ACQ800

Hardware Manual
ACQ800-37 Drives (55 to 450 kW / 75 to 550 hp)

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List of related manuals

Drive hardware manuals and guides

ACQ800-37 Drives (55 to 450 kW / 75 to 550 hp) Hardware Manual	*3AXD50000038534*

Drive (inverter) firmware manuals and guides

ACQ800 Pump Control Program Firmware Manual	*3AXD50000035604*
Adaptive Programming Application Guide	*3AFE64527274*

Option manuals and guides

Cabinet Options for ACS800-07/U7/17/37 Description	*3AUA0000053130*
Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

ACQ800-37 Drives
55 to 450 kW (75 to 550 hp)

Hardware Manual

3AXD50000038534 REV A EN
EFFECTIVE: 2016-06-01

Safety instructions

What this chapter contains

This chapter contains safety instructions 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.

Usage 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, and advise on 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 voltages 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, or damage the equipment.

WARNING!

- Only qualified electricians are allowed to install and maintain the drive.
- The main switch on the cabinet door does not remove the voltage from the input busbars of the drive. Before working on the drive, isolate the whole drive from the supply.
- Never work on the drive, the motor cable or the motor when main power is applied. After switching off the input power, always wait for 5 min to let the intermediate circuit capacitors discharge before you start working on the drive, the motor or the motor cable. Measure the voltage between terminals UDC+ and UDC- (L+ and L–) with a multimeter (impedance at least 1 Mohm) to ensure that the drive is discharged before beginning work.
- Apply temporary grounding before working on the unit.
- 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 to exist inside the drive even when the main power of 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.
- When joining shipping splits (if any), check the cable connections at the joints before switching on the supply voltage.
- Live parts on the inside of the doors are protected against direct contact. Special attention shall be paid when handling metallic shrouds.
- After maintaining or modifying a drive safety circuit or changing circuit boards inside the module, retest the functioning of the safety circuit according to the start-up instructions.
- Do not change the electrical installations of the drive except for the essential control and power connections. Changes may affect the safety performance or operation of the drive unexpectedly. All customer-made changes are the customer’s responsibility.

Note:

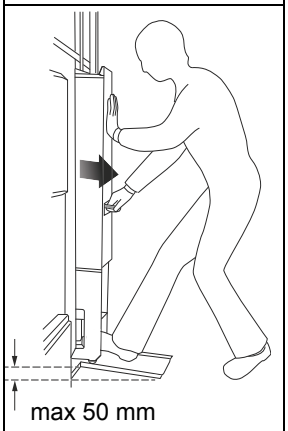
- The motor cable terminals on the drive are at a dangerously high voltage when the input power is on, regardless of whether the motor is running or not.

- 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 relay outputs of the drive system.

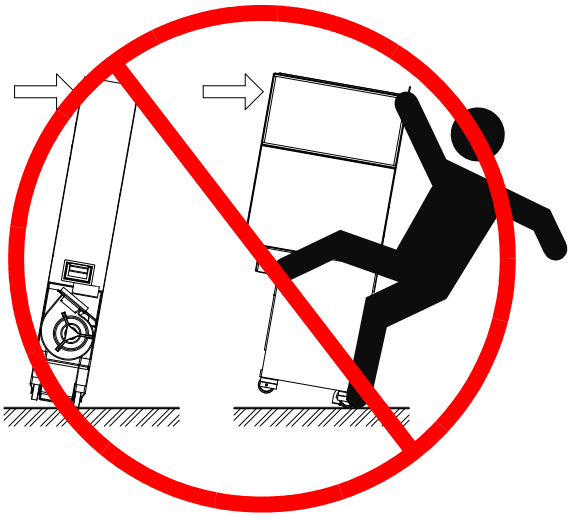
WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Use extreme caution when maneuvering an inverter, supply or filter module that runs on wheels. The modules are heavy and have a high center of gravity. They topple over easily if handled carelessly.
- Do not use the ramp which is supplied with the drive with heights over 50 mm (1.97 in) (the standard plinth height of ABB cabinets). The ramp is designed for a plinth height of 50 mm (1.97 in).

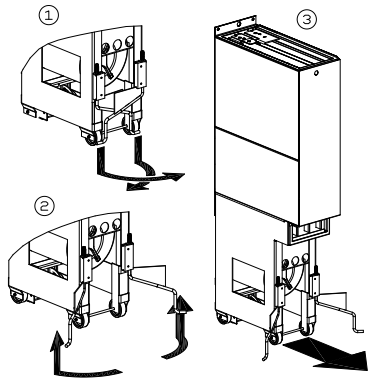
Support the top and bottom of the module while removing!



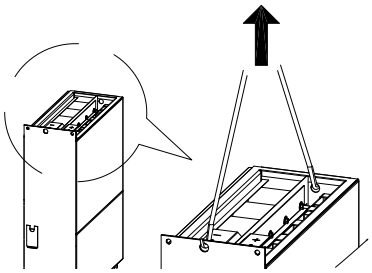
Do not tilt!



Extend the support legs outside the cabinet!

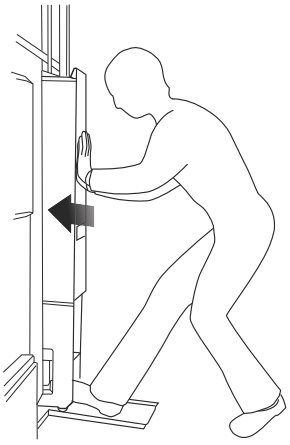


Lift the module by the upper part only using the lifting hole(s) at the top!



Mind your fingers! Keep fingers away from the edges of the front flange of the module!

Support the top and bottom of the module while replacing!



- When removing a module which is equipped with wheels, pull the module carefully out of the cubicle along the ramp. Make sure that the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.
- When replacing a module which is equipped with wheels, push the module up the ramp and back into the cubicle. Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.
- Electrically conductive dust inside the unit may cause damage or lead to malfunction. Make sure that dust from drilling does not enter the drive when installing.
- Fastening the cabinet by riveting or welding is not recommended. However, if welding is necessary, ensure the return wire is properly connected in order not to damage the electronic equipment in the cabinet. Also ensure that welding fumes are not inhaled.
- Ensure sufficient cooling of the unit.
- Cooling fans may continue to rotate for a while after the disconnection of the electrical supply.
- Some parts inside the drive cabinet, such as heatsinks of power semiconductors, remain hot for a while after the disconnection of the electrical supply.

