ACS800

Hardware Manual
ACS800-07 Drives (45 to 560 kW)
ACS800-U7 Drives (50 to 600 HP)

ACS800 Single Drive Manuals

HARDWARE MANUALS (appropriate manual is included in the delivery)

ACS800-01/U1 Hardware Manual 0.55 to 110 kW (0.75 to 150 HP) 3AFE64382101 (English)

ACS800-01/U1/04 Marine Supplement 0.55 to 132 kW (0.75 to 150 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 to110 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 Hardware Manual 0.55 to 132 kW 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 Application Program Firmware Manual 3AFE64527592 (English)

System Application Program Firmware Manual 3AFE64670646 (English)

Application Program Template Firmware Manual 3AFE64616340 (English)

Master/Follower 3AFE64590430 (English)

Pump Control Application 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.

ACS800-07 Drives
45 to 560 kW
ACS800-U7 Drives
50 to 600 HP

Hardware Manual

3AFE64702165 Rev C EN
EFFECTIVE: 30.5.2006

Safety instructions

What this chapter contains

This chapter contains the safety instructions which you must follow 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.

Use of warnings and notes

There are two types of safety instructions throughout this manual: warnings and notes. Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. Notes draw attention to a particular condition or fact, or give information on a subject. The warning symbols are used as follows:

Dangerous voltage warning warns of high voltage which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

Electrostatic discharge warning warns of electrostatic discharge which can damage the equipment.

Installation and maintenance work

These warnings are intended for all who work on the drive, motor cable or motor. Ignoring the instructions can cause physical injury or death.

WARNING!

- **Only qualified electricians are allowed to install and maintain the drive.**
- Never work on the drive, motor cable or motor when main power is applied. After switching off the power, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you start working on the drive, the motor or the motor cable.

  Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:

  1. Voltage between drive input phases L1, L2 and L3 and the frame is close to 0 V.
  2. Voltage between terminals UDC+ and UDC- and the frame is close to 0 V.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation or voltage withstand tests on the drive or drive modules.
- When reconnecting the motor cable, always check that the phase order is correct.

Note:

- The disconnecting device (means) of the drive does not isolate the input cables and busbars from the main AC supply. Before working inside the cabinet, isolate the input cables and busbars from the main supply with the disconnecting device at the distribution board or with the disconnector of the supply transformer.
- The motor cable terminals on the drive are at a dangerously high voltage when the input power is on, regardless of whether the motor is running or not.
- The brake control terminals (UDC+, UDC-, R+ and R- terminals) carry a dangerous DC voltage (over 500 V).
- Depending on the external wiring, dangerous voltages [115 V, 220 V or 230 V] may be present on the terminals of relay outputs RO1 to RO3.
- The Prevention of Unexpected Start function does not remove the voltage from the main and auxiliary circuits.

WARNING!

- Cover the drive when installing to ensure that dust from drilling or foreign objects do not enter the drive. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
- Welding of the cabinet frame is not recommended. However, if electric welding is the only way to mount the cabinet, follow the instructions given in chapter *Mechanical installation*. Ensure that welding fumes are not inhaled. If the welding return wire is connected improperly, the welding circuit may damage electronic circuits in the cabinet.
- When removing the module from the cabinet and manoeuvring it outside the cabinet, prevent it from toppling over by securing it. The drive module is heavy and has a high centre of gravity.

WARNING! The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.

Grounding

These instructions are intended for all who are responsible for the grounding of the drive. Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic interference.

WARNING!

- Ground the drive, the motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and pick-up.
- Make sure that grounding conductors are adequately sized as required by safety regulations.
- In a multiple-drive installation, connect each drive separately to protective earth (PE).
- Do not install a drive with EMC filter option +E202 on an ungrounded power system or a high resistance-grounded (over 30 ohms) power system.

Note:

- Power cable shields are suitable for equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the drive is higher than 3.5 mA AC or 10 mA DC (stated by EN 50178, 5.2.11.1), a fixed protective earth connection is required.

Fibre optic cables

WARNING! Handle the fibre optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibres with bare hands as the fibre is extremely sensitive to dirt. The minimum allowed bend radius is 35 mm (1.4 in.).

Operation

These warnings are intended for all who plan the operation of the drive or operate the drive. Ignoring the instructions can cause physical injury or death or damage the equipment.

WARNING!

- Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the speed provided by connecting the motor directly to the power line.
- Do not activate automatic fault reset functions of the Standard Application Program if dangerous situations can occur. When activated, these functions will reset the drive and resume operation after a fault.
- Do not control the motor with the disconnecting device (disconnecting means); instead, use the control panel keys and , or commands via the I/O board of the drive. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is five in ten minutes.
- Do not use the optional Prevention of Unexpected Start function for stopping the drive when the drive is running. Give a Stop command instead.

Note:

- If an external source for start command is selected and it is ON, the drive (with Standard Application Program) will start immediately after fault reset unless the drive is configured for 3-wire (a pulse) start/stop.
- When the control location is not set to Local (L not shown in the status row of the display), the stop key on the control panel will not stop the drive. To stop the drive using the control panel, press the LOC/REM key and then the stop key .

Permanent magnet motor

These are additional warnings concerning permanent magnet motor drives.

WARNING! Do not work on the drive when the permanent magnet motor is rotating. Also, when the supply power is switched off and the inverter is stopped, a rotating permanent magnet motor feeds power to the intermediate circuit of the drive and the supply connections become live.

Installation and maintenance work

Before installation and maintenance work on the drive:

- Disconnect the motor from the drive with a safety switch

and additionally if possible (or)

- lock the motor shaft and ground the motor connection terminals temporarily by connecting them together as well as to the PE. Before grounding, measure that the motor is de-energized.

Operation

Do not run the motor over the rated speed. Motor overspeed leads to overvoltage which may explode the capacitors in the intermediate circuit of the drive.

Table of contents

Planning the electrical installation

Electrical installation

Motor control and I/O board (RMIO)

Installation checklist and start-up

Maintenance

Technical data

Dimensional drawings

Resistor braking

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, install, commission, use and service the drive. Read the manual before working on the drive. 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 performed per the National Electrical Code and local codes are marked with (US).

Common chapters for four products

Chapters *Planning the electrical installation*, *Motor control and I/O board (RMIO)* and *Resistor braking* apply to the ACS800-01/U1, ACS800-02/U2, ACS800-04/U4, and ACS800-07/U7.

Categorization according to the frame size

Some instructions, technical data and dimensional drawings which concern only certain frame sizes are marked with the symbol of the frame size R2, R3... 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*.

Categorization according to the + code

The instructions, technical data and dimensional drawings which concern only certain optional selections are marked with + codes, e.g. +E205. The options included in the drive can be identified from the + codes visible on the type designation label of the drive. The + code selections are listed in chapter *The ACS800-07/U7* under *Type code*.

Contents

The chapters of this manual are briefly described below.

Safety instructions give safety instructions for the installation, commissioning, operation and maintenance of the drive.

About this manual introduces this manual.

The ACS800-07/U7 describes the drive.

Mechanical installation shows how to move and unpack the delivery and how to fasten the cabinet to the floor.

Planning the electrical installation instructs on the motor and cable selection, the protections and the cable routing.

Electrical installation instructs how to wire the drive.

Motor control and I/O board (RMIO) shows external control connections to the motor control and I/O board and its specifications.

Installation checklist and start-up helps in checking the mechanical and electrical installation of the drive.

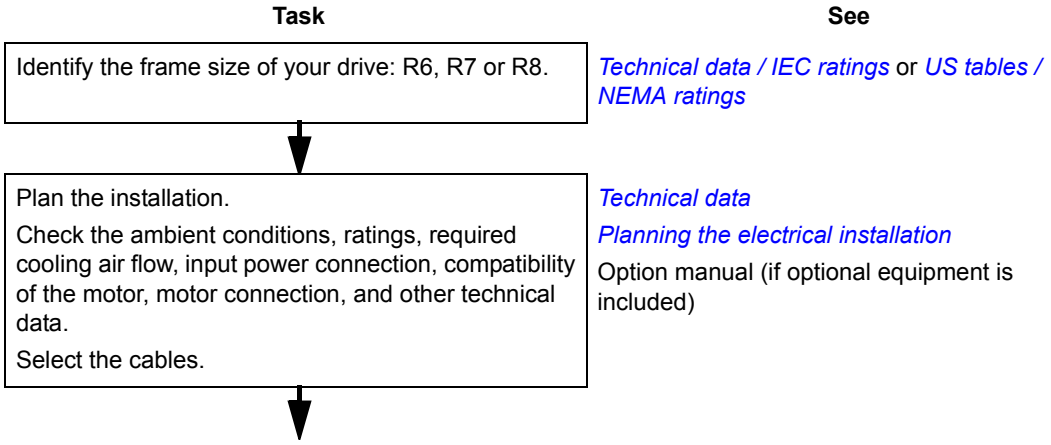
Maintenance contains preventive maintenance instructions.

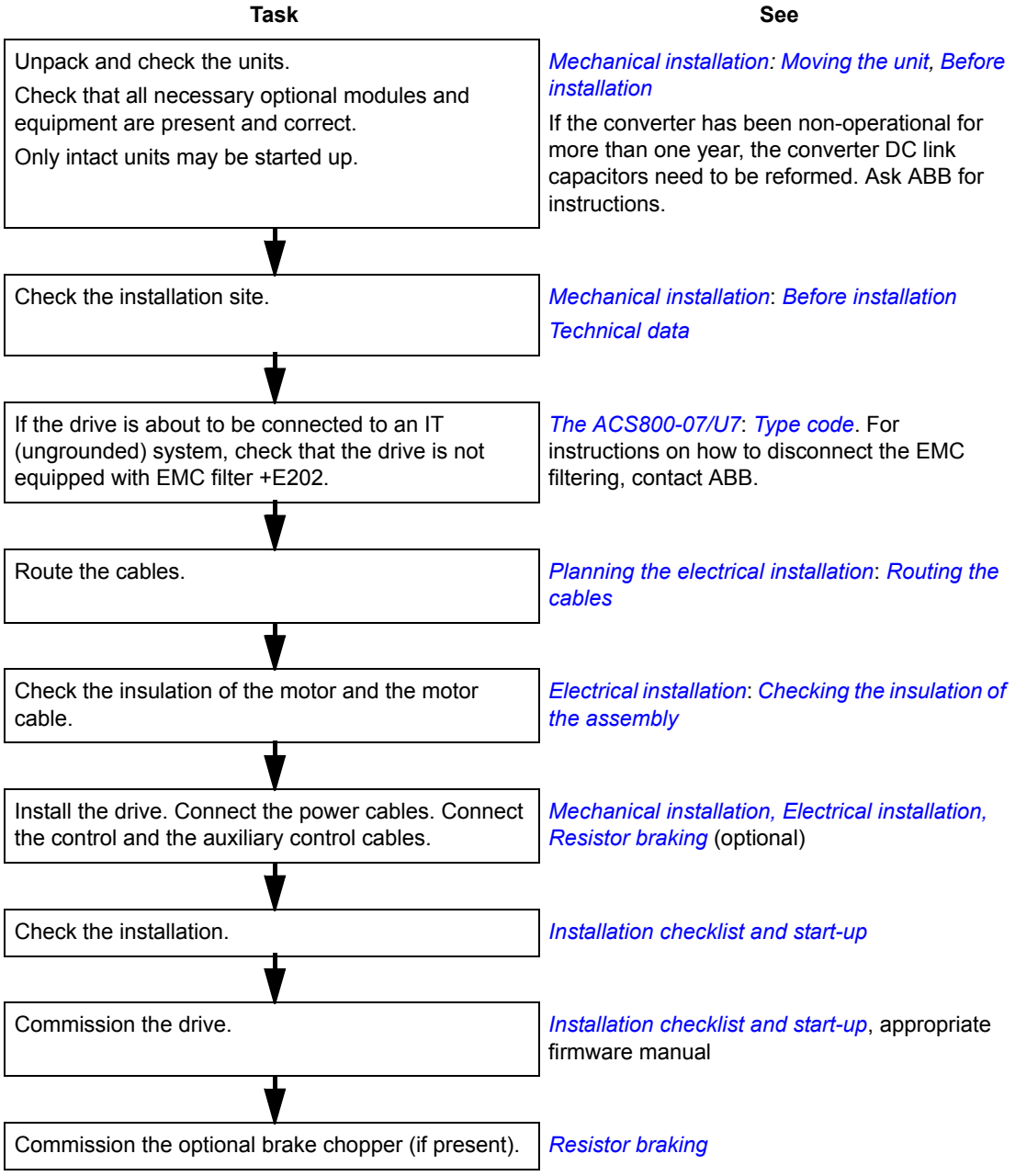
Technical data contains the technical specifications of the drive, e.g. the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings and warranty policy.

Dimensional drawings contains the dimensional drawings of the drive.

Resistor braking describes how to select, protect and wire optional brake choppers and resistors. The chapter also contains technical data.

Installation and commissioning flowchart





Inquiries

Address any inquiries about the product to the local ABB representative, quoting the type code and the serial number of the unit. If the local ABB representative cannot be contacted, address inquiries to the manufacturing facility.

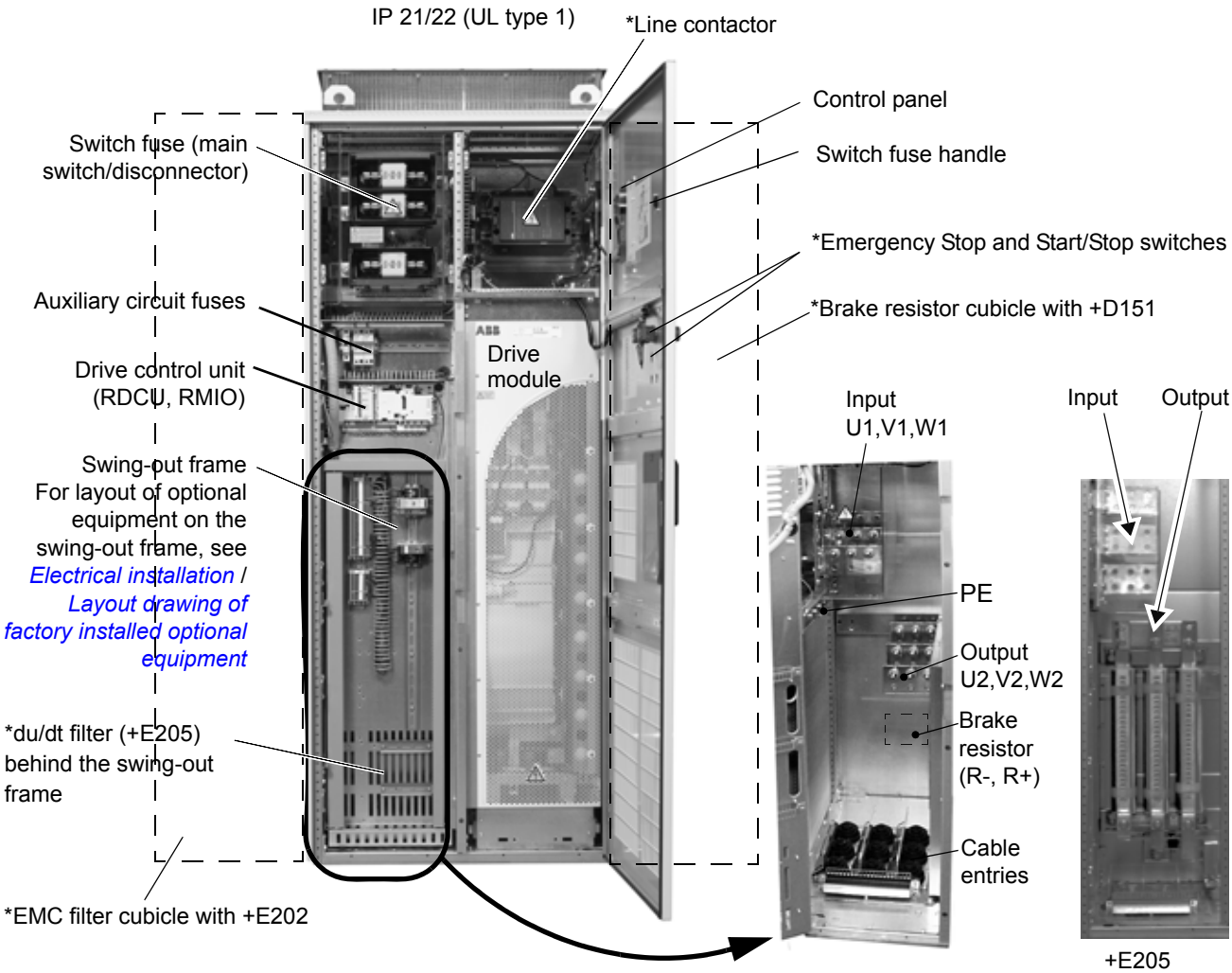
The ACS800-07/U7

What this chapter contains

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

The ACS800-07/U7

The ACS800-07/U7 is a cabinet-installed drive for controlling AC motors.



Power and signal cable terminals, and du/dt filter (+E205), behind the swing-out frame

* Denotes optional equipment not present on all units.

View of frame size R8

Note: The input terminals are located in the EMC filter cubicle with +E202.

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. ACS800-07-0170-5). The optional selections are given thereafter, separated by + 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).

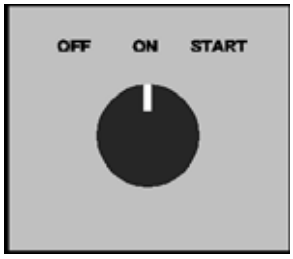
Selection	**Alternatives**	
Product series	ACS800 product series	
Type	07	cabinet built. When no options are selected: 6-pulse diode input bridge, IP 21, switch fuse with gG fuses, control panel CDP312R, no EMC filter, Standard Application Program, bottom entry and exit of cables, boards without coating, one set of manuals.
	U7	cabinet built (USA). When no options are selected: 6-pulse diode bridge, UL type 1, switch fuse with class T/L fuses, control panel CDP312R, no EMC filter, US version of the Standard Application Program (three-wire start/stop as default setting), cable conduit entry, common mode filter in frame size R8, boards without coating, one set of manuals.
Size	See *Technical data: IEC ratings*.	
Voltage range (nominal rating in bold)	3	380/**400**/415 VAC
	5	380/400/415/440/460/480/**500** VAC
	7	525/575/600/**690** VAC
+ options		
Degree of protection	B053	IP 22 (UL type 1)
	B054	IP 42 (UL type 2)
	B056	IP 54 (UL type 12)
	B059	IP 54R with connection to air outlet duct
Construction	C121	marine construction (reinforced mechanics and fastening, marking of conductors according to class A1, door handles, self-extinctive materials)
	C129	UL listed (for ACS800-07 units only): US type main switch fuse, 115 VAC control voltage, US cable conduit entry, all components UL listed/recognized, max. supply voltage 600 V.
Resistor braking	D150	brake chopper (external resistor)
	D151	brake chopper and resistor
Filter	E200	EMC/RFI filter for second environment TN (grounded) system
	E202	EMC/RFI filter for first environment TN (grounded) system, restricted (A limits)
	E210	EMC/RFI filter for second environment TN/IT (grounded/ ungrounded) system
	E205	du/dt filter
	E206	sine filter
	E208	common mode filter
Line options	F250	line contactor
	F260	ultra-rapid line fuses (aR)

Selection	Alternatives	
Cabinet options	G300	cabinet heater (external supply)
	G304	115 VAC control voltage
	G307	terminals for external control voltage (UPS)
	G313	output for motor heater (external supply)
	G330	halogen-free materials and control wiring
Cabling	H351	top entry
	H353	top exit
	H358	cable conduit entry (US and UK version)
Fieldbus	K...	Refer to *ACS800 Ordering Information* (EN code: 64556568).
I/O	L504	additional terminal block X2
	L505	thermistor relay (1 or 2 pcs)
	L506	Pt100 relay (3, 5 or 8 pcs)
	L...	Refer to *ACS800 Ordering Information* (EN code: 64556568).
Starter for auxiliary motor fan	M600	1...1.6 A
	M601	1.6...2.5 A
	M602	2.5...4 A
	M603	4...6.3 A
	M604	6.3...10 A
	M605	10...16 A
Application program	N...	Refer to *ACS800 Ordering Information* (EN code: 64556568).
Language of manual	R...	
Specialities	P901	coated boards
	P902	customized
	P904	extended warranty
	P913	special colour
Safety features	Q950	prevention of unexpected start
	Q951	emergency stop of category 0 (+F250 required)
	Q952	emergency stop of category 1 (+F250 required)
	Q954	earth fault monitoring for IT (ungrounded) systems

Main circuit and control

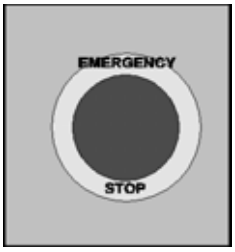
Door switches

The following switches are mounted on the cabinet door:



Operating switch (units with main contactor only)

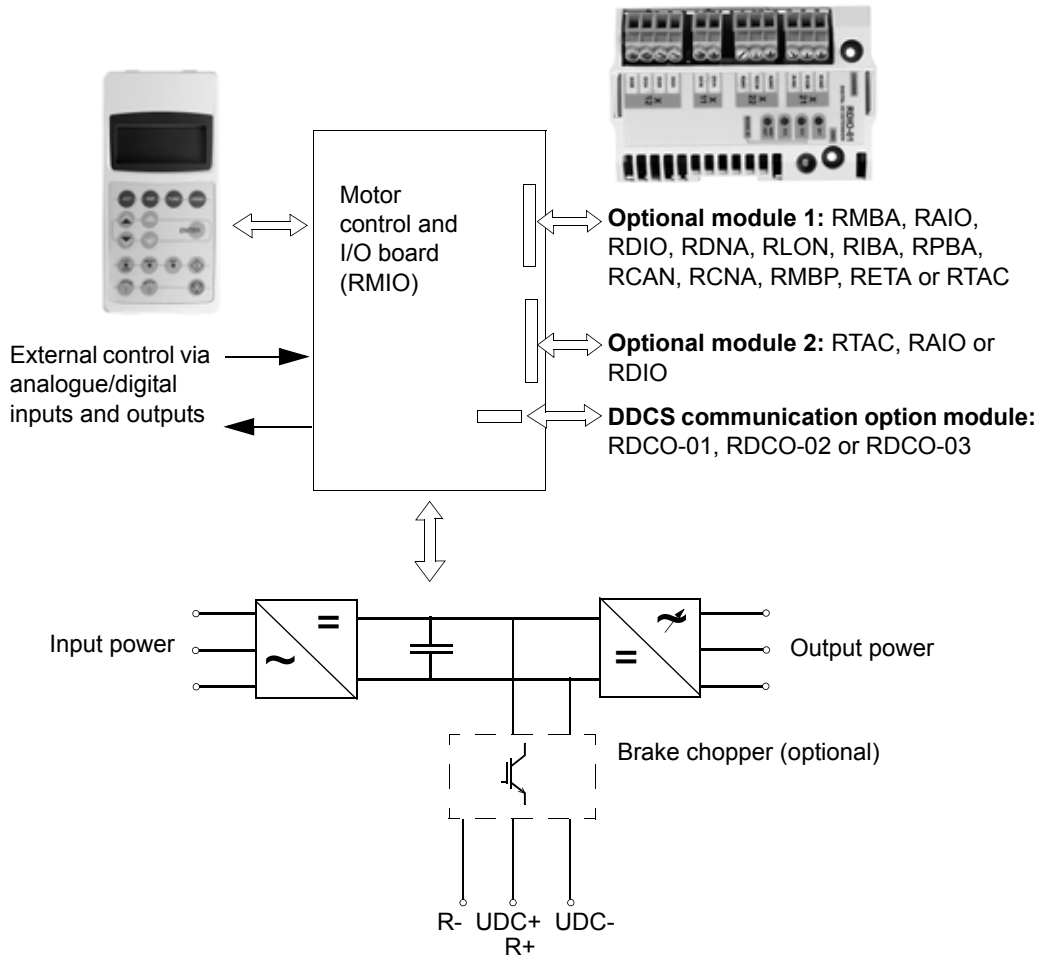
“START” position closes the main contactor; “ON” position keeps the main contactor closed; “OFF” position opens the main contactor.



Emergency stop button (optional)

Diagram

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



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 varistors and snubbers for the thyristors
- power supply board (APOW)
- gate driver control board (AGDR)
- diagnostics and panel interface board (ADPI)
- EMC filter boards (NRFC) with option +E202
- 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.

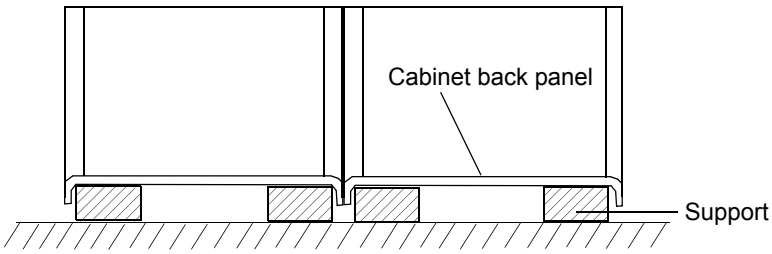
Mechanical installation

What this chapter contains

This chapter describes the mechanical installation procedure of the drive.

Moving the unit

Move the transport package by truck and pallet truck to the installation site.



View of cabinet laid on its back

It is allowed to tilt the drive if required, or move it on its back when supported properly from below.

WARNING! Lift the drive by the upper part only using the lifting lugs/bars attached to the top of the unit.

Before installation

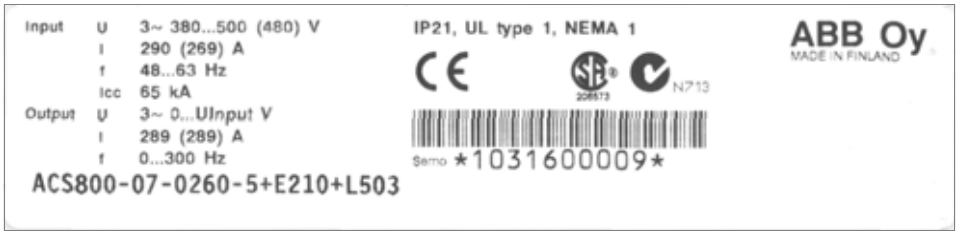
Delivery check

The drive delivery contains:

- drive cabinet including factory installed options such as optional modules (inserted onto the RMIO board in the RDCU unit)
- residual voltage warning stickers
- hardware manual
- appropriate firmware manuals and guides
- appropriate optional module manuals
- delivery documents.

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. The 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 designation label

Serial number label

Requirements for the installation site

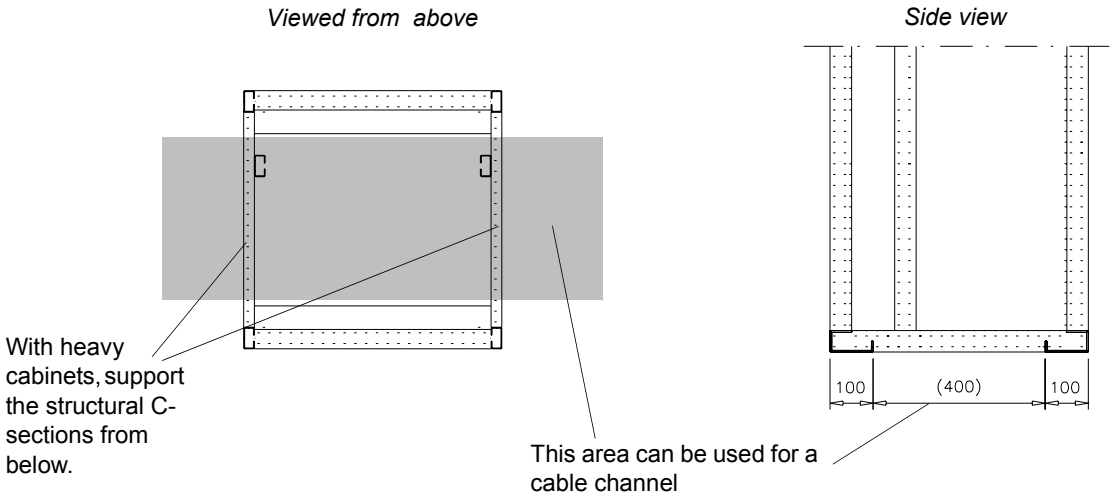
Check the installation site according to the requirements below. See *ACS800-07/U7 Dimensional Drawings* [3AFE64775421 (English)] for frame details. See *Technical data* for the allowed operation conditions of the drive.

Cooling air flow

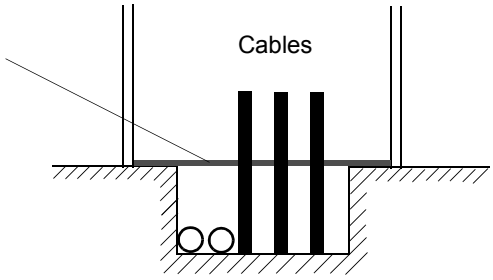
Provide the drive with the amount of clean cooling air given in *Technical data* / *IEC ratings* or *US tables*.

Cable channel in the floor below the cabinet

A cable channel can be constructed below the 400 mm wide middle part of the cabinet. The cabinet weight lies on the two 100 mm wide transverse sections which the floor must carry.

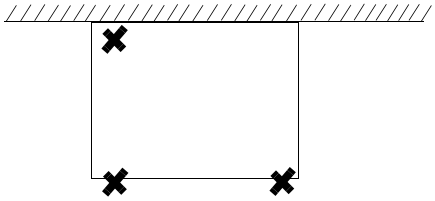


Prevent the cooling air flow from the cable channel to the cabinet by bottom plates. To ensure the degree of protection for the cabinet use the original bottom plates delivered with the unit. With user-defined cable entries take care of the degree of protection, fire protection and EMC compliance.

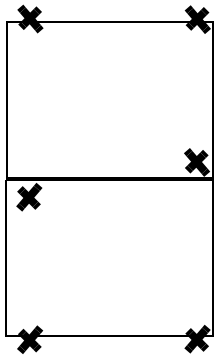


Fastening the cabinet to the floor and wall (non-marine units)

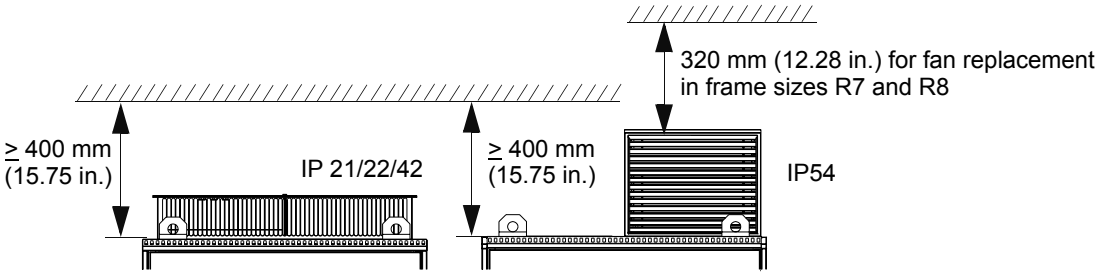
Fasten the cabinet to the floor either with the outside fastening brackets from front and back, or by the fastening holes inside the cabinet. When fastening at the back is not possible, fasten the cabinet at the top using L-brackets bolted to the holes of the lifting lugs (M16 bolt). The cabinet can be fastened against a wall or back to back with another cabinet. See chapter *Dimensional drawings* for the horizontal and vertical fastening points. Height adjustment can be done by using metal shims between the bottom frame and floor.



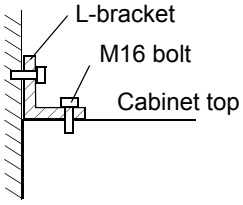
Fastening points when installed back against wall



Fastening points when installed back against back



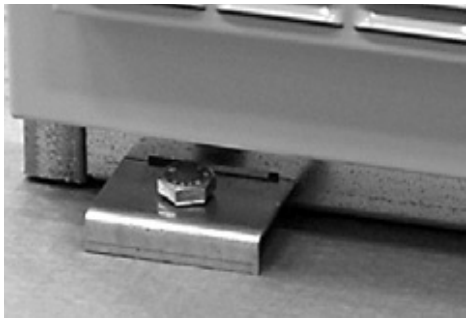
Top clearance



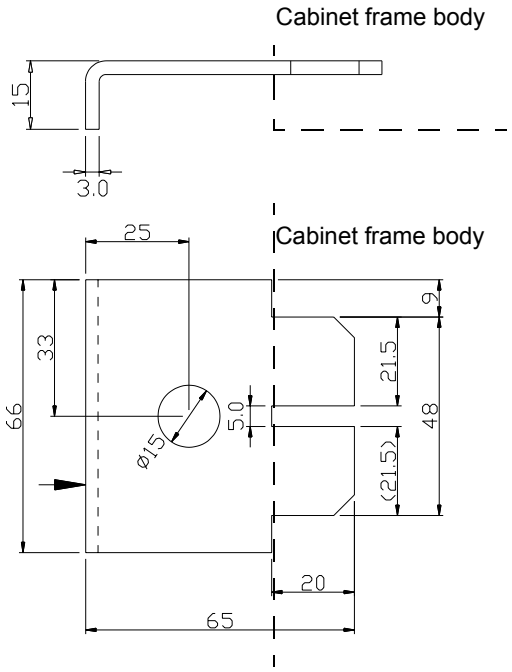
Fastening the cabinet at the top by using L-brackets (side view)

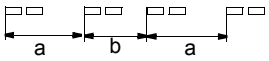
Fastening the cabinet with the outside brackets

Insert the bracket into the longitudinal hole in the edge of the cabinet frame body and fasten it with a bolt to the floor.



