabinet.

The drawing below shows two typical cabinet cooling solutions. The air inlet is at the bottom of the cabinet, while the outlet is at the top, either on the upper part of the door or on the roof.



The internal cooling fans of the converter modules and reactors/chokes are usually sufficient to keep the component temperatures low enough in IP 22 cabinets.

In IP 54 cabinets, thick filter mats are used to prevent water splashes from entering the cabinet. This entails the installation of additional cooling equipment, such as a hot air exhaust fan.

Arrange the cooling air flow through the converter module so that the requirements given in chapter *Technical data in ACS800-04/04M/U4 Hardware Manual* [3AFE64671006 (English)] are met:

- cooling air flow  
**Note:** The figures apply to continuous nominal load. If the load is cyclic or less than nominal, less cooling air is required.

- allowed ambient temperature.

See section *Cabinet cooling data* for:

- allowed temperature rise inside the cabinet
- allowed pressure drop over the cabinet that the module fan can overcome
- air inlet and outlet sizes required for the module cooling and recommended filter material (if used).

## Cabinet cooling data

### *IP 22 cabinet with no extra fan*

The table below shows the data the IP 22 cabinet should meet to ensure efficient cooling of the converter module. No extra fan is used. The pressure drop over the cabinet is the additional counterpressure that the module fan is capable of overcoming while still maintaining the required air flow through the module.

Frame size	Temp. rise Over module °C	Pressure drop		Cabinet air inlet		Min. cabinet air outlet size* mm
		Over module Pa	Over cabinet Pa	Min. size mm	Filter by Luffilter	
R7	30	300	30	288×292+688×521	airTex G150	398×312 (2 pcs)
R8	30	300	45	288×292+688×521	airTex G150	398×312 (2 pcs)

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\* size when the outlet is located on the cabinet roof

### *IP 54 cabinet with an extra fan*

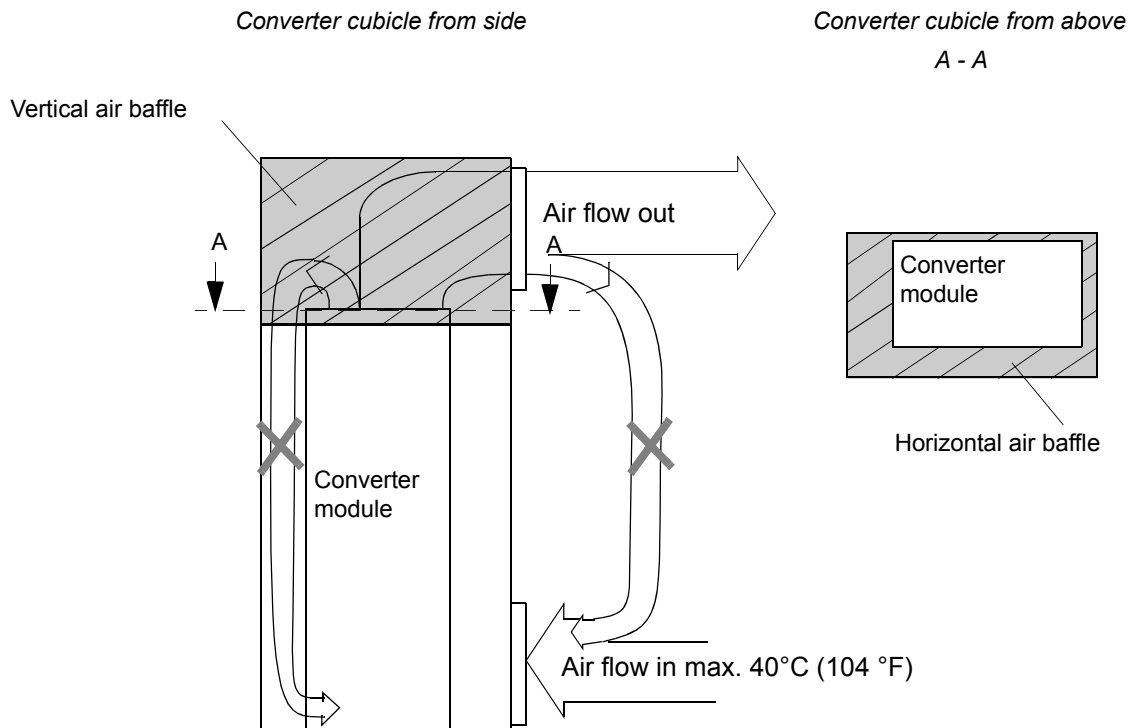
The table below shows the data the IP 54 cabinet should meet to ensure efficient cooling of the converter module. An extra fan is used. The pressure drop over the cabinet is the counterpressure the extra fan must overcome. The given fan types and filter materials are examples. Corresponding products by another manufacturer may be used as well. See the manufacturer's Internet site for the detailed specification.

Frame Size	Temp. rise Over module °C	Pressure drop Over cabinet Pa	Extra fan type	Air inlet and outlet filter by Luffilter	
				Min. inlet (door) mm	Min. outlet (roof) mm
R7	30	250*	RB2C-225/088 K093 or R2E225-AU64 by ebm	airComp 300-50 288×292 + 688×521	airTex G150 398×312 (2 pcs)
R8	30	250*	RH35M-4EK.2F.1R by Ziehl-Abegg or RB4T- 355/170 by ebm	airComp 300-50 288×292 + 688×521	airTex G150 398×312 (2 pcs)

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\* inlet filter 50 % unclean

## Preventing the recirculation of hot air



### Outside the cabinet

Prevent hot air circulation outside the cabinet by leading the outcoming 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.

### Inside the cabinet

Prevent hot air circulation inside the cabinet with e.g. leak-proof air baffles at the positions shown in the diagrams in section *Required free space around the drive module for cooling*. No gaskets are usually required.

## Cubicle heaters

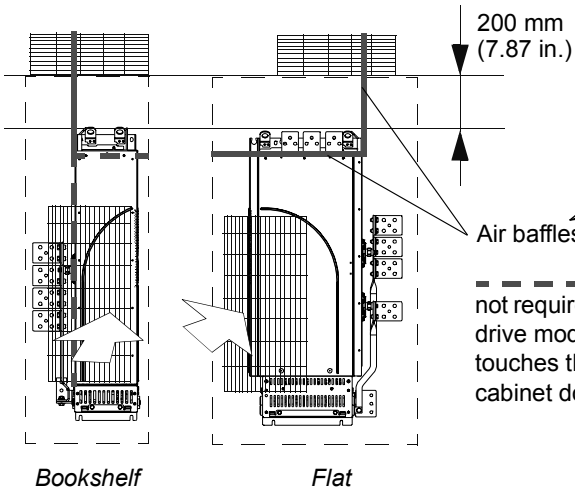
Use a cubicle heater if there is a risk of condensation in the cabinet. Although the primary function of the heater is to keep the air dry, it may also be required for heating at low temperatures. When placing the heater, follow the instructions provided by its manufacturer.

## Required free space around the drive module for cooling

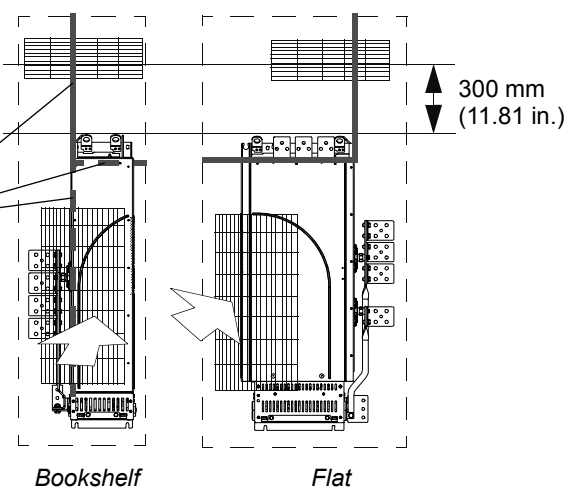
### Free space at the top of the drive module

Required free space at the top of the module for frame sizes R7 and R8 is shown below (views of frame size R7). **Note:** Air inlet gratings only at the lower part of the cabinet door are not recommended without an extra fan. The air baffles are examples.

**Air outlet on the cabinet roof and high air inlet gratings in the cabinet door**

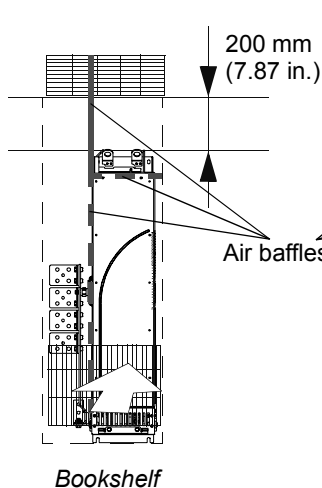


**Air outlet and high air inlet gratings in the cabinet door**

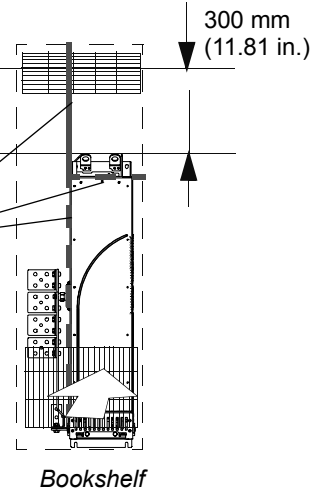


See also pages 31 and 32.