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 equipped with an EMC (line) filter to 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, a fixed protective earth connection is required by EN 61800-5-1, 4.3.5.5.2. The cross-section of the protective grounding conductor must be at least 10 mm^2 Cu or 16 mm^2 Al.

Fiber optic cables

WARNING!

- Handle the fiber optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibers with bare hands as the fiber 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 Control 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 (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 Prevention of unexpected start-up function (option +Q950) for stopping the drive when the inverter unit(s) is running. Give a Stop command instead.
- The Safe torque off function (option +Q968) can be used for stopping the drive in emergency stop situations. In the normal operating mode, use the Stop command instead.

Note:

- If an external source for start command is selected and it is ON, the drive (with Standard Control 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 .

Table of contents

Electrical installation

Maintenance

Fault tracing

Technical data

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 installed per the National Electrical Code and local codes are marked with (US).

Common chapters for multiple products

Some chapters in this manual apply to several products including the ACQ800-37. Other product types may be mentioned in these chapters.

Categorization according to the frame size

Some instructions, technical data and dimensional drawings which concern only certain drive frame sizes are marked with the symbol of the frame size (such as “R8i”, etc.). 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*.

Contents

The chapters of this manual are briefly described below.

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

About this manual introduces this manual.

The ACQ800-37 describes the drive.

Mechanical installation instructs how to move, place and mount the drive.

Planning the electrical installation provides advice on motor and cable selection, the protective functions of the drive, and cable routing.

Electrical installation describes the cabling and wiring of 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.

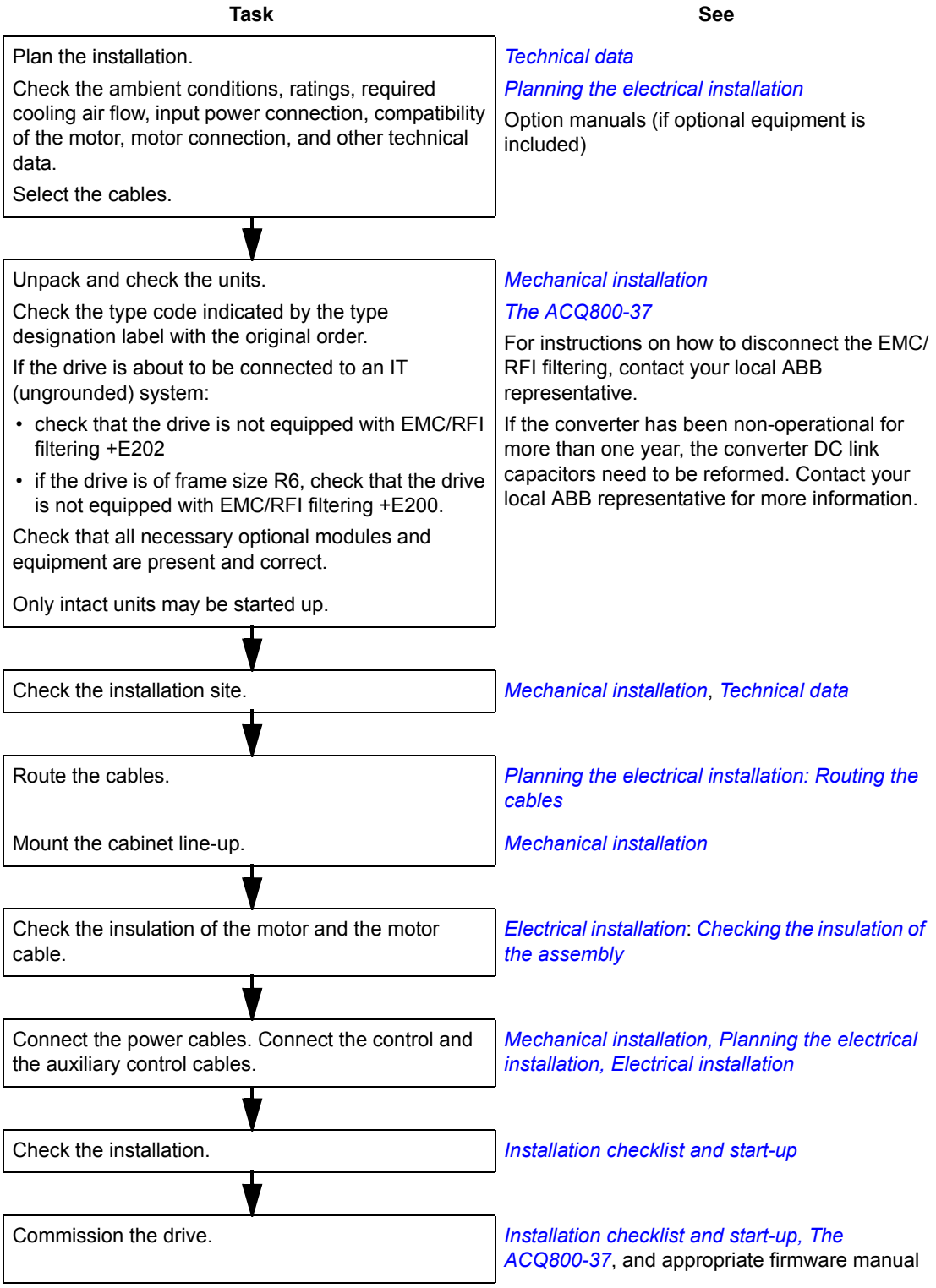
Maintenance contains preventive maintenance instructions.

Fault tracing contains troubleshooting instructions.

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

Dimensions contains information on the dimensions of the drive.

Installation and commissioning flowchart



Inquiries

Address any inquiries about the product to the local ABB representative, quoting the type code and serial number of the unit. If the local ABB representative cannot be contacted, address inquiries to ABB Inc., Discrete Automation & Motion, Drives and Controls, 16250 West Glendale Drive, New Berlin, WI 53151.