Dimensions of the fastening bracket:

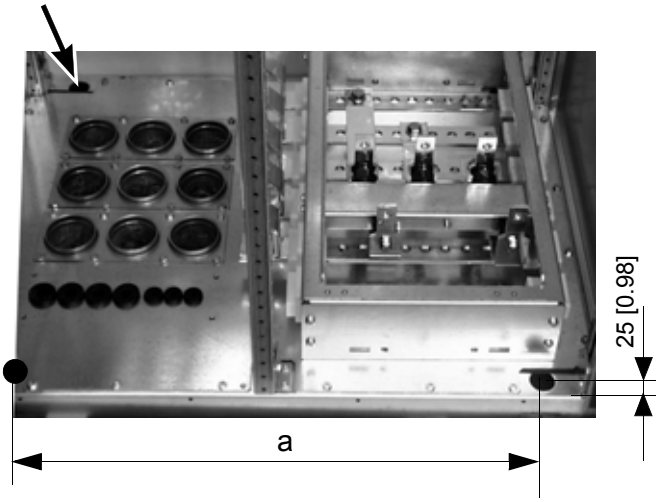


Cubicle width mm [in.]	Fastening hole distance in mm [in.] 
200 [7.87]	
400 [15.75]	a: 250 [9.84]
600 [23.62]	a: 450 [17.71]
800 [31.50]	a: 650 [25.29]
1000 [39.37]	a: 350 [13.78], b: 150 [5.91], a: 350 [13.78]
1200 [47.24]	a: 450 [17.71], b: 150 [5.91], a: 450 [17.71]

Fastening bolt: M10 to M12 (3/8” to 1/2”).

Fastening the cabinet through the holes inside the cabinet

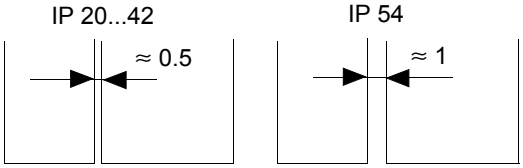
The cabinet can be fastened to the floor using the fastening holes inside the cabinet, if they are available and accessible. The maximum allowed distance between the fastening points is 800 mm (31.50 in.).



Side plates of the cabinet: 15 mm

Back plate of the cabinet: 10 mm

Gap between the 200 mm, 400 mm, 600 mm, 800 mm, 1000 mm and 1500 mm cubicles:



Cubicle width mm [in.]	Fastening hole distance in mm [in.] a b a ∅ 31 mm [1.22]
200 [7.87]	a: 50 [1.97]
400 [15.75]	a: 250 [9.84]
600 [23.62]	a: 450 [17.71]
800 [31.50]	a: 650 [25.29]
1000 [39.37]	a: 350 [13.78], b: 150 [5.91], a: 350 [13.78]
1200 [47.24]	a: 450 [17.71], b: 150 [5.91], a: 450 [17.71]

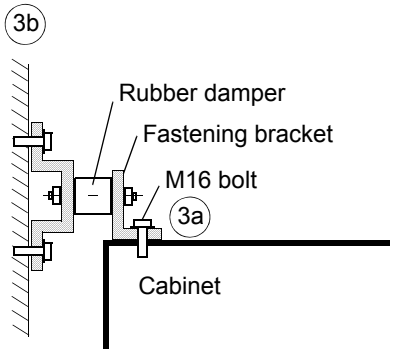
Fastening bolt: M10 to M12 (3/8” to 1/2”).

Fastening the cabinet to the floor and roof/wall (marine units)

See *ACS800-07 Dimensional Drawings* [3AFE64775421 (English)] for the locations of the fastening holes in the flat bars below the cabinet and for fastening points at the top of the cabinet. Top fastening brackets are included in the delivery.

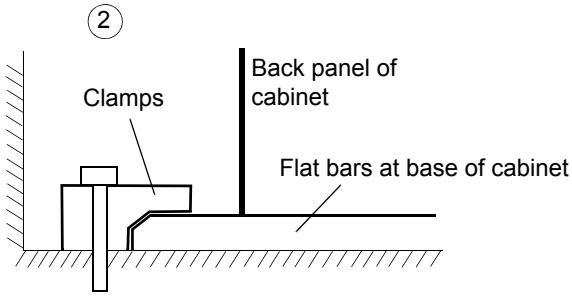
Fasten the cabinet to the floor and roof (wall) as follows:

1. Bolt the unit to the floor through the holes in each flat bar at the base of the cabinet using M10 or M12 screws.
2. If there is not enough room behind the cabinet for installation, clamp the rear ends of the flat bars.
3. Remove the lifting lugs and bolt the fastening brackets into the lifting lug holes (a). Fasten the top of the cabinet to the rear wall and/or roof using a rubber damper between the brackets (b).



Fastening bracket

Fastening the cabinet at the top with brackets and rubber dampers (side view)



Clamping the cabinet to the floor at the back

Electric welding

It is not recommended to fasten the cabinet by welding.

Cabinets without flat bars at the base (non-marine versions)

If the preferred fastening methods (clamping or bolting through the holes inside the cabinet) cannot be used, proceed as follows:

- Connect the return conductor of the welding equipment to the cabinet frame at the bottom within 0.5 metres of the welding point.

Cabinets with flat bars at the base (marine versions)

If the fastening cannot be done using screws, proceed as follows:

- Weld only on the flat bar under the cabinet, not the cabinet frame itself.
- Clamp the welding electrode onto the flat bar about to be welded or onto the floor within 0.5 metres of the welding point.

WARNING! If the welding return wire is connected improperly, the welding circuit may damage electronic circuits in the cabinet. The thickness of the zinc coating of the cabinet frame is 100 to 200 micrometres; on the flat bars the coating is approximately 20 micrometres. Ensure that the welding fumes are not inhaled.

Planning the electrical installation

What this chapter contains

This chapter contains the instructions that you must follow when selecting the motor, cables, protections, cable routing and way of operation for the drive system. Always follow local regulations.

Note: If the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

To which products this chapter applies

This chapter applies to the ACS800-01/U1, ACS800-02/U2, ACS800-04/U4 and ACS800-07/U7 types up to -0610-x.

Motor selection and compatibility

1. Select the motor according to the rating tables in chapter *Technical data*. Use the DriveSize PC tool if the default load cycles are not applicable.
2. Check that the motor ratings lie within the allowed ranges of the drive control program:
   - motor nominal voltage is 1/2 ... 2 · U_N of the drive
   - motor nominal current is 1/6 ... 2 · I_{2hd} of the drive in DTC control and 0 ... 2 · I_{2hd} in scalar control. The control mode is selected by a drive parameter.
3. Check that the motor voltage rating meets the application requirements:
   - The motor voltage is selected according to the AC voltage feeding the drive when the drive is equipped with a diode input bridge (a non-regenerative drive) and will operate in motor mode (i.e. no braking).
   - The motor nominal voltage is selected according to “the equivalent AC power source voltage of the drive” if the intermediate DC circuit voltage of the drive is increased from the nominal level by resistor braking or by the control program of a regenerative IGBT line-side converter (parameter selectable function).

     The equivalent AC power source voltage for the drive is calculated as follows:

     $$U_{ACeq} = U_{DCmax}/1.35$$

     where

     U_{ACeq} = equivalent AC power source voltage of the drive

     U_{DCmax} = maximum intermediate DC circuit voltage of the drive

     See notes 6 and 7 below the *Requirements table.*

4. Consult the motor manufacturer before using a motor in a drive system where the motor nominal voltage differs from the AC power source voltage.
5. Ensure that the motor insulation system withstands the maximum peak voltage in the motor terminals. See the *Requirements table* below for the required motor insulation system and drive filtering.

   Example: When the supply voltage is 440 V and the drive is operating in motor mode only, the maximum peak voltage in the motor terminals can be approximated as follows: 440 V · 1.35 · 2 = 1190 V. Check that the motor insulation system withstands this voltage.

Protecting the motor insulation and bearings

The output of the drive comprises – regardless of output frequency – pulses of approximately 1.35 times the equivalent mains network voltage with a very short rise time. This is the case with all drives employing modern IGBT inverter technology.

The voltage of the pulses can be almost double at the motor terminals, depending on the attenuation and reflection properties of the motor cable and the terminals. This in turn can cause additional stress on the motor and motor cable insulation.

Modern variable speed drives with their fast rising voltage pulses and high switching frequencies can generate current pulses that flow through the motor bearings, which can gradually erode the bearing races and rolling elements.

The stress on motor insulation can be avoided by using optional ABB du/dt filters. du/dt filters also reduce bearing currents.

To avoid damage to motor bearings, the cables must be selected and installed according to the instructions given in the hardware manual. In addition, insulated N-end (non-driven end) bearings and output filters from ABB must be used according to the following table. Two types of filters are used individually or in combinations:

- optional du/dt filter (protects motor insulation system and reduces bearing currents).
- common mode filter (mainly reduces bearing currents).

Requirements table

The following table shows how to select the motor insulation system and when an optional ABB du/dt filter, insulated N-end (non-driven end) motor bearings and ABB common mode filters are required. The motor manufacturer should be consulted regarding the construction of the motor insulation and additional requirements for explosion-safe (EX) motors. Failure of the motor to fulfil the following requirements or improper installation may shorten motor life or damage the motor bearings.

Manufacturer	Motor type	Nominal mains voltage (AC line voltage)	Requirement for			
			Motor insulation system	ABB du/dt filter, insulated N-end bearing and ABB common mode filter		
				P_N < 100 kW and frame size < IEC 315	**100 kW ≤ P_N < 350 kW** or frame size ≥ IEC 315	**P_N ≥ 350 kW** or frame size ≥ IEC 400
				P_N < 134 HP and frame size < NEMA 500	**134 HP ≤ P_N < 469 HP** or frame size ≥ NEMA 500	**P_N ≥ 469 HP** or frame size > NEMA 580
ABB	Random-wound M2_ and M3_	$U_N \leq 500$ V	Standard	-	+ N	+ N + CMF
		500 V < $U_N \leq$ 600 V	Standard	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
			or			
			Reinforced	-	+ N	+ N + CMF
		600 V < $U_N \leq$ 690 V	Reinforced	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
	Form-wound HX_ and AM_	380 V < $U_N \leq$ 690 V	Standard	n.a.	+ N + CMF	P_N < 500 kW: + N + CMF
						$P_N \geq$ 500 kW: + N + CMF + du/dt
	Old* form-wound HX_ and modular	380 V < $U_N \leq$ 690 V	Check with the motor manufacturer.	+ du/dt with voltages over 500 V + N + CMF		
	Random-wound HX_ and AM_ **	0 V < $U_N \leq$ 500 V	Enamelled wire with fibre glass taping	+ N + CMF		
		500 V < $U_N \leq$ 690 V		+ du/dt + N + CMF		
NON-ABB	Random-wound and form-wound	$U_N \leq 420$ V	Standard: $\hat{U}_{LL}$ = 1300 V	-	+ N or CMF	+ N + CMF
		420 V < $U_N \leq$ 500 V	Standard: $\hat{U}_{LL}$ = 1300 V	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
					or	
					+ du/dt + CMF	
			or			
			Reinforced: $\hat{U}_{LL}$ = 1600 V, 0.2 microsecond rise time	-	+ N or CMF	+ N + CMF
		500 V < $U_N \leq$ 600 V	Reinforced: $\hat{U}_{LL}$ = 1600 V	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
					or	
					+ du/dt + CMF	
			or			
			Reinforced: $\hat{U}_{LL}$ = 1800 V	-	+ N or CMF	+ N + CMF
		600 V < $U_N \leq$ 690 V	Reinforced: $\hat{U}_{LL}$ = 1800 V	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
			Reinforced: $\hat{U}_{LL}$ = 2000 V, 0.3 microsecond rise time ***	-	N + CMF	N + CMF

* manufactured before 1.1.1998

** For motors manufactured before 1.1.1998, check for additional instructions with the motor manufacturer.

*** If the intermediate DC circuit voltage of the drive will be increased from the nominal level by resistor braking or by the IGBT supply unit control program (parameter selectable function), check with the motor manufacturer if additional output filters are needed in the applied drive operation range.

Note 1: The abbreviations used in the table are defined below.

Abbreviation	Definition
U_N	nominal voltage of the supply network
$\hat{U}_{LL}$	peak line-to-line voltage at motor terminals which the motor insulation must withstand
P_N	motor nominal power
du/dt	du/dt filter at the output of the drive +E205
CMF	common mode filter +E208
N	N-end bearing: insulated motor non-driven end bearing
n.a.	Motors of this power range are not available as standard units. Consult the motor manufacturer.

Note 2: *Explosion-safe (EX) motors*

The motor manufacturer should be consulted regarding the construction of the motor insulation and additional requirements for explosion-safe (EX) motors.

Note 3: *High-output motors and IP 23 motors*

For motors with higher rated output than what is stated for the particular frame size in EN 50347 (2001) and for IP 23 motors, the requirements of ABB random-wound motor series M3AA, M3AP, M3BP are given below. For other motor types, see the *Requirements table* above. Apply the requirements of range **100 kW < P_N < 350 kW** to motors with P_N < 100 kW. Apply the requirements of range **$P_N \geq$ 350 kW** to motors within the range **100 kW < P_N < 350 kW**. In other cases, consult the motor manufacturer.

Manufacturer	Motor type	Nominal mains voltage (AC line voltage)	Requirement for			
			Motor insulation system	ABB du/dt filter, insulated N-end bearing and ABB common mode filter		
				P_N < 55 kW	**55 kW ≤ P_N < 200 kW**	**$P_N \geq$ 200 kW**
				P_N < 74 HP	**74 HP ≤ P_N < 268 HP**	**$P_N \geq$ 268 HP**
A B B	Random-wound M3AA, M3AP, M3BP	$U_N \leq$ 500 V	Standard	-	+ N	+ N + CMF
		500 V < $U_N \leq$ 600 V	Standard	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
			or			
			Reinforced	-	+ N	+ N + CMF
		600 V < $U_N \leq$ 690 V	Reinforced	+ du/dt	+ du/dt + N	+ du/dt + N + CMF

Note 4: *HXR and AMA motors*

All AMA machines (manufactured in Helsinki) for drive systems have form-wound windings. All HXR machines manufactured in Helsinki starting 1.1.1998 have form-wound windings.

Note 5: *ABB motors of types other than M2_, M3_, HX_ and AM_*

Use the selection criteria given for non-ABB motors.

Note 6: *Resistor braking of the drive*

When the drive is in braking mode for a large part of its operation time, the intermediate circuit DC voltage of the drive increases, the effect being similar to increasing the supply voltage by up to 20 percent. The voltage increase should be taken into consideration when determining the motor insulation requirement.

Example: Motor insulation requirement for a 400 V application must be selected as if the drive were supplied with 480 V.

Note 7: *Drives with an IGBT supply unit*

If voltage is raised by the drive (this is a parameter selectable function), select the motor insulation system according to the increased intermediate circuit DC voltage level, especially in the 500 V supply voltage range.

Permanent magnet synchronous motor

Only one permanent magnet motor can be connected to the inverter output.

It is recommended to install a safety switch between the permanent magnet synchronous motor and the motor cable. The switch is needed to isolate the motor during any maintenance work on the drive.

Supply connection

Disconnecting device (disconnecting means)

ACS800-01, ACS800-U1, ACS800-02, ACS800-U2 without enclosure extension, ACS800-04, ACS800-U4

Install a hand-operated input disconnecting device (disconnecting means) between the AC power source and the drive. The disconnecting device must be of a type that can be locked to the open position for installation and maintenance work.

ACS800-U2 with enclosure extension, ACS800-07 and ACS800-U7

These units are equipped with a hand-operated input disconnecting device (disconnecting means) which isolates the drive and the motor from the AC power as standard. The disconnecting device does not, however, isolate the input busbars from the AC power. Therefore during installation and maintenance work on the drive, the input cables and busbars must be isolated from the input power with a disconnector at the distribution board or at the supplying transformer.

EU

To meet the European Union Directives, according to standard EN 60204-1, Safety of Machinery, the disconnecting device must be one of the following types:

- a switch-disconnector of utilization category AC-23B (EN 60947-3)
- a disconnector that has an auxiliary contact that in all cases causes switching devices to break the load circuit before the opening of the main contacts of the disconnector (EN 60947-3)
- a circuit breaker suitable for isolation in accordance with EN 60947-2.

US

The disconnecting means must conform to the applicable safety regulations.

Fuses

See section *Thermal overload and short-circuit protection*.

Thermal overload and short-circuit protection

The drive protects itself and the input and motor cables against thermal overload when the cables are dimensioned according to the nominal current of the drive. No additional thermal protection devices are needed.

WARNING! If the drive is connected to multiple motors, a separate thermal overload switch or a circuit breaker must be used for protecting each cable and motor. These devices may require a separate fuse to cut off the short-circuit current.

The drive protects the motor cable and motor in a short-circuit situation when the motor cable is dimensioned according to the nominal current of the drive.

Mains cable (AC line cable) short-circuit protection

Always protect the input cable with fuses. Size the fuses according to local safety regulations, appropriate input voltage and the rated current of the drive (see chapter *Technical data*).

ACS800-01/U1, ACS800-02/U2 without enclosure extension and ACS800-04/U4

When placed at the distribution board, standard gG (US: CC or T for the ACS800-U1; T or L for the ACS800-U2 and ACS800-U4) fuses will protect the input cable in short-circuit situations, restrict drive damage and prevent damage to adjoining equipment in case of a short-circuit inside the drive.

Drive AC fuses (ACS800-07/U7, and ACS800-02/U2 with enclosure extension)

ACS800-07/U7 units and ACS800-02/U2 units with enclosure extension are equipped with standard gG (US: T/L) or optional aR fuses listed in *Technical data*. The fuses restrict drive damage and prevent damage to adjoining equipment in case of a short-circuit inside the drive.

Operating time of the fuses

Check that the operating time of the fuse is below 0.5 seconds. The operating time depends on the fuse type (gG or aR), supply network impedance and the cross-sectional area, material and length of the supply cable. In case the 0.5 seconds operating time is exceeded with gG (US: CC/T/L) fuses, ultra-rapid (aR) fuses will in most cases reduce the operating time to an acceptable level. The US fuses must be of the “non-time delay” type.

For fuse ratings, see *Technical data*.

WARNING! Circuit breakers must not be used without fuses.

Ground fault protection

The drive is equipped with an internal ground fault protective function to protect the unit against ground faults in the motor and motor cable. This is not a personal safety or a fire protection feature. The ground fault protective function can be disabled with a parameter, refer to the appropriate *ACS800 Firmware Manual*.

The EMC filter of the drive includes capacitors connected between the main circuit and the frame. These capacitors and long motor cables increase the ground leakage current and may cause fault current circuit breakers to function.

Emergency stop devices

For safety reasons, install the emergency stop devices at each operator control station and at other operating stations where emergency stop may be needed.

Note: Pressing the stop key () on the control panel of the drive does not generate an emergency stop of the motor or separate the drive from dangerous potential.

ACS800-02/U2 with enclosure extension and ACS800-07/U7

An emergency stop function is optionally available for stopping and switching off the whole drive. Two stop categories according to IEC/EN 60204-1 (1997) are available: immediate removal of power (Category 0 for ACS800-02/U2 and ACS800-07/U7) and controlled emergency stop (Category 1 for ACS800-07/U7).

Restarting after an emergency stop

After an emergency stop, the emergency stop button must be released and the drive started by turning the operating switch of the drive from position “ON” to “START”.

Prevention of Unexpected Start (ACS800-07/U7 only)

The drive can be equipped with an optional Prevention of Unexpected Start function according to standards IEC/EN 60204-1: 1997; ISO/DIS 14118: 2000 and EN 1037: 1996.

The Prevention of Unexpected Start function disables the control voltage of the power semiconductors, thus preventing the inverter from generating the AC voltage required to rotate the motor. By using this function, short-time operations (like cleaning) and/or maintenance work on non-electrical parts of the machinery can be performed without switching off the AC power supply to the drive.

The operator activates the Prevention of Unexpected Start function by opening a switch on a control desk. An indicating lamp on the control desk will light, signalling that the prevention is active. The switch can be locked out.

The user must install on a control desk near the machinery:

- switching/disconnecting device for the circuitry. “Means shall be provided to prevent inadvertent, and/or mistaken closure of the disconnecting device.” EN 60204-1: 1997.
- indicating lamp; on = starting the drive is prevented, off = drive is operative.

For connections to the drive, see the circuit diagram delivered with the drive.

WARNING! The Prevention of Unexpected Start function does not disconnect the voltage of the main and auxiliary circuits from the drive. Therefore maintenance work on electrical parts of the drive or the motor can only be carried out after isolating the drive system from the main supply.

Note: When a running drive is stopped by using the Prevention of Unexpected Start function, the drive will stop by coasting. If this is not acceptable (e.g. causes danger), the drive and machinery must be stopped using the appropriate stopping mode before using this function.

Selecting the power cables

General rules

Dimension the mains (input power) and motor cables **according to local regulations**:

- The cable must be able to carry the drive load current. See chapter *Technical data* for the rated currents.
- The cable must be rated for at least 70 °C maximum permissible temperature of conductor in continuous use. For US, see *Additional US requirements*.
- The inductance and impedance of the PE conductor/cable (grounding wire) must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs).
- 600 VAC cable is accepted for up to 500 VAC. 750 VAC cable is accepted for up to 600 VAC. For 690 VAC rated equipment, the rated voltage between the conductors of the cable should be minimum 1 kV.

For drive frame size R5 and larger, or motors larger than 30 kW (40 HP), symmetrical shielded motor cable must be used (figure below). A four-conductor system can be used up to frame size R4 with up to 30 kW (40 HP) motors, but shielded symmetrical motor cable is recommended.

A four-conductor system is allowed for input cabling, but shielded symmetrical cable is recommended. To operate as a protective conductor, the shield conductivity must be as follows when the protective conductor is made of the same metal as the phase conductors:

Cross-sectional area of the phase conductors **S (mm^2)**	**Minimum cross-sectional area of the corresponding protective conductor** **S_p (mm^2)**
$S \leq 16$	S
$16 < S \leq 36$	16
$35 < S$	S/2

Compared to a four-conductor system, the use of symmetrical shielded cable reduces electromagnetic emission of the whole drive system as well as motor bearing currents and wear.

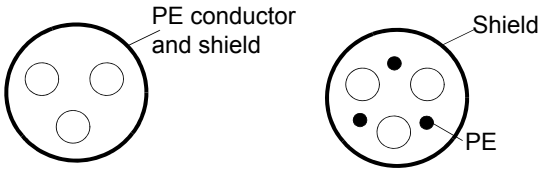
The motor cable and its PE pigtail (twisted shield) should be kept as short as possible in order to reduce electromagnetic emission.

Alternative power cable types

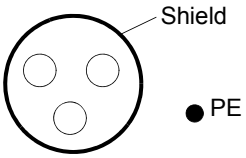
Power cable types that can be used with the drive are represented below.

Recommended

Symmetrical shielded cable: three phase conductors and a concentric or otherwise symmetrically constructed PE conductor, and a shield

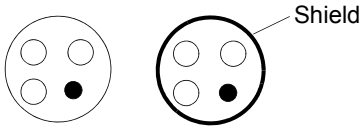


A separate PE conductor is required if the conductivity of the cable shield is < 50 % of the conductivity of the phase conductor.



A four-conductor system: three phase conductors and a protective conductor.

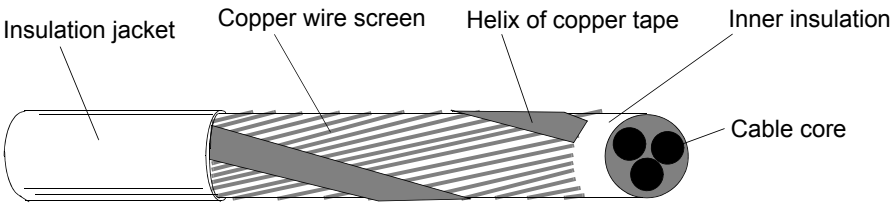
Not allowed for motor cables



Not allowed for motor cables with phase conductor cross section larger than 10 mm^2 [motors > 30 kW (40 HP)].

Motor cable shield

To effectively suppress radiated and conducted radio-frequency emissions, the shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminium shield. The minimum requirement of the motor cable shield of the drive is shown below. It consists of a concentric layer of copper wires with an open helix of copper tape. The better and tighter the shield, the lower the emission level and bearing currents.



Additional US requirements

Type MC continuous corrugated aluminum armor cable with symmetrical grounds or shielded power cable must be used for the motor cables if metallic conduit is not used. For the North American market, 600 VAC cable is accepted for up to 500 VAC. 1000 VAC cable is required above 500 VAC (below 600 VAC). For drives rated over 100 amperes, the power cables must be rated for 75 °C (167 °F).

Conduit

Where conduits must be coupled together, bridge the joint with a ground conductor bonded to the conduit on each side of the joint. Bond the conduits also to the drive enclosure. Use separate conduits for input power, motor, brake resistors, and control wiring. Do not run motor wiring from more than one drive in the same conduit.

Armored cable / shielded power cable

The motor cables can be run in the same cable tray as other 460 V or 600 V power wiring. Control and signal cables must not be run in the same tray as power cables. Six conductor (3 phases and 3 ground) type MC continuous corrugated aluminum armor cable with symmetrical grounds is available from the following suppliers (trade names in parentheses):

- Anixter Wire & Cable (Philsheath)
- BICC General Corp (Philsheath)
- Rockbestos Co. (Gardex)
- Oaknite (CLX).

Shielded power cables are available from Belden, LAPPKABEL (ÖLFLEX) and Pirelli.

Power factor compensation capacitors

Do not connect power factor compensation capacitors or surge absorbers to the motor cables (between the drive and the motor). They are not designed to be used with drives, and will degrade motor control accuracy. They can cause permanent damage to the drive or themselves due to the rapid changes in the drive output voltage.

If there are power factor compensation capacitors in parallel with the three phase input of the drive, ensure that the capacitors and the drive are not charged simultaneously to avoid voltage surges which might damage the drive system.

Equipment connected to the motor cable

Installation of safety switches, contactors, connection boxes, etc.

To minimize the emission level when safety switches, contactors, connection boxes or similar equipment are installed in the motor cable (i.e. between the drive and the motor):

- EU: Install the equipment in a metal enclosure with 360 degrees grounding for the shields of both the incoming and outgoing cable, or connect the shields of the cables otherwise together.
- US: Install the equipment in a metal enclosure in a way that the conduit or motor cable shielding runs consistently without breaks from the drive to the motor.

Bypass connection

WARNING! Never connect the supply power to the drive output terminals U2, V2 and W2. If frequent bypassing is required, employ mechanically connected switches or contactors. Mains (line) voltage applied to the output can result in permanent damage to the unit.

Before opening a contactor (DTC control mode selected)

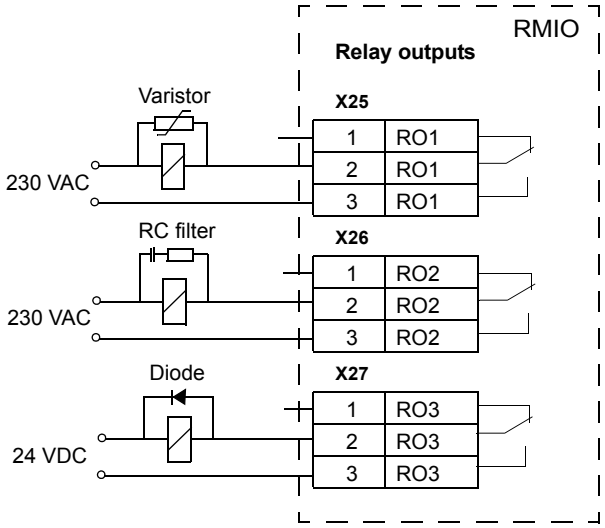
Stop the drive and wait for the motor to stop before opening a contactor between the output of the drive and the motor when the DTC control mode is selected. See the appropriate ACS800 application program firmware manual for the required parameter settings. Otherwise, the contactor will be damaged. In scalar control, the contactor can be opened with the drive running.

Protecting the relay output contacts and attenuating disturbances in case of inductive loads

Inductive loads (relays, contactors, motors) cause voltage transients when switched off.

The relay contacts on the RMIO board are protected with varistors (250 V) against overvoltage peaks. In spite of this, it is highly recommended to equip inductive loads with noise attenuating circuits [varistors, RC filters (AC) or diodes (DC)] in order to minimize the EMC emission at switch-off. If not suppressed, the disturbances may connect capacitively or inductively to other conductors in the control cable and form a risk of malfunction in other parts of the system.

Install the protective component as close to the inductive load as possible. Do not install protective components at the RMIO board terminal block.

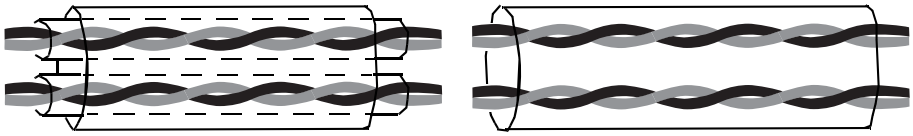


Selecting the control cables

All control cables must be shielded.

Use a double-shielded twisted pair cable (Figure a, e.g. JAMAK by NK Cables, Finland) for analogue signals. This type of cable is recommended for the pulse encoder signals also. Employ one individually shielded pair for each signal. Do not use common return for different analogue signals.

A double-shielded cable is the best alternative for low-voltage digital signals but single-shielded twisted multipair cable (Figure b) is also usable.



a
A double-shielded twisted pair cable

b
A single-shielded twisted multipair cable

Run analogue and digital signals in separate, shielded cables.

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. It is recommended that the relay-controlled signals be run as twisted pairs.

Never mix 24 VDC and 115/230 VAC signals in the same cable.

Relay cable

The cable type with braided metallic screen (e.g. ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Control panel cable

In remote use, the cable connecting the control panel to the drive must not exceed 3 metres (10 ft). The cable type tested and approved by ABB is used in control panel option kits.

Connection of a motor temperature sensor to the drive I/O

WARNING! IEC 60664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.

To fulfil this requirement, the connection of a thermistor (and other similar components) to the digital inputs of the drive can be implemented in three alternate ways:

1. There is double or reinforced insulation between the thermistor and live parts of the motor.
2. Circuits connected to all digital and analogue inputs of the drive are protected against contact and insulated with basic insulation (the same voltage level as the drive main circuit) from other low voltage circuits.
3. An external thermistor relay is used. The insulation of the relay must be rated for the same voltage level as the main circuit of the drive. For connection, see *ACS800 Firmware Manual*.

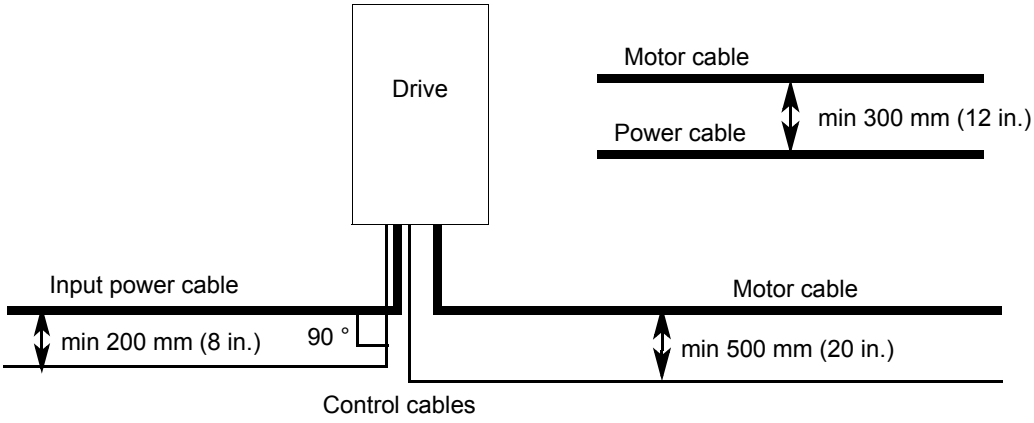
Routing the cables

Route the motor cable away from other cable routes. Motor cables of several drives can be run in parallel installed next to each other. It is recommended that the motor cable, input power cable and control cables be installed on separate trays. Avoid long parallel runs of motor cables with other cables in order to decrease electromagnetic interference caused by the rapid changes in the drive output voltage.

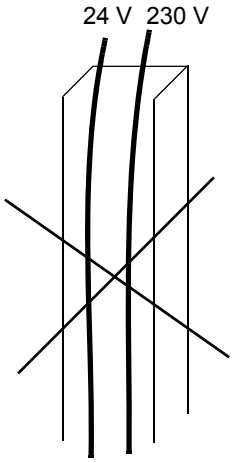
Where control cables must cross power cables make sure they are arranged at an angle as near to 90 degrees as possible. Do not run extra cables through the drive.