**Air outlet on the cabinet roof and low air inlet gratings in the cabinet door**



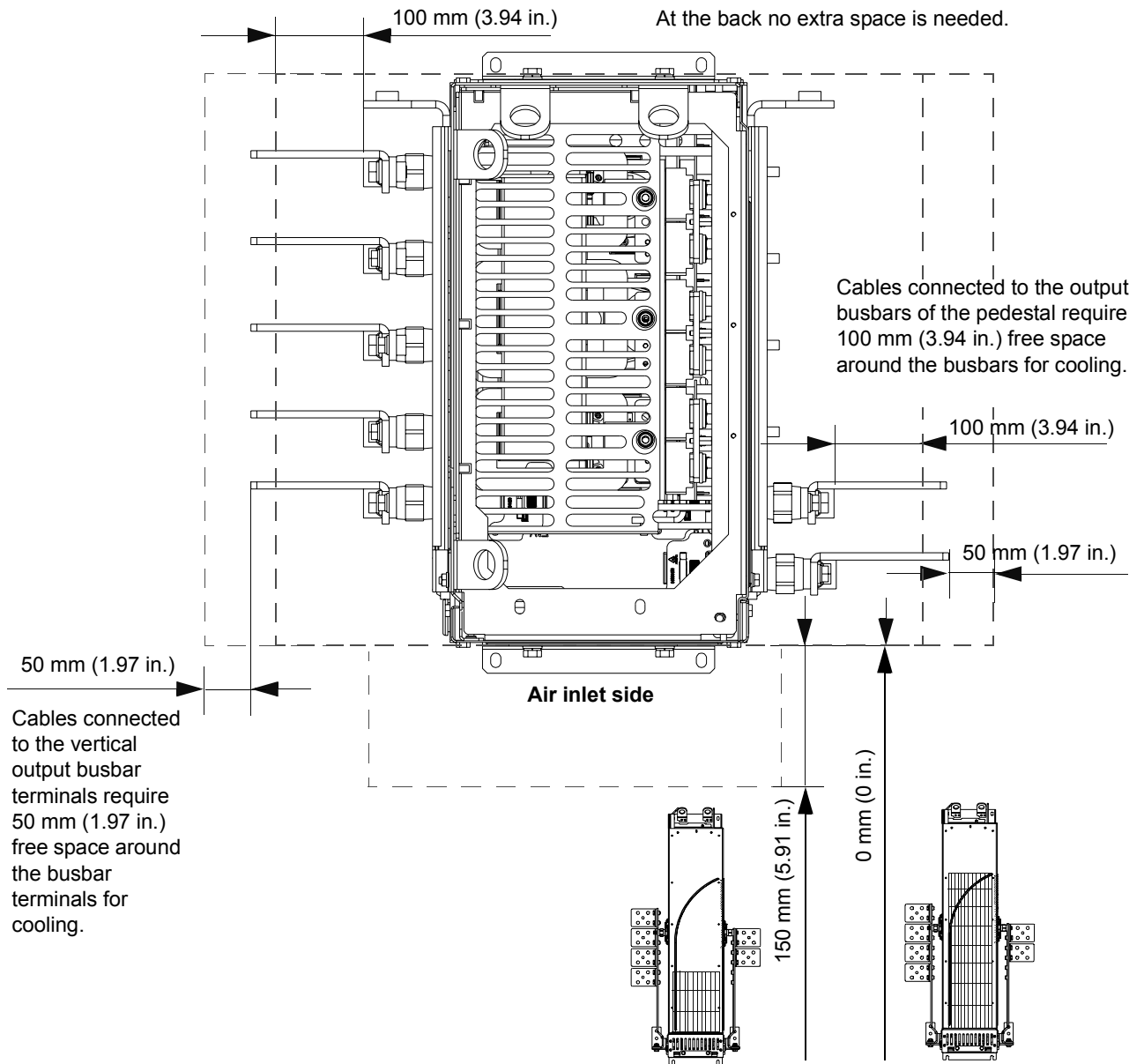
**Air outlet and low air inlet gratings in the cabinet door**



See also pages 31 and 32.

**Free space around units with busbars on the long side (bookshelf mounting +H354)**

The figure below shows the required free space in a unit with motor and brake busbars connected to the left-hand side and DC busbars to the right-hand side of the module (+H354+H356+H362+H363). The required free space when no vertical busbars are used is also shown.



The required free space in front of the unit depends on the gratings in the cabinet door:

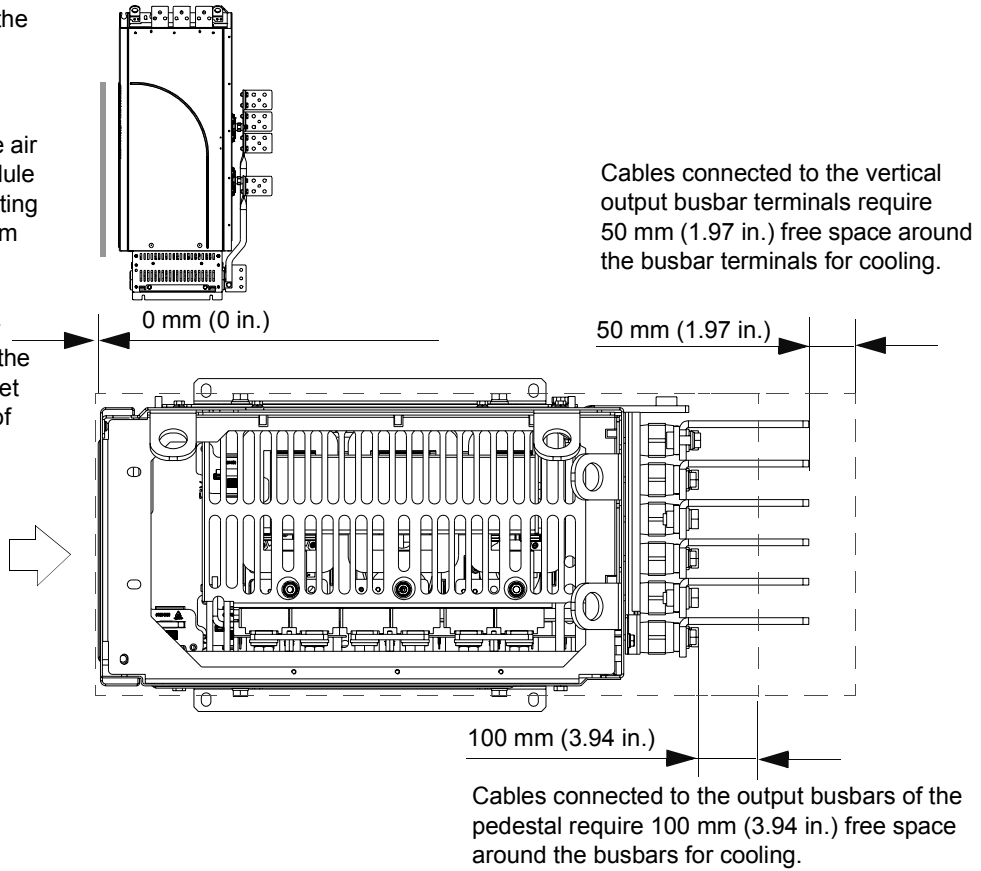
- 0 mm (0 in.) with air inlets as high as the grating in the module [R7: 675 mm (27 in.), R8: 1120 mm (44 in.)]
- 150 mm (5.91 in.) with air inlets at the lower part of the cabinet only.

### Free space around units with busbars on the short side (flat mounting +H360)

The required free space at the air inlet side of the drive module:

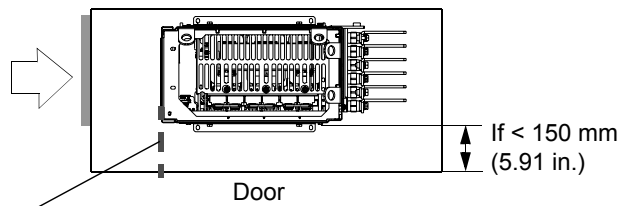
- 0 mm (0 in.) if cabinet gratings are located at the air inlet side of the drive module and are as high as the grating in the module [R7: 675 mm (27 in.), R8: 1120 mm (44 in.)]
- 150 mm (5.91 in.) with air inlets at the lower part of the cabinet only or with cabinet gratings at the long side of the drive module only.

Air inlet side of the drive module

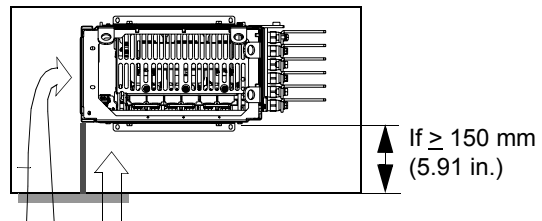


### Location of air inlet gratings

Air inlet gratings in the cabinet are recommended at the air inlet side of the drive module if free space in front of the long side of the module is less than 150 mm (5.91 in.). The required area of the gratings is approximately 3 × 300 mm × 300 mm (3 × 11.81 in. × 11.81 in.), the minimum area is given on page 28.



Air baffle. Not needed if the drive module touches the cabinet door or the module air inlet touches the air inlet grating of the cabinet.