Terms and abbreviations

Term/Abbreviation	Explanation
AGPS	Gate driver power supply board. An optional board within drives, used to implement the Prevention of unexpected start-up function.
APBU	Type of optical branching unit used for connecting parallel-connected converter modules to the RDCU.
ASTO	An optional board within drives, used to implement the Safe torque off function.
CMF	Common mode filtering.
DDCS	Distributed Drives Communication System; a protocol used in optical fiber communication inside and between ABB drives.
Drive unit	See *Motor-side converter*.
EMC	Electromagnetic Compatibility.
Frame (size)	Relates to the construction type of the component in question. For example, several drive types with different power ratings may have the same basic construction, and this term is used in reference to all those drive types. With the ACQ800-37, the frame size of the drive indicates the quantity and frame size of the inverter modules, e.g. “R8i”. To determine the frame size of a drive type, see the rating tables in chapter *Technical data*.
IGBT	Insulated Gate Bipolar Transistor; a voltage-controlled semiconductor type widely used in inverters because of their easy controllability and high switching frequency.
IGBT supply module	Bidirectional IGBT bridge and related components enclosed inside a metal frame or enclosure. Intended for cabinet installation. Used as the supply module in regenerative and low-harmonic drives.
IGBT supply unit (ISU)	See *Line-side converter*.
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed inside a metal frame or enclosure. Intended for cabinet installation.
Inverter unit (INU)	See *Motor-side converter*.
Line-side converter	A converter that is connected to the supply network and is capable of transferring energy from the network to the DC link of the drive. With ACQ800-37 drives of frame size R8i, the line-side converter is also called the (IGBT) supply unit or the ISU.

Term/Abbreviation	Explanation
Motor-side converter	A converter that is connected to the motor and controls the motor operation. With ACQ800-37 drives of frame size R8i, the motor-side converter is also called the inverter unit or INU.
PPCS	Power Plate Communication System; a protocol used in the optical fiber link that controls the output semiconductors of an inverter module.
RDCU	Drive control unit. The RDCU is a separate unit consisting of an RMIO board built in a plastic housing.
RFI	Radio-Frequency Interference.
RMIO	Motor control and I/O board. Contains the principal inputs and outputs of the drive. The RMIO is contained within the RDCU drive control unit.
THD	Total Harmonic Distortion.

The ACQ800-37

What this chapter contains

This chapter describes the construction of the drive in short.

The ACQ800-37

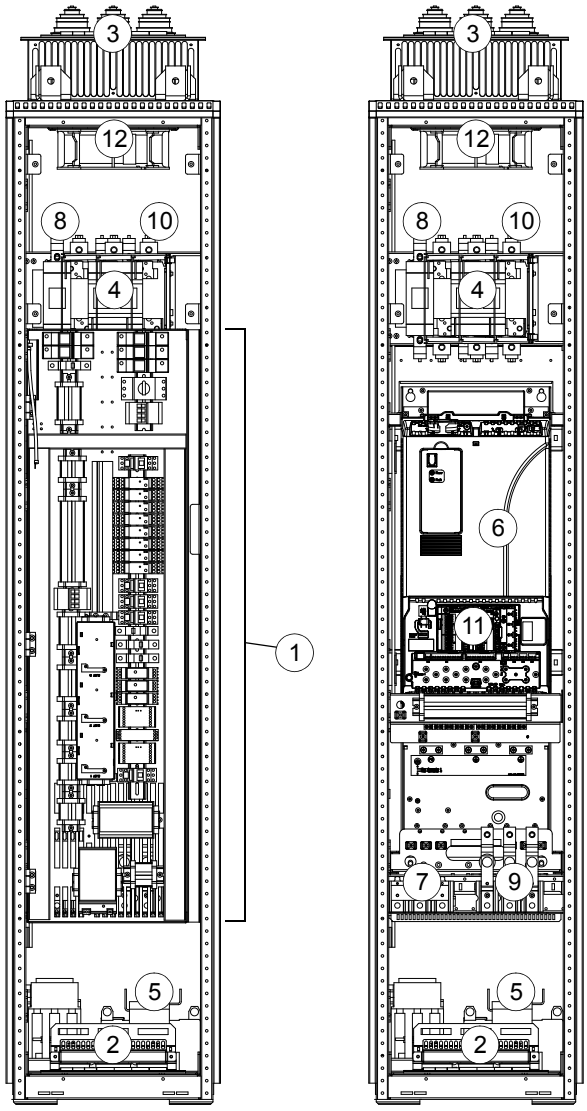
The ACQ800-37 is a cabinet-built, low-harmonic drive for controlling AC motors.

Cabinet line-up

The drive consists of one or more cubicles that contain the supply and motor terminals, 1 IGBT supply module forming the line-side converter, 1 inverter module forming the motor-side converter, and optional equipment. (Frame R6 drives employ an integrated supply/inverter module.) The actual arrangement of the cubicles varies from type to type and with the selected options. See also chapter *Dimensions* for the different line-up variations.

Frame R6

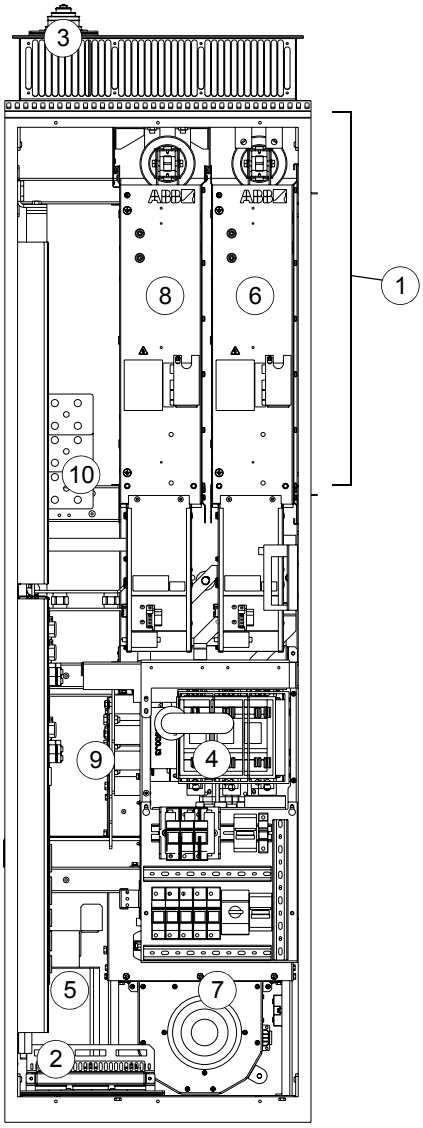
The picture below shows the main components of a frame R6 drive with the door open, and with the swing-out frame closed (left) and open (right).