The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminium tray systems can be used to improve local equalizing of potential.

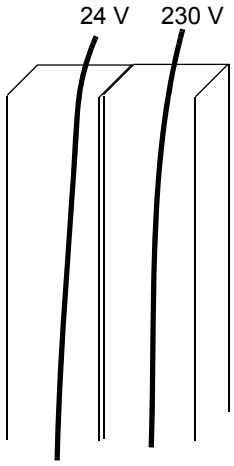
A diagram of the cable routing is shown below.



Control cable ducts



Not allowed unless the 24 V cable is insulated for 230 V or insulated with an insulation sleeving for 230 V.



Lead 24 V and 230 V control cables in separate ducts inside the cabinet.

Electrical installation

What this chapter contains

This chapter describes the electrical installation procedure of the drive.

WARNING! Only qualified electricians are allowed to carry out the work described in this chapter. Follow the *Safety instructions* on the first pages of this manual. Ignoring the safety instructions can cause injury or death.

Before installation

IT (ungrounded) systems

A drive equipped with no EMC filter or with EMC filter +E210 is suitable for IT (ungrounded systems). If the drive is equipped with EMC filter +E202, disconnect the filter before connecting the drive to an ungrounded system. For detailed instructions on how to do this, please contact your local ABB representative.

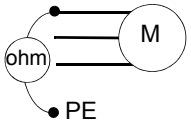
WARNING! If a drive with EMC filter +E202 is installed on an IT system [an ungrounded power system or a high resistance-grounded (over 30 ohms) power system], the system will be connected to earth potential through the EMC filter capacitors of the drive. This may cause danger or damage the unit.

Checking the insulation of the assembly

Every drive module has been tested for insulation between the main circuit and the chassis (2500 V rms 50 Hz for 1 second) at the factory. Therefore, do not make any voltage tolerance or insulation resistance tests (e.g. hi-pot or megger) on any part of the drive. Check the insulation of the assembly as follows.

WARNING! Check the insulation before connecting the drive to the mains. Make sure that the drive is disconnected from the mains (input power).

1. Check that the motor cable is disconnected from the drive output terminals U2, V2 and W2.
2. Measure the insulation resistances of the motor cable and the motor between each phase and the Protective Earth by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.

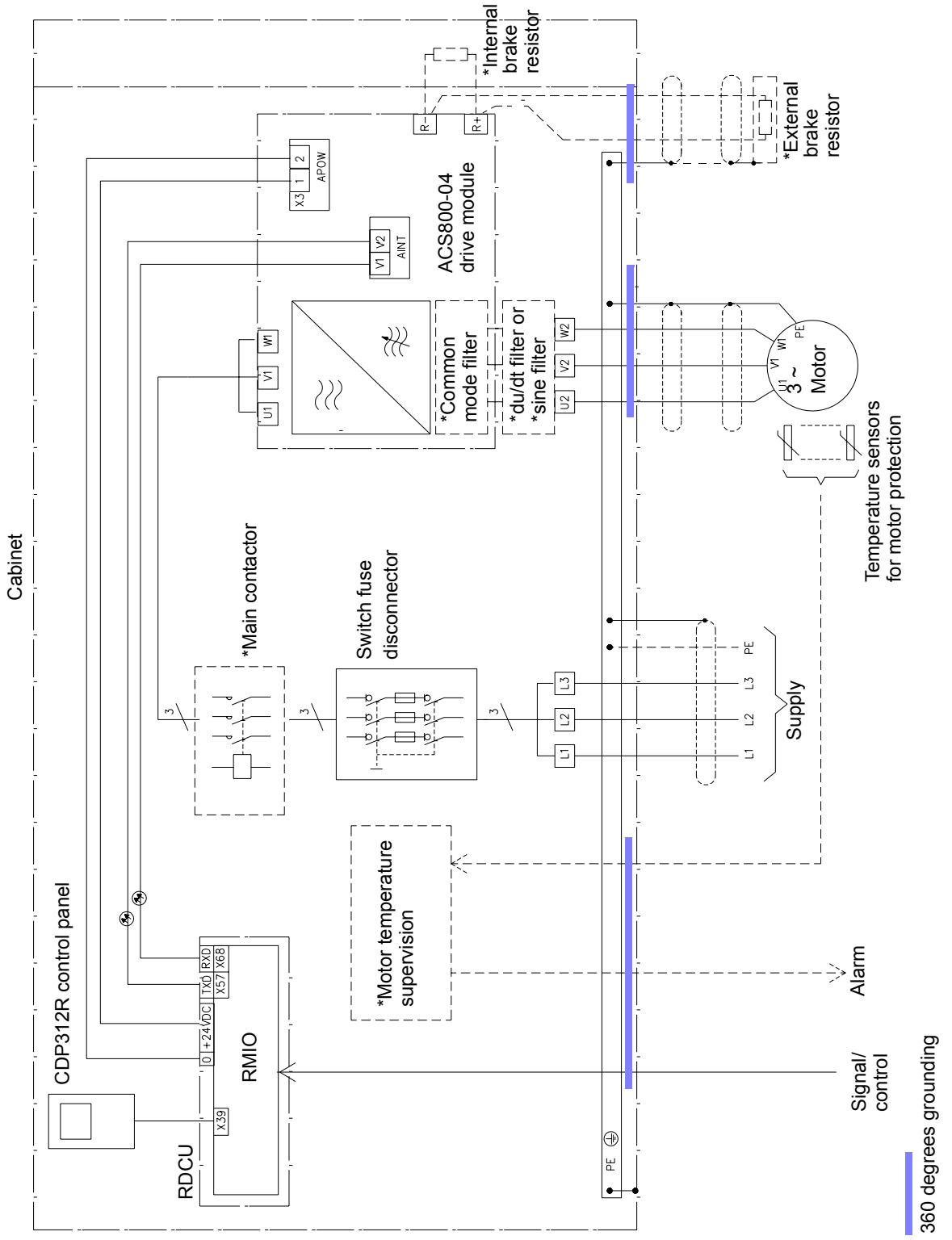


Warning sticker

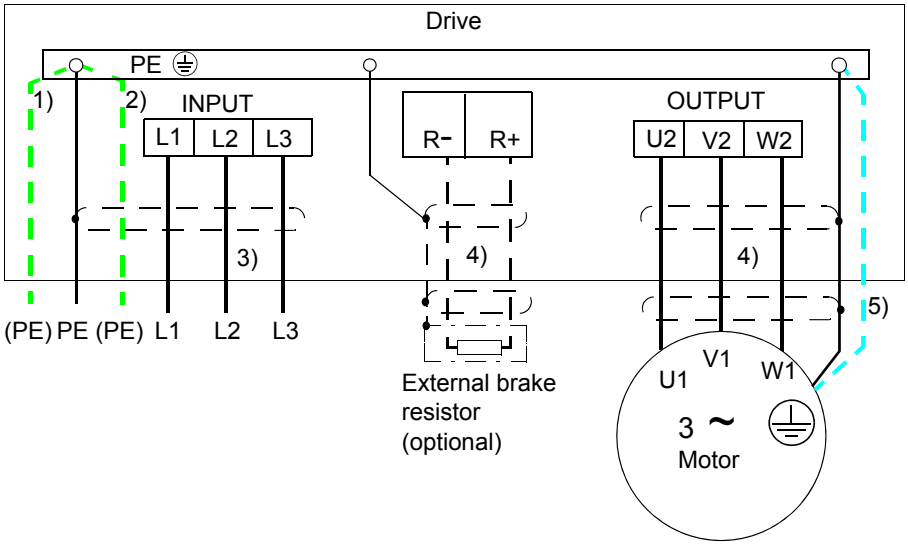
A multi-language sticker is attached onto the drive module cover. Attach the warning sticker in the local language onto the cover of the drive module.

Example wiring diagram

The diagram below presents an example for the main wiring. Note that the diagram includes optional components (marked *) which are not always included in the delivery.



Power cable connection diagram



1), 2)

If shielded cable is used (not required but recommended), use a separate PE cable (1) or a cable with a grounding conductor (2) if the conductivity of the input cable shield is < 50% of the conductivity of the phase conductor.

Ground the other end of the input cable shield or PE conductor at the distribution board.

3) 360 degrees grounding recommended if shielded cable

4) 360 degrees grounding required

5) Use a separate grounding cable if the conductivity of the cable shield is < 50% of the conductivity of the phase conductor and there is no symmetrically constructed grounding conductor in the cable (see *Planning the electrical installation* / *Selecting the power cables*).

Note:

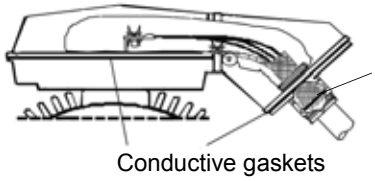
If there is a symmetrically constructed grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the drive and motor ends.

Do not use an asymmetrically constructed motor cable. Connecting its fourth conductor at the motor end increases bearing currents and causes extra wear.

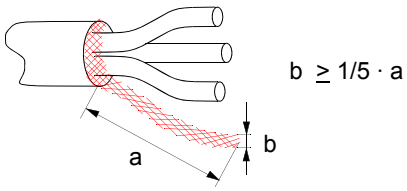
Grounding of the motor cable shield at the motor end

For minimum radio frequency interference:

- ground the cable shield 360 degrees at the lead-through of the motor terminal box

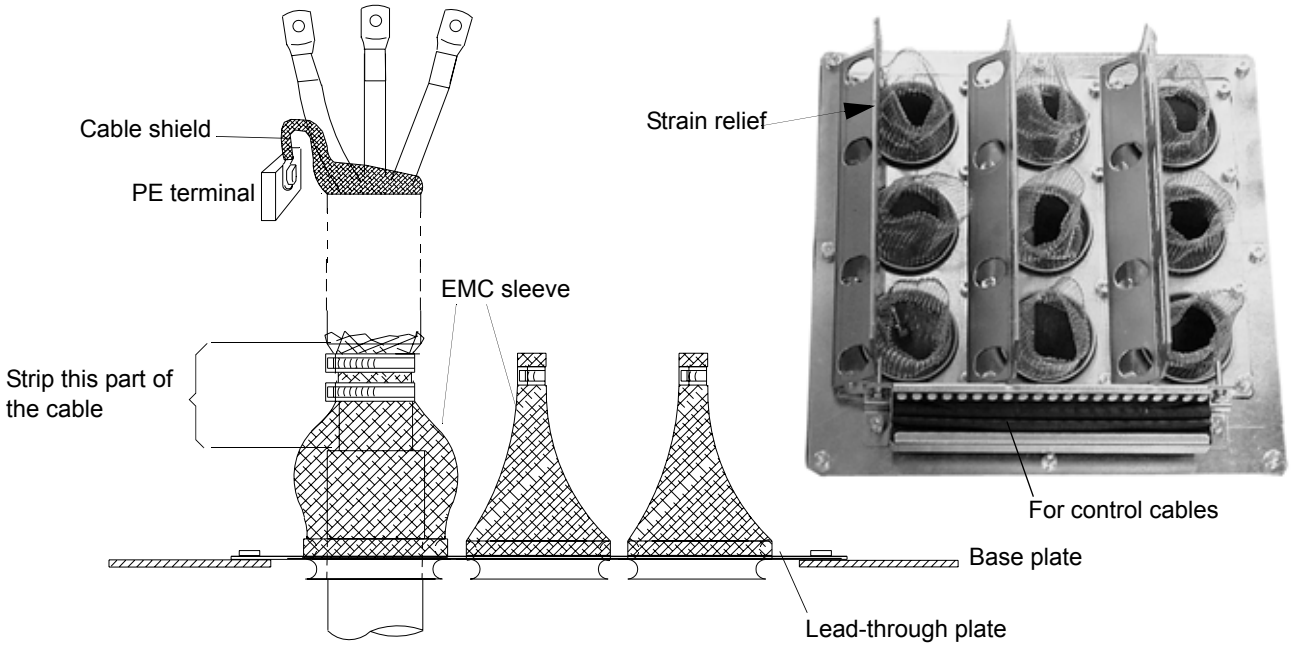


- or ground the cable by twisting the shield as follows: flattened width ≥ 1/5 · length.



Connecting the power cables

1. Open the swing-out frame.
2 Remove the additional cabinet cooling fan (if any). See *Replacing the additional fan at the lower part of the cubicle (not in all units)* on page *86*.
3. If fire insulation is used, make an opening in the mineral wool sheet according to the diameter of the cable.
4. Cut adequate holes to the rubber grommet (if present) in the lead-through plate and lead the cable through the grommet and the conductive sleeve (if present) into the cabinet.
5. Strip the cable.
6. Connect the twisted shield of the cable to the PE terminal of the cabinet.
7. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals and the phase conductors of the motor cable to the U2, V2 and W2 terminals.
8. Peel off 3 to 5 cm of the outer insulation of the cable above the lead-through plate for the 360° high-frequency earthing.
9. Fasten the conductive sleeve to the cable shield with cable ties.
10. Seal the slot between the cable and mineral wool sheet (if used) with sealing compound (e.g. CSD-F, ABB brand name DXXT-11, code 35080082).
11. Tie up the unused conductive sleeves with cable ties.

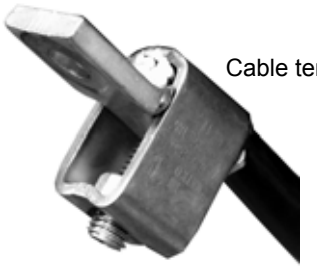


Additional instructions for frame size R6

Cable terminals R+ and R-

Power cable conductors of sizes 95 to 185 mm^2 (3/0 to 350 AWG) are connected to the cable terminals as follows:

- Undo the fastening screw of the terminal.
- Connect the conductor to the terminal.
- Screw the terminal to the original location.



Cable terminal

WARNING! If the wire size is less than 95 mm^2 (3/0 AWG), a cable lug must be used. A cable of wire size less than 95 mm^2 (3/0 AWG) connected to this terminal will loosen and may damage the drive.

Cable lug installations to R+ and R- screws

Cables of sizes 16 to 70 mm^2 (6 to 2/0 AWG) can be connected to the screws with cable lugs. Isolate the ends of the cable lugs with insulating tape or shrink tubing. To meet UL requirements, use UL listed cable lugs and tools given below or corresponding.

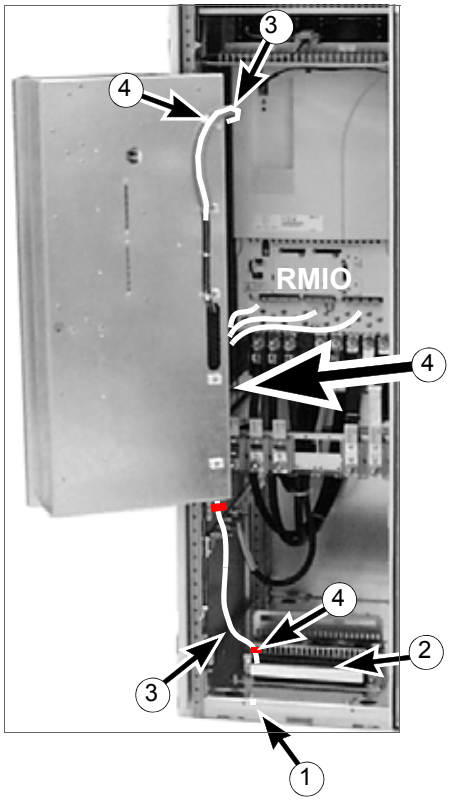
Wire size	**Compression lug**		**Crimping tool**		
kcmil/AWG	Manufacturer	Type	Manufacturer	Type	No. of crimps
6	Burndy	YAV6C-L2	Burndy	MY29-3	1
	Ilsco	CCL-6-38	Ilsco	ILC-10	2
4	Burndy	YA4C-L4BOX	Burndy	MY29-3	1
	Ilsco	CCL-4-38	Ilsco	MT-25	1
2	Burndy	YA2C-L4BOX	Burndy	MY29-3	2
	Ilsco	CRC-2	Ilsco	IDT-12	1
	Ilsco	CCL-2-38	Ilsco	MT-25	1
1	Burndy	YA1C-L4BOX	Burndy	MY29-3	2
	Ilsco	CRA-1-38	Ilsco	IDT-12	1
	Ilsco	CCL-1-38	Ilsco	MT-25	1
	Thomas & Betts	54148	Thomas & Betts	TBM-8	3
1/0	Burndy	YA25-L4BOX	Burndy	MY29-3	2
	Ilsco	CRB-0	Ilsco	IDT-12	1
	Ilsco	CCL-1/0-38	Ilsco	MT-25	1
	Thomas & Betts	54109	Thomas & Betts	TBM-8	3
2/0	Burndy	YAL26T38	Burndy	MY29-3	2
	Ilsco	CRA-2/0	Ilsco	IDT-12	1
	Ilsco	CCL-2/0-38	Ilsco	MT-25	1
	Thomas & Betts	54110	Thomas & Betts	TBM-8	3

Connecting the control cables

Routing the cables (frame size R6)

Run the cables to the inside of the cabinet through the grommets (1) and the EMI conductive cushions (2) to the swing-out frame or the RMIO board as shown below.

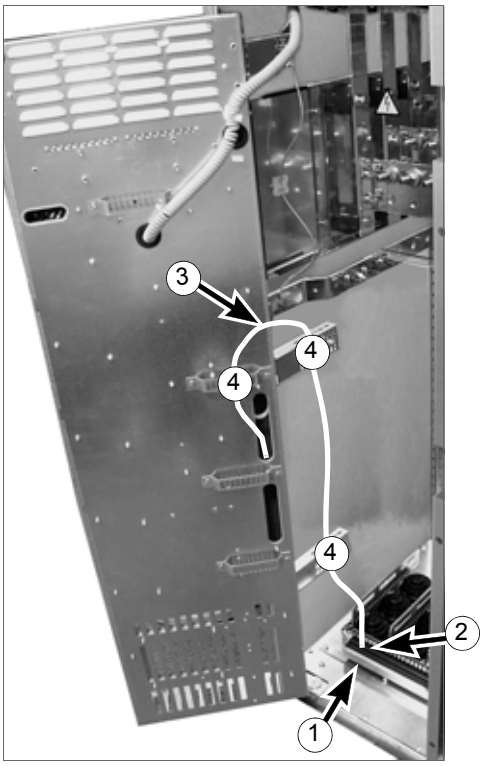
Use sleeving wherever the cables are laid against sharp edges. Leave some slack in the cable at the hinge (3) to allow the frame to open fully. Tie the cables to the braces (4) to provide strain relief.



Routing the cables (frame sizes R7 and R8)

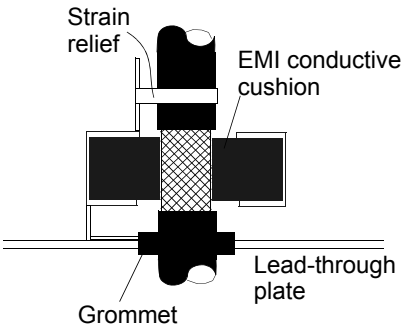
Run the cables to the inside of the cabinet through the grommets (1) and the EMI conductive cushions (2) to the swing-out frame as shown below.

Use sleeving wherever the cables are laid against sharp edges. Leave some slack in the cable at the hinge (3) to allow the frame to open fully. Tie the cables to the braces (4) to provide strain relief.

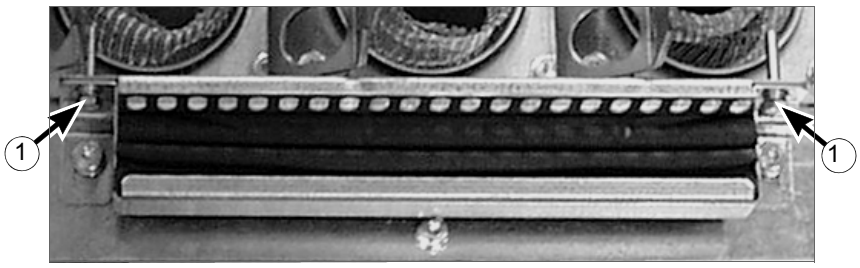


360 degrees EMC grounding at the cable entry

1. Loosen the fastening screws of the *EMI conductive cushions* and pull the cushions apart.
2. Cut adequate holes to the rubber grommets in the lead-through plate and lead the cables through the grommets and the cushions into the cabinet.



Side view

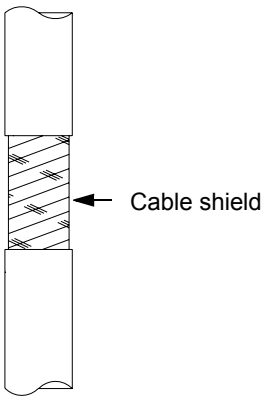


View from above

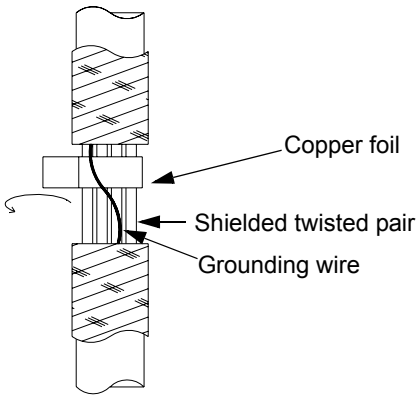
3. Strip off the cable plastic sheath above the lead-through plate just enough to ensure proper connection of the bare shield and the *EMI conductive cushions*.
4. Tighten the two fastening screws (1) so that the *EMI conductive cushions* press tightly round the bare shield.

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

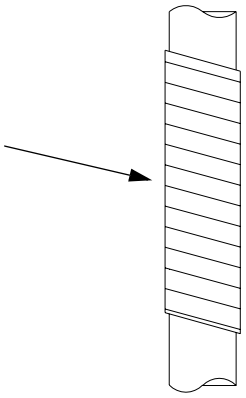
   - Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
   - Turn the shield inside out to expose its conductive surface.
   - Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.



Stripped cable



Conductive surface of the shield exposed



Stripped part covered with copper foil

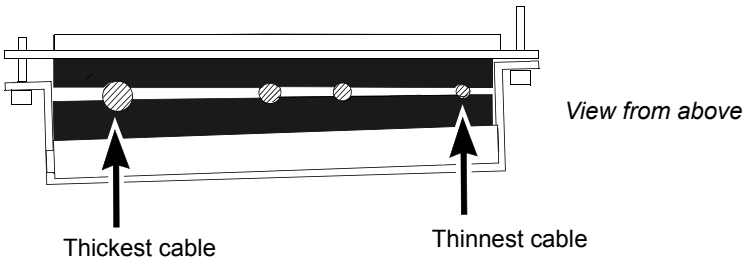
Special for top entry

When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if very many control cables come to one cabinet, plan the installation beforehand as follows:

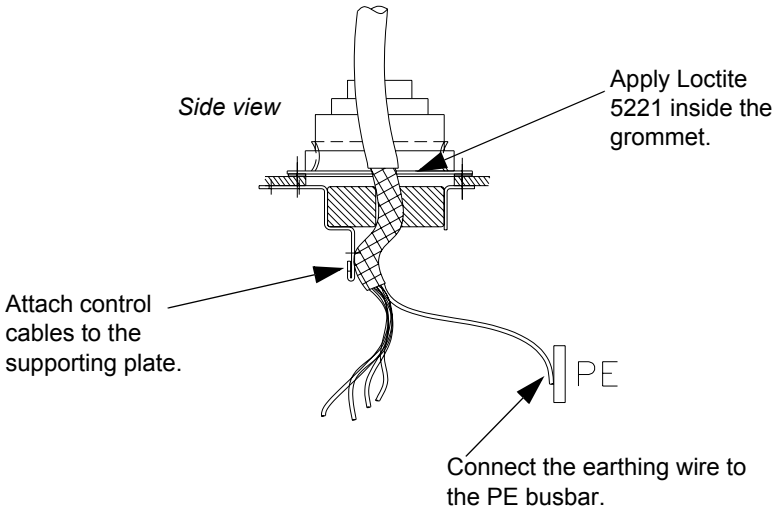
1. Make a list of the cables coming to the cabinet.
2. Sort the cables going to the left into one group and the cables going to the right into another group to avoid unnecessary crossing of cables inside the cabinet.
3. Sort the cables in each group according to size.
4. Group the cables for each grommet as follows ensuring that each cable has a proper contact to the cushions on both sides.

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

5. Divide the bunches so that cables will be arranged according to size between the *EMI conductive cushions*.

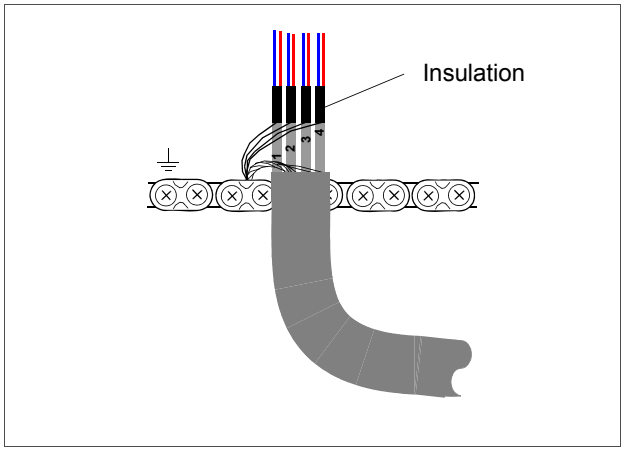


6. If more than one cable go through a grommet, the grommet must be sealed by Loctite 5221 (catalogue number 25551).

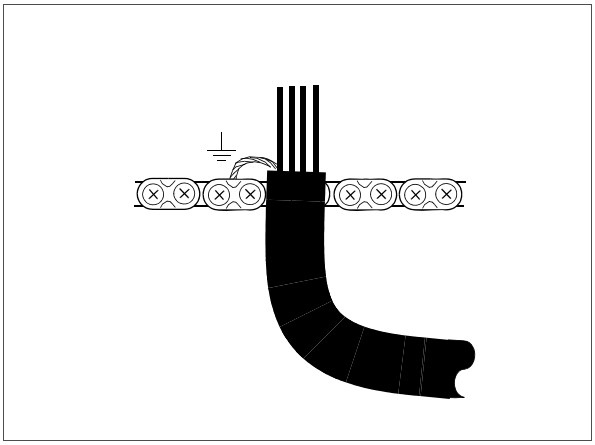


Connecting the cables to the I/O terminals

Connect the conductors to the appropriate detachable terminals of the RMIO board or optional terminal X2 [see chapter *Motor control and I/O board (RMIO)*]. Tighten the screws to secure the connection.



Double-shielded cable



Single-shielded cable

Single-shielded cable: Twist the grounding wires of the outer shield and connect them to the nearest grounding clamp. Double-shielded cable: Connect the inner shields and the grounding wires of the outer shield to the nearest grounding clamp.

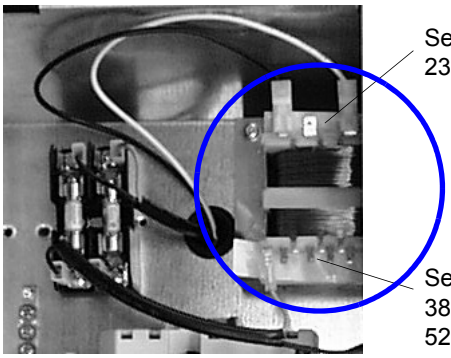
Do not connect shields of different cables to the same grounding clamp.

Leave the other end of the shield unconnected or ground it indirectly via a few nanofarads high-frequency capacitor (e.g. 3.3 nF / 630 V). The shield can also be grounded directly at both ends if they are *in the same ground line* with no significant voltage drop between the end points.

Keep the signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.

Settings of the cooling fan transformer

The voltage transformer of the cooling fan is located at the top right-hand corner of the drive module. Remove the front cover for adjusting the settings and replace the cover after setting.



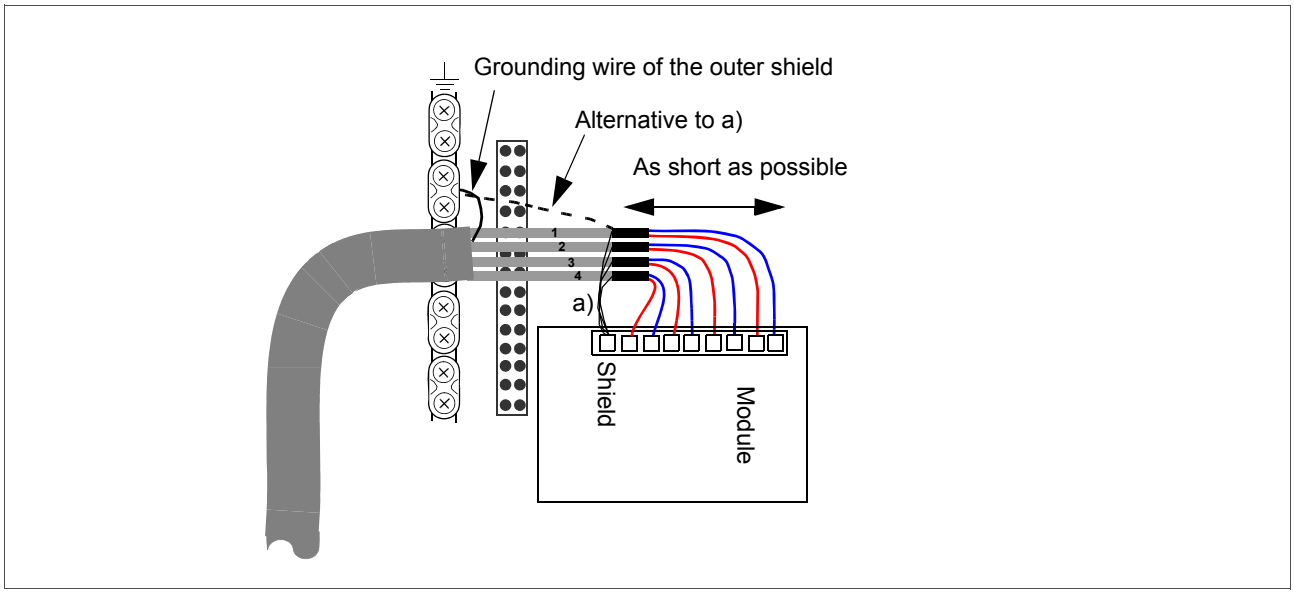
Set to 220 V if the supply frequency is 60 Hz. Set to 230 V if the supply frequency is 50 Hz.

Set according to the supply voltage:
380 V, 400 V, 415 V, 440 V, 480 V or 500 V; or
525 V, 575 V, 600 V, 660 V or 690 V.

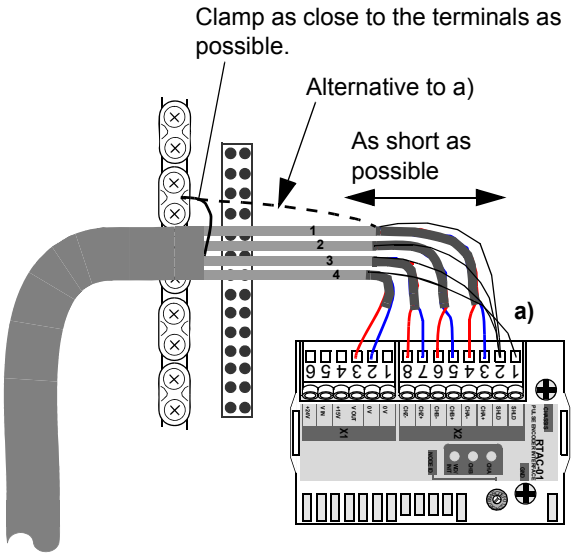
Installation of optional modules

The optional module (such as a fieldbus adapter, an I/O extension module and the pulse encoder interface) is inserted in the optional module slot of the RMIO board in the RDCU unit and fixed with two screws. See the appropriate optional module manual for the cable connections.

Cabling of I/O and fieldbus modules



Pulse encoder module cabling



Note 1: If the encoder is of unisolated type, ground the encoder cable at the drive end only. If the encoder is galvanically isolated from the motor shaft and the stator frame, ground the encoder cable shield at the drive and the encoder end.

Note 2: Twist the pair cable wires.

Note 3: The grounding wire of the outer shield of the cable can alternatively be connected to the SHLD terminal of the RTAC module.