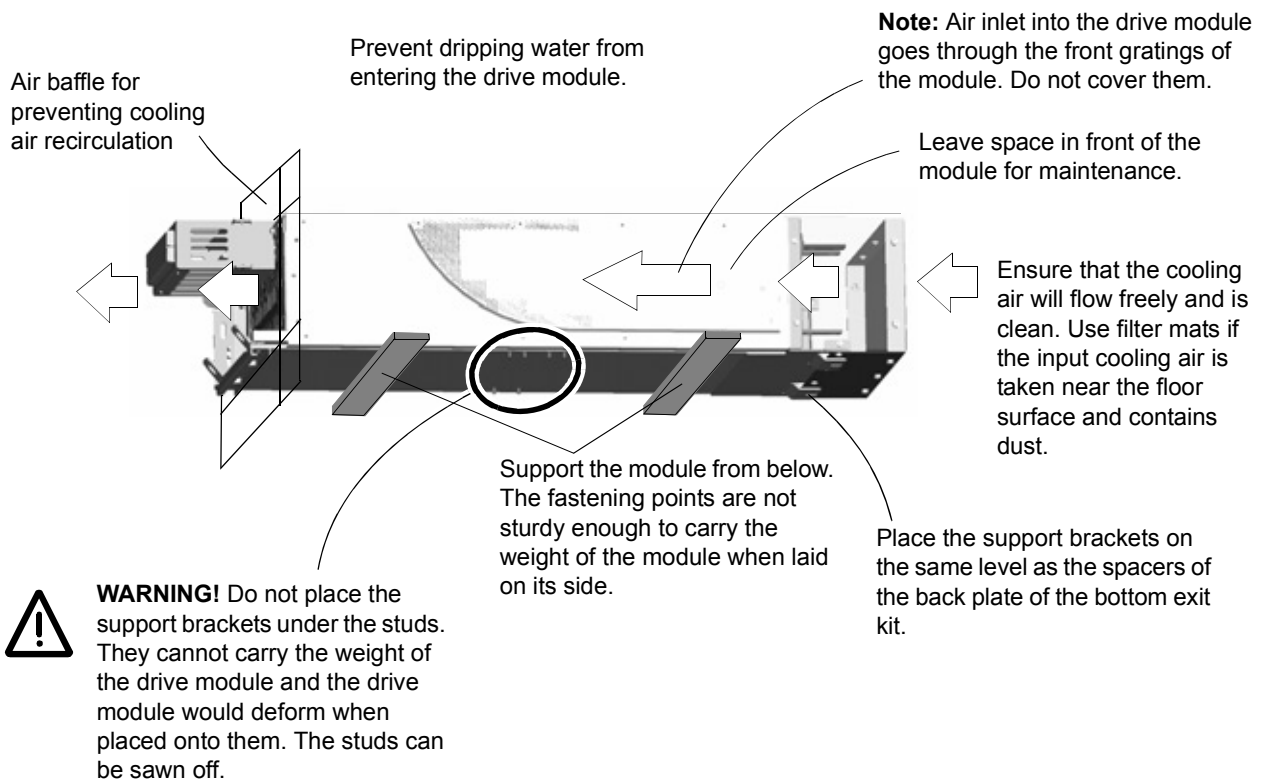
Required area of air inlet gratings is approximately 3 × 300 mm × 300 mm (3 × 11.81 in. × 11.81 in.)



## When the drive module is installed in another position than vertically

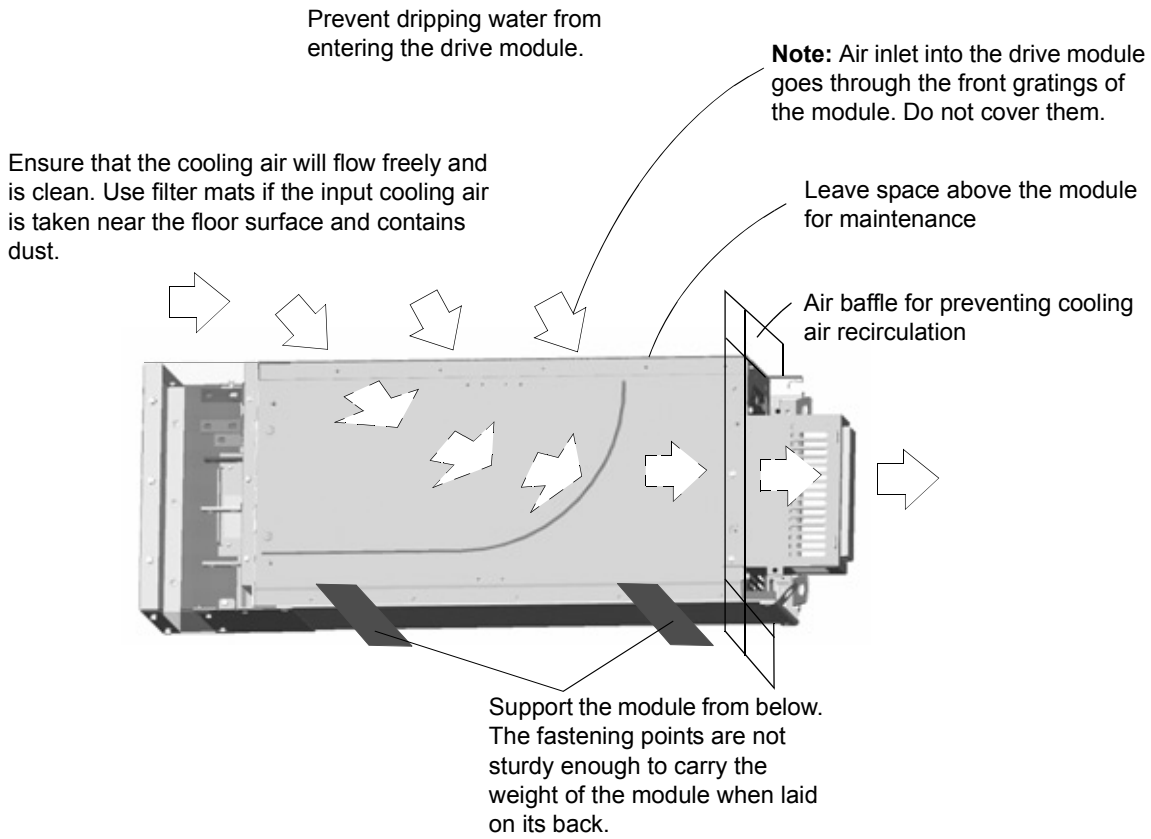
- Fasten the drive module by the fastening points.
- Lay support brackets below the module to carry the module weight.
- Ensure that hot air flows freely out of the cabinet and does not build up pressure.
- Reserve enough space for the cabling.
- In case of a short-circuit inside the drive module, hot ionized gases may escape sideways/upwards from the module through its ventilation holes. Ensure that the cabinet is constructed so that this will not cause any danger.
- The outlet cooling air is 25...30 °C (77...86 °F) hotter than the inlet air and flows sideways. Ensure that this does not cause danger.
- Ensure that the front panel, and preferably also the profiled side panel, can be removed and the cooling fan and capacitor pack changed.
- Ensure that the module can be changed, e.g. by sliding out of the cabinet on rails.

### Drive module of frame size R7 on its side



64796003\_bottom\_exit\_copy<64796003>.asm

### Drive module of frame size R7 on its back



64796003\_bottom\_exit\_copy<64796003>.asm

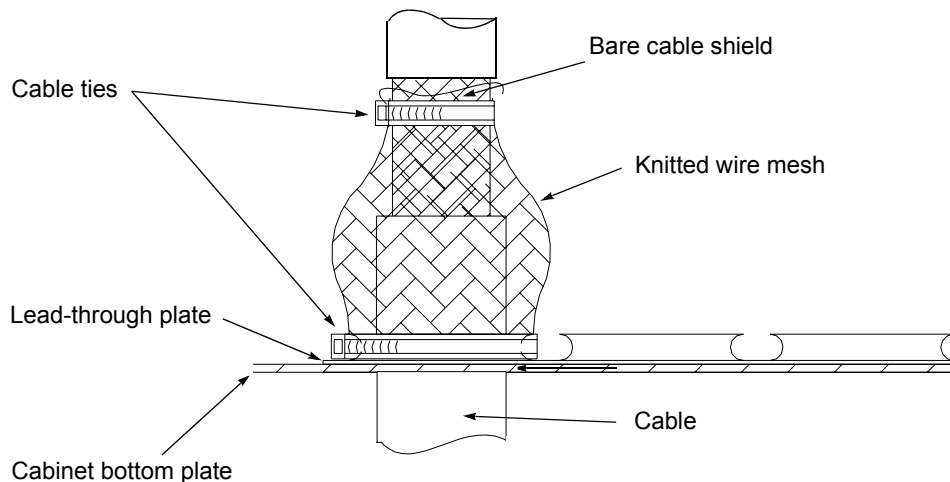
## EMC requirements

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. Special attention must be paid 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, the seams between the panels **are recommended to be left 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.

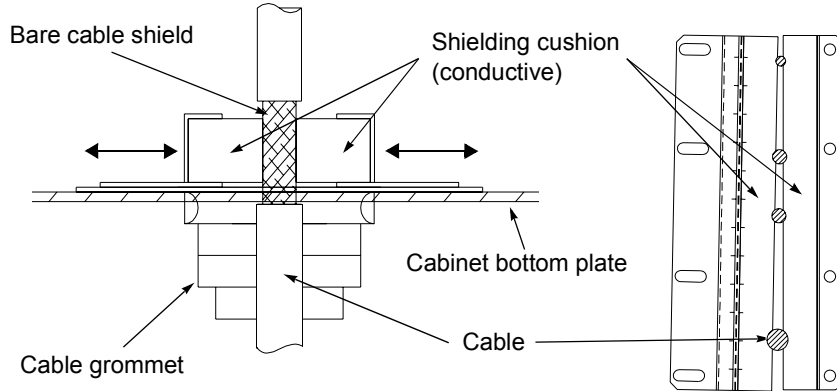
Sufficient high-frequency grounding network must be constructed in the cabinet to avoid voltage differences and forming of high-impedance radiator structures. A good high-frequency grounding is made with short flat copper braids for low inductance. One-point high-frequency grounding cannot be used due to the long distances inside the cabinet.

*First environment EMC compliance* <sup>\*)</sup> of the drive requires 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.