No.	Description
1	Swing-out frame (see page 29)
2	Cable entries for power and control cables (bottom cable entry/exit models)
3	Cable entries for power and control cables (top cable entry/exit models)
4	Switch fuse
5	Auxiliary voltage transformer
6	Integrated line-side/motor-side converter module
7	Input terminals (bottom cable entry/exit models)
8	Input terminals (top cable entry/exit models)
9	Output terminals (bottom cable entry/exit models)
10	Output terminals (top cable entry/exit models)
11	Control unit (RDCU) for motor-side converter
12	Cabinet cooling fan

Frame R7i

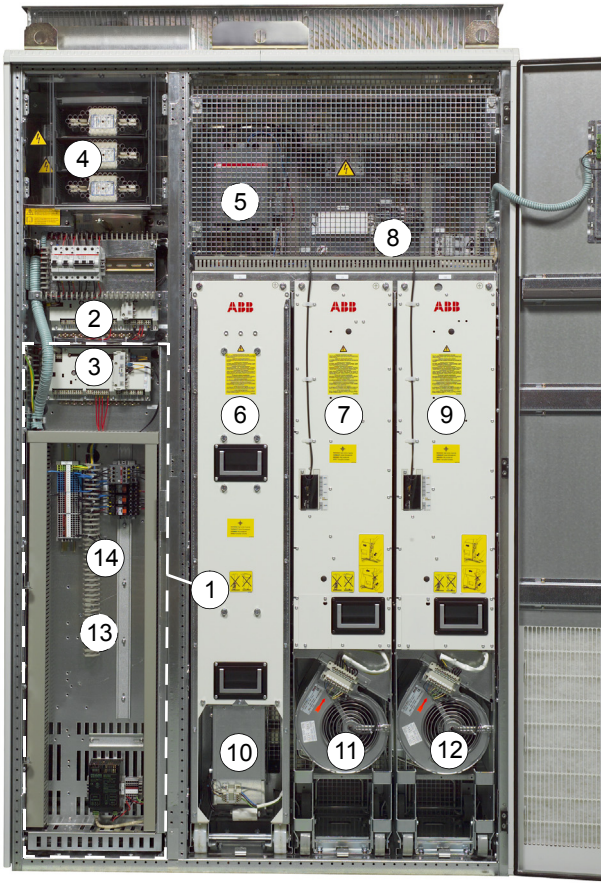
The picture below shows the main components of a frame R7i drive with the door and the swing-out frame open.



No.	Description
1	Swing-out frame (see page 29) (not shown). The drive control units for both converter modules are installed on the swing-out frame.
2	Cable entries for power and control cables (bottom cable entry/exit models)
3	Cable entries for power and control cables (top cable entry/exit models)
4	Switch fuse
5	Auxiliary voltage transformer
6	Line-side converter module
7	LCL filter
8	Motor-side converter module
9	Input terminals
10	Output terminals

Frame R8i

The picture below shows the main components of a frame R8i drive with the doors open.



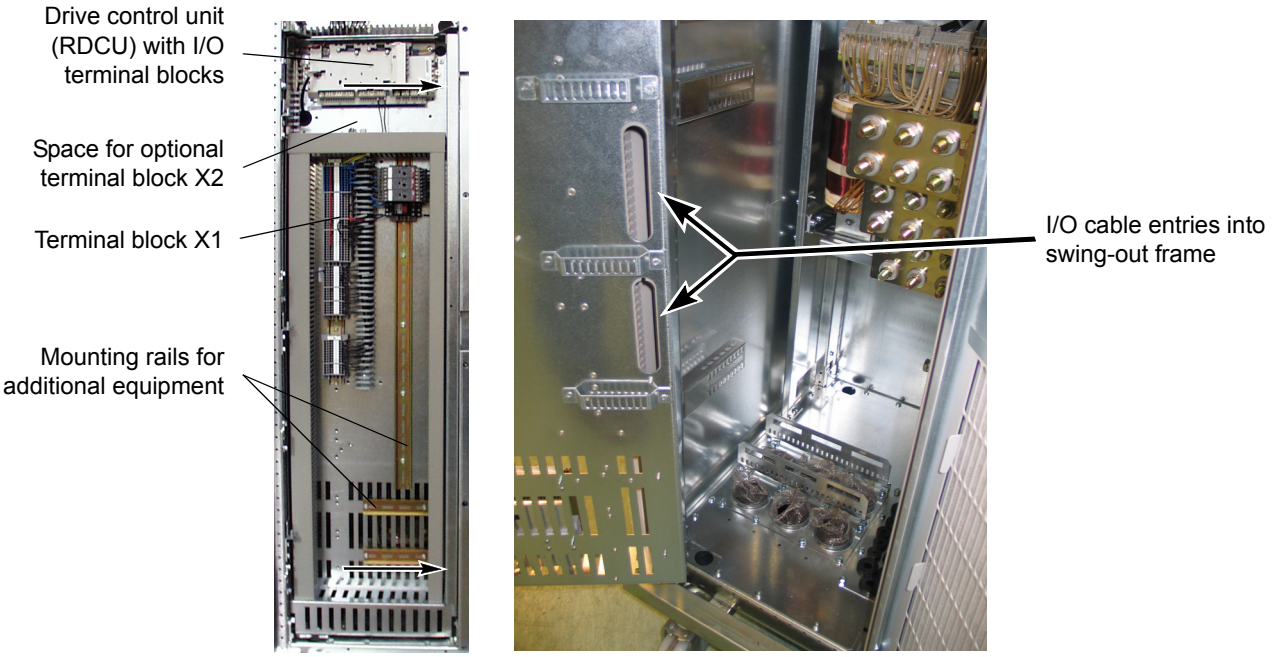
No.	Description
1	Swing-out frame (see picture on page 29)
2	Supply unit controller (RDCU)
3	Inverter unit controller (RDCU)
4	Switch-disconnector
5	Input contactor
6	LCL filter
7	IGBT supply module
8	Intermediate DC link
9	Inverter module
10	Cooling fan for LCL filter
11	Cooling fan for IGBT supply module
12	Cooling fan for inverter module
13	Auxiliary voltage transformer (accessible by opening the swing-out frame)
14	Auxiliary voltage circuitry (relays etc.)