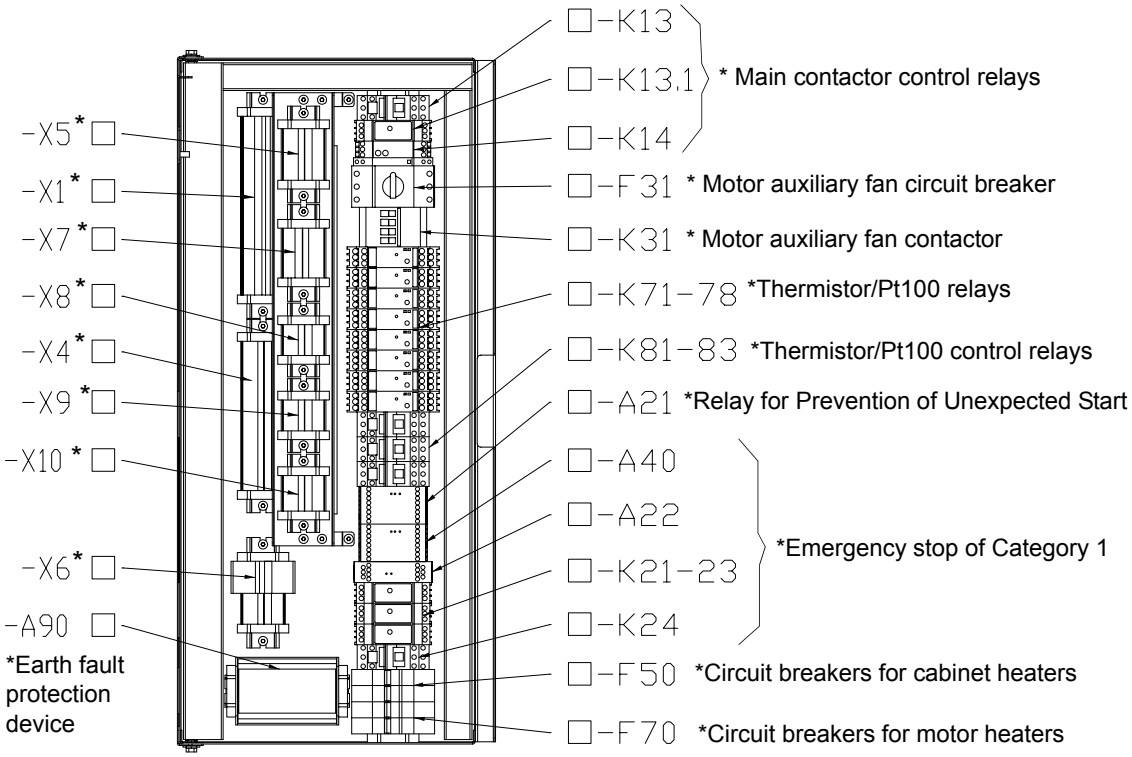
Fibre optic link

A DDCS fibre optic link is provided via the RDCO optional module for PC tools, master/follower link, NDIO, NTAC, NAIO, AIMA I/O module adapter and fieldbus adapter modules of type Nxxx. See *RDCO User's Manual* [3AFE64492209 (English)] for the connections. Observe colour coding when installing fibre optic cables. Blue connectors go to blue terminals, and grey connectors to grey terminals.

When installing multiple modules on the same channel, connect them in a ring.

Layout drawing of factory installed optional equipment

Frame size R6



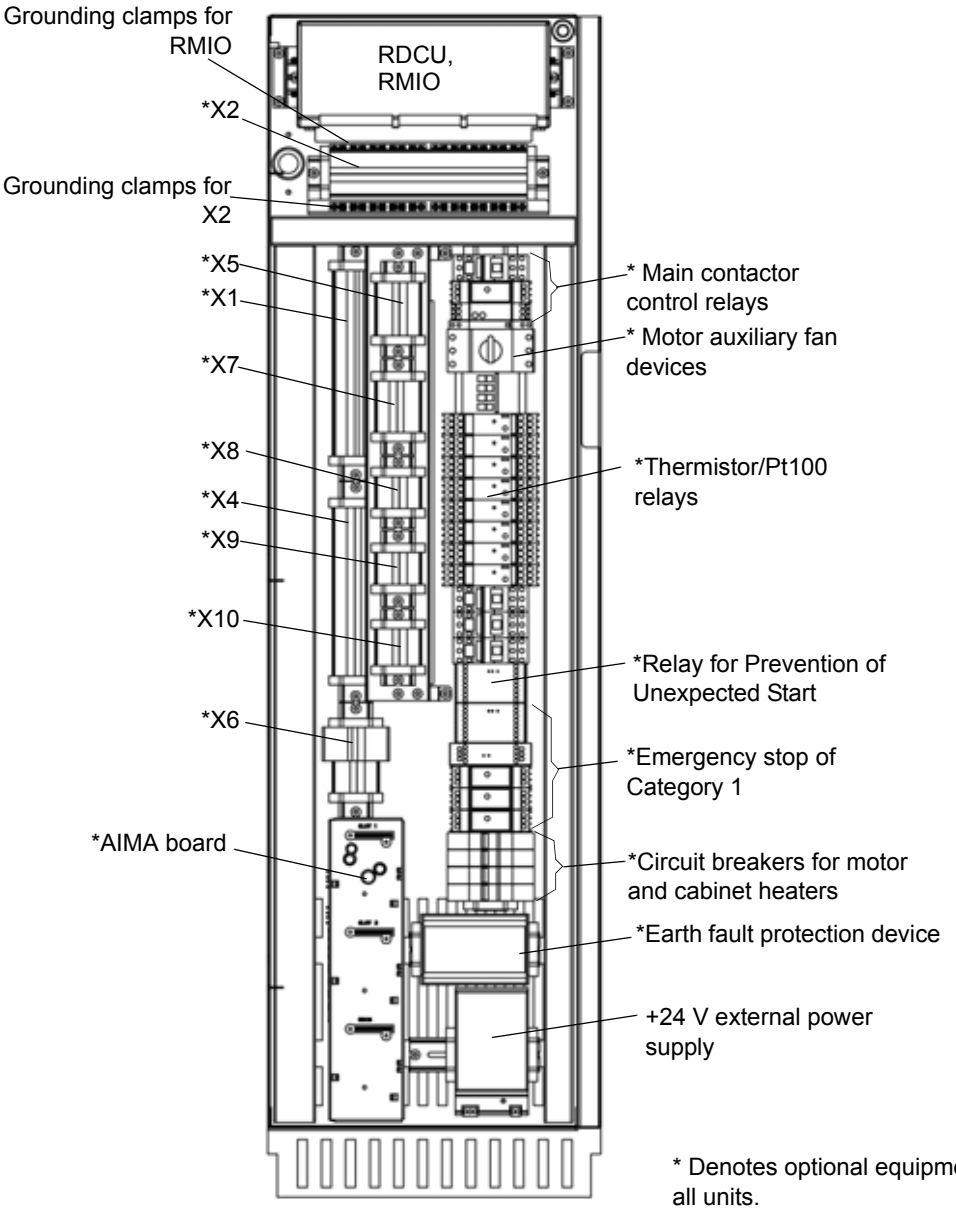
Swing-out frame (front view)

* Denotes optional equipment not present on all units.

Additional terminal blocks

*X1	line contactor control and auxiliary voltage supply
*X2	RMIO/RDCU
*X4	temperature supervision
*X5	cabinet heaters
*X6	motor auxiliary fan supply
*X7	motor heater
*X8	emergency stop of Category 1
*X9	prevention of unexpected start
*X10	earth fault protection

Frame size R7 and R8



Swing-out frame (front view)

64744291 A

For additional terminal blocks X1 to X10, see *Additional terminal blocks*.

Installation of brake resistors (units with brake chopper option)

See *Resistor braking*. Connect the resistor as shown in section *Power cable connection diagram* above.

Motor control and I/O board (RMIO)

What this chapter contains

This chapter shows

- external control connections to the RMIO board for the ACS800 Standard Application Program (Factory Macro)
- specifications of the inputs and outputs of the board.

To which products this chapter applies

This chapter applies to ACS800 units which employ the RMIO board.

Note for the ACS800-02 with enclosure extension and the ACS800-07

The connections for the RMIO board shown below apply also to optional terminal block X2 available for the ACS800-02 and ACS800-07. The terminals of the RMIO board are wired to terminal block X2 internally.

Terminals of X2 accept cables from 0.5 to 4.0 mm^2 (22 to 12 AWG). Tightening torque for screw terminals is 0.4 to 0.8 Nm (0.3 to 0.6 lbf ft). For disconnecting wires from spring terminals, use a screw driver with a blade thickness of 0.6 mm (0.024 in.) and width of 3.5 mm (0.138 in.), e.g. PHOENIX CONTACT SZF 1-0,6X3,5.

Note on external power supply

WARNING! If the RMIO board is supplied from an external power source, the loose end of the cable removed from the RMIO board terminal must be secured mechanically to a location where it cannot come into contact with electrical parts. If the screw terminal plug of the cable is removed, the wire ends must be individually insulated.

External control connections (non-US)

External control cable connections to the RMIO board for the ACS800 Standard Application Program (Factory Macro) are shown below. For external control connections of other application macros and programs, see the appropriate *Firmware Manual*.

RMIO

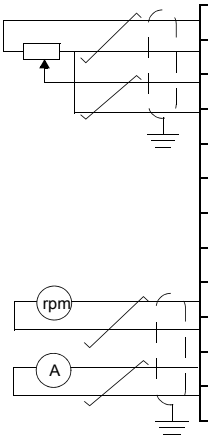
Terminal block size:

cables 0.3 to 3.3 mm^2 (22 to 12 AWG)

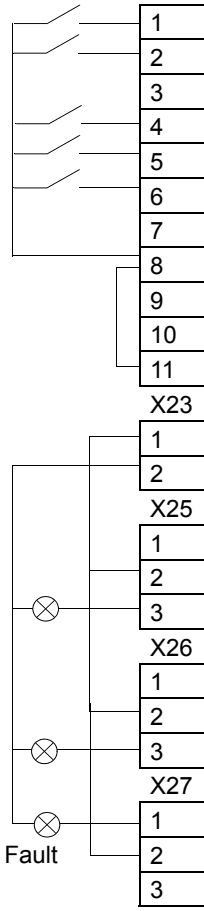
Tightening torque:

0.2 to 0.4 Nm

(0.2 to 0.3 lbf ft)



X2*	RMIO		
X20	X20		
1	1	VREF-	Reference voltage -10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	2	AGND	
X21	X21		
1	1	VREF+	Reference voltage 10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	2	AGND	
3	3	AI1+	Speed reference 0(2) ... 10 V, R_{in} > 200 kohm
4	4	AI1-	
5	5	AI2+	By default, not in use. 0(4) ... 20 mA, R_{in} = 100 ohm
6	6	AI2-	
7	7	AI3+	By default, not in use. 0(4) ... 20 mA, R_{in} = 100 ohm
8	8	AI3-	
9	9	AO1+	Motor speed 0(4)...20 mA ≙ 0...motor nom. speed, R_L ≤ 700 ohm
10	10	AO1-	
11	11	AO2+	Output current 0(4)...20 mA ≙ 0...motor nom. current, R_L ≤ 700 ohm
12	12	AO2-	
X22	X22		
1	1	DI1	Stop/Start
2	2	DI2	Forward/Reverse [1]
3	3	DI3	Not in use
4	4	DI4	Acceleration & deceleration select [2]
5	5	DI5	Constant speed select [3]
6	6	DI6	Constant speed select [3]
7	7	+24VD	+24 VDC max. 100 mA
8	8	+24VD	
9	9	DGND1	Digital ground
10	10	DGND2	Digital ground
11	11	DIIL	Start interlock (0 = stop) [4]
X23	X23		
1	1	+24V	Auxiliary voltage output, non-isolated, 24 VDC 250 mA [5]
2	2	GND	
X25	X25		
1	1	RO1	Relay output 1: ready
2	2	RO1	
3	3	RO1	
X26	X26		
1	1	RO2	Relay output 2: running
2	2	RO2	
3	3	RO2	
X27	X27		
1	1	RO3	Relay output 3: fault (-1)
2	2	RO3	
3	3	RO3	



* optional terminal block in ACS800-02 and ACS800-07

[1] Only effective if par. 10.03 is set to REQUEST by the user.

[2] 0 = open, 1 = closed

DI4	Ramp times according to
0	parameters 22.02 and 22.03
1	parameters 22.04 and 22.05

[3] See par. group 12 CONSTANT SPEEDS.

DI5	DI6	Operation
0	0	Set speed through AI1
1	0	Constant speed 1
0	1	Constant speed 2
1	1	Constant speed 3

[4] See parameter 21.09 START INTRL FUNC.

[5] Total maximum current shared between this output and optional modules installed on the board.

External control connections (US)

External control cable connections to the RMIO board for the ACS800 Standard Application Program (Factory Macro US version) are shown below. For external control connections of other application macros and programs, see the appropriate *Firmware Manual*.

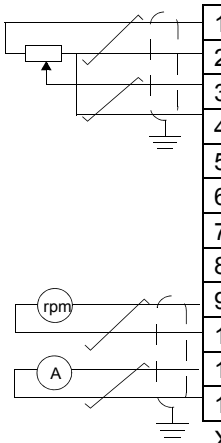
RMIO

Terminal block size:

cables 0.3 to 3.3 mm^2 (22 to 12 AWG)

Tightening torque:

0.2 to 0.4 Nm (0.2 to 0.3 lbf ft)



X2*	RMIO		
X20	X20		
1	1	VREF-	Reference voltage -10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	2	AGND	
X21	X21		
1	1	VREF+	Reference voltage 10 VDC, 1 kohm ≤ R_L ≤ 10 kohm
2	2	AGND	
3	3	AI1+	Speed reference 0(2) ... 10 V, R_{in} > 200 kohm
4	4	AI1-	
5	5	AI2+	By default, not in use. 0(4) ... 20 mA, R_{in} = 100 ohm
6	6	AI2-	
7	7	AI3+	By default, not in use. 0(4) ... 20 mA, R_{in} = 100 ohm
8	8	AI3-	
9	9	AO1+	Motor speed 0(4)...20 mA ≙ 0...motor nom. speed, R_L ≤ 700 ohm
10	10	AO1-	
11	11	AO2+	Output current 0(4)...20 mA ≙ 0...motor nom. current, R_L ≤ 700 ohm
12	12	AO2-	
X22	X22		
1	1	DI1	Start (⌐‾)
2	2	DI2	Stop (‾⌐)
3	3	DI3	Forward/Reverse [1]
4	4	DI4	Acceleration & deceleration select [2]
5	5	DI5	Constant speed select [3]
6	6	DI6	Constant speed select [3]
7	7	+24VD	+24 VDC max. 100 mA
8	8	+24VD	
9	9	DGND1	Digital ground
10	10	DGND2	Digital ground
11	11	DIIL	Start interlock (0 = stop) [4]
X23	X23		
1	1	+24V	Auxiliary voltage output, non-isolated, 24 VDC 250 mA [5]
2	2	GND	
X25	X25		
1	1	RO1	Relay output 1: ready
2	2	RO1	
3	3	RO1	
X26	X26		
1	1	RO2	Relay output 2: running
2	2	RO2	
3	3	RO2	
X27	X27		
1	1	RO3	Relay output 3: fault (-1)
2	2	RO3	
3	3	RO3	

Fault

* optional terminal block in ACS800-U2 and ACS800-U7

1) Only effective if par. 10.03 is set to REQUEST by the user.

2) 0 = open, 1 = closed

DI4	Ramp times according to
0	parameters 22.02 and 22.03
1	parameters 22.04 and 22.05

3) See par. group 12 CONSTANT SPEEDS.

DI5	DI6	Operation
0	0	Set speed through AI1
1	0	Constant speed 1
0	1	Constant speed 2
1	1	Constant speed 3

4) See parameter 21.09 START INTRL FUNC.

5) Total maximum current shared between this output and optional modules installed on the board.

RMIO board specifications

Analogue inputs

	With Standard Application Program two programmable differential current inputs (0 mA / 4 mA ... 20 mA, R_{in} = 100 ohm) and one programmable differential voltage input (-10 V / 0 V / 2 V ... +10 V, R_{in} > 200 kohm).
	The analogue inputs are galvanically isolated as a group.
Isolation test voltage	500 VAC, 1 min
Max. common mode voltage between the channels	±15 VDC
Common mode rejection ratio	≥ 60 dB at 50 Hz
Resolution	0.025% (12 bit) for the -10 V ... +10 V input. 0.5% (11 bit) for the 0 ... +10 V and 0 ... 20 mA inputs.
Inaccuracy	± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ± 100 ppm/°C (± 56 ppm/°F), max.

Constant voltage output

Voltage	+10 VDC, 0, -10 VDC ± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ± 100 ppm/°C (± 56 ppm/°F) max.
Maximum load	10 mA
Applicable potentiometer	1 kohm to 10 kohm

Auxiliary power output

Voltage	24 VDC ± 10%, short circuit proof
Maximum current	250 mA (shared between this output and optional modules installed on the RMIO)

Analogue outputs

	Two programmable current outputs: 0 (4) to 20 mA, R_L ≤ 700 ohm
Resolution	0.1% (10 bit)
Inaccuracy	± 1% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ± 200 ppm/°C (± 111 ppm/°F) max.

Digital inputs

	With Standard Application Program six programmable digital inputs (common ground: 24 VDC, -15% to +20%) and a start interlock input. Group isolated, can be divided in two isolated groups (see *Isolation and grounding diagram* below).
	Thermistor input: 5 mA, < 1.5 kohm ≙ “1” (normal temperature), > 4 kohm ≙ “0” (high temperature), open circuit ≙ “0” (high temperature).
	Internal supply for digital inputs (+24 VDC): short-circuit proof. An external 24 VDC supply can be used instead of the internal supply.
Isolation test voltage	500 VAC, 1 min
Logical thresholds	< 8 VDC ≙ “0”, > 12 VDC ≙ “1”
Input current	DI1 to DI 5: 10 mA, DI6: 5 mA
Filtering time constant	1 ms

Relay outputs

	Three programmable relay outputs
Switching capacity	8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC
Minimum continuous current	5 mA rms at 24 VDC
Maximum continuous current	2 A rms
Isolation test voltage	4 kVAC, 1 minute

DDCS fibre optic link

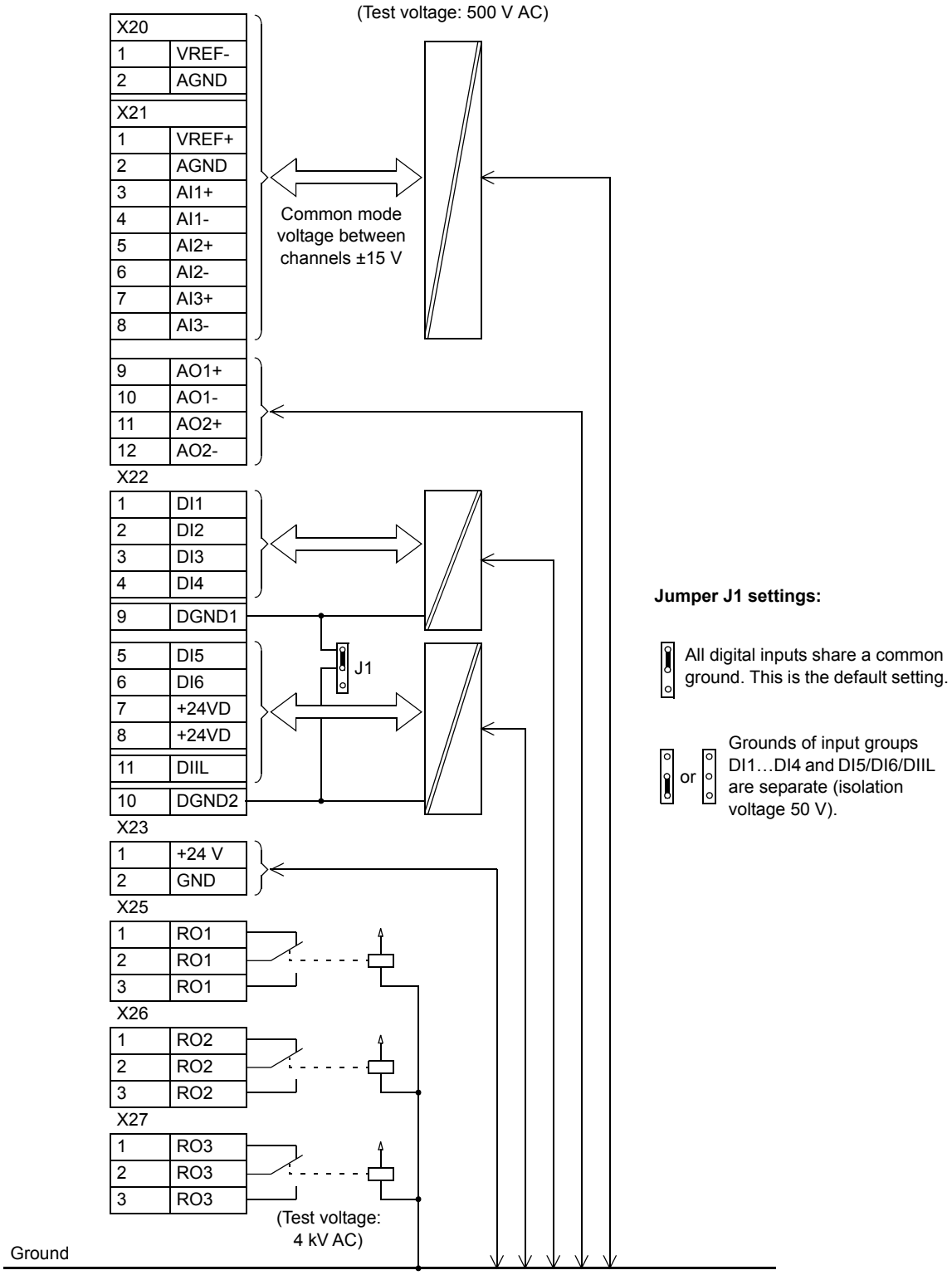
	With optional communication adapter module RDCO. Protocol: DDCS (ABB Distributed Drives Communication System)

24 VDC power input

Voltage	24 VDC ± 10%
Typical current consumption (without optional modules)	250 mA
Maximum current consumption	1200 mA (with optional modules inserted)

The terminals on the RMIO board as well as on the optional modules attachable to the board fulfil the Protective Extra Low Voltage (PELV) requirements stated in EN 50178 provided that the external circuits connected to the terminals also fulfil the requirements.

Isolation and grounding diagram



Installation checklist and start-up

Checklist

Check the mechanical and electrical installation of the drive before start-up. Go through the checklist below together with another person. Read the *Safety instructions* on the first pages of this manual before you work on the unit.

Check	
MECHANICAL INSTALLATION	
The ambient operating conditions are allowed. See *Mechanical installation, Technical data: IEC ratings* or *US tables / NEMA ratings, Ambient conditions*.	☐
The unit is fixed properly on floor and a vertical non-flammable wall. See *Mechanical installation.*	☐
The cooling air will flow freely.	☐
ELECTRICAL INSTALLATION See *Planning the electrical installation, Electrical installation.*	
The motor and the driven equipment are ready for start. See *Planning the electrical installation: Motor selection and compatibility, Technical data: Motor connection*.	☐
The +E202 EMC filter capacitors are disconnected if the drive is connected to an IT (ungrounded) system.	☐
The capacitors are reformed if stored over one year, refer to *ACS 600/800 Capacitor Reforming Guide* [64059629 (English)].	☐
The drive is grounded properly.	☐
The mains (input power) voltage matches the drive nominal input voltage.	☐
The mains (input power) connections at L1, L2 and L3 and their tightening torques are OK. See *Technical data* / *Cable entries*.	☐
Appropriate mains (input power) fuses and disconnector are installed.	☐
The motor connections at U2, V2 and W2 and their tightening torques are OK. See *Technical data* / *Cable entries*.	☐
The motor cable is routed away from other cables.	☐
Voltage setting of the cooling fan transformer	☐
Setting of the auxiliary voltage transformer T10 (if present). For location, see *Maintenance* / *Cabinet layout.*	☐
Voltage setting of the IP 54 fan transformer T15 (if present). For location, see *Maintenance* / *Cabinet layout.*	☐
Voltage setting of the brake resistor fan transformer (if present).	☐
There are no power factor compensation capacitors in the motor cable.	☐
The external control connections inside the drive are OK.	☐
There are no tools, foreign objects or dust from drilling inside the drive.	☐
Mains (input power) voltage cannot be applied to the output of the drive (with bypass connection).	☐
Drive, motor connection box and other covers are in place.	☐

Start-up procedure

	Action	Additional information
Safety		
☐	Only qualified electricians are allowed to start-up the drive. The safety instructions must be followed during the start-up procedure.	See chapter *Safety instructions.*
Checks with no voltage connected		
☐	Check the tuning of the insulation monitoring device.	Optional device. See delivery specific circuit diagrams and *IRDH265 Operating Manual* by Bender (code: TGH1249).
☐	Pt 100 settings (if present)	
Starting the drive		
☐	Close the switch fuse (main disconnector).	
☐	Units with line contactor: Close the contactor by turning the start switch on the cabinet door from OFF into START position for 2 seconds. Leave the switch to ON position.	
Application program set-up		
☐	Follow the instructions in the *Firmware Manual* to start up the drive and to set the drive parameters.	
On-load checks		
☐	Check that the Prevention of Unexpected Start function (if installed) works: • Start and Stop the drive and wait until the motor has stopped. • Open the Prevention of Unexpected Start switch (mounted on a control desk). The indicating lamp should lit. • Give a Start command. The drive should not start. • Reset the drive from the control panel.	Optional function. See delivery specific circuit diagrams.
☐	Check that the cooling fans rotate freely in the right direction, and the air flows upwards.	A paper sheet set on the intake (door) gratings stays. The fans run noiselessly.
☐	Check the direction of rotation of the motor.	
☐	Check the correct operation of the emergency-stop circuits from each operating location.	

Maintenance

What this chapter contains

This chapter contains preventive maintenance instructions.

Safety

WARNING! Read the *Safety instructions* on the first pages of this manual before performing any maintenance on the equipment. Ignoring the safety instructions can cause injury or death.

Maintenance intervals

If installed in an appropriate environment, the drive requires very little maintenance. This table lists the routine maintenance intervals recommended by ABB.

Interval	Maintenance	For instruction, see section
Every year when stored	Capacitor reforming	*Reforming*
Every year	IP 54 air filter change	*Checking and replacing the air filters*
	IP 42 air filter check and change if necessary	
	IP 22 air filter check and change if necessary	
	Cleanliness check	*Heatsink*
Every 6 years	Cabinet cooling fan change (frame size R6)	*Replacing the cabinet fans (R6)*
Every 6 years	Cabinet cooling fan change (frame size R8)	*Replacing the cabinet fans (frame size R8 only)*
Every 6 years	Change of additional cabinet cooling fan on the roof (frame sizes R7 and R8)	*Replacing the additional cabinet fan (frame sizes R7 and R8 only with IP 22 and IP 42 when cabling: bottom entry/exit)*
Every 6 years	Change of additional cabinet cooling fan at the bottom (frame sizes R7 and R8)	*Replacing the additional cabinet fan (frame sizes R7 and R8 only with IP 22 and IP 42 when cabling: top entry and bottom exit, bottom entry and top exit or top entry/exit)*
Every 6 years	Change of optional brake resistor (1xSAFUR and 2xSAFUR) cabinet fan, optional du/dt filter fan of types ACS800-07-0120-3 and -0140-5	-
Every 6 years	IP 54 and IP 54R fan change (frame sizes R6, R7 and R8)	*Replacing the IP 54 (UL type 12) fan in frame size R6* or *Replacing the IP 54 (UL type 12) fan in frame sizes R7 and R8*

Every 6 years	Drive module cooling fan change (frame size R6)	*Replacing the drive module fan (R6)*
Every 6 years	Drive module cooling fan change (frame size R7)	*Replacing the drive module fan (R7)*
Every 6 years	Drive module cooling fan change (frame size R8)	*Replacing the drive module fan (R8)*
Every 10 years	Capacitor change	*Capacitors*

Required tools for maintenance

- 3 mm screw driver
- torque wrench with 500 mm (20 in.) or 2 x 250 mm (2 x 10 in.) extension bar
- 19 mm socket
  for frame size R7: 13 mm magnetic end socket
  for frame size R8: 17 mm magnetic end socket.

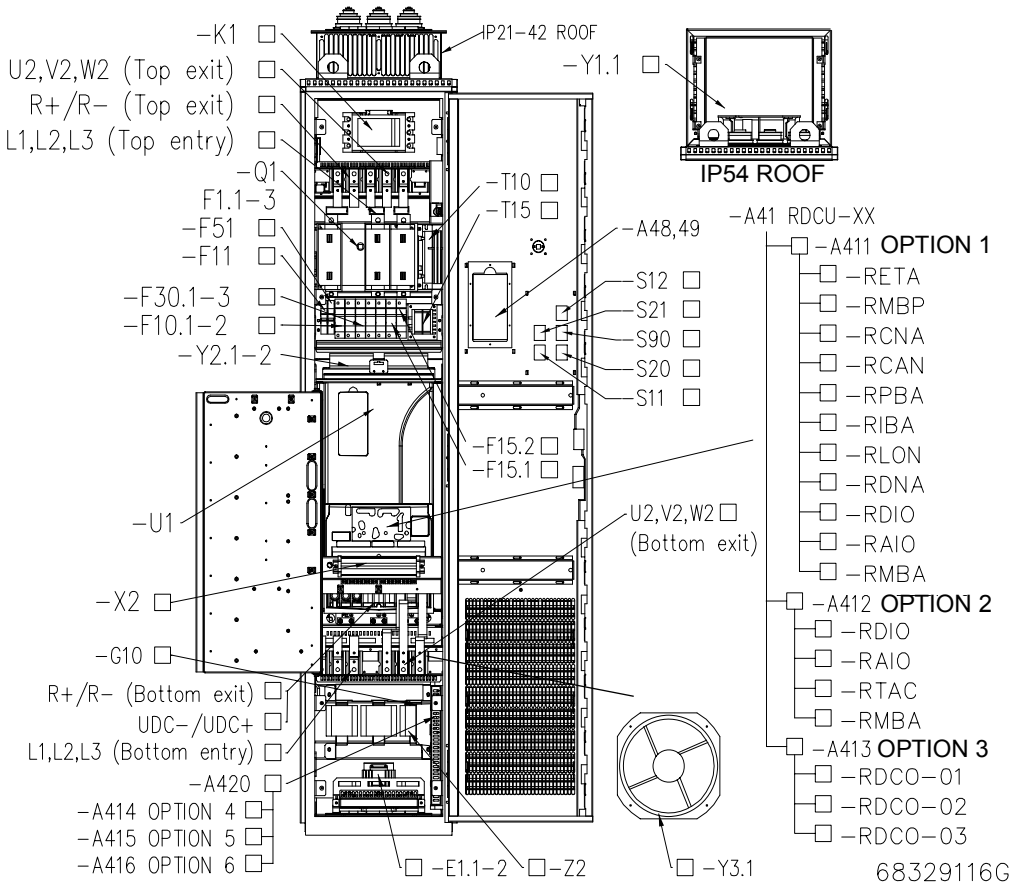
Screw	Grade	Tool	Tightening torque	
		mm	Nm	lbf ft
M4	8.8	7	2	1.46
M5	8.8	8	4	3
M6	8.8	10	6...9	4...7
M8	8.8	13	15...22	11...16
M10	8.8	17	30...44	22...32
M12	8.8	19	50...75	37...55

Cabinet layout

Cabinet layout stickers are shown below. The symbols are described under *Designations*.

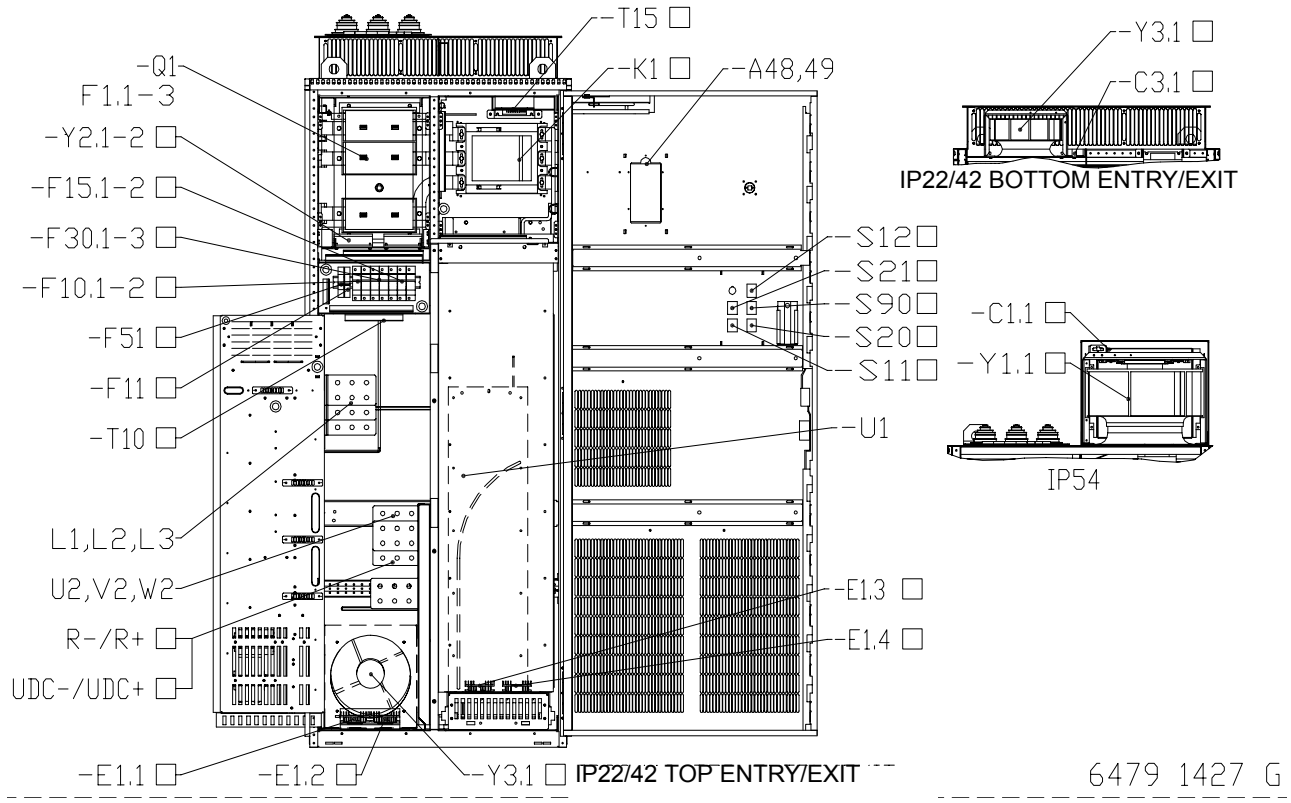
Frame sizes R6

The options included are marked with x at the factory.