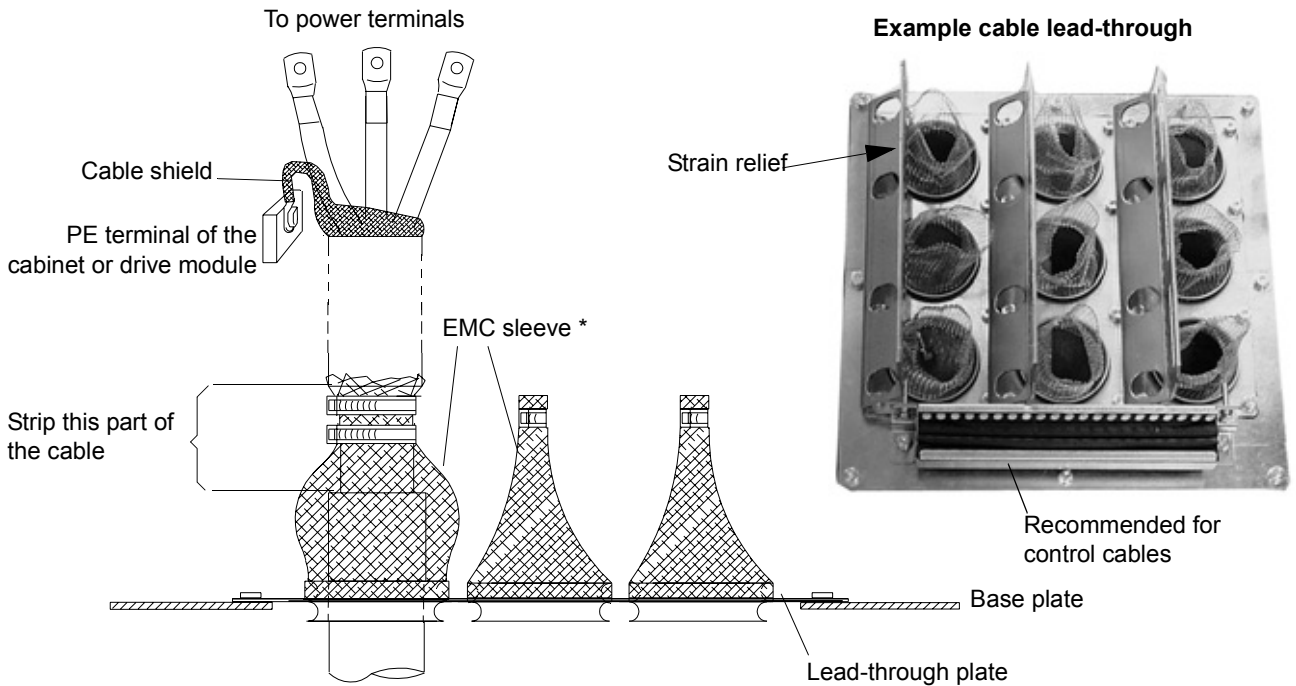


\*) First environment EMC compliance is defined in chapter *Technical data / CE marking* in *ACS800-04/04M/U4 Hardware Manual* [64671006 (English)].

360° high frequency grounding of the control cable shields is recommended at their entries. The shields can be grounded by means of conductive shielding cushions pressed against the cable shield from both directions:



### Grounding of cable shields



\* required for motor cables in first environment installations. First environment EMC compliance is defined in chapter *Technical data / CE marking* in *ACS800-04/04M/U4 Hardware Manual* [64671006 (English)].

### Installing the Drive Control Unit (RDCU)

See *RDCU Drive Control Unit Hardware Manual* [3AFE64636324 (English)].

## Fastening of the control panel (CDP312R)

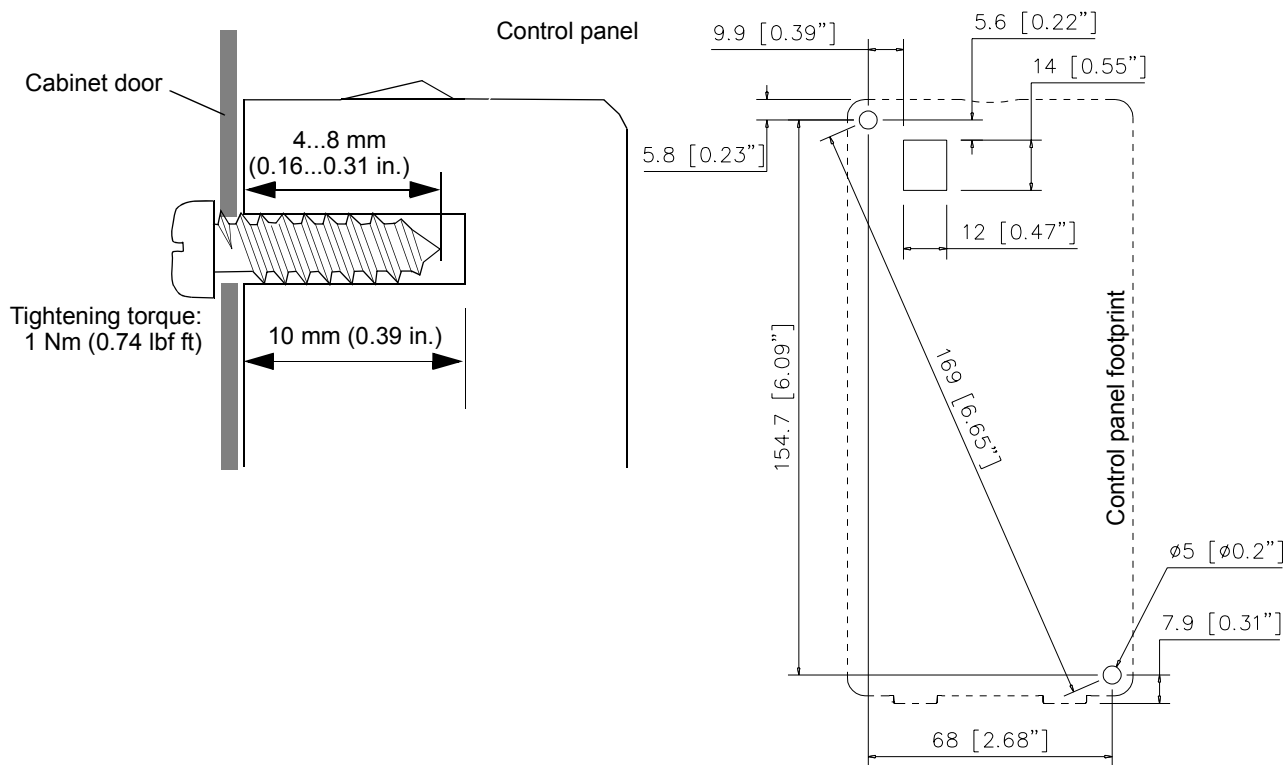
The control panel can be fastened directly to the cabinet door, or a mounting platform or control panel holder (+J413) can be used.

### Installing the control panel directly on the cabinet door

Fasten the control panel from the back side with two screws of one of the following types:

- standard screw with nominal diameter of 4 mm (0.16 in.)
- tapping screw with nominal diameter of 4.2 mm (0.17 in.) DIN 7981 C, DIN 7982 C, DIN 7983 C or DIN 7976 C
- PT screw for thermoplastics with nominal diameter of 4 mm (0.16 in.).

*View from outside the cabinet door*

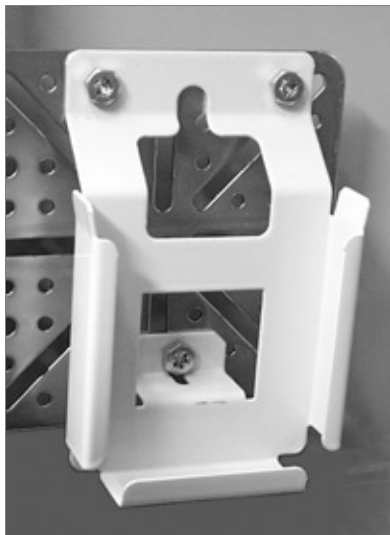


### Control Panel Mounting Platform RPMP-11/13 (+J410)

For installation of the mounting platform, see *RPMP-11/13 Control Panel Mounting Platform Kit Installation Guide* [3AFE68400643 (English)].

**Control Panel Holder RPMP-21 (+J413)**

Fasten the control panel holder to the cabinet frame or wall with three screws. Do not fasten the panel holder to the drive module.



## Mechanical installation of pre-assembled units (ACS800-04/U4)

### What this chapter contains

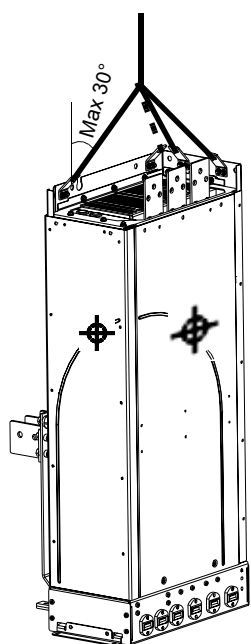
This chapter describes how to install a pre-assembled drive module into a cabinet. First, before-installation information is given, such as required tools, moving the unit and checking the delivery. Then, the mechanical installation procedure is described.

### Moving and unpacking the unit

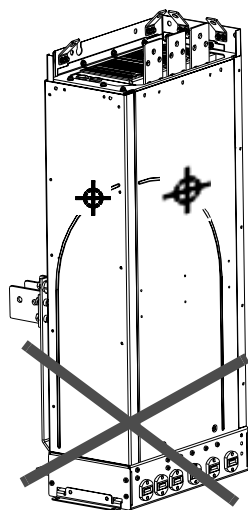


**WARNING!** The drive is heavy [frame size R7: 100 kg (220 lb), frame size R8: 200 kg (441 lb)]. Lift the drive by the upper part only using the lifting lugs attached to the top of the unit. The lower part will be deformed from lifting. Do not remove the pedestal before lifting.