Swing-out frame

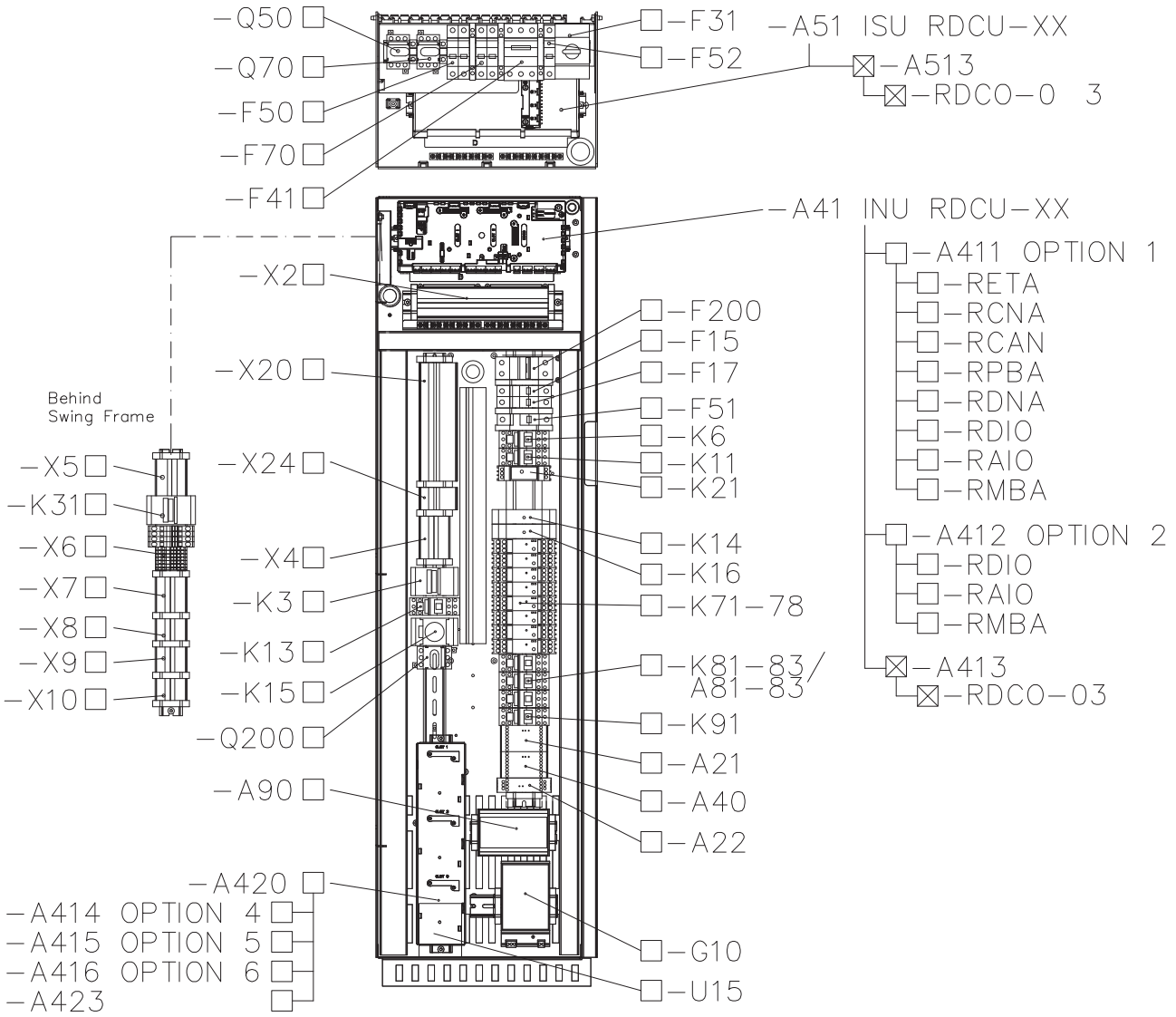
The swing-out frame provides space for the control circuitry of the drive as well as optional electrical equipment. The frame can be opened by removing the locking screws (arrowed in the picture below) and moving the swing-out frame aside. Depending on the frame size of the drive, the actual equipment of the drive may differ from what is depicted.

Remove screws (arrowed) to open swing-out frame

Swing-out frame open



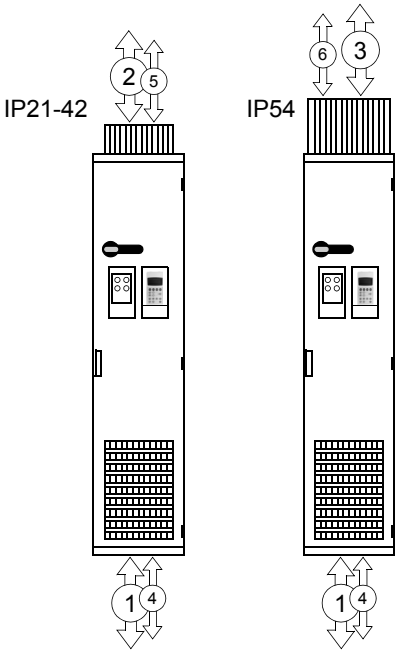
The following is a generic device layout diagram for the swing-out frame (drive frame size R8i). The diagram is also attached to the inside of the cubicle door, with installed devices marked. Refer to the circuit diagrams delivered with the drive for device designations.



Cabling direction

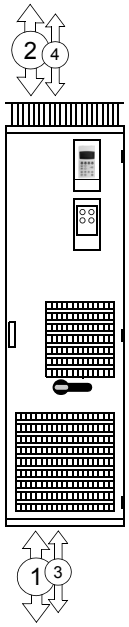
The drawings below show the available cabling directions of the drive.