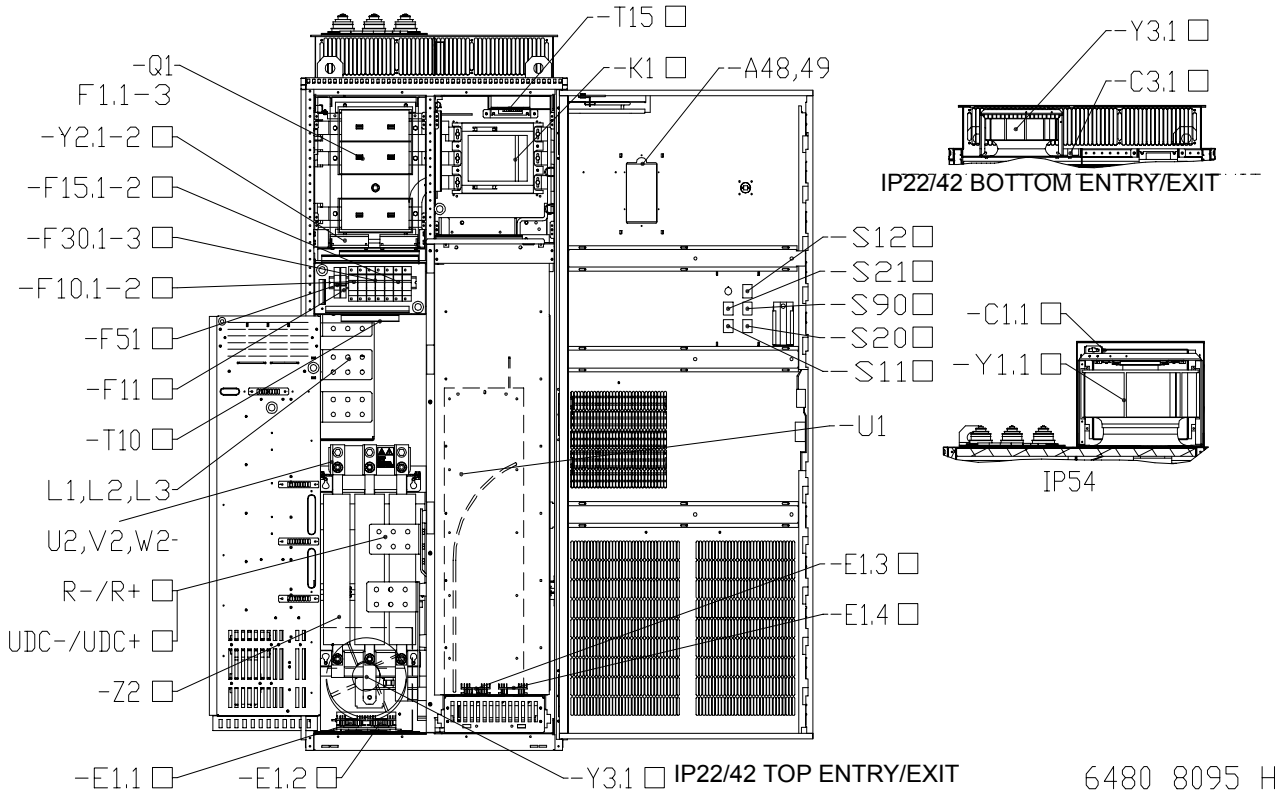
Frame sizes R7 and R8 without du/dt filter

The options included are marked with x at the factory.



Frame sizes R7 and R8 with du/dt filter

The options included are marked with x at the factory.



Designations

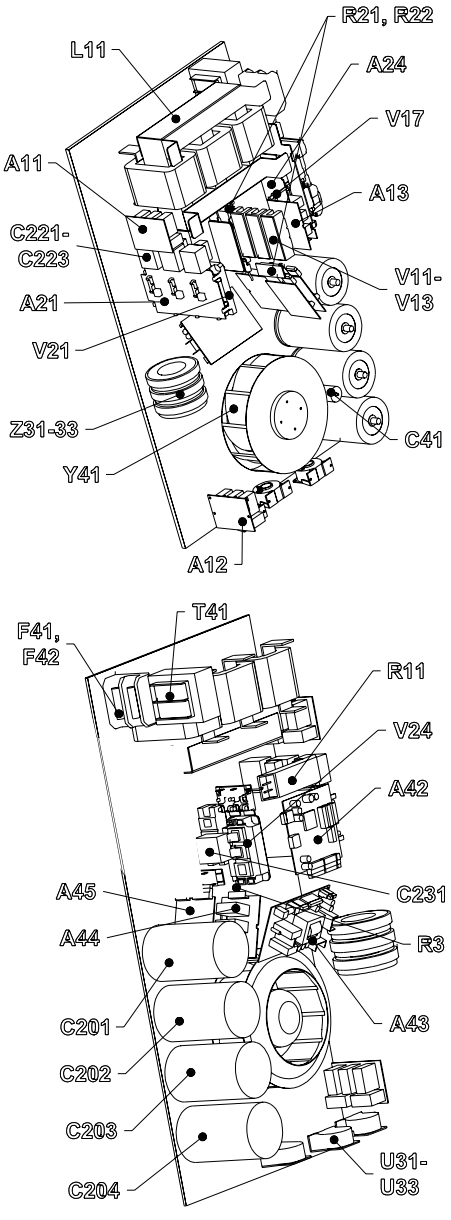
Designation	Component
A48,49	Control panel mounting platform, control panel
C1, C3	Fan capacitor
E1	Cabinet heater
F10.1-2	Auxiliary voltage transformer fuses
F11	Circuit breaker
F15.1-2	IP 22/42/54 fan fuses
F30.1-3	Motor auxiliary fan fuses
F51	Circuit breaker
G10	+24 VDC external power supply
K1	Line contactor
Q1, F1.1 -3	Switch fuse
S11	Start/Stop switch
S20	Emergency Stop switch
S21	Emergency Stop reset
S90	Earth fault reset
T10	Auxiliary voltage transformer
T15	IP 54 fan transformer
U1	drive module
X2	Additional terminal block for RMIO board
Y1.1	IP 54 fan
Y2	Additional cabinet fan
Y3.1	IP 22/42 fan
Z2	du/dt filter

Layout of the drive module

The layout stickers of the drive module are shown below. The stickers show all possible components. Not all of them are present in each delivery. Components that need to be changed regularly are listed below:

Designation	Component
Y41	Cooling fan
C_	Capacitors

R7



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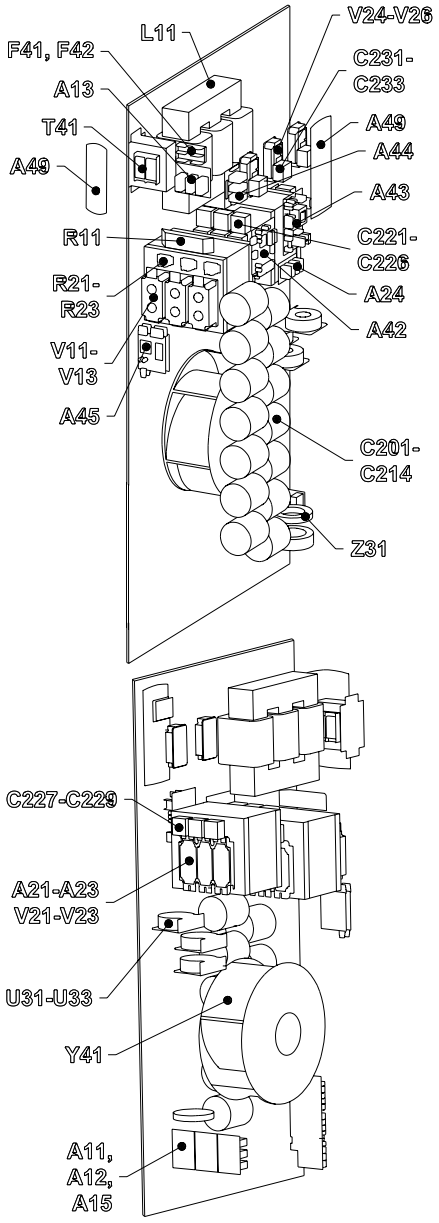
R8



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Checking and replacing the air filters

Check the air filters and replace if necessary (see *Technical data* for the correct filter types). The inlet (door) filters can be accessed by removing the fastener(s) at the top of the grating, then lifting the grating and pulling it away from the door. The outlet (roof) filter in IP 54 units can be accessed by pulling the grating upwards.

Air filter mat

Heatsink

Check the cleanliness of the cabinet and the surroundings. When necessary, clean the interior of the cabinet with a soft brush and a vacuum cleaner.

The module heatsink fins pick up dust from the cooling air. The drive runs into overtemperature warnings and faults if the heatsink is not clean. When necessary, contact ABB for cleaning of the heatsink (frame sizes R7 and R8).

In frame size R6, proceed as follows:

1. Remove the cooling fan (see section *Fans*).
2. Remove the drive module from the cabinet.
3. Blow dry clean compressed air from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. **Note:** Prevent dust from entering adjoining equipment.
4. Replace the cooling fan.

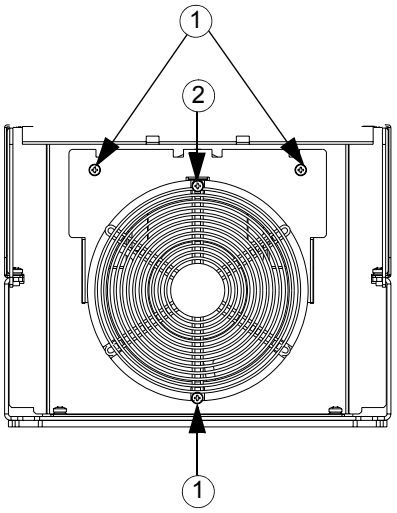
Fans

The lifespan of the cooling fan of the drive module is about 50 000 hours. The actual lifespan depends on the running time of the fan, ambient temperature and dust concentration. See the appropriate ACS800 firmware manual for the actual signal which indicates the running time of the cooling fan.

Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

Replacing the drive module fan (R6)

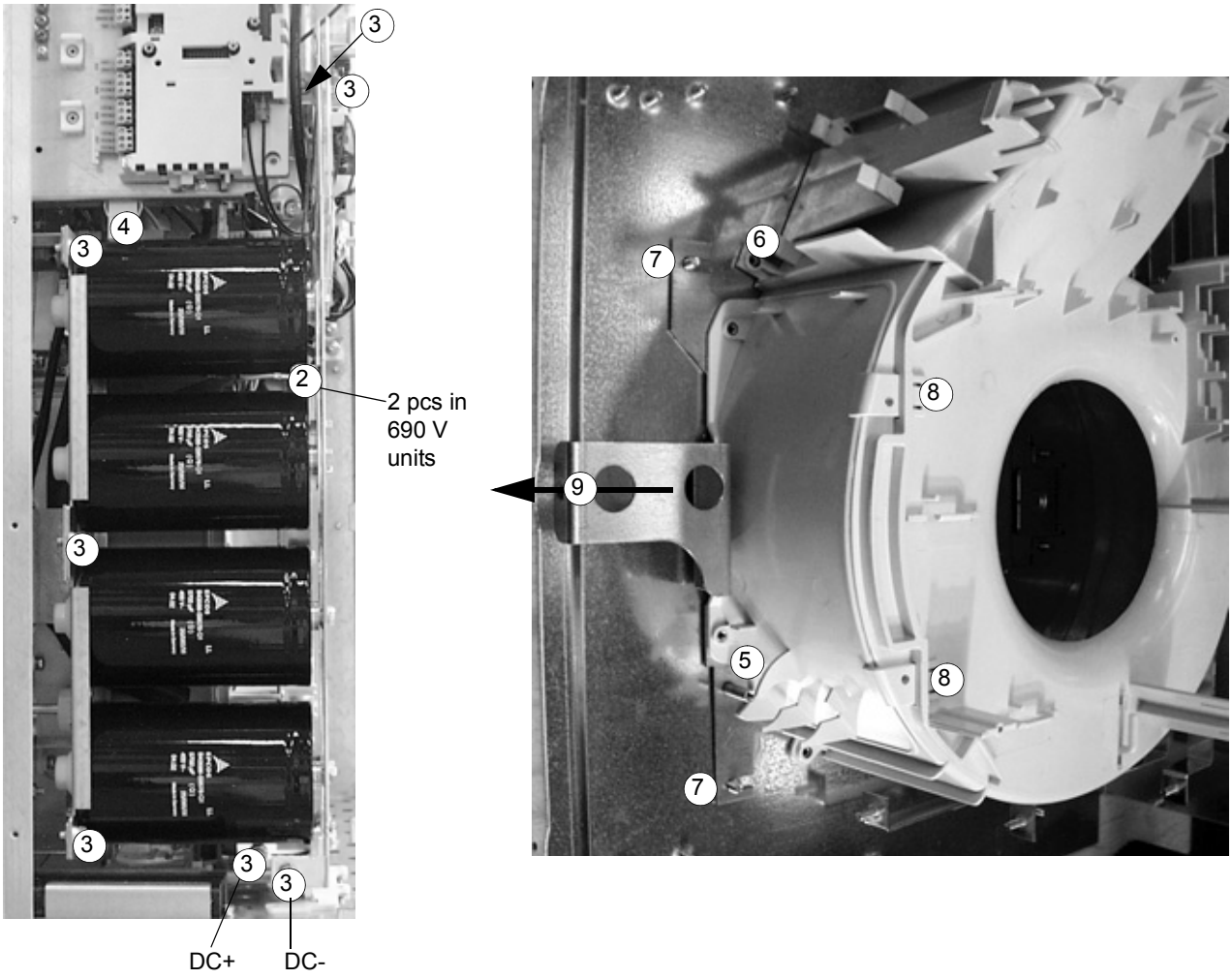
To remove the fan, undo the fixing screws. Disconnect the cable. Install the fan in reverse order.



Bottom view

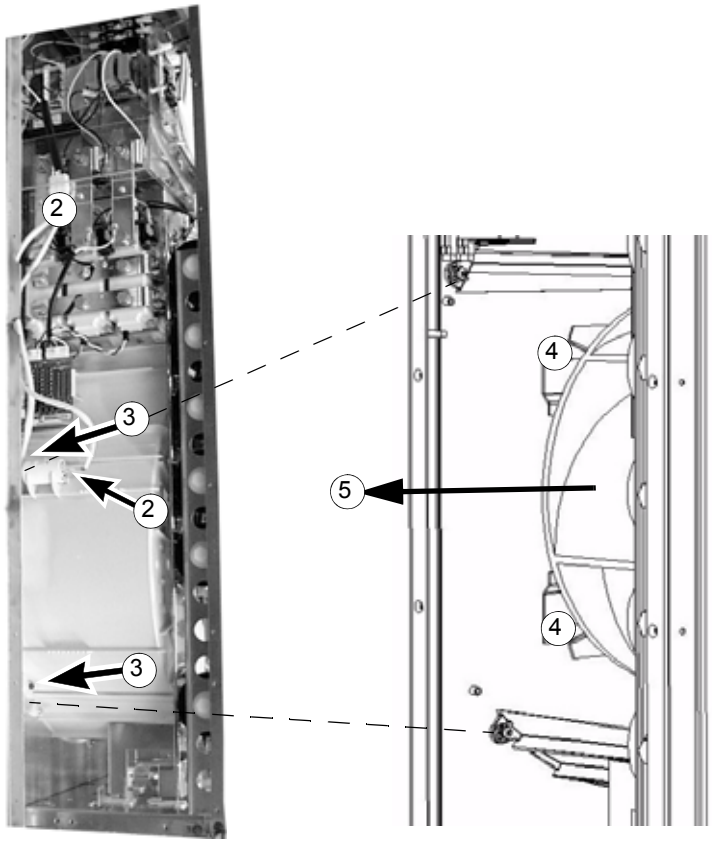
Replacing the drive module fan (R7)

1. Remove the front cover.
2. Disconnect the discharging resistor wire(s).
3. Remove the DC capacitor pack by undoing the red fixing screws and pulling the pack out.
4. Disconnect the fan supply wires (detachable connector).
5. Disconnect the fan capacitor wires.
6. Disconnect the AINP board wires from connectors X1 and X2.
7. Undo the red fixing screws of the fan cassette.
8. Press the snap-on holders to release the side cover.
9. Lift the handle and pull the fan cassette out.
10. Install the new fan and fan capacitor in reverse order to the above.



Replacing the drive module fan (R8)

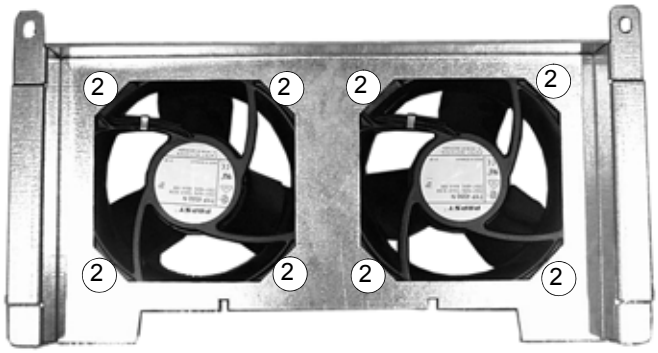
1. Remove the front cover.
2. Disconnect the fan capacitor and power supply wires.
3. Undo the red fastening screws of the plastic side cover of the fan. Shift the cover to the right to free its right-hand edge and lift the cover off.
4. Undo the red fastening screws of the fan.
5. Lift the fan out of the cabinet.
6. Install the new fan and fan capacitor in reverse order to the above.



Replacing the cabinet fans (R6)

Replacing the fans at upper part of the cubicle

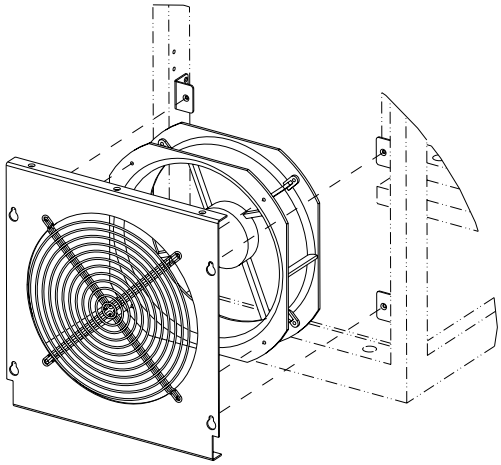
1. Remove the fan cassette from the cabinet as shown in *Replacing the drive module (R6)*.
2. Undo the fastening screws of the fans.
3. Install the new fans in reverse order to the above.



Fan cassette
(view from below)

Replacing the additional fan at the lower part of the cubicle (not in all units)

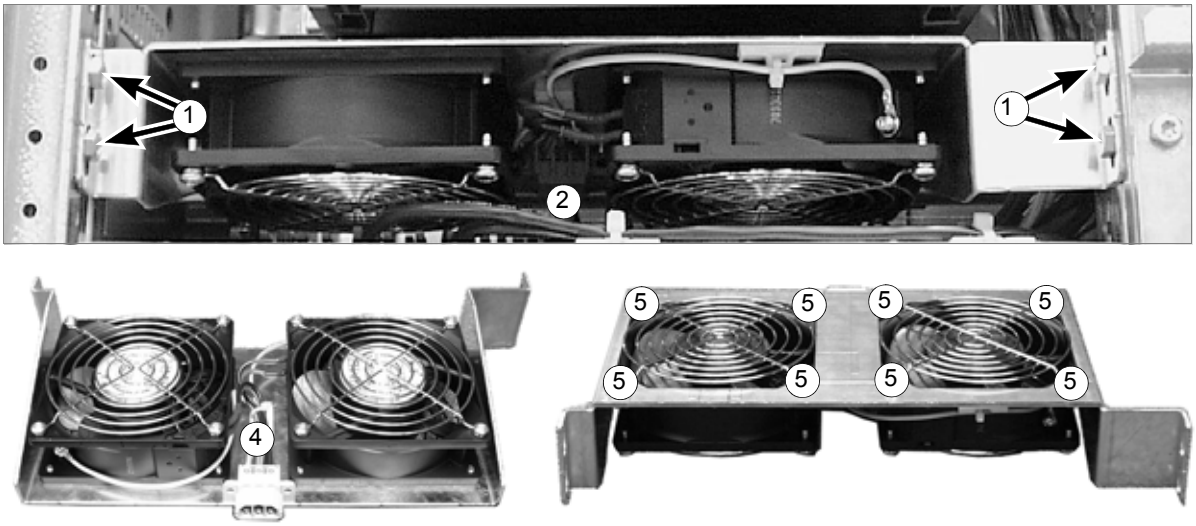
1. Remove the screws that mount the support frame of the fan to the to the cabinet frame.
2. Pull the fan support frame outwards and disconnect the fan supply wires (detachable connector).
3. Remove the fan frame from the cabinet.
4. Remove the screws that mount the fan to the fan frame.
5. Install a new fan in reverse order.



Replacing the cabinet fans (frame size R8 only)

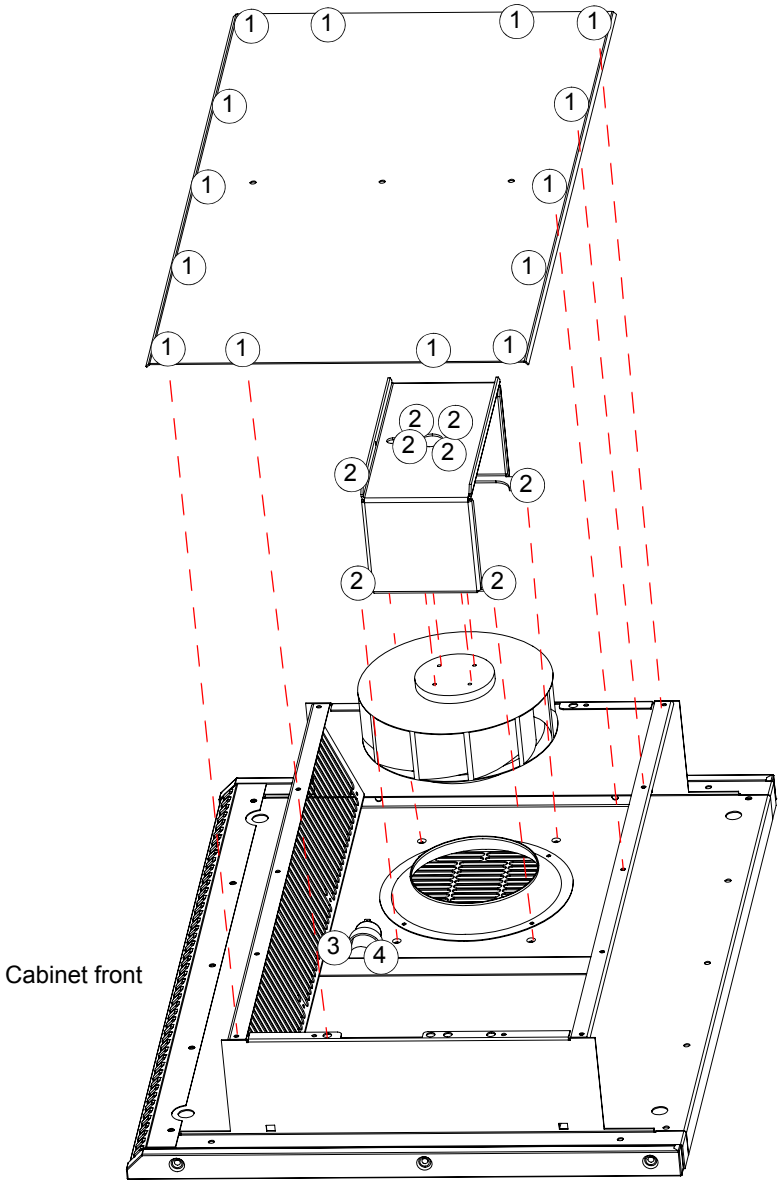
For location of the cabinet fans, see *Cabinet layout*.

1. Undo the fastening screws.
2. Disconnect the fan supply wires (detachable connector at the back edge of the fan cassette).
3. Pull the fan cassette out.
4. Disconnect the fan wires from the terminal.
5. Undo the fastening screws of the fans.
6. Install the new fans in reverse order to the above.



Replacing the additional cabinet fan (frame sizes R7 and R8 only with IP 22 and IP 42 when cabling: bottom entry/exit)

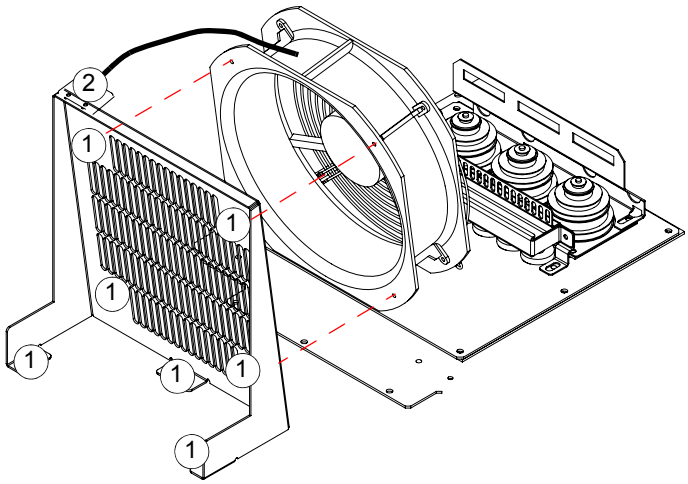
1. Remove the top plate of the cabinet roof by undoing the fastening screws.
2. Remove the fan cover by undoing the fastening screws.
3. Disconnect the fan supply wires (detachable connector) and undo the cable ties on the fan cover.
4. Remove the fan capacitor by undoing the fastening screw of the clamp.
5. Pull the fan out.
6. Install the new fan and fan capacitor in reverse order to the above.



Pro/E: 6469 4952 (cab-r7-8_roof_fan_bot-ee.asm), 6471 7154

Replacing the additional cabinet fan (frame sizes R7 and R8 only with IP 22 and IP 42 when cabling: top entry and bottom exit, bottom entry and top exit or top entry/exit)

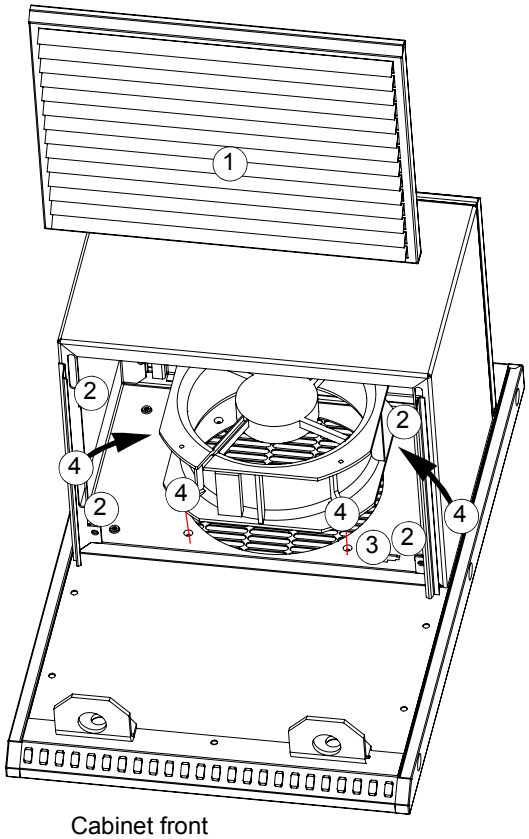
1. Remove the shroud by undoing the fastening screws.
2. Disconnect the fan supply wires (detachable connector).
3. Remove the fan capacitor by undoing the fastening screw of the clamp.
4. Install the new fan and fan capacitor in reverse order to the above.



Pro/E: 6828 4759

Replacing the IP 54 (UL type 12) fan in frame size R6

1. Remove the front grating of the fan cubicle by lifting it upwards.
2. Remove the shroud by undoing the fastening screws.
3. Disconnect the fan supply wires (detachable terminal).
4. Undo the fastening screws of the fan.
5. Install the new fan in reverse order to the above.

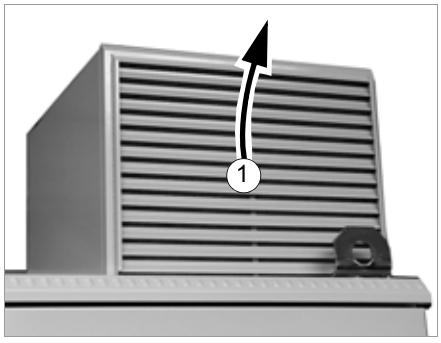


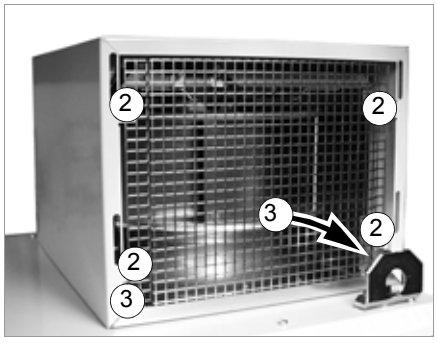
Cabinet front

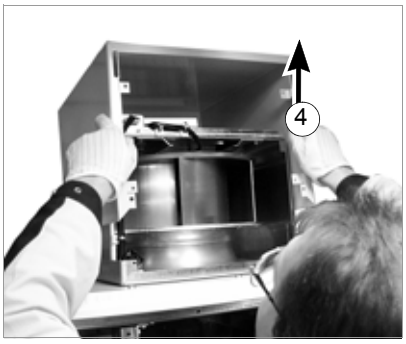
Pro/E: 64784803A_ip54_roof-400,
64784803I_ip54_roof-400_b-ee

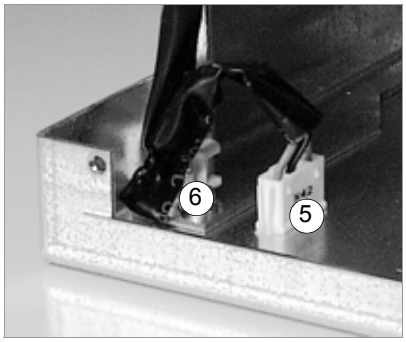
Replacing the IP 54 (UL type 12) fan in frame sizes R7 and R8

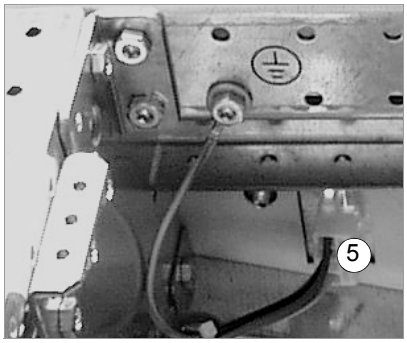
1. Remove the front and back gratings of the fan cubicle by lifting them upwards.
2. Remove the shrouds by undoing the fastening screws.
3. Undo the fastening screws of the side/top cover of the fan.
4. Lift the side/top cover of the fan off.
5. Disconnect the fan supply wire connector from the cabinet roof (on top and inside the cabinet).
6. Undo the fastening screws of the fan cassette at each corner.
7. Lift the fan cassette off.
8. Undo the cable ties on the top of the fan cassette.
9. Disconnect the cables (detachable terminals).
10. Remove the fan capacitor by undoing the fastening screw of the clamp.
11. Undo the fastening screws of the fan.
12. Pull the fan out.
13. Install the new fan and fan capacitor in reverse order to the above. Ensure that the fan is centred and rotates freely.