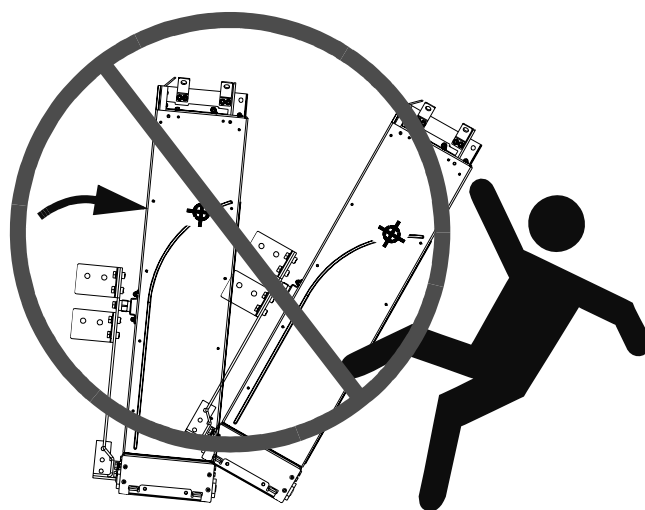
Do not tilt the drive. **The centre of gravity of the unit is high.** The unit will overturn from a tilt of about 6 degrees. **An overturning unit can cause physical injury.**



Views of frame size R7

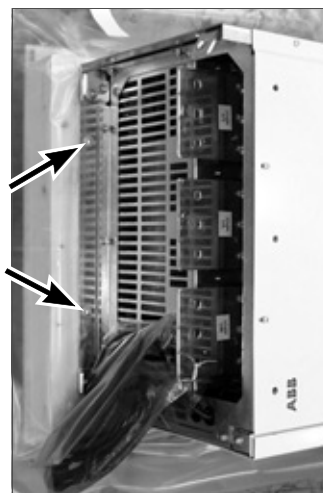


Do not lift by the lower part of the frame.



**Do not tilt!**

Move the transport package by pallet truck to the installation site. Unpack the package as shown below.



Undo the fastening screws.

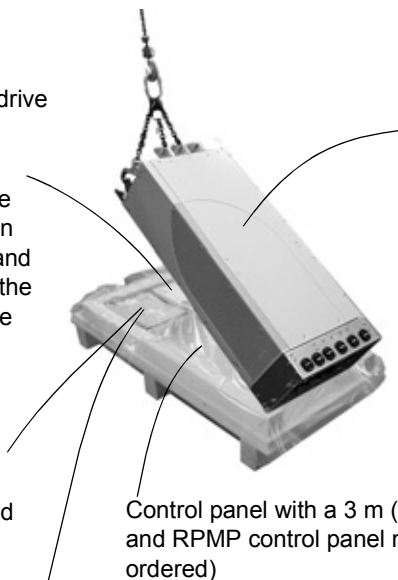
The following items are located below the drive module:

**Drive Control Unit (RDCU)**

**Note:** Optional modules (if ordered) are factory installed onto the RMIO board in the RDCU unit. The fibre optic cables and power supply cable to be connected to the RMIO board are coiled on the top of the drive module.

Base and wall fastening brackets, terminals for output cable connection and PE grounding. Screws are included in a plastic bag.

Manuals (hardware, appropriate firmware, optional module), delivery documents, residual voltage warning stickers



The following items are fastened to the drive module:

- pedestal
- output busbars U2, V2 and W2
- busbars for brake resistor connection if brake chopper is included.
- DC busbars if ordered

Control panel with a 3 m (98 in.) cable and RPMP control panel mounting kit (if ordered)

**Delivery check**

Check that there are no signs of damage. Before attempting installation and operation, check the information on the type designation label of the drive to verify that the unit is of the correct type.



## Required tools

- set of screw drivers
- torque wrench with a 500 mm (20 in.) or 2 × 250 mm (2 × 10 in.) long extension bar
- 19 mm (3/4 in.) socket  
for frame size R7: 13 mm (1/2 in.) magnetic-end socket  
for frame size R8: 17 mm (11/16 in.) magnetic-end socket.

## Installation procedure

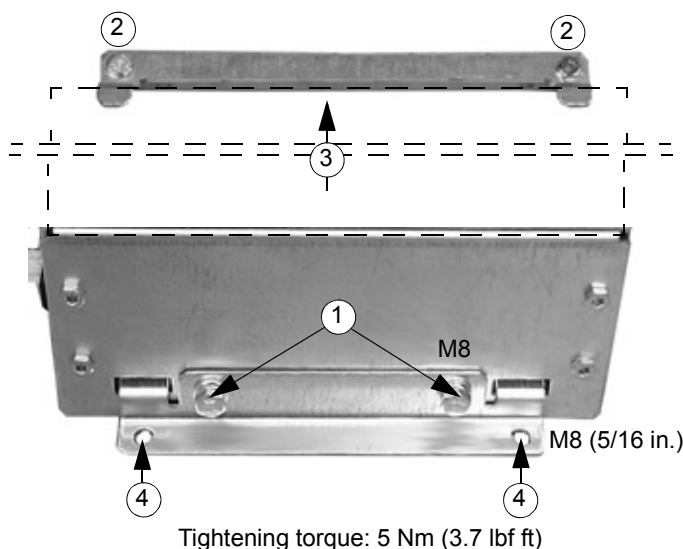
### Fasten the module to the cabinet

Fasten the module to the base of the cabinet with the outside fastening brackets as described below. For instructions in alternative fastening methods, refer to *Mechanical installation of non-pre-assembled units (ACS800-04M)*.

It is recommended to fasten the module also from the fastening points at the top of the unit. Refer to *Dimensional drawings* for the horizontal and vertical fastening points.

#### Clamping the pedestal with the outside brackets

1. Fasten the front bracket to the pedestal with two screws.
2. Fasten the back fastening bracket onto the cabinet floor with two screws.
3. Place the pedestal on the cabinet floor and push it so that the tabs of the fastening bracket enter the slots in the pedestal.
4. Fasten the front bracket to the base with two screws.



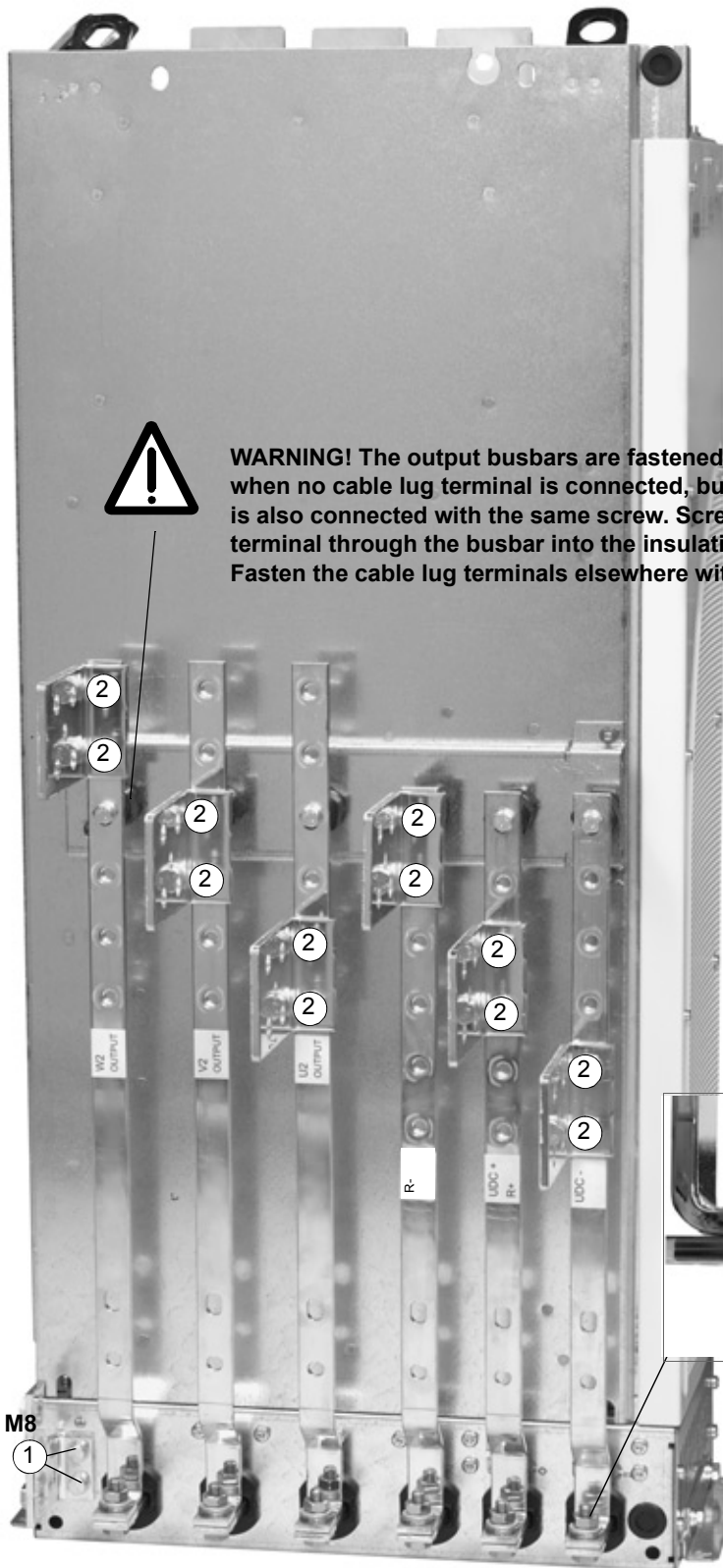
**Note:** Place the module on a solid base. The fastening brackets are not strong enough to carry the weight of the module on their own.