Frame size R6



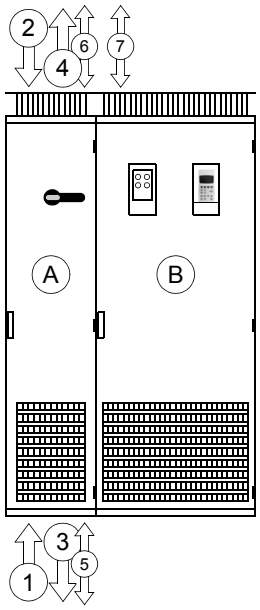
	Description
1	Input/Motor output – Bottom entry
2	Input/Motor output – Top entry (IP21-42)
3	Input/Motor output – Top entry (IP54)
4	Signal cable input/output – Bottom entry
5	Signal cable input/output – Top entry (IP21-42)
6	Signal cable input/output – Top entry (IP54)

Frame size R7i



	Description
1	Input/Motor output – Bottom entry
2	Input/Motor output – Top entry
3	Signal cable input/output – Bottom entry
4	Signal cable input/output – Top entry

Frame size R8i



	Description
A	Input/output cubicle
B	Supply and inverter unit cubicle
1	Standard input (bottom entry)
2	Standard input (top entry)
3	Standard output (bottom exit)
4	Standard output (top exit)
5	Signal cable input/output – Bottom entry
6	Signal cable input/output – Top entry (IP54)
7	Signal cable input/output – Top entry (IP21-42)

Operation principle

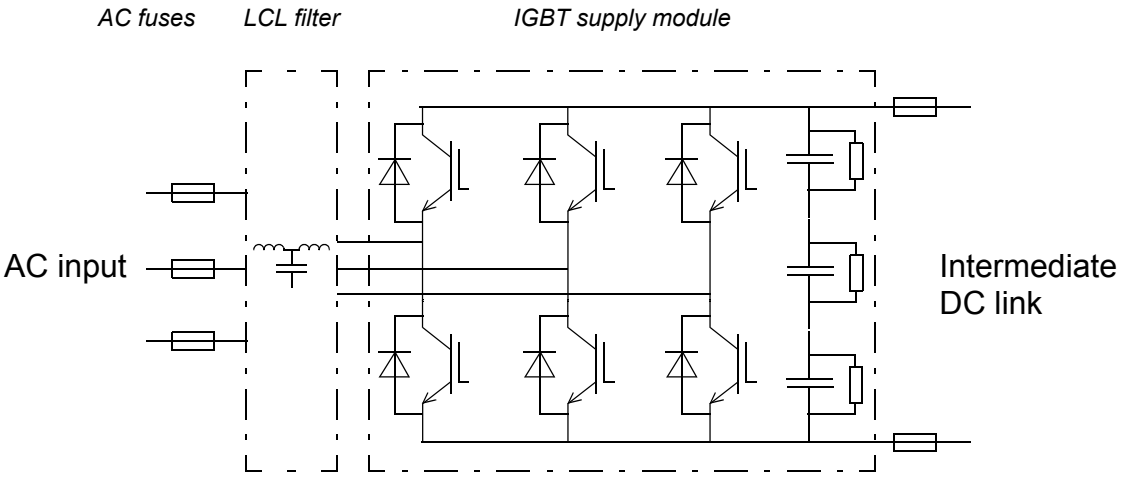
The line-side and motor-side converters have their own RDCU control units and control programs. The parameters of each program can be viewed and changed using one control panel. The converter to be controlled can be selected using the control panel; see section *Controls* below.

Line-side converter

The line-side converter rectifies three-phase AC current to direct current for the intermediate DC link of the drive. The intermediate DC link is further supplying the motor-side converter that runs the motor.

The line-side converter is an active unit that, together with an LCL (inductor-capacitor-inductor) filter, enables low harmonic distortion at the input terminals of the drive.

By default, the line-side converter controls the DC link voltage to the peak value of the line-to-line voltage. The DC voltage reference can also be set higher by a parameter. The control of the IGBT power semiconductors is based on the Direct Torque Control (DTC) method also used in the motor control of the drive. Two line currents and the DC link voltage are measured and used for the control.