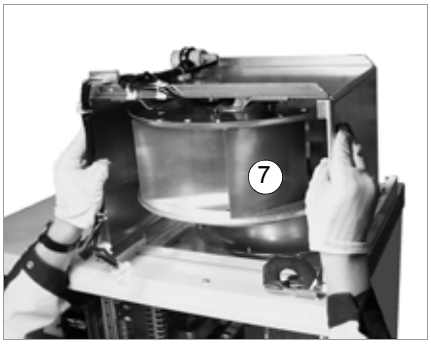


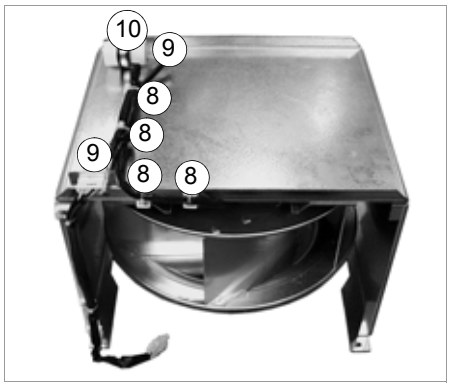


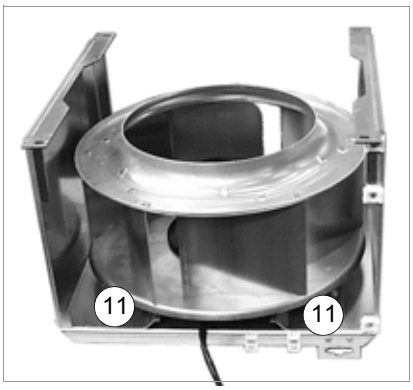


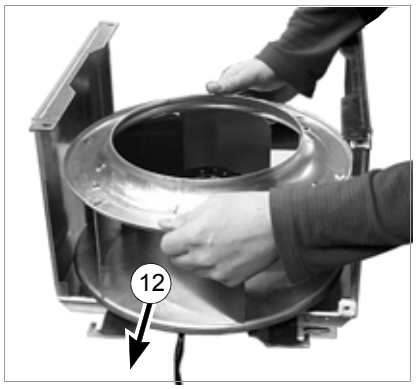












Capacitors

The drive intermediate circuit employs several electrolytic capacitors. Their lifespan is at least 90 000 hours depending on the operating time of the drive, loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature.

It is not possible to predict a capacitor failure. Capacitor failure is usually followed by damage to the unit and an input cable fuse failure, or a fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not use other than ABB specified spare parts.

Reforming

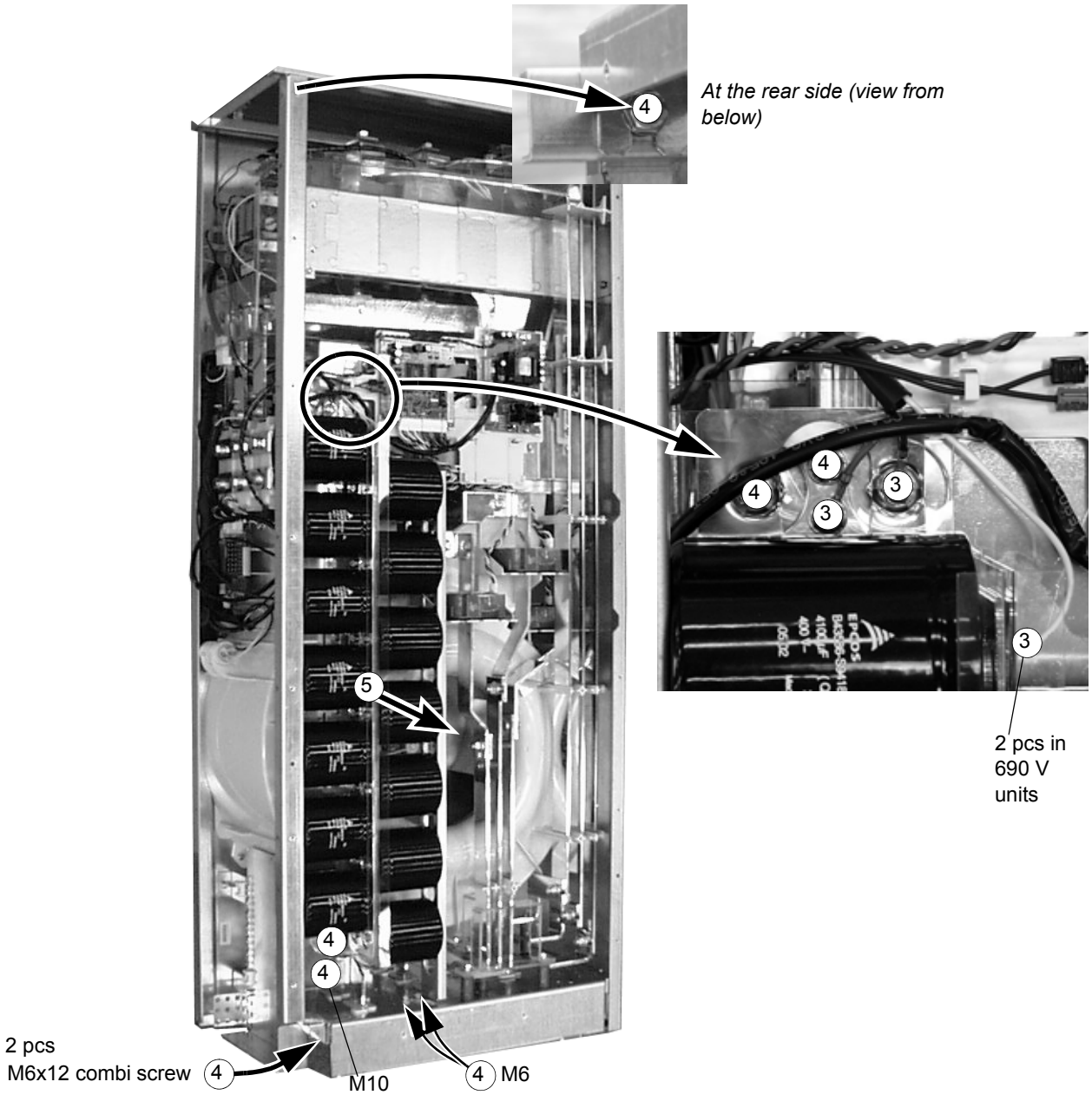
Reform (re-age) spare part capacitors once a year according to *ACS 600/800 Capacitor Reforming Guide* [code: 64059629 (English)].

Replacing the capacitor pack (R7)

Replace the capacitor pack as described in section *Replacing the drive module fan (R7)*.

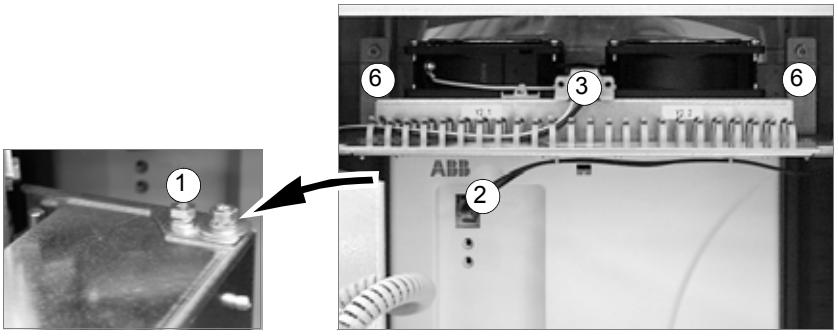
Replacing the capacitor pack (R8)

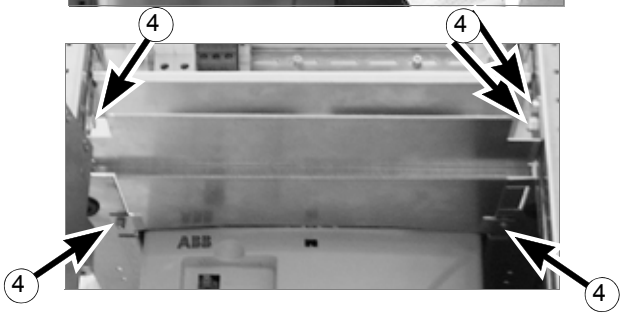
1. Remove the module from the cabinet as described in section *Replacing the drive module (R7 and R8).*
2. Remove the front cover. Remove the profiled side plate.
3. Disconnect the discharging resistor wires.
4. Undo the red fastening screws.
5. Lift the capacitor pack out.
6. Install the new capacitor pack in reverse order to the above.

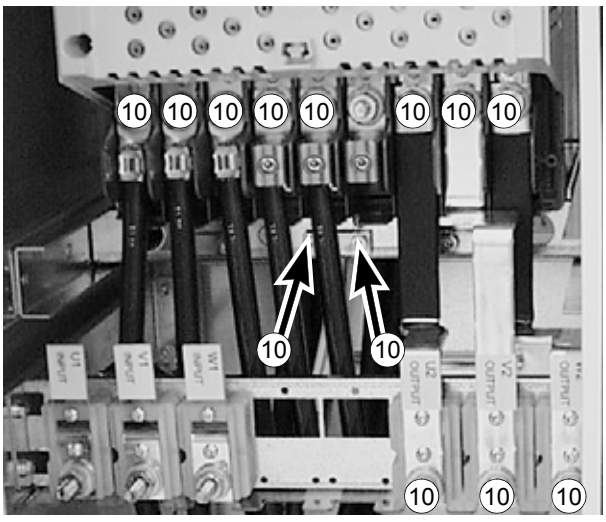


Replacing the drive module (R6)

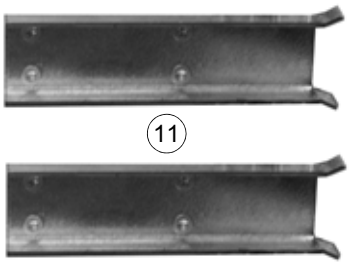
1. Open the swing-out frame. Undo screw (1) to open the swing-out frame wide.
2. Disconnect the control panel cable.
3. Disconnect the fan wires (detachable terminal).
4. Undo the fastening screws of the air baffle and fan cassette, and pull the air baffle out.
5. Pull the fan cassette out.
6. Remove the shroud at the top of the module by undoing the fastening screws.
7. Remove the shrouds in the lower part of the cabinet.
8. Remove the additional fan (if any). See *Replacing the additional fan at the lower part of the cubicle (not in all units)* on page *86*.
9. Disconnect the control cables by detaching the RMIO board terminals.
10. Disconnect the power busbars and cables.

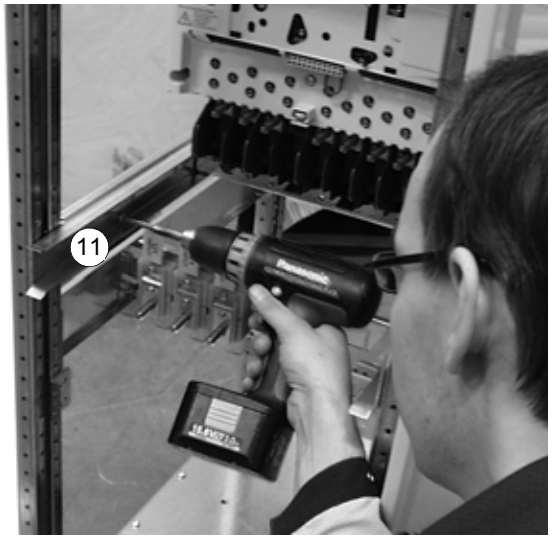


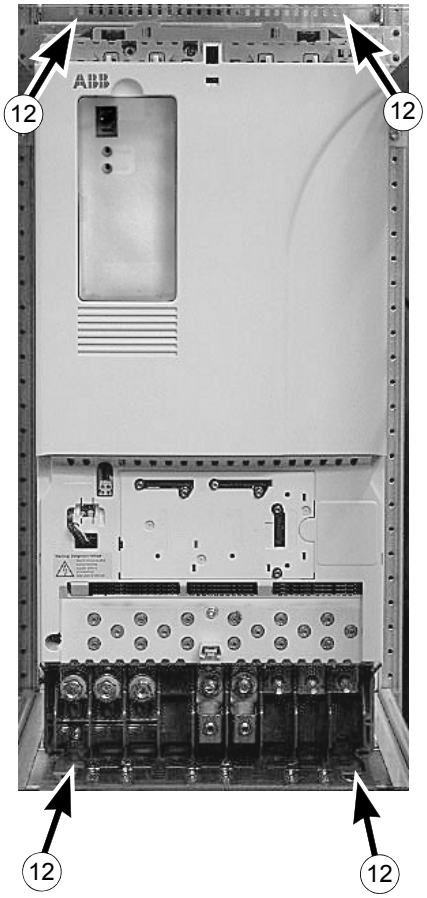


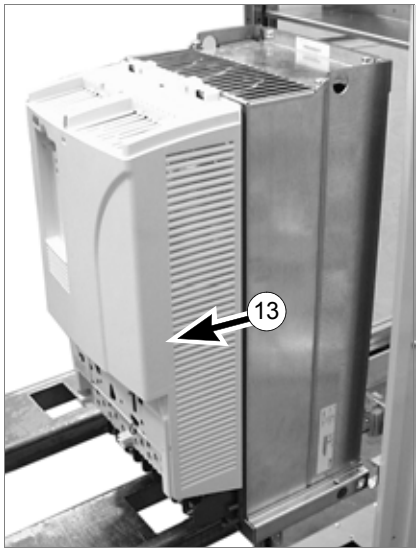


11. Fasten the slide rails at the bottom of the cabinet to the sides of the cabinet.
12. Undo the fastening screws of the module. Use a torque wrench with an extension bar.
13. Slide the module out onto a pallet truck.
14. Install the new module in reverse order to the above.



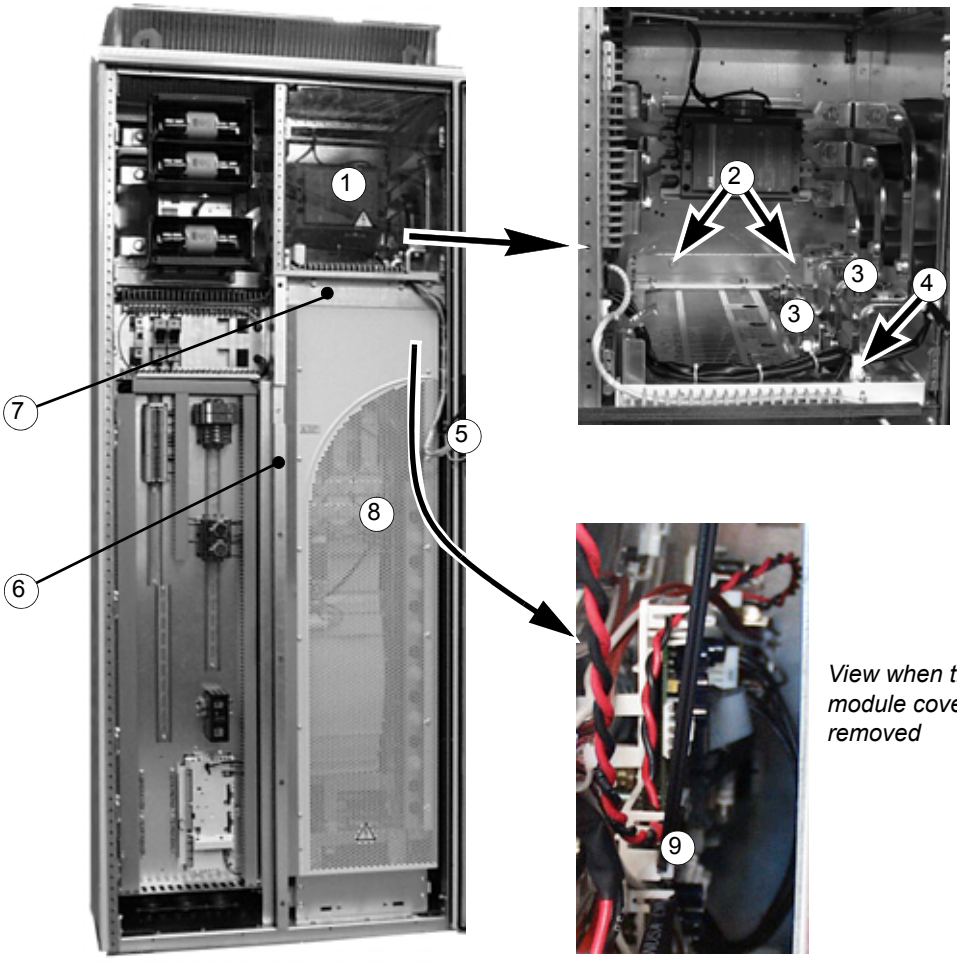






Replacing the drive module (R7 and R8)

1. Remove the shroud.
2. Undo the fastening screws.
3. Disconnect the input power busbars from the module.
4. Disconnect the power supply cable from the APOW board.
5. Disconnect the door wires.
6. Remove the air guide.
7. Remove the fastening bracket.
8. Remove the front cover of the module.
9. Disconnect the fibre optic cables from the AINT board and mark down the terminals for reconnecting.

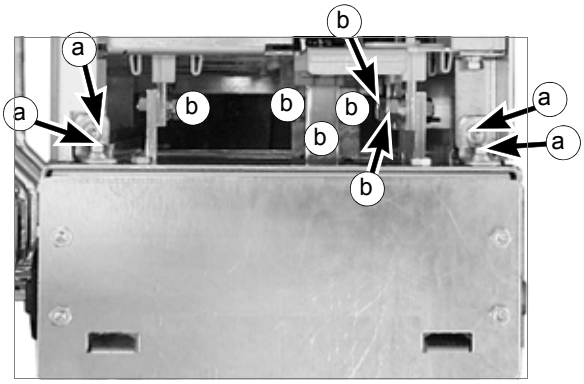


View when the module cover is removed

Photos of frame size R8

10. Disconnect the pedestal from the module by undoing the fastening (a) and busbar connecting (b) screws.

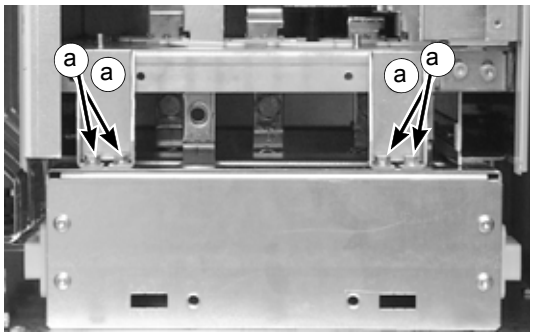
Frame size R7



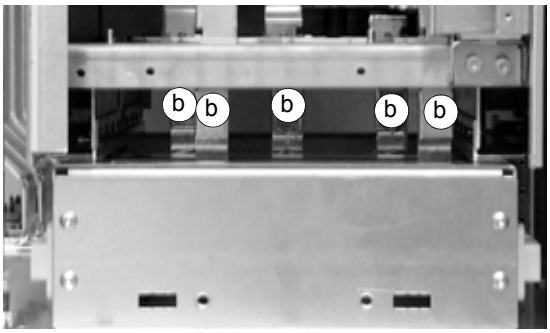
(a) M6 combi screw
Tightening torque: 5 Nm (3.7 lbf ft)

(b) M8x25 combi screw
Tightening torque: 15...22 Nm (11...16 lbf ft)

Frame size R8

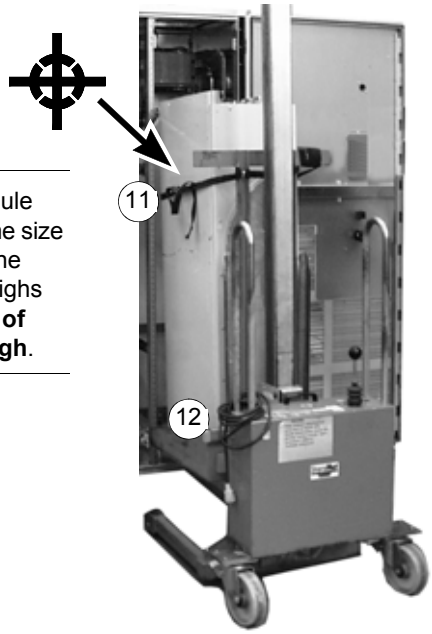


(a) M6x16 combi screws
Tightening torque: 5 Nm (3.7 lbf ft)



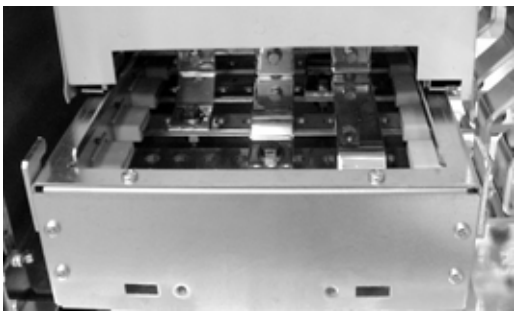
(b) M10x25 combi screws
Tightening torque: 30...44 Nm (22...32 lbf ft)

11. Secure the module to a fork lift.
12. Pull the module from the cabinet onto the fork lift.



WARNING! Secure the module properly. The module of frame size R7 weighs 90 kg (198 lb). The module of frame size R8 weighs 200 kg (441 lb). **The centre of gravity of the module is high**.

13. Install the new module in reverse order to the above.



The module is slid in on the pedestal rails (view from back, the back plate of the cabinet removed)

WARNING! Fastening of screws (a) is important because the screws are required for the grounding of the drive.

LEDs

This table describes LEDs of the drive.

Where	LED	When the LED is lit
RMIO board	Red	Drive in fault state
	Green	The power supply on the board is OK.
Control panel mounting platform	Red	Drive in fault state
	Green	The main + 24 V power supply for the control panel and the RMIO board is OK.
AINT board	V204 (green)	+5 V voltage of the board is OK.
	V309 (red)	Prevention of unexpected start is ON.
	V310 (green)	IGBT control signal transmission to the gate driver control boards is enabled.

Technical data

What this chapter contains

This chapter contains the technical specifications of the drive, e.g. the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings, and warranty policy.

IEC ratings

The IEC ratings for the ACS800-07 with 50 Hz and 60 Hz supplies are given below. The symbols are described below the table.

ACS800-07 size	Nominal ratings		No-overload use	Light-overload use		Heavy-duty use		Frame size	Air flow	Heat dissipation
	$I_{cont.max}$ A	I_{max} A	$P_{cont.max}$ kW	I_{2N} A	P_N kW	I_{2hd} A	P_{hd} kW		m^3/h	W
Three-phase supply voltage 380 V, **400 V** or 415 V										
-0070-3	141	164	75	132	55	97	45	R6	405	1440
-0100-3	166	202	90	155	75	115	55	R6	405	1940
-0120-3	202	282	110	184	90	141	75	R6	405	2310
-0130-3	214/225 4)	282	110	209/220 4)	110	162 2)	90	R6	405	2570
-0140-3	206	326	110	202	110	163	90	R7	540	3000
-0170-3	248	404	132	243	132	202	110	R7	540	3650
-0210-3	289	432	160	284	160	240 1)	132	R7	540	4300
-0260-3	445	588	200	440	200	340	160	R8	1220	6600
-0320-3	521	588	250	516	250	370	200	R8	1220	7150
-0400-3	602	840	315	590	315	477	250	R8	1220	8100
-0440-3	693	1017	355	679	355	590 2)	315	R8	1220	8650
-0490-3	720	1017	400	704	400	635 3)	355	R8	1220	9100
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V										
-0100-5	124	164	75	115	75	88	55	R6	405	1940
-0120-5	157	202	90	145	90	113	75	R6	405	2310
-0140-5	180	282	110	163	110	141	90	R6	405	2810
-0150-5	199/209 4)	282	132	194/204 4)	132	162 1)	110	R6	405	3260
-0170-5	196	326	132	192	132	162	110	R7	540	3000
-0210-5	245	384	160	240	160	192	132	R7	540	3800
-0260-5	289	432	200	284	200	224	160	R7	540	4500
-0320-5	440	588	250	435	250	340	200	R8	1220	6850
-0400-5	515	588	315	510	315	370	250	R8	1220	7800
-0440-5	550	840	355	545	355	490	315	R8	1220	7600
-0490-5	602	840	400	590	400	515 2)	355	R8	1220	8100
-0550-5	684	1017	450	670	450	590 2)	400	R8	1220	9100
-0610-5	718	1017	500	704	500	632 3)	450	R8	1220	9700
Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or **690** V										

ACS800-07 size	Nominal ratings		No-overload use	Light-overload use		Heavy-duty use		Frame size	Air flow	Heat dissipation
	$I_{cont.max}$ A	I_{max} A	$P_{cont.max}$ kW	I_{2N} A	P_N kW	I_{2hd} A	P_{hd} kW		m^3/h	W
-0070-7	79	104	75	73	55	54	45	R6	405	1220
-0100-7	93	124	90	86	75	62	55	R6	405	1650
-0120-7	113	172	110	108	90	86	75	R6	405	1960
-0140-7	134	190	132	125	110	95	90	R7	540	2800
-0170-7	166	263	160	155	132	131	110	R7	540	3550
-0210-7	166/203*	294	160	165/195*	160	147	132	R7	540	4250
-0260-7	175/230*	326	160/200*	175/212*	160/200*	163	160	R7	540	4800
-0320-7	315	433	315	290	250	216	200	R8	1220	6150
-0400-7	353	548	355	344	315	274	250	R8	1220	6650
-0440-7	396	656	400	387	355	328	315	R8	1220	7400
-0490-7	445	775	450	426	400	387	355	R8	1220	8450
-0550-7	488	853	500	482	450	426	400	R8	1220	8300
-0610-7	560	964	560	537	500	482	450	R8	1220	9750

PDM code: 00096931-H.22

1) 50% overload is available for one minute every 5 minutes if ambient temperature is less than 25 °C. If ambient temperature is 40 °C, max. available overload is 37%.

2) 50% overload is available for one minute every 5 minutes if ambient temperature is less than 30 °C. If ambient temperature is 40 °C, max. available overload is 40%.

3) 50% overload is available one minute every 5 minutes if ambient temperature is less than 20°C. If ambient temperature is 40 °C, max. available overload is 30%.

4) Higher value is valid if ambient temperature is less than 35°C.

* higher value applicable if output frequency is above 41 Hz

Symbols

Nominal ratings

$I_{cont.max}$ continuous rms output current. No overload capability at 40 °C.

I_{max} maximum output current. Available for 10 s at start, otherwise as long as allowed by drive temperature.

Typical ratings:

No-overload use

$P_{cont.max}$ typical motor power. The power ratings apply to most IEC 34 motors at the nominal voltage, 400 V, 500 V or 690 V.

Light-overload use (10% overload capability)

I_{2N} continuous rms current. 10% overload is allowed for one minute every 5 minutes.

P_N typical motor power. The power ratings apply to most IEC 34 motors at the nominal voltage, 400 V, 500 V or 690 V.

Heavy-duty use (50% overload capability)

I_{2hd} continuous rms current. 50% overload is allowed for one minute every 5 minutes.

P_{hd} typical motor power. The power ratings apply to most IEC 34 motors at the nominal voltage, 400 V, 500 V or 690 V.

Sizing

The current ratings are the same regardless of the supply voltage within one voltage range. To achieve the rated motor power given in the table, the rated current of the drive must be higher than or equal to the rated motor current.

Note 1: The maximum allowed motor shaft power is limited to $1.5 \cdot P_{hd}$, $1.1 \cdot P_N$ or $P_{cont.max}$ (whichever value is greatest). If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload. If the condition exists for 5 minutes, the limit is set to $P_{cont.max}$.

Note 2: The ratings apply at an ambient temperature of 40 °C (104 °F). At lower temperatures the ratings are higher (except I_{max}).

Note 3: Use the DriveSize PC tool for a more accurate dimensioning if the ambient temperature is below 40 °C (104 °F) or the drive is loaded cyclically.

Derating

The load capacity (current and power) decreases if the installation site altitude exceeds 1000 metres (3281 ft), or if the ambient temperature exceeds 40 °C (104 °F).

Temperature derating

In the temperature range +40 °C (+104 °F) to +50 °C (+122 °F), the rated output current is decreased 1 % for every additional 1 °C (1.8 °F). The output current is calculated by multiplying the current given in the rating table by the derating factor.

Example If the ambient temperature is 50 °C (+122 °F), the derating factor is 100% - 1 $\frac{\%}{°C}$ · 10 °C = 90 % or 0.90. The output current is then $0.90 \cdot I_{2N}$, $0.90 \cdot I_{2hd}$ or $0.90 \cdot I_{cont.max}$.

Altitude derating

At altitudes from 1000 to 4000 m (3281 to 13123 ft) above sea level, the derating is 1% for every 100 m (328 ft). For a more accurate derating, use the DriveSize PC tool. If the installation site is higher than 2000 m (6562 ft) above sea level, please contact your local ABB distributor or office for further information.

Fuses

The drive is equipped with standard gG or optional aR fuses listed below. The fuses restrict drive damage and prevent damage to adjoining equipment in case of a short-circuit inside the drive. **Check that the operating time of the fuse is below 0.5 seconds.** The operating time depends on the fuse type (gG or aR), supply network impedance and the cross-sectional area, material and length of the supply cable. In case the 0.5 seconds operating time is exceeded with gG fuses, ultra-rapid (aR) fuses will in most cases reduce the operating time to an acceptable level. See also *Planning the electrical installation*: *Thermal overload and short-circuit protection*. For UL recognized fuses, see *US tables*.

Note 1: In multicable installations, install only one fuse per phase (not one fuse per conductor).

Note 2: Larger fuses must not be used.

Note 3: Fuses from other manufacturers can be used if they meet the ratings.

Note 4: Circuit breakers must not be used without fuses.

Standard gG fuses

ACS800-07 size	Input current	Fuse					
	A	A	A^2s	V	Manufacturer	Type	IEC size
Three-phase supply voltage 380 V, **400 V** or 415 V							
-0070-3	138	160	200 000	500	ABB Control	OFAF00H160	00
-0100-3	163	200	350 000	500	ABB Control	OFAF1H200	1
-0120-3	198	224	420 000	500	ABB Control	OFAF1H224	1
-0130-3	220	250	550 000	500	ABB Control	OFAF1H250	1
-0140-3	196	250	550 000	500	ABB Control	OFAF1H250	1
-0170-3	237	315	1 100 000	500	ABB Control	OFAF2H315	2
-0210-3	286	315	1 100 000	500	ABB Control	OFAF2H315	2
-0260-3	438	500	2 900 000	500	ABB Control	OFAF3H500	3
-0320-3	501	630	4 000 000	500	ABB Control	OFAF3H630	3
-0400-3	581	630	4 000 000	500	ABB Control	OFAF3H630	3
-0440-3	674	800	7 400 000	500	ABB Control	OFAF3H800	3
-0490-3	705	800	7 400 000	500	ABB Control	OFAF3H800	3
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V							
-0100-5	121	160	200 000	500	ABB Control	OFAF00H160	00
-0120-5	155	200	350 000	500	ABB Control	OFAF1H200	1
-0140-5	180	200	350 000	500	ABB Control	OFAF1H200	1
-0150-5	205	224	420 000	500	ABB Control	OFAF1H224	1
-0170-5	191	250	550 000	500	ABB Control	OFAF1H250	1
-0210-5	243	315	1 100 000	500	ABB Control	OFAF2H315	2
-0260-5	291	315	1 100 000	500	ABB Control	OFAF2H315	2
-0320-5	424	500	2 900 000	500	ABB Control	OFAF3H500	3
-0400-5	498	630	4 000 000	500	ABB Control	OFAF3H630	3
-0440-5	543	630	4 000 000	500	ABB Control	OFAF3H630	3
-0490-5	590	630	4 000 000	500	ABB Control	OFAF3H630	3
-0550-5	669	800	7 400 000	500	ABB Control	OFAF3H800	3
-0610-5	702	800	7 400 000	500	ABB Control	OFAF3H800	3
Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or **690** V							
-0070-7	79	80	52200	690	ABB Control	OFAA0GG80	0
-0100-7	91	100	93000	690	ABB Control	OFAA1GG100	1
-0120-7	112	125	126000	690	ABB Control	OFAA1GG125	1
-0140-7	126	160	220 000	690	ABB Control	OFAA1GG160	1
-0170-7	156	200	350 000	690	ABB Control	OFAA1GG200	1
-0210-7	158/191*	250	700 000	690	ABB Control	OFAA2GG250	2
-0260-7	166/217*	250	700 000	690	ABB Control	OFAA2GG250	2
-0320-7	298	315	820 000	690	ABB Control	OFAA2GG315	2
-0400-7	333	400	1 300 000	690	ABB Control	OFAA3GG400	3
-0440-7	377	500	3 800 000	690	ABB Control	OFAA3H500	3
-0490-7	423	500	3 800 000	690	ABB Control	OFAA3H500	3
-0550-7	468	500	3 800 000	690	ABB Control	OFAA3H500	3
-0610-7	533	630	10 000 000	690	Bussmann	630NH3G-690 **	3

PDM code: 00096931-H.22

* output frequencies above 41 Hz

** rated braking capacity only up to 50 kA

Optional ultrarapid (aR) fuses

ACS800-07 size	Input current A	Fuse					
		A	A^2s	V	Manufacturer	Type DIN 43620 	Size
Three-phase supply voltage 380 V, **400 V** or 415 V							
-0070-3	138	315	80 500	690	Bussmann	170M1572	DIN000
-0100-3	163	315	46 500	690	Bussmann	170M3817	DIN1*
-0120-3	198	400	105 000	690	Bussmann	170M3819	DIN1*
-0130-3	220	400	105 000	690	Bussmann	170M3819	DIN1*
-0140-3	196	400	105 000	690	Bussmann	170M3819	DIN1*
-0170-3	237	500	145 000	690	Bussmann	170M5810	DIN2*
-0210-3	286	550	190 000	690	Bussmann	170M5811	DIN2*
-0260-3	438	800	465 000	690	Bussmann	170M6812	DIN3
-0320-3	501	1000	945 000	690	Bussmann	170M6814	DIN3
-0400-3	581	1250	1 950 000	690	Bussmann	170M8554	DIN3
-0440-3	674	1600	3 900 000	690	Bussmann	170M8557	DIN3
-0490-3	705	1600	3 900 000	690	Bussmann	170M8557	DIN3
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V							
-0100-5	121	315	80 500	690	Bussmann	170M1572	DIN000
-0120-5	155	315	46 500	690	Bussmann	170M3817	DIN1*
-0140-5	180	400	105 000	690	Bussmann	170M3819	DIN1*
-0150-5	220	400	105 000	690	Bussmann	170M3819	DIN1*
-0170-5	191	400	105 000	690	Bussmann	170M3819	DIN1*
-0210-5	243	500	145 000	690	Bussmann	170M5810	DIN2*
-0260-5	291	550	190 000	690	Bussmann	170M5811	DIN2*
-0320-5	424	800	465 000	690	Bussmann	170M6812	DIN3
-0400-5	498	1000	945 000	690	Bussmann	170M6814	DIN3
-0440-5	543	1250	1 950 000	690	Bussmann	170M8554	DIN3
-0490-5	590	1250	1 950 000	690	Bussmann	170M8554	DIN3
-0550-5	669	1600	3 900 000	690	Bussmann	170M8557	DIN3
-0610-5	702	1600	3 900 000	690	Bussmann	170M8557	DIN3
Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or **690** V							
-0070-7	79	125	8 500	690	Bussmann	170M1568	000
-0100-7	91	160	16 000	690	Bussmann	170M1569	000
-0120-7	112	200	15 000	690	Bussmann	170M3815	1*
-0140-7	126	350	68 500	690	Bussmann	170M3818	DIN1*
-0170-7	156	350	68 500	690	Bussmann	170M3818	DIN1*
-0210-7	158/191*	400	74 000	690	Bussmann	170M5808	DIN2*
-0260-7	166/217*	400	74 000	690	Bussmann	170M5808	DIN2*
-0320-7	298	630	275 000	690	Bussmann	170M5812	DIN2*
-0400-7	333	630	210 000	690	Bussmann	170M6810	DIN3
-0440-7	377	800	465 000	690	Bussmann	170M6812	DIN3
-0490-7	423	900	670 000	690	Bussmann	170M6813	DIN3
-0550-7	468	900	670 000	690	Bussmann	170M6813	DIN3
-0610-7	533	1000	945 000	690	Bussmann	170M6814	DIN3

PDM code: 00096931-H.22

A^2s value for -7 units at 660 V

* output frequencies above 41 Hz

Cable types

The table below gives copper and aluminium cable types for different load currents. Cable sizing is based on max. 9 cables laid on a cable ladder side by side, ambient temperature 30 °C, PVC insulation, surface temperature 70 °C (EN 60204-1 and IEC 60364-5-2/2001). For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive.