### Fasten the terminals to the busbars

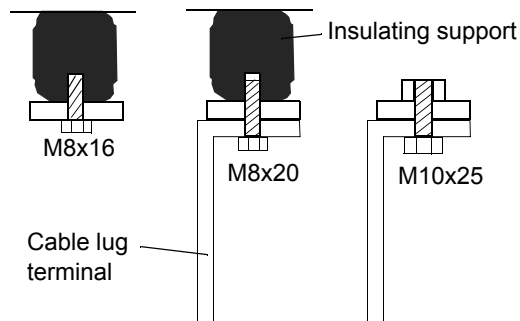
1. Connect the PE terminal to the long side plate of the pedestal with screws.
2. Connect the output cable terminals to the busbars with screws.

**Note 1:** The output cable terminals and PE terminal need not necessarily be used. The output cables can be also connected directly to the vertical output busbar holes with cable lugs. The PE conductors can be connected to the PE terminal screws. Busbars for output cables can be connected to the pedestal busbars.

View of output busbar connections of frame size R7 (DC and brake busbars included)



Top view of insulating support and cable lug terminal connections

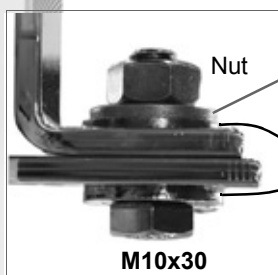


**WARNING!** The output busbars are fastened to the insulating supports with M8x16 screws when no cable lug terminal is connected, but with M8x20 screws when a cable lug terminal is also connected with the same screw. Screwing an M8x20 screw without a cable lug terminal through the busbar into the insulating support will break the insulating support. Fasten the cable lug terminals elsewhere with M10x25 screws.

Tightening torques

M8: 15...22 Nm (3.7 lbf ft)

M10: 30...44 Nm (22...32 lbf ft)

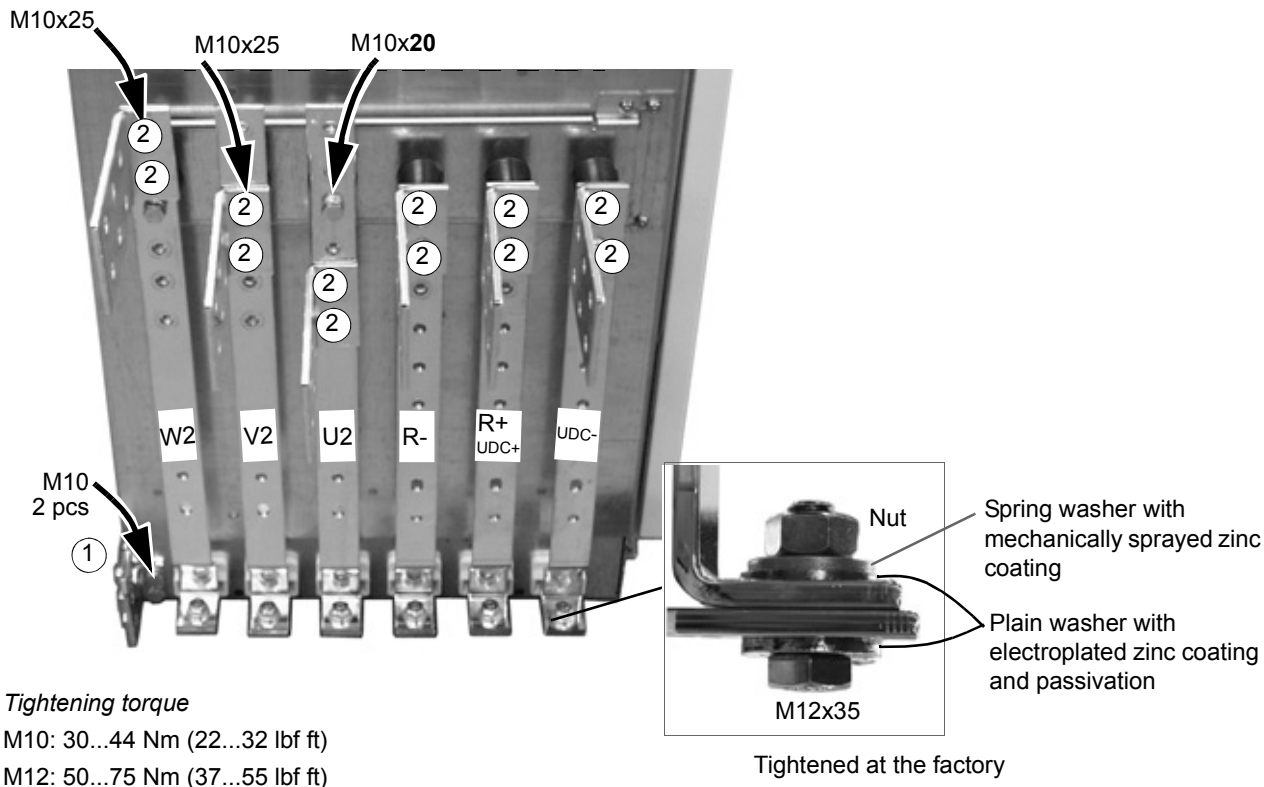


Tightened at the factory

*View of output busbar connections of frame size R8 (DC and brake busbars included)*



**WARNING!** Fasten the output busbars to the insulating supports with M10x20 screws when no cable lug terminal is connected, but with M10x25 screws when a cable lug terminal is connected as well. Screwing an M10x25 screw without a cable lug terminal through the busbar into the insulating support will break the insulating support.



**User connections of Prevention of Unexpected Start (+Q950)**

See pages 72 and 97.

# Mechanical installation of non-pre-assembled units (ACS800-04M)

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## What this chapter contains

This chapter describes how to assemble the drive from the assembly kits. First, before-installation information is given, such as required tools, moving the unit and checking the delivery. Then, the working order of the mechanical installation is described. Thereafter, particular assembling instructions follow.

## How to read this chapter

### Units with bottom exit

1. Read sections *Required tools and tightening torques* and *Moving and unpacking the unit*.
2. Go to section *Frame size R7 units with bottom exit (+H352)* on page 49.

### Units with pedestal and busbars on the long side (+H354, bookshelf mounting)

1. Read sections *Required tools and tightening torques* and *Moving and unpacking the unit*.
2. Identify your unit by its type code with the help of section *Units with pedestal and busbars on the long side (+H354, bookshelf mounting)* on page 57.
3. Choose the applying instructions in section *Assembling procedure for units with busbars on the long side (+H354)* on page 73.

### Units with pedestal and busbars on the short side (+H360, flat mounting)

1. Read sections *Required tools and tightening torques* and *Moving and unpacking the unit*.
2. Identify your unit by its type code with the help of section *Units with pedestal and busbars on the short side (+H360, flat mounting)* on page 91.
3. Choose the applying instructions in section *Assembling procedure for units with busbars on the short side (+H360)* on page 104.

## Required tools and tightening torques

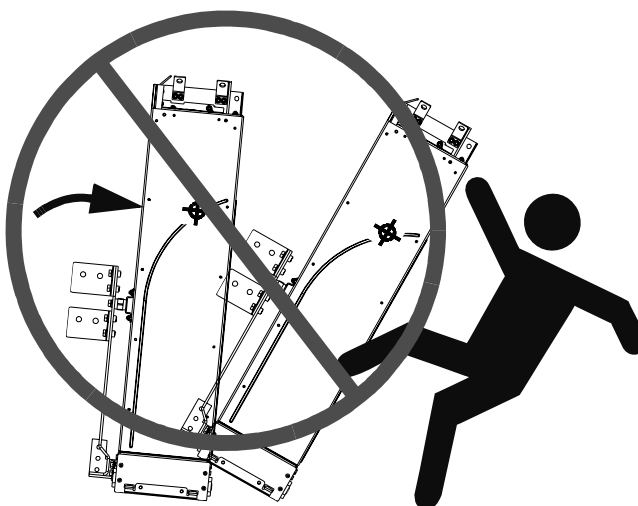
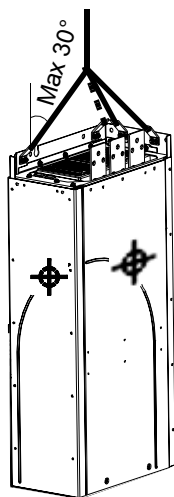
- set of screw drivers
- torque wrench with a 500 mm (20 in.) or 2 x 250 mm (2 x 10 in.) long extension bar
- 19 mm (3/4 in.) socket  
for frame size R7: 13 mm (1/2 in.) magnetic-end socket  
for frame size R8: 17 mm (11/16 in.) magnetic-end socket.

Screw	Grade	Tool		Tightening torque	
		mm	in.	Nm	lbf ft
M4	8.8	7		2	1.46
M5	8.8	8		4	
M6	8.8	10		6...9	3.7
M8	8.8	13	5/16	15...22	3.7
M10	8.8	17	3/8	30...44	22...32
M12	8.8	19	1/2	50...75	37...55

## Moving and unpacking the unit



**WARNING!** The drive is heavy [frame size R7: 100 kg (220 lb), frame size R8: 200 kg (441 lb)]. Lift the drive using the lifting lugs attached to the top of the unit. Do not tilt the drive. **The centre of gravity of the unit is high.** The unit will overturn from a tilt of about 6 degrees. **An overturning unit can cause physical injury.**



**Do not tilt!**

The module is delivered in a two-level package. Unpack the package as shown below.



Move the transport package by pallet truck to the installation site. Lift up the top cover. The following items are located in the upper package (1):

- pedestal
- output busbars U2, V2 and W2
- supports, screws and terminals for the output busbars and PE grounding
- fastening brackets for base and wall mounting
- busbars for brake resistor connection (if brake chopper is ordered)
- adapter (if output busbars on the short side of the module)
- DC busbars (if ordered)
- control panel and a 3 m (98 in.) cable (if ordered)
- control panel mounting platform (if ordered).