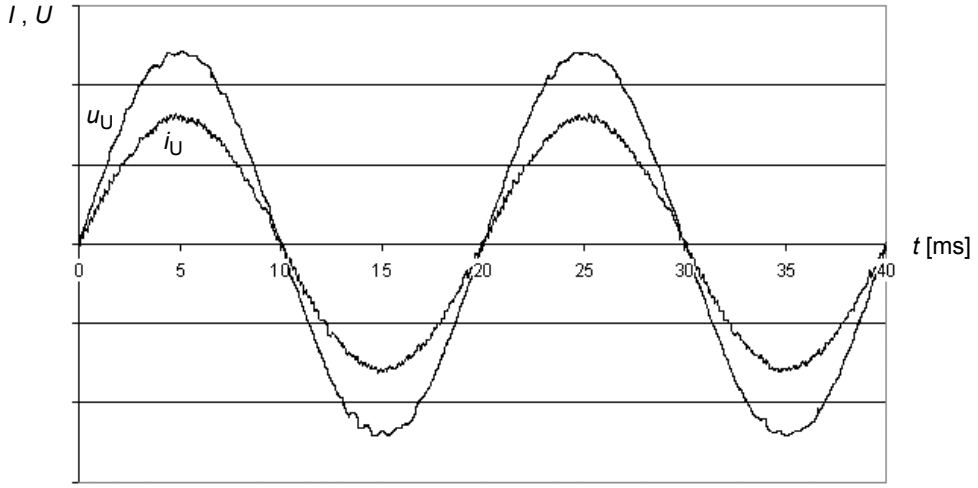


AC voltage and current waveforms

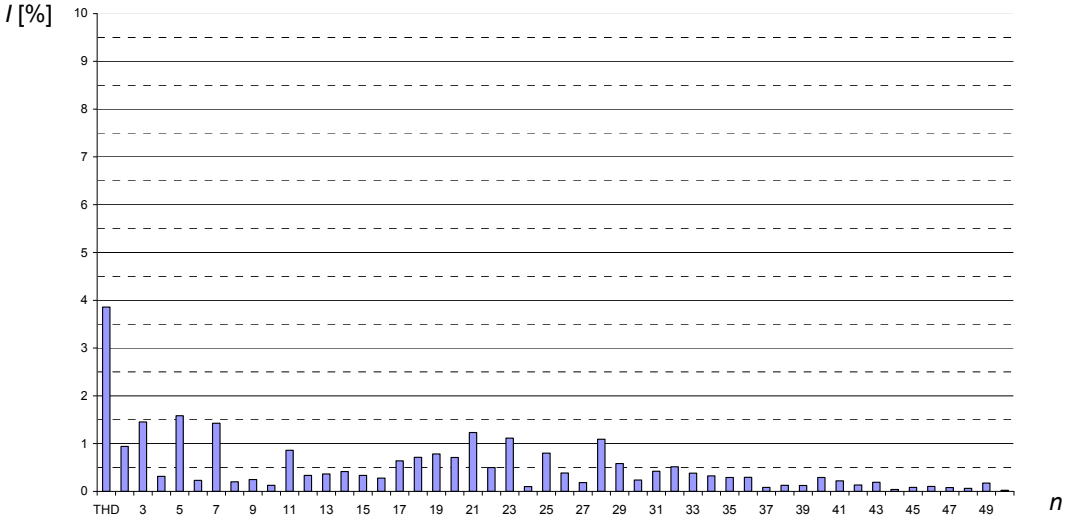
The AC current is sinusoidal at a unity power factor. The IGBT supply unit does not generate characteristic current or voltage overtones like a traditional 6- or 12-pulse bridge does.

The Total Harmonic Distortion (THD) in voltage depends slightly on the Short Circuit Ratio in the Point of Common Coupling (PCC). The high-frequency switching and high du/dt slightly distort the voltage waveform at the input of the converter.

Typical line current (i_U) and phase voltage (u_U) waveforms are shown below.



An example spectrum and THD value of the current at the input of the drive are shown below. Each harmonic is presented in percent of nominal current. *n* denotes the ordinal number of the harmonic.



Motor-side converter

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 control is measured for earth fault (ground fault) protection.

Frame R6

The motor-side converter is controlled by an RDCU drive control unit located in the integrated line-side/converter-side module.

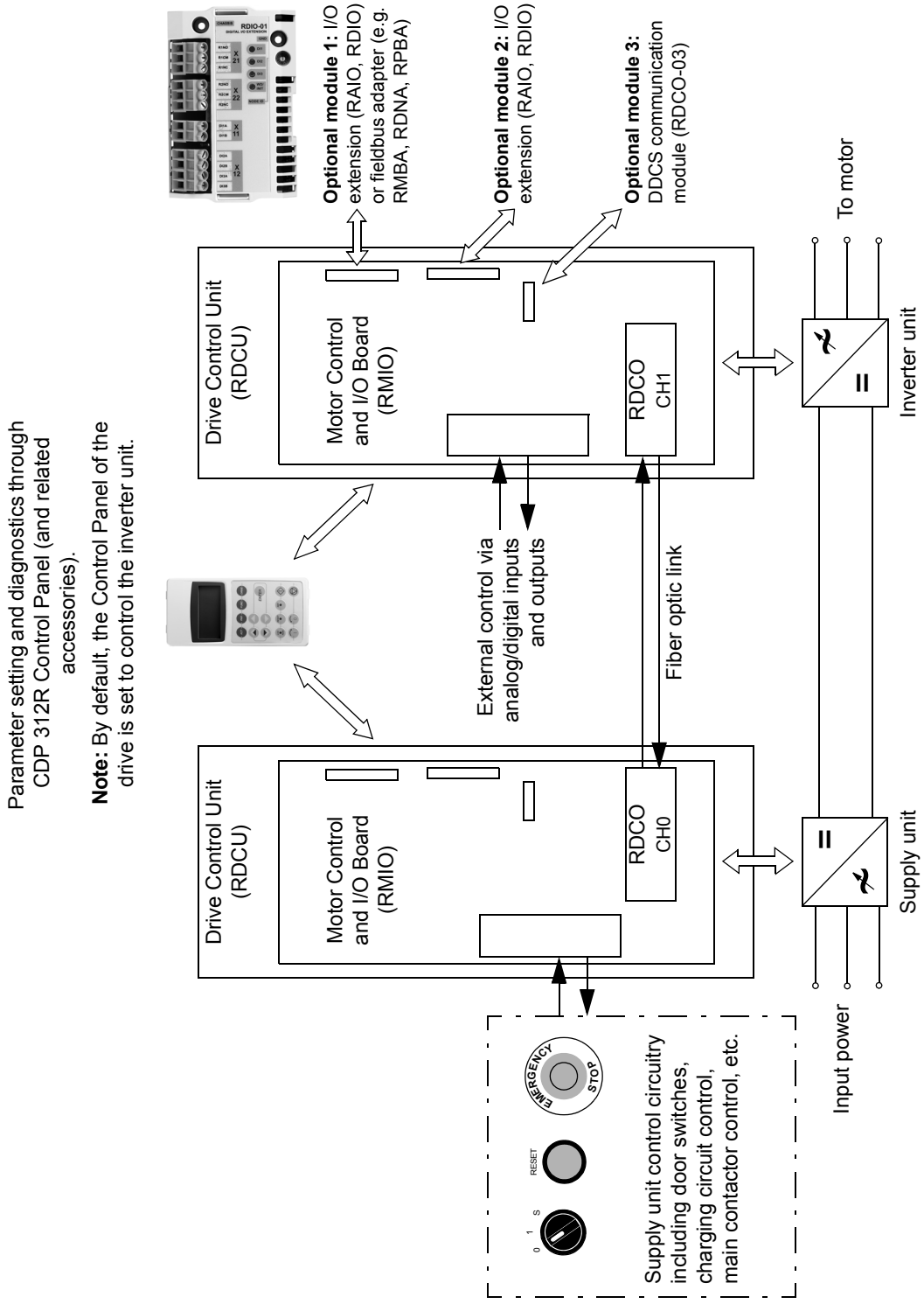
Frame R7 and up

The motor-side converter is controlled by an RDCU drive control unit located in the swing-out frame of the cabinet. The RDCU is connected to the inverter module(s) by a fiber optic link, distributed through an optical branching unit. In the inverter modules, the optic link connects to the AINT board, the terminals of which are accessible through a hole on the front panel of the module.