Copper cables with concentric copper shield		Aluminium cables with concentric copper shield	
Max. load current A	Cable type mm^2	Max. load current A	Cable type mm^2
62	3x16	61	3x25
79	3x25	75	3x35
98	3x35	91	3x50
119	3x50	117	3x70
153	3x70	143	3x95
186	3x95	165	3x120
215	3x120	191	3x150
249	3x150	218	3x185
284	3x185	257	3x240
335	3x240	274	3 x (3x50)
358	3 x (3x50)	285	2 x (3x95)
371	2 x (3x95)	331	2 x (3x120)
431	2 x (3x120)	351	3 x (3x70)
459	3 x (3x70)	382	2 x (3x150)
498	2 x (3x150)	428	3 x (3x95)
557	3 x (3x95)	437	2 x (3x185)
568	2 x (3x185)	496	3 x (3x120)
646	3 x (3x120)	515	2 x (3x240)
671	2 x (3x240)	573	3 x (3x150)
746	3 x (3x150)	655	3 x (3x185)
852	3 x (3x185)	772	3 x (3x240)
1006	3 x (3x240)		

PDM code: 00096931-C

Cable entries

Mains, motor and brake resistor cable terminal sizes (per phase), maximum accepted cable and tightening torques are given below.

Frame size	L1, L2, L3, U2, V2, W2, UDC+/R+, UDC-, R-					Earthing PE	
	Number of holes per phase	Hole diameter mm	Max. wire size mm^2	Screw	Tightening torque Nm	Screw	Tightening torque Nm
R6	1	60	185	M10	20...40	M10	30...44
R7	3	60	1x240 or 2x185	M12	50...75	M10	30...44
R8	3	60	3x240	M12	50...75	M10	30...44

Dimensions, weights and noise

Frame size	Height [1]		Width [2]	Depth [5]	Weight	Noise
	IP 21/22/42	IP 54				
	mm	mm	mm	mm	kg	dB
R6	2130	2315	430	689	300	63
R7	2130	2315	830 [3]	689	400	71
R8	2130	2315	830 [4]	689	500	72

1) in marine applications (+C121) extra height: 10 mm from the fastening bar at the bottom of the cabinet

2) extra width for units with brake resistors (+D151): SAFURxxxFxxx 400 mm, 2xSAFURxxxFxxx 800 mm, 4xSAFURxxxFxxx 1600 mm

3) extra width for units with EMC filter (+E202): 200 mm

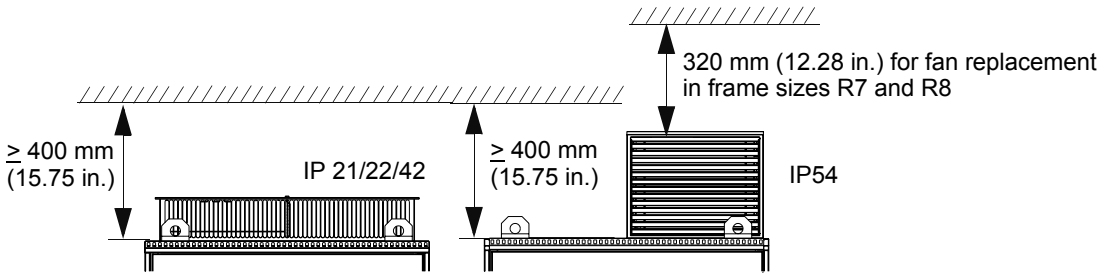
4) extra width for units with EMC filter (+E202): 400 mm

5) in marine applications (+C121) depth with fastening bars: 700 mm

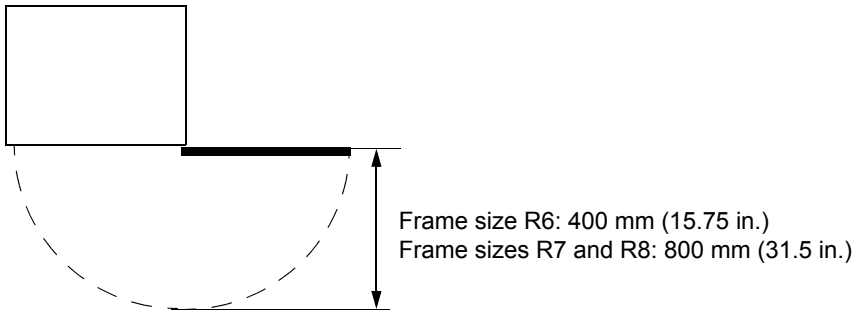
Free space around the unit

Frame size	Required free space around the unit for cooling					
	Front		Side		Above*	
	mm	in.	mm	in.	mm	in.
R6	150	5.91	-	-	400	15.75
R7	150	5.91	-	-	400	15.75
R8	150	5.91	-	-	400	15.75

* measured from the base plate of the cabinet



Space requirement for the door opening:



Input power connection

Voltage (L_1)

380/400/415 VAC 3-phase ± 10% for 400 VAC units

380/400/415/440/460/480/500 VAC 3-phase ± 10% for 500 VAC units

525/550/575/600/660/690 VAC 3-phase ± 10% for 690 VAC units

Prospective short-circuit current (IEC 60439-1)

Icw / 1 sec.	Ipk
50 kA	105 kA

US and Canada: The drive is suitable for use in a circuit capable of delivering not more than 65,000 symmetrical amperes (rms) at 600 V maximum.

Frequency

48 to 63 Hz, maximum rate of change 17%/s

Imbalance

Max. ± 3% of nominal phase to phase input voltage

Fundamental power factor (cos phi$_1$)

0.98 (at nominal load)

Motor connection

Voltage (U_2)

0 to L_1, 3-phase symmetrical, U_{max} at the field weakening point

Frequency

DTC mode: 0 to 3.2 · f_{FWP}. Maximum frequency 300 Hz.

$$f_{FWP} = \frac{U_{Nmains}}{U_{Nmotor}} \cdot f_{Nmotor}$$

f_{FWP}: frequency at field weakening point; U_{Nmains}: mains (input power) voltage; U_{Nmotor}: rated motor voltage; f_{Nmotor}: rated motor frequency

Frequency resolution

0.01 Hz

Current

See section *IEC ratings.*

Power limit

1.5 · P_{hd}, 1.1 · P_N or $P_{cont.max}$ (whichever value is greatest)

Field weakening point

8 to 300 Hz

Switching frequency

3 kHz (average). In 690 V units 2 kHz (average).

Maximum recommended motor cable length

Type code (EMC equipment)	Max. motor cable length	
	DTC control	Scalar control
-	300 m (984 ft)	300 m (984 ft)
+E202 *, +E210 *	100 m (328 ft)	100 m (328 ft)

* Motor cable longer than 100 m (328 ft) is allowed but then the EMC Directive requirements may not be fulfilled.

Efficiency

Approximately 98% at nominal power level

Cooling

Method

Internal fan, flow direction from front to top

Filter material

	Inlet (door)	Outlet (roof)
IP22 / IP 42 units	airTex G150 288 mm x 292 mm 688 mm x 521 mm	-
IP 54 units	Luftfilter/airComp 300-50 288 mm x 292 mm 688 mm x 521 mm	Luftfilter/airTex G150 2 pcs: 398 mm x 312 mm

Free space around the unit

See *Free space around the unit*.

Cooling air flow

See *IEC ratings.*

Degrees of protection

IP 21 (UL type 1), IP 22 (UL type 1), IP 42 (UL type 2), IP 54 (UL type 12 for indoor use only), IP 54R

Ambient conditions

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

	Operation installed for stationary use	**Storage** in the protective package	**Transportation** in the protective package
Installation site altitude	0 to 4000 m (13123 ft) above sea level [above 1000 m (3281 ft), see section *Derating*]	-	-
Air temperature	-15 to +50 °C (5 to 122 °F). See section *Derating.*	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	5 to 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination levels (IEC 60721-3-3, IEC 60721-3-2, IEC 60721-3-1)	No conductive dust allowed.		
	Boards without coating: Chemical gases: Class 3C1 Solid particles: Class 3S2 **Boards with coating:** Chemical gases: Class 3C2 Solid particles: Class 3S2	**Boards without coating:** Chemical gases: Class 1C2 Solid particles: Class 1S3 **Boards with coating:** Chemical gases: Class 1C2 Solid particles: Class 1S3	**Boards without coating:** Chemical gases: Class 2C2 Solid particles: Class 2S2 **Boards with coating:** Chemical gases: Class 2C2 Solid particles: Class 2S2
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres	70 to 106 kPa 0.7 to 1.05 atmospheres	60 to 106 kPa 0.6 to 1.05 atmospheres
Vibration (IEC 60068-2)	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 3.5 mm (0.14 in.) (2 to 9 Hz), max. 15 m/s^2 (49 ft/s^2) (9 to 200 Hz) sinusoidal
Shock (IEC 60068-2-29)	Not allowed	Max. 100 m/s^2 (330 $ft./s^2$), 11 ms	Max. 100 m/s^2 (330 $ft./s^2$), 11 ms
Free fall	Not allowed	100 mm (4 in.) for weight over 100 kg (220 lb)	100 mm (4 in.) for weight over 100 kg (220 lb)

Materials

Cabinet	Hot-dip zinc coated 1.5 mm thick steel sheet (thickness of coating approximately 20 micrometres). Polyester thermosetting powder coating (thickness approximately 80 micrometres) on visible surfaces. Colour RAL 7035 light beige semigloss.
Busbars	Tin-plated copper
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items mostly self-extinctive
Package	Wood. Plastic covering of the package: PE-LD, bands PP or steel.
Disposal	The drive contains raw materials that should be recycled to preserve energy and natural resources. The package materials are environmentally compatible and recyclable. All metal parts can be recycled. The plastic parts can either be recycled or burned under controlled circumstances, according to local regulations. Most recyclable parts are marked with recycling marks. If recycling is not feasible, all parts excluding electrolytic capacitors and printed circuit boards can be landfilled. The DC capacitors (C1-1 to C1-x) contain electrolyte and the printed circuit boards contain lead, both of which will be classified as hazardous waste within the EU. They must be removed and handled according to local regulations. For further information on environmental aspects and more detailed recycling instructions, please contact your local ABB distributor.

Applicable standards

	The drive complies with the standards below. The compliance with the European Low Voltage Directive is verified according to standards EN 50178 and EN 60204-1.
• EN 50178 (1997)	Electronic equipment for use in power installations
• EN 60204-1 (1997)	Safety of machinery. Electrical equipment of machines. Part 1: General requirements. *Provisions for compliance:* The final assembler of the machine is responsible for installing - an emergency-stop device
• EN 60529: 1991 (IEC 529)	Degrees of protection provided by enclosures (IP code)
• IEC 60664-1 (1992)	Insulation coordination for equipment within low-voltage systems. Part 1: Principles, requirements and tests.
• EN 61800-3 (1996) + Amendment A11 (2000)	EMC product standard including specific test methods
• UL 508C	UL Standard for Safety, Power Conversion Equipment, second edition
• UL 508A	UL Standard for Industrial Control Panels, first edition
• NEMA 250 (2003)	Enclosures for Electrical Equipment (1000 Volts Maximum)
• CSA C22.2 No. 14-95	Industrial control equipment

CE marking

A CE mark is attached to the drive to verify that the unit follows the provisions of the European Low Voltage and EMC Directives (Directive 73/23/EEC, as amended by 93/68/EEC and Directive 89/336/EEC, as amended by 93/68/EEC).

Definitions

EMC stands for **E**lectro**m**agnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard [EN 61800-3 + Amendment A11 (2000)] covers requirements stated for drives.

First environment includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes.

Second environment includes establishments connected to a network not supplying domestic premises.

Restricted distribution: mode of sales distribution in which the manufacturer restricts the supply of equipment to suppliers, customers or users who separately or jointly have technical competence in the EMC requirements of the application of drives.

Unrestricted distribution: mode of sales distribution in which the supply of equipment is not dependent on the EMC competence of the customer or user for the application of drives.

Compliance with the EMC Directive

First environment

The requirements of the EMC Directive can be met as follows for restricted distribution:

1. The drive is equipped with EMC filter E202.
2. The motor and control cables are selected as specified in the *Hardware Manual*.
3. The drive is installed according to the instructions given in the *Hardware Manual*.
4. Maximum cable length is 100 metres.

WARNING! The drive may cause radio interference if used in a residential or domestic environment. The user is required to take measures to prevent interference, in addition to the requirements for CE compliance listed above, if necessary.

Note: It is not allowed to install a drive equipped with EMC filter E202 on IT (unearthed) systems. The supply network becomes connected to earth potential through the EMC filter capacitors which may cause danger or damage the unit.

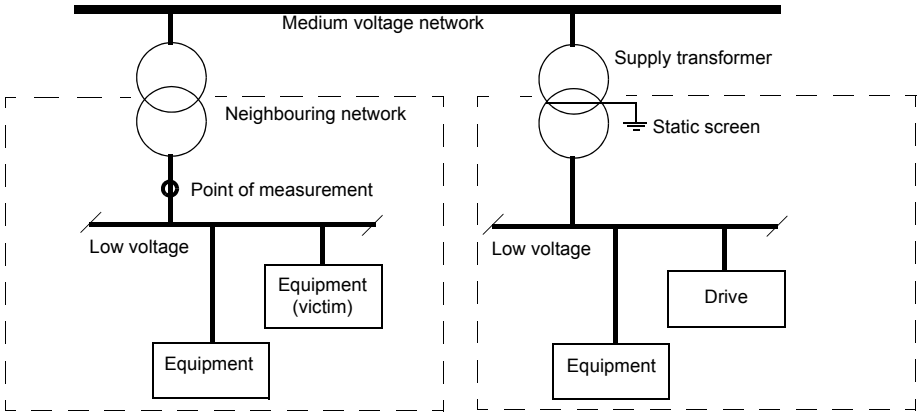
Second environment

The requirements of the EMC Directive can be met as follows:

1. The drive is equipped with EMC filter E200 [suitable for TN (earthed) networks] or E210 [suitable for TN (earthed) and IT (unearthed) networks].
2. The motor and control cables are selected as specified in the *Hardware Manual*.
3. The drive is installed according to the instructions given in the *Hardware Manual*.
4. Maximum cable length is 100 metres.

If the above listed provisions cannot be met, the requirements of the EMC Directive can be met as follows for restricted distribution:

1. It is ensured that no excessive emission is propagated to neighbouring low-voltage networks. In some cases, the natural suppression in transformers and cables is sufficient. If in doubt, the supply transformer with static screening between the primary and secondary windings can be used.



2. An EMC plan for preventing disturbances is drawn up for the installation. A template is available from the local ABB representative.
3. The motor and control cables are selected as specified in the *Hardware Manual*.
4. The drive is installed according to the instructions given in the *Hardware Manual*.

Machinery Directive

The drive complies with the European Union Machinery Directive (98/37/EC) requirements for an equipment intended to be incorporated into machinery.

“C-tick” marking

“C-tick” marking is pending as follows.

“C-tick” marking is required in Australia and New Zealand. A “C-tick” mark is attached to each drive in order to verify compliance with the relevant standard (IEC 61800-3 (1996) – Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods), mandated by the Trans-Tasman Electromagnetic Compatibility Scheme.

Definitions

EMC stands for **E**lectro**m**agnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

The Trans-Tasman Electromagnetic Compatibility Scheme (EMCS) was introduced by the Australian Communication Authority (ACA) and the Radio Spectrum Management Group (RSM) of the New Zealand Ministry of Economic Development (NZMED) in November 2001. The aim of the scheme is to protect the radio frequency spectrum by introducing technical limits for emission from electrical/ electronic products.

First environment includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes.

Second environment includes establishments connected to a network not supplying domestic premises.

Restricted distribution: mode of sales distribution in which the manufacturer restricts the supply of equipment to suppliers, customers or users who separately or jointly have technical competence in the EMC requirements of the application of drives.

Unrestricted distribution: mode of sales distribution in which the supply of equipment is not dependent on the EMC competence of the customer or user for the application of drives.

Compliance with IEC 61800-3

First environment (restricted distribution)

The drive complies with the limits of IEC 61800-3 with the following provisions:

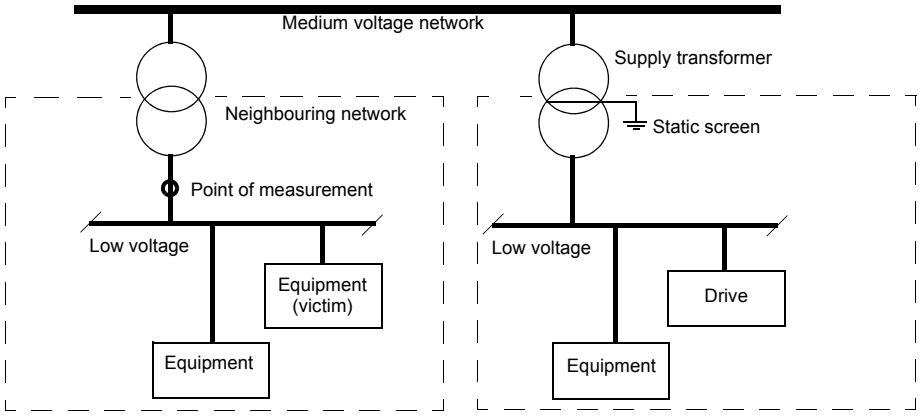
1. The drive is equipped with EMC filter E202.
2. The drive is installed according to the instructions given in the *Hardware Manual*.
3. The motor and control cables used are selected as specified in the *Hardware Manual*.
4. Maximum cable length is 100 metres.

Note: The drive must not be equipped with the EMC filter E202 when installed to IT (unearthed) systems. The mains becomes connected to earth potential through the EMC filter capacitors. In IT systems this may cause danger or damage the unit.

Second environment

The drive complies with the limits of IEC 61800-3 with the following provisions:

1. It is ensured that no excessive emission is propagated to neighbouring low-voltage networks. In some cases, the natural suppression in transformers and cables is sufficient. If in doubt, the supply transformer with static screening between the primary and secondary windings is strongly recommended.



2. The drive is installed according to the instructions given in the *Hardware Manual*.
3. The motor and control cables used are selected as specified in the *Hardware Manual*.

Equipment warranty and liability

The manufacturer warrants the equipment supplied against defects in design, materials and workmanship for a period of twelve (12) months after installation or twenty-four (24) months from date of manufacturing, whichever first occurs. The local ABB office or distributor may grant a warranty period different to the above and refer to local terms of liability as defined in the supply contract.

The manufacturer is not responsible for

- any costs resulting from a failure if the installation, commissioning, repair, alternation, or ambient conditions of the drive do not fulfil the requirements specified in the documentation delivered with the unit and other relevant documentation.
- units subjected to misuse, negligence or accident
- units comprised of materials provided or designs stipulated by the purchaser.

In no event shall the manufacturer, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, losses or penalties.

If you have any questions concerning your ABB drive, please contact the local distributor or ABB office. The technical data, information and specifications are valid at the time of printing. The manufacturer reserves the right to modifications without prior notice.

US tables

NEMA ratings

The NEMA ratings for the ACS800-U7 and ACS800-07 with 60 Hz supplies are given below. The symbols are described below the table. For sizing, derating and 50 Hz supplies, see *IEC ratings*.

ACS800-U7 size ACS800-07 size	I_{max}	Normal use		Heavy-duty use		Frame size	Air flow	Heat dissipation
		I_{2N}	P_N	I_{2hd}	P_{hd}			
	A	A	HP	A	HP		ft^3/min	BTU/Hr
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V								
-0100-5	164	124	100	96	75	R6	238	6610
-0120-5	202	157	125	124	100	R6	238	7890
-0140-5	282	180	150	156	125	R6	238	9600
-0170-5	326	192	150	162	125	R7	318	10100
-0210-5	384	240	200	192	150	R7	318	12900
-0260-5	432	289 [1]	250 [2]	224	150	R7	318	15300
-0270-5 **	480	316	250	240	200	R8	718	15350
-0300-5 **	568	361	300	302	250	R8	718	18050
-0320-5	588	435	350	340	250	R8	718	23250
-0400-5	588	510	400	370	300	R8	718	26650
-0440-5	840	545	450	490	400	R8	718	25950
-0490-5	840	590	500	515 [3]	450	R8	718	27600
-0550-5	1017	670	550	590 [3]	500	R8	718	31100
-0610-5	1017	718 [4]	600	590 [3]	500	R8	718	33000
Three-phase supply voltage 525 V, **575 V** or 600 V								
-0070-7	104	73	60	54	50	R6	238	4200
-0100-7	124	86	75	62	60	R6	238	5650
-0120-7	172	108	100	86	75	R6	238	6700
-0140-7	190	125	125	95	100 [2]	R7	318	9600
-0170-7	263	155	150	131	125	R7	318	12150
-0210-7	294	165/195*	150/200*	147	150	R7	318	14550
-0260-7	326	175/212*	150/200*	163	150	R7	318	16400
-0320-7	433	290	300	216	200	R8	718	21050
-0400-7	548	344	350	274	250	R8	718	22750
-0440-7	656	387	400	328	350 [2]	R8	718	25300
-0490-7	775	426	450	387	400	R8	718	28900
-0550-7	853	482	500	426	450	R8	718	28350
-0610-7	964	537	500	482	500	R8	718	33300

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[1] available if ambient temperature is less than 30 °C (86 °F). If ambient temperature is 40 °C (104 °F), I_{2N} is 286 A.

[2] special 4-pole high-efficiency NEMA motor

[3] 50% overload is allowed for one minute every five minutes if ambient temperature is less than 30 °C (86 °F). 40% overload is allowed if ambient temperature is 40 °C (104 °F).

[4] available if ambient temperature is less than 30 °C (86 °F). If ambient temperature is 40 °C (104 °F), I_{2N} is 704 A.

* higher value available if output frequency is above 41 Hz

** ACS800-U7 types only

Symbols

I_{max}	maximum output current. Available for 10 s at start, otherwise as long as allowed by drive temperature.
Normal use (10% overload capability)	
I_{2N}	continuous rms current. 10% overload is typically allowed for one minute every 5 minutes.
P_N	typical motor power. The power ratings apply to most 4-pole NEMA rated motors (460 V or 575 V).
Heavy-duty use (50% overload capability)	
I_{2hd}	continuous rms current. 50% overload is typically allowed for one minute every 5 minutes.
P_{hd}	typical motor power. The power ratings apply to most 4-pole NEMA rated motors (460 V or 575 V).

Note: The ratings apply at an ambient temperature of 40 °C (104 °F). At lower temperatures the ratings are higher.

Input cable fuses

The drive is equipped for branch circuit protection per NEC with standard T/L or optional aR fuses listed below. The fuses restrict drive damage and prevent damage to adjoining equipment in case of a short-circuit inside the drive. **Check that the operating time of the fuse is below 0.5 seconds.** The operating time depends on the fuse type (T/L or aR), supply network impedance and the cross-sectional area, material and length of the supply cable. The fuses must be of the “non-time delay” type. See also *Planning the electrical installation*: *Thermal overload and short-circuit protection*.

Note 1: In multicable installations, install only one fuse per phase (not one fuse per conductor).

Note 2: Larger fuses must not be used.

Note 3: Fuses from other manufacturers can be used if they meet the ratings.

Note 4: Circuit breakers must not be used without fuses.

ACS800-U7 type	Input current	Fuse				
	A	A	V	Manufacturer	Type	UL class
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V						
-0100-5	121	150	600	Bussmann	JJS-150	T
-0120-5	155	200	600	Bussmann	JJS-200	T
-0140-5	179	225	600	Bussmann	JJS-225	T
-0170-5	175	250	600	Bussmann	JJS-250	T
-0210-5	220	300	600	Bussmann	JJS-300	T
-0260-5	267	400	600	Bussmann	JJS-400	T
-0270-5	293	500	600	Bussmann	JJS-500	T
-0300-5	331	500	600	Bussmann	JJS-500	T
-0320-5	397	500	600	Bussmann	JJS-500	T
-0400-5	467	600	600	Bussmann	JJS-600	T
-0440-5	501	800	600	Bussmann	KTU-800	L
-0490-5	542	800	600	Bussmann	KTU-800	L
-0550-5	614	800	600	Bussmann	KTU-800	L
-0610-5	661	800	600	Bussmann	KTU-800	L
Three-phase supply voltage 525 V, **575 V** or 600 V						
-0070-7	70	100	600	Bussmann	JJS-100	T
-0100-7	82	125	600	Bussmann	JJS-125	T
-0120-7	103	150	600	Bussmann	JJS-150	T
-0140-7	117	200	600	Bussmann	JJS-200	T
-0170-7	146	200	600	Bussmann	JJS-200	T
-0210-7	184	250	600	Bussmann	JJS-250	T
-0260-7	199	300	600	Bussmann	JJS-300	T
-0320-7	273	500	600	Bussmann	JJS-500	T
-0400-7	325	500	600	Bussmann	JJS-500	T
-0440-7	370	500	600	Bussmann	JJS-500	T
-0490-7	407	600	600	Bussmann	JJS-600	T
-0550-7	463	600	600	Bussmann	JJS-600	T
-0610-7	513	700	600	Bussmann	KTU-700	L

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Cable types

Cable sizing is based on NEC Table 310-16 for copper wires, 75 °C (167 °F) wire insulation at 40 °C (104 °F) ambient temperature. Not more than three current-carrying conductors in raceway or cable or earth (directly buried). For other conditions, dimension the cables according to local safety regulations, appropriate input voltage and the load current of the drive.

Copper cables with concentric copper shield	
Max. load current A	**Cable type** AWG/kcmil
57	6
75	4
88	3
101	2
114	1
132	1/0
154	2/0
176	3/0
202	4/0
224	250 MCM or 2 x 1
251	300 MCM or 2 x 1/0
273	350 MCM or 2 x 2/0
295	400 MCM or 2 x 2/0
334	500 MCM or 2 x 3/0
370	600 MCM or 2 x 4/0 or 3 x 1/0
405	700 MCM or 2 x 4/0 or 3 x 2/0
449	2 x 250 MCM or 3 x 2/0
502	2 x 300 MCM or 3 x 3/0
546	2 x 350 MCM or 3 x 4/0
590	2 x 400 MCM or 3 x 4/0
669	2 x 500 MCM or 3 x 250 MCM
739	2 x 600 MCM or 3 x 300 MCM
810	2 x 700 MCM or 3 x 350 MCM
884	3 x 400 MCM or 4 x 250 MCM
1003	3 x 500 MCM or 4 x 300 MCM
1109	3 x 600 MCM or 4 x 400 MCM
1214	3 x 700 MCM or 4 x 500 MCM

Cable entries

Input, motor and brake resistor cable terminal sizes (per phase) and tightening torques are given below. Two-hole 1/2 inch diameter cable lugs can be used.

Frame size		**L1, L2, L3, U2, V2, W2, UDC+/R+, UDC-, R-**		**Earthing PE**	
	Max. cable kcmil/AWG	**Screw**	**Tightening torque** lbf ft	**Screw**	**Tightening torque** lbf ft
R6	350 MCM	3/8	14.8...29.5	3/8	22...32
R7	2x250 MCM	1/2	37...55	3/8	22...32
R8	3x700 MCM	1/2	37...55	3/8	22...32

Dimensions and weights

Frame size	Height [1]		Width [2]	Depth [5]	Weight
	UL type 1 in.	UL type 12 in.	 in.	 in.	 lb
R6	84.22	91.08	16.93	27.28	700
R7	84.22	91.08	32.92 [3]	27.28	900
R8	84.22	91.08	32.92 [4]	27.28	1100

1) in marine applications (+C121) extra height: 0.39 in. from the fastening bar at the bottom of the cabinet

2) extra width for units with brake resistors (+D151): SAFURxxxFxxx 15.75 in., 2xSAFURxxxFxxx 19.68 in., 4xSAFURxxxFxxx 62.99 in.

3) extra width for units with EMC filter (+E202): 7.87 in.

4) extra width for units with EMC filter (+E202): 15.75 in.

5) in marine applications (+C121) depth with fastening bars: 27.56 in.

UL/CSA markings

The ACS800-U7 and the ACS800-07+C129 are C-UL US listed. CSA marking is pending. The approval is valid with rated voltages (up to 600 V).

UL

The drive is suitable for use on a circuit capable of delivering not more than 65 kA rms symmetrical amperes at the drive nominal voltage (600 V maximum for 690 V units).

The drive provides overload protection in accordance with the National Electrical Code (US). See *ACS800 Firmware Manual* for setting. Default setting is off; the setting must be activated at start-up.

The drives are to be used in a heated indoor controlled environment. See section *Ambient conditions* for specific limits.

ABB brake choppers, when applied with appropriately sized brake resistors, will allow the drive to dissipate regenerative energy (normally associated with quickly decelerating a motor). Proper application of the brake chopper is defined in chapter *Resistor braking*. This can be applied to a single drive or multiple drives with DC bus connected to allow a sharing of regenerative energy.

US patents

This product is protected by one or more of the following US patents.

4,920,306	5,301,085	5,463,302	5,521,483	5,532,568	5,589,754
5,654,624	5,799,805	5,940,286	5,942,874	5,952,613	6,094,364
6,147,887	6,175,256	6,184,740	6,195,274	6,229,356	6,252,436
6,265,724	6,305,464	6,313,599	6,316,896	6,335,607	6,370,049
6,396,236	6,448,735	6,498,452	6,552,510	6,597,148	6,741,059
6,774,758	6,844,794	6,856,502	6,859,374	6,922,883	6,940,253
6,934,169	6,956,352	6,958,923	6,967,453	6,972,976	6,977,449
6,984,958	6,985,371	6,992,908	6,999,329	7,023,160	7,034,510
7,036,223	7,045,987	D503,931	D510,319	D510,320	D511,137
D511,150	D512,026	D512,696			

Other patents pending.