In the lower package (2):

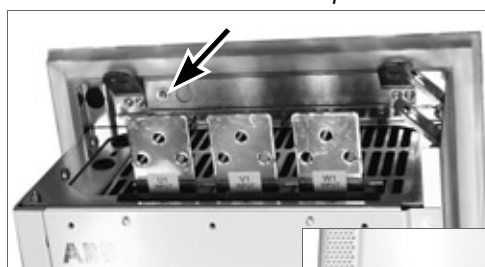
- drive module.

Below the drive module (3):

- **Drive Control Unit (RDCU).** **Note:** The fibre optic cables and power supply cable to be connected to the RMIO board inside the RDCU unit are wound on the top of the drive module.
- optional modules (if ordered) factory installed onto the RMIO board in the RDCU unit
- residual voltage warning and output busbar stickers
- hardware manual
- appropriate firmware manuals and guides
- delivery documents
- optional module manuals.



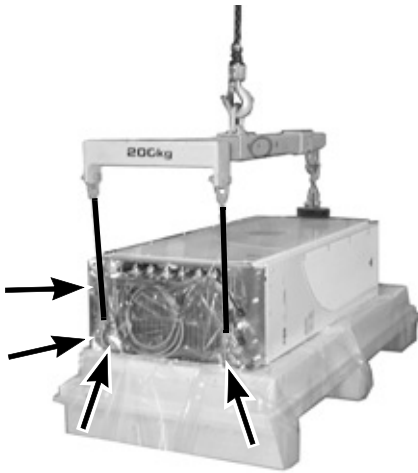
*Top view*



*Bottom view*



Undo the fastening screws.



Fasten the lifting hooks to the lifting lugs of the drive module. A hook can be fastened to the base bracket also. Use at least three fastening points because the module is turns over easily.


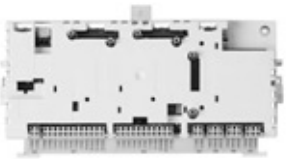




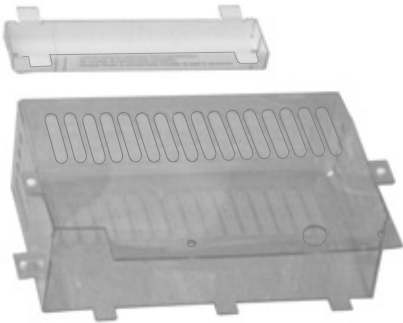
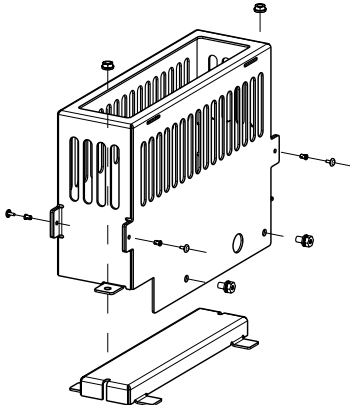

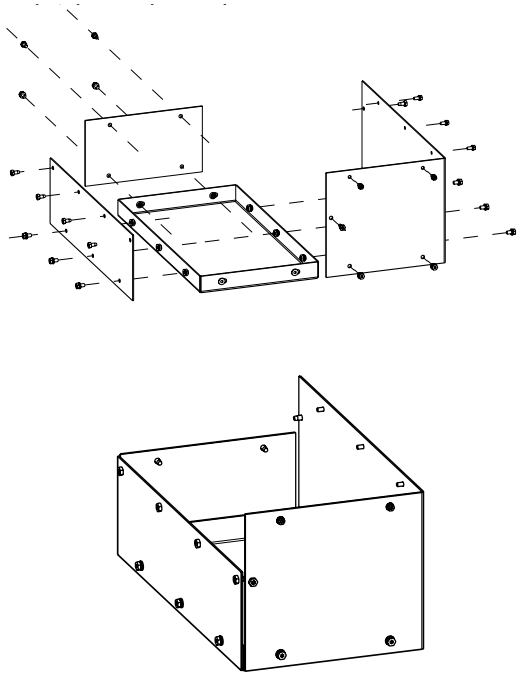
## Frame size R7 units with bottom exit (+H352)

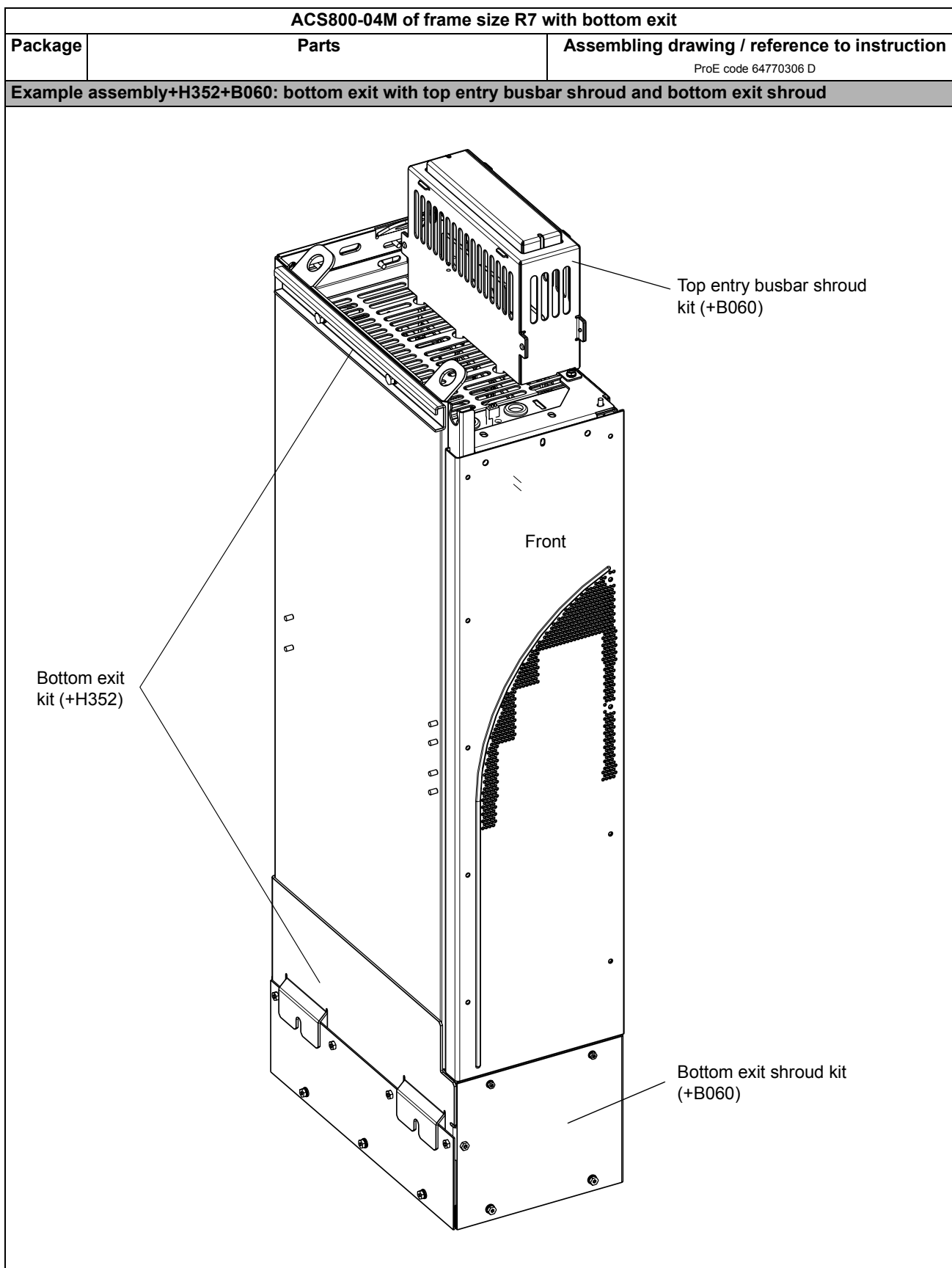
### Delivery check

Check that there are no signs of damage. Before attempting installation and operation, check the information on the type designation label of the drive to verify that the unit is of the correct type.

ACS800-04M of frame size R7 with bottom exit		
Package	Parts	Assembling drawing / reference to instruction ProE code 64770306 D
<b>Basic unit (type code ACS800-0M4-XXXX-X+H352)</b>		
	 <p>Drive module</p>	Refer to section <i>Assembling procedure</i> on page 53.
Drive control unit (RDCU)	 <p>RDCU drive control unit</p>	See <i>RDCU Drive Control Unit Hardware Manual</i> [3AFE64636324 (English)].

ACS800-04M of frame size R7 with bottom exit		
Package	Parts	Assembling drawing / reference to instruction ProE code 64770306 D
Bottom exit kit R7 +H352	68324963	
	<p>L-plate</p> <p>Spacers for wall mounting</p> <p>R-busbar with fastening pin</p> <p>Bottom plate</p>	<p>Front</p>

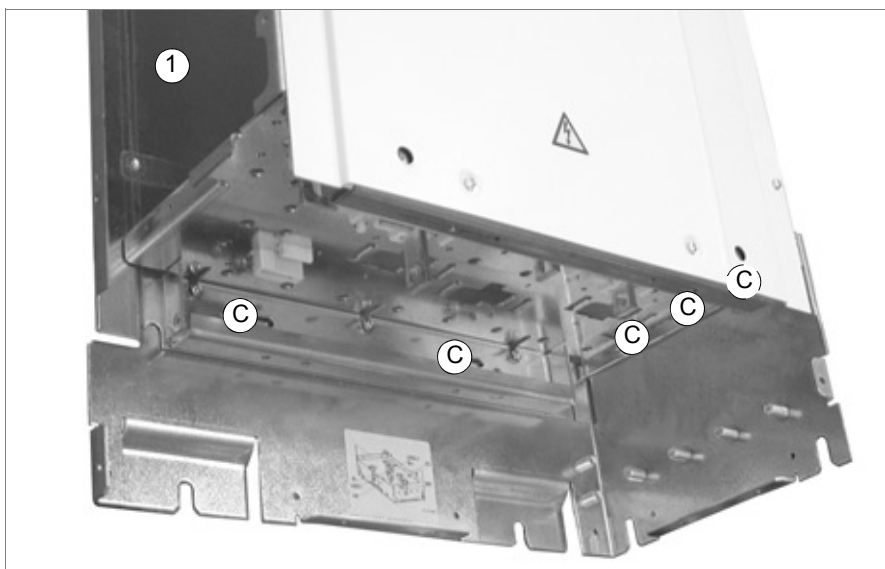
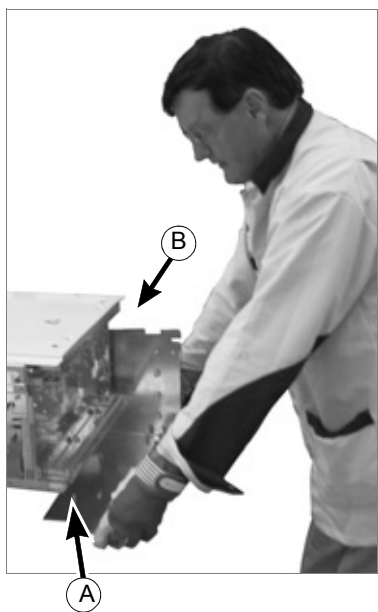
ACS800-04M of frame size R7 with bottom exit		
Package	Parts	Assembling drawing / reference to instruction ProE code 64770306 D
<b>Optional selection +H352+B060: top entry busbar shroud and bottom exit shroud</b>		
Top entry busbar shroud kit R7 +B060	68363977 	
Bottom exit shroud kit R7 +B060	68339545  Screws	



### Assembling procedure

Assemble the units with bottom exit (+H352) as follows:

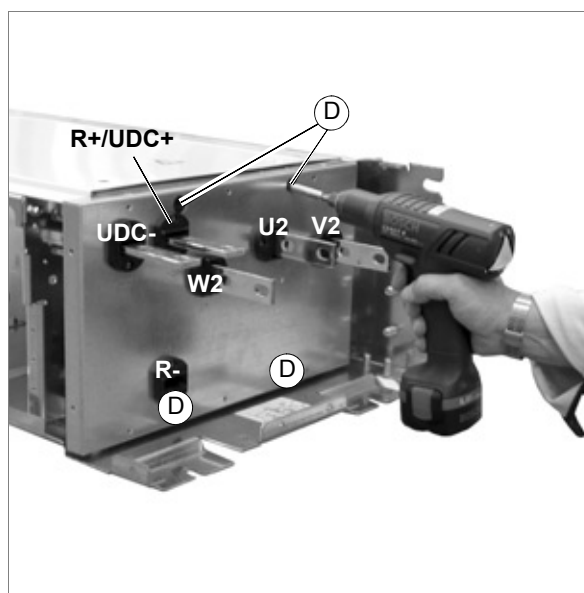
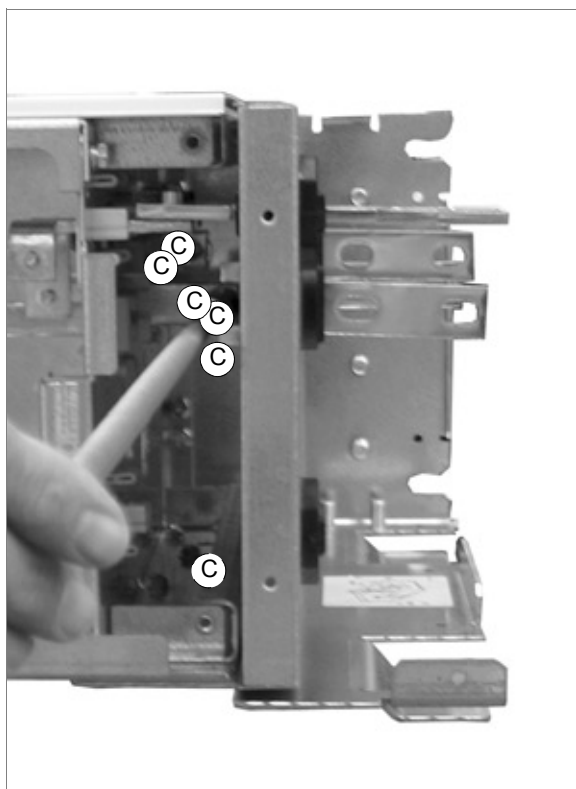
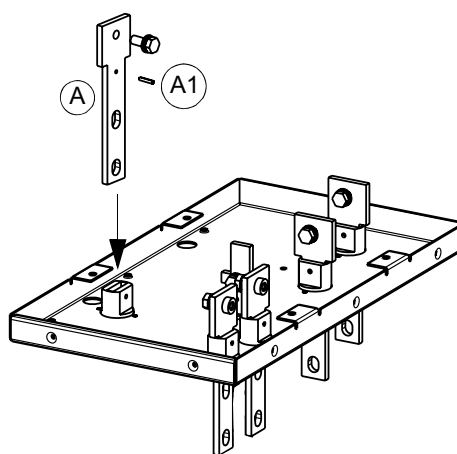
1. Remove the front cover of the drive module.
2. Fasten the L-plate to the base of the module.
  - A. Insert the two pins of the longer side of the L-plate to the counter holes in the side plate of the drive module.
  - B. Slide the L-plate horizontally to match the three pins in its shorter side with the counter holes in the drive module.
  - C. Fasten the L-plate with 5 screws.



### 3. Fasten the bottom plate to the base of the drive module.



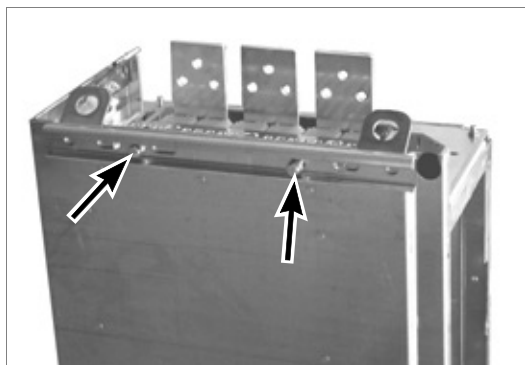
- A. With brake chopper option (+D150), fasten R- busbar to the bottom plate with pin A1.
- B. Insert the bottom plate onto its place.
- C. Connect the busbars of the bottom plate to the busbars of the drive module with M8x25 combi screws using a torque wrench with an extension bar. Tightening torque: 15...22 Nm (11...16 lbf ft).
- D. Fasten the bottom plate to the drive module with four M6 screws. Tightening torque: 6...9 Nm (3.7 lbf ft).



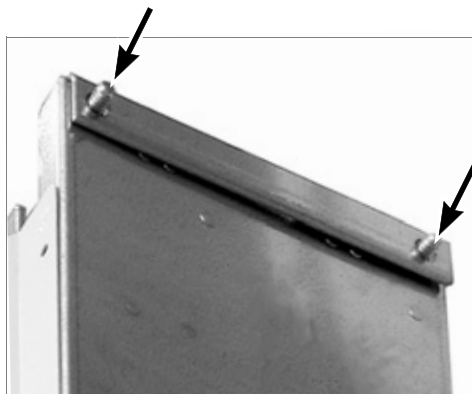
### 4. Fasten the front cover.

### Fastening the spacer

Fasten the the drive module to the cabinet or wall using a spacer at the top of the module on the fastening side.



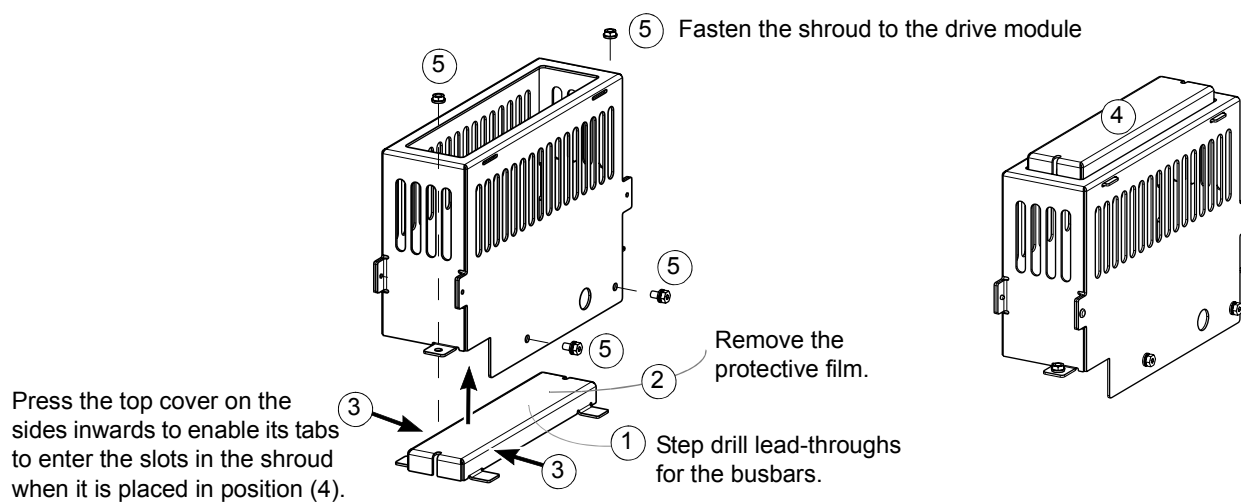
*Fastening the spacer to the long side of the module (flat mounting)*



*Fastening the spacer to the short side of the module (bookshelf mounting)*

### Fastening the top entry busbar and bottom exit shrouds (+B060)

#### *Top entry busbar shroud*



### Bottom exit shroud