Controls

Control interfaces of the drive

The following diagram shows the control interfaces and I/O options of the drive.



Door switches

Main switch-disconnector (Q1 in frame size R6 to R8i)

The switch-disconnector handle switches the main and auxiliary voltages to the drive on and off.

Other door switches

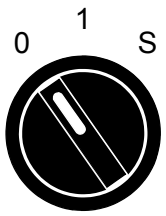
These switches are only installed if the drive is equipped with the optional emergency stop function.

Start switch

0 = Cooling fans are disabled. (Other auxiliary voltages are on.)

0 ⇒ S = Starts the cooling fans, closes the main contactor and starts the supply unit.

1 ⇒ 0 = Switches off the drive and opens the main contactor. Other auxiliary voltages are on.

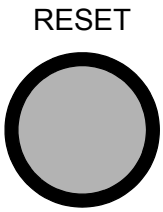


Emergency stop button

Reset button

Resets an emergency stop, after which the supply unit can be started using the start switch.

(Drive faults are reset via the drive control panel or serial communication)



Control panel

A control panel (type CDP-312R) is installed on the door of the drive. The CDP-312R is the user interface of the supply unit (line-side converter) and the inverter unit (motor-side converter) of the drive, providing the essential controls such as Start/Stop/Direction/Reset/Reference, and the parameter settings for the units' control programs. More information on using the panel can be found in the *Firmware Manual* delivered with the drive.

The control panel is wired to both the supply unit and the inverter unit using a Y-splitter. The unit that is currently being controlled is indicated by the drive name on the drive display; the suffix "MR" denotes inverter unit, "LR" denotes supply unit. The control is switched between the units as follows:

To control the supply unit…

Step	Action	Press…	Display (example)
1.	To enter the Drive Selection Mode **Note:** In local control mode, the motor-side converter trips if parameter 30.02 PANEL LOSS is set to FAULT. Refer to the appropriate inverter control program firmware manual.	DRIVE	ACQ 800 0460_5MR BWXR-7xxx ID-NUMBER 1
2.	To scroll to ID number 2	▲	ACQ 800 0460_5LR ILXR7xxx ID-NUMBER 2
3.	To verify the change to the line-side converter and display the warning or fault text	ACT	2 -> 380.0 V ACQ 800 0460_5LR *** FAULT *** DC OVERVOLT (3210)

WARNING! The drive does not stop by pressing the control panel Stop key in local control mode.

To control the inverter unit…

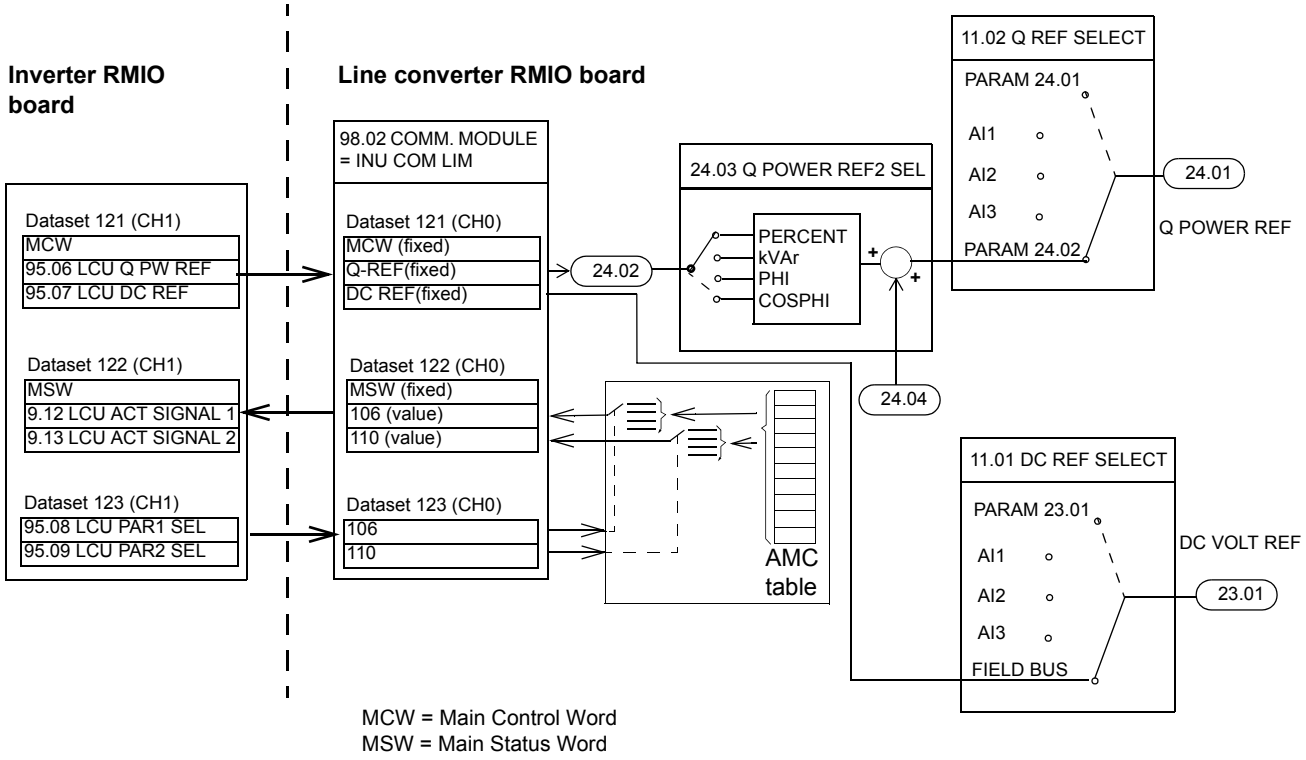
Step	Action	Press…	Display (example)
1.	To enter the Drive Section Mode	DRIVE	ACQ 800 0460_5LR ILXR7xxx ID-NUMBER 2
2.	To scroll to ID number 1	▼	ACQ 800 0460_5MR BWXR7xxx ID-NUMBER 1
3.	To verify the change to the motor-side converter	ACT	1 L -> 0.0 rpm I FREQ 0.00 Hz CURRENT 0.00 A POWER 0.00 %

Fieldbus control of the line-side converter

Fieldbus