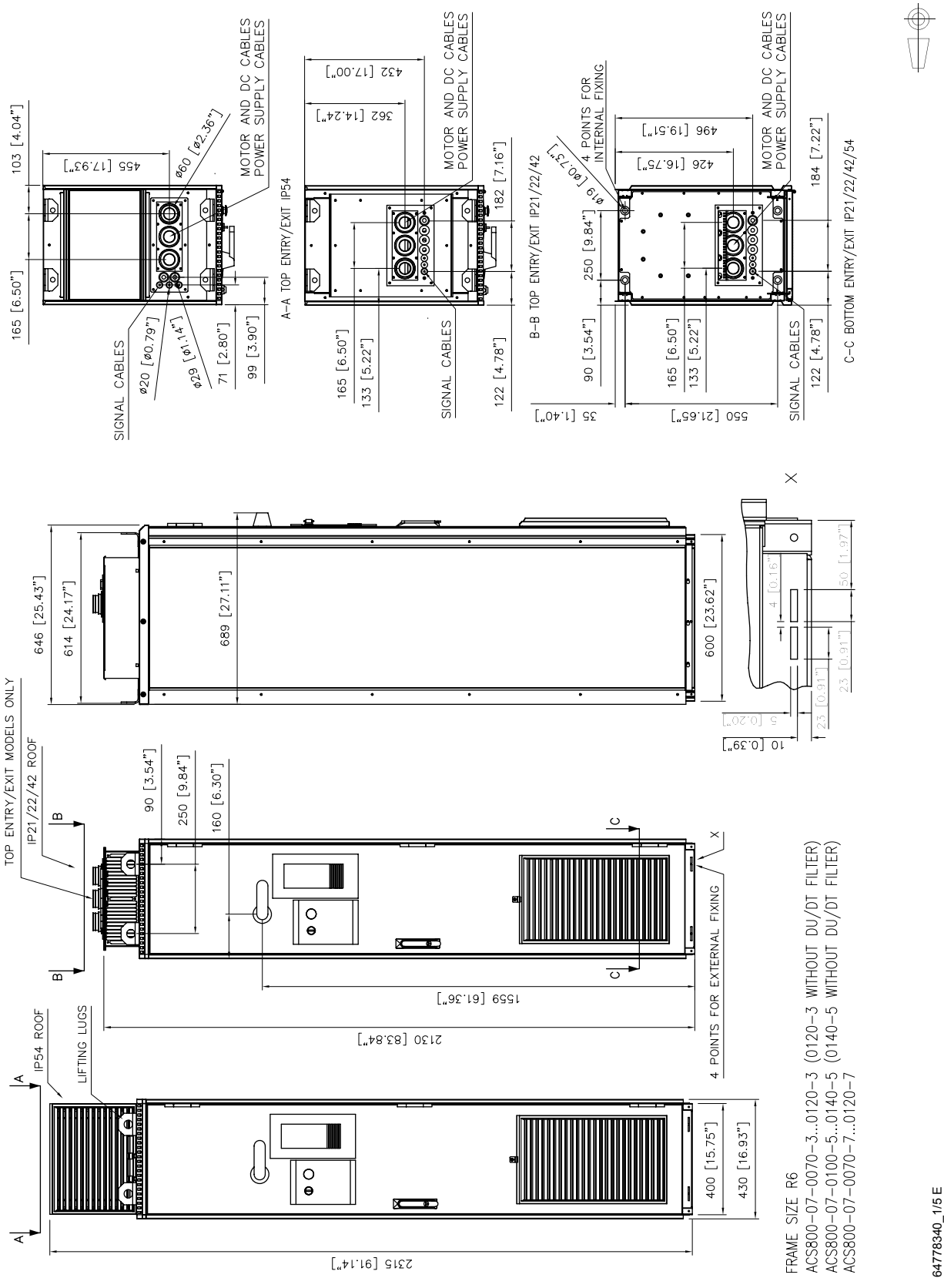
Dimensional drawings

Example dimensional drawings with dimensions in milllimetres and [inches] are shown below.

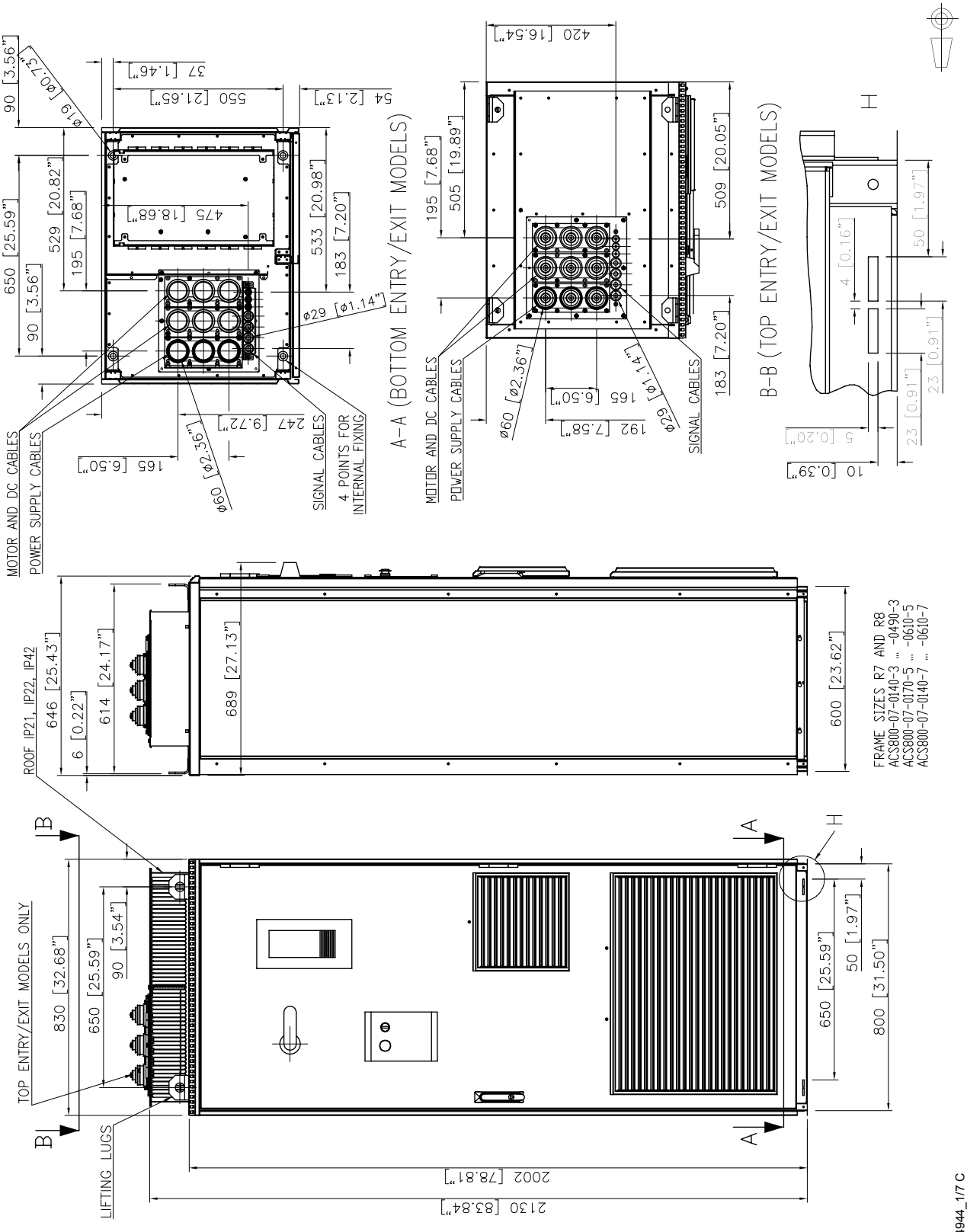
See *ACS800-07/U7 Dimensional Drawings* [3AFE 64775421 (English)] for

- location of cable connection terminals
- units with EMC filter, du/dt filter and brake resistors
- marine units
- US drawings.

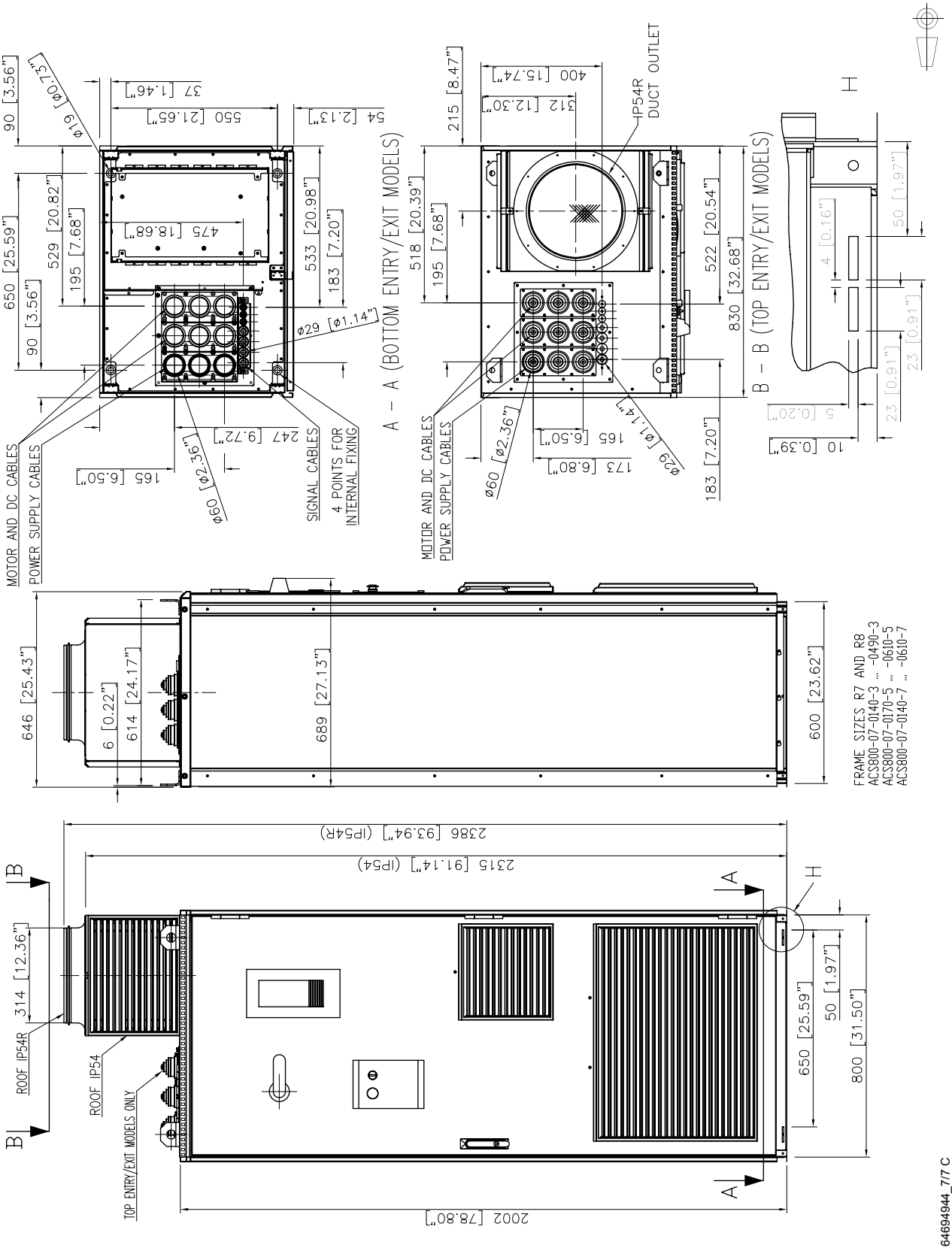
Frame size R6



Frame sizes R7 and R8



IP 54 and IP 54R units of frame sizes R7 and R8



Resistor braking

What this chapter contains

This chapter describes how to select, protect and wire brake choppers and resistors. The chapter also contains the technical data.

To which products this chapter applies

This chapter applies to the ACS800-01/U1 (frame sizes R2 to R6), ACS800-02/U2 (frame sizes R7 and R8), ACS800-04/U4 (frame sizes R7 and R8) and ACS800-07/U7 (frame sizes R6, R7 and R8).

Availability of brake choppers and resistors for the ACS800

Frame R2 and R3 drives have a built-in brake chopper as standard equipment. For frames R4 and up, brake choppers are optionally available as built-in units, indicated in the type code by +D150.

Resistors are available as add-on kits. For the ACS800-07/U7, resistors are available as factory installed.

How to select the correct drive/chopper/resistor combination

1. Calculate the maximum power *(P_{max})* generated by the motor during braking.
2. Select a suitable drive / brake chopper / brake resistor combination for the application according to the following tables (take account of other factors in the drive selection also). The following condition must be met:

   $$P_{br} \geq P_{max}$$

   where

   P_{br} denotes P_{br5}, P_{br10}, P_{br30}, P_{br60}, or P_{brcont} depending on the duty cycle.

3. Check the resistor selection. The energy generated by the motor during a 400-second period must not exceed the resistor heat dissipation capacity E_R.

   If the E_R value is not sufficient, it is possible to use a four-resistor assembly in which two standard resistors are connected in parallel, two in series. The E_R value of the four-resistor assembly is four times the value specified for the standard resistor.

Note: A resistor other than the standard resistor can be used provided that:

- its resistance is not lower than the resistance of the standard resistor.

WARNING! Never use a brake resistor with a resistance below the value specified for the particular drive / brake chopper / resistor combination. The drive and the chopper are not able to handle the overcurrent caused by the low resistance.

- the resistance does not restrict the braking capacity needed, i.e.,

$$P_{max} < \frac{U_{DC}^2}{R}$$

where

P_{max}	maximum power generated by the motor during braking
U_{DC}	voltage over the resistor during braking, e.g., 1.35 · 1.2 · 415 VDC (when supply voltage is 380 to 415 VAC), 1.35 · 1.2 · 500 VDC. (when supply voltage is 440 to 500 VAC) or 1.35 · 1.2 · 690 VDC (when supply voltage is 525 to 690 VAC).
R	resistor resistance (ohm)

- the heat dissipation capacity *(E_R)* is sufficient for the application (see step 3 above).

Optional brake chopper and resistor(s) for the ACS800-01/U1

The nominal ratings for dimensiong the brake resistors for the ACS800-01 and ACS800-U1 are given below at an ambient temperature of 40 °C (104 °F).

ACS 800-01 type **ACS 800-U1 type**	**Braking power of the chopper and the drive**	**Brake resistor(s)**			
	P_{brcont} (kW)	**Type**	R (ohm)	E_R (kJ)	P_{Rcont} (kW)
230 V units					
-0001-2	0.55	SACE08RE44	44	248	1
-0002-2	0.8	SACE08RE44	44	248	1
-0003-2	1.1	SACE08RE44	44	248	1
-0004-2	1.5	SACE08RE44	44	248	1
-0005-2	2.2	SACE15RE22	22	497	2
-0006-2	3.0	SACE15RE22	22	497	2
-0009-2	4.0	SACE15RE22	22	497	2
-0011-2	5.5	SACE15RE13	13	497	2
-0016-2	11	SAFUR90F575	8	1800	4.5
-0020-2	17	SAFUR90F575	8	1800	4.5
-0025-2	23	SAFUR80F500	6	2400	6
-0030-2	28	SAFUR125F500	4	3600	9
-0040-2	33	SAFUR125F500	4	3600	9
-0050-2	45	2xSAFUR125F500	2	7200	18
-0060-2	56	2xSAFUR125F500	2	7200	18
-0070-2	68	2xSAFUR125F500	2	7200	18

ACS 800-01 type ACS 800-U1 type	Braking power of the chopper and the drive	Brake resistor(s)			
	P_{brcont} (kW)	Type	R (ohm)	E_R (kJ)	P_{Rcont} (kW)
400 V units					
-0003-3	1.1	SACE08RE44	44	210	1
-0004-3	1.5	SACE08RE44	44	210	1
-0005-3	2.2	SACE08RE44	44	210	1
-0006-3	3.0	SACE08RE44	44	210	1
-0009-3	4.0	SACE08RE44	44	210	1
-0011-3	5.5	SACE15RE22	22	420	2
-0016-3	7.5	SACE15RE22	22	420	2
-0020-3	11	SACE15RE22	22	420	2
-0025-3	23	SACE15RE13	13	435	2
-0030-3	28	SACE15RE13	13	435	2
-0040-3	33	SAFUR90F575	8	1800	4.5
-0050-3	45	SAFUR90F575	8	1800	4.5
-0060-3	56	SAFUR90F575	8	1800	4.5
-0070-3	68	SAFUR80F500	6	2400	6
-0100-3	83	SAFUR125F500	4	3600	9
-0120-3	113	SAFUR125F500	4	3600	9
500 V units					
-0004-5	1.5	SACE08RE44	44	210	1
-0005-5	2.2	SACE08RE44	44	210	1
-0006-5	3.0	SACE08RE44	44	210	1
-0009-5	4.0	SACE08RE44	44	210	1
-0011-5	5.5	SACE08RE44	44	210	1
-0016-5	7.5	SACE15RE22	22	420	2
-0020-5	11	SACE15RE22	22	420	2
-0025-5	15	SACE15RE22	22	420	2
-0030-5	28	SACE15RE13	13	435	2
-0040-5	33	SACE15RE13	13	435	2
-0050-5	45	SAFUR90F575	8	1800	4.5
-0060-5	56	SAFUR90F575	8	1800	4.5
-0070-5	68	SAFUR90F575	8	1800	4.5
-0100-5	83	SAFUR125F500	4	3600	9
-0120-5	113	SAFUR125F500	4	3600	9
-0140-5	135	SAFUR125F500	4	3600	9
690 V units					
-0011-7	5.5	SACE08RE44	44	248	1
-0016-7	7.5	SACE08RE44	44	248	1
-0020-7	11	SACE08RE44	44	248	1
-0025-7	15	SACE08RE44	44	248	1
-0030-7	18.5	SACE15RE22	22	497	2
-0040-7	22	SACE15RE22	22	497	2
-0050-7	30	SAFUR90F575	8	1800	4.5
-0060-7	37	SAFUR90F575	8	1800	4.5
-0070-7	45	SAFUR90F575	8	1800	4.5
-0100-7	55	SAFUR80F500	6	2400	6
-0120-7	75	SAFUR80F500	6	2400	6

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P_{brcont} The drive and the chopper will withstand this continuous braking power. The braking is considered continuous if the braking time exceeds 30 s.
Note: Check that the braking energy transmitted to the specified resistor(s) in 400 seconds does not exceed E_R.

R Resistance value for the listed resistor assembly. **Note:** This is also the minimum allowed resistance for the brake resistor.

E_R Short energy pulse that the resistor assembly withstands every 400 seconds. This energy will heat the resistor element from 40 °C (104 °F) to the maximum allowable temperature.

P_{Rcont} Continuous power (heat) dissipation of the resistor when placed correctly. Energy E_R dissipates in 400 seconds.

All braking resistors must be installed outside the converter module. The SACE brake resistors are built in an IP 21 metal housing. The SAFUR brake resistors are built in an IP 00 metal frame. **Note:** The SACE and SAFUR resistors are not UL listed.

Optional brake chopper and resistor(s) for the ACS800-02/U2, ACS800-04/04M/U4 and ACS800-07/U7

The nominal ratings for dimensiong the brake resistors for the ACS800-02/U2, ACS800-04/04M/U4 and ACS800-07/U7 are given below at an ambient temperature of 40 °C (104 °F).

ACS 800 type	Frame size	Braking power of the chopper and the drive				Brake resistor(s)			
		5/60 s P_{br5} (kW)	10/60 s P_{br10} (kW)	30/60 s P_{br30} (kW)	P_{brcont} (kW)	Type	R (ohm)	E_R (kJ)	P_{Rcont} (kW)
230 V units									
-0080-2	R7	68	68	68	54	SAFUR160F380	1.78	3600	9
-0100-2	R7	83	83	83	54	SAFUR160F380	1.78	3600	9
-0120-2	R7	105	67	60	40	2xSAFUR200F500	1.35	10800	27
-0140-2	R8	135	135	135	84	2xSAFUR160F380	0.89	7200	18
-0170-2	R8	135	135	135	84	2xSAFUR160F380	0.89	7200	18
-0210-2	R8	165	165	165	98	2xSAFUR160F380	0.89	7200	18
-0230-2	R8	165	165	165	113	2xSAFUR160F380	0.89	7200	18
-0260-2	R8	223	170	125	64	4xSAFUR160F380	0.45	14400	36
-0300-2	R8	223	170	125	64	4xSAFUR160F380	0.45	14400	36
400 V units									
-0070-3	R6	-	-	-	68	SAFUR80F500	6	2400	6
-0100-3	R6	-	-	-	83	SAFUR125F500	4	3600	9
-0120-3	R6	-	-	-	113	SAFUR125F500	4	3600	9
-0130-3	R6	-	-	-	113	SAFUR125F500	4	3600	9
-0140-3	R7	135	135	100	80	SAFUR200F500	2.70	5400	13.5
-0170-3	R7	165	150	100	80	SAFUR200F500	2.70	5400	13.5
-0210-3	R7	165	150	100	80	SAFUR200F500	2.70	5400	13.5
-0260-3	R8	240	240	240	173	2XSAFUR210F575	1.70	8400	21
-0320-3	R8	300	300	300	143	2xSAFUR200F500	1.35	10800	27
-0400-3	R8	375	375	273	130	4xSAFUR125F500	1.00	14400	36
-0440-3	R8	473	355	237	120	4xSAFUR210F575	0.85	16800	42
-0490-3	R8	500	355	237	120	4xSAFUR210F575	0.85	16800	42
500 V units									
-0100-5	R6	-	-	-	83	SAFUR125F500	4	3600	9
-0120-5	R6	-	-	-	113	SAFUR125F500	4	3600	9
-0140-5	R6	-	-	-	135	SAFUR125F500	4	3600	9
-0150-5	R6	-	-	-	135	SAFUR125F500	4	3600	9
-0170-5	R7	165	132 [2]	120	80	SAFUR200F500	2.70	5400	13.5
-0210-5	R7	198	132 [2]	120	80	SAFUR200F500	2.70	5400	13.5
-0260-5	R7	198 [1]	132 [2]	120	80	SAFUR200F500	2.70	5400	13.5
-0270-5*	R8	240	240	240	240	2xSAFUR125F500	2.00	7200	18
-0300-5*	R8	280	280	280	280	2xSAFUR125F500	2.00	7200	18
-0320-5	R8	300	300	300	300	2xSAFUR125F500	2.00	7200	18
-0400-5	R8	375	375	375	234	2XSAFUR210F575	1.70	8400	21
-0440-5	R8	473	473	450	195	2xSAFUR200F500	1.35	10800	27
-0490-5	R8	480	480	470	210	2xSAFUR200F500	1.35	10800	27
-0550-5	R8	600	400 [4]	300	170	4xSAFUR125F500	1.00	14400	36
-0610-5	R8	600 [3]	400 [4]	300	170	4xSAFUR125F500	1.00	14400	36

ACS 800 type	Frame size	Braking power of the chopper and the drive				Brake resistor(s)			
		5/60 s P_{br5} (kW)	10/60 s P_{br10} (kW)	30/60 s P_{br30} (kW)	P_{brcont} (kW)	Type	R (ohm)	E_R (kJ)	P_{Rcont} (kW)
690 V units									
-0070-7	R6	-	-	-	45	SAFUR90F575	8.00	1800	4.5
-0100-7	R6	-	-	-	55	SAFUR80F500	6.00	2400	6
-0120-7	R6	-	-	-	75	SAFUR80F500	6.00	2400	6
-0140-7	R7	125 [5)]	110	90	75	SAFUR80F500	6.00	2400	6
-0170-7	R7	125 [6)]	110	90	75	SAFUR80F500	6.00	2400	6
-0210-7	R7	125 [6)]	110	90	75	SAFUR80F500	6.00	2400	6
-0260-7	R7	135 [7)]	120	100	80	SAFUR80F500	6.00	2400	6
-0320-7	R8	300	300	300	260	SAFUR200F500	2.70	5400	13.5
-0400-7	R8	375	375	375	375	SAFUR200F500	2.70	5400	13.5
-0440-7	R8	430	430	430	385	SAFUR200F500	2.70	5400	13.5
-0490-7	R8	550	400	315	225	2xSAFUR125F500	2.00	7200	18
-0550-7	R8	550	400	315	225	2xSAFUR125F500	2.00	7200	18
-0610-7	R8	550	400	315	225	2xSAFUR125F500	2.00	7200	18

PDM code 00096931-G

P_{br5} Maximum braking power of the drive with the specified resistor(s). The drive and the chopper will withstand this braking power for 5 seconds per minute.

P_{br10} The drive and the chopper will withstand this braking power for 10 seconds per minute.

P_{br30} The drive and the chopper will withstand this braking power for 30 seconds per minute.

P_{brcont} The drive and the chopper will withstand this continuous braking power. The braking is considered continuous if the braking time exceeds 30 s.

Note: Check that the braking energy transmitted to the specified resistor(s) in 400 seconds does not exceed E_R.

R Resistance value for the resistor assembly. **Note:** This is also the minimum allowed resistance for the brake resistor.

E_R Short energy pulse that the resistor assembly withstands every 400 seconds. This energy will heat the resistor element from 40 °C (104 °F) to the maximum allowable temperature.

P_{Rcont} Continuous power (heat) dissipation of the resistor when placed correctly. Energy E_R dissipates in 400 seconds.

***** ACS800-Ux types only

1) 240 kW possible if ambient temperature is below 33 °C (91 °F)

2) 160 kW possible if ambient temperature is below 33 °C (91 °F)

3) 630 kW possible if ambient temperature is below 33 °C (91 °F)

4) 450 kW possible if ambient temperature is below 33 °C (91 °F)

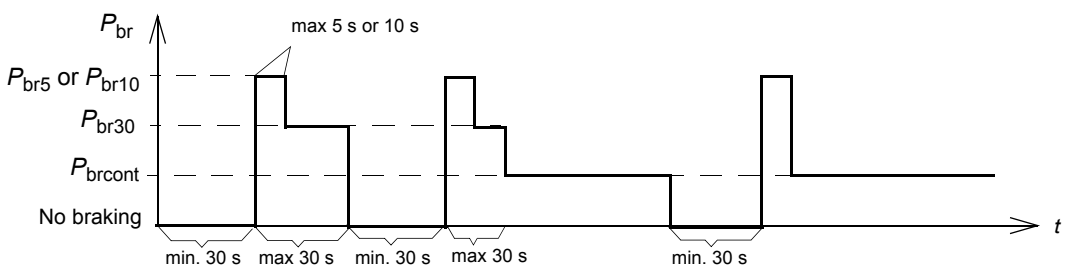
5) 135 kW possible if ambient temperature is below 33 °C (91 °F)

6) 148 kW possible if ambient temperature is below 33 °C (91 °F)

7) 160 kW possible if ambient temperature is below 33 °C (91 °F)

Combined braking cycles for R7:

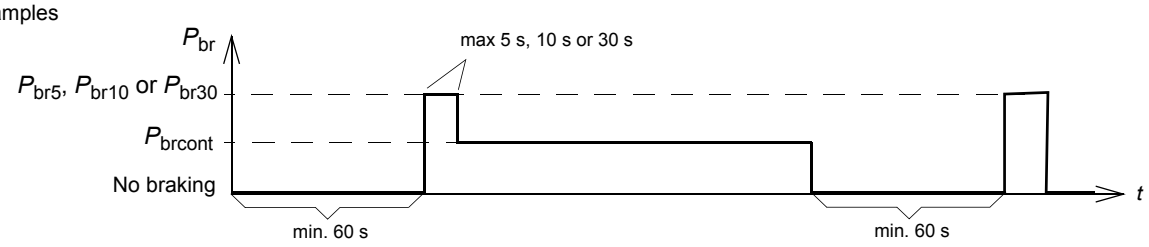
Examples



- After P_{br5}, P_{br10} or P_{br30} braking, the drive and the chopper will withstand P_{brcont} continuously.
- P_{br5}, P_{br10} or P_{br30} braking is allowed once every minute.
- After P_{brcont} braking, there has to be at least 30 seconds without any braking if the subsequent braking power is greater than P_{brcont}.
- After P_{br5} or P_{br10} braking, the drive and the chopper will withstand P_{br30} within a total braking time of 30 seconds.
- P_{br10} braking is not acceptable after P_{br5} braking.

Combined braking cycles for R8:

Examples



- After P_{br5}, P_{br10} or P_{br30} braking, the drive and the chopper will withstand P_{brcont} continuously. (P_{brcont} is the only allowed braking power after P_{br5}, P_{br10} or P_{br30}.)
- P_{br5}, P_{br10} or P_{br30} braking is allowed once every minute.
- After P_{brcont} braking, there has to be at least 60 seconds without any braking if the subsequent braking power is greater than P_{brcont}.

All braking resistors must be installed outside the converter module. The resistors are built in an IP 00 metal frame. The 2xSAFUR and 4xSAFUR resistors are connected in parallel. **Note:** The SAFUR resistors are not UL listed.

Resistor installation and wiring

All resistors must be installed outside the drive module in a place where they will cool.

WARNING! The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. Protect the resistor against contact.

Use the cable type used for drive input cabling (see chapter *Technical data)* to ensure the input fuses will also protect the resistor cable. Alternatively, two-conductor shielded cable with the same cross-sectional area can be used. The maximum length of the resistor cable(s) is 10 m (33 ft). For the connections, see the power connection diagram of the drive.

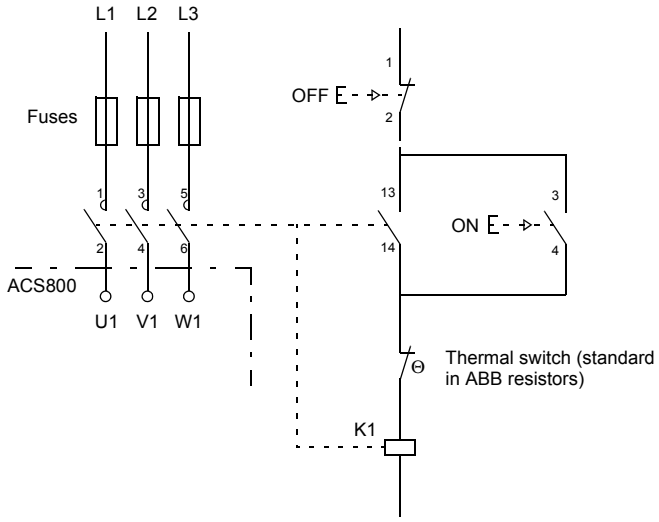
ACS800-07/U7

If ordered, the resistors are factory installed in a cubicle(s) next to the drive cabinet.

Protection of frame sizes R2 to R5 (ACS800-01/U1)

It is highly recommended to equip the drive with a main contactor for safety reasons. Wire the contactor so that it opens in case the resistor overheats. This is essential for safety since the drive will not otherwise be able to interrupt the main supply if the chopper remains conductive in a fault situation.

Below is a simple example wiring diagram.

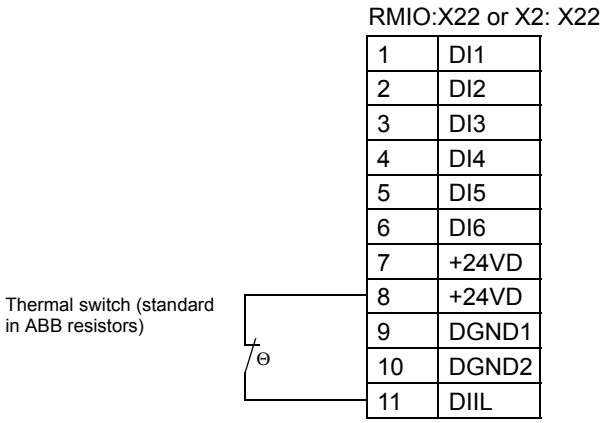


Protection of frame size R6 (ACS800-01, ACS800-07) and frame sizes R7 and R8 (ACS800-02, ACS800-04, ACS800-07)

A main contactor is not required for protecting against resistor overheating when the resistor is dimensioned according to the instructions and the internal brake chopper is in use. The drive will disable power flow through the input bridge if the chopper remains conductive in a fault situation. **Note:** If an external brake chopper (outside the drive module) is used, a main contactor is always required.

A thermal switch (standard in ABB resistors) is required for safety reasons. The cable must be shielded and not longer than the resistor cable.

With Standard Application Program, wire the thermal switch as shown below. By default, the drive will stop by coasting when the switch opens.



For other application programs, the thermal switch may be wired to a different digital input. Programming of the input to trip the drive by “EXTERNAL FAULT” may be needed. See the appropriate firmware manual.

Brake circuit commissioning

For Standard Application Program:

- Enable the brake chopper function (parameter 27.01).
- Switch off the overvoltage control of the drive (parameter 20.05).
- Check the resistance value setting (parameter 27.03).
- Frame sizes R6, R7 and R8: Check the setting of parameter 21.09. If stop by coasting is required, select OFF2 STOP.

For the use of the brake resistor overload protection (parameters 27.02...27.05), consult an ABB representative.

WARNING! If the drive is equipped with a brake chopper but the chopper is not enabled by parameter setting, the brake resistor must be disconnected because the protection against resistor overheating is then not in use.

For settings of other application programs, see the appropriate firmware manual.

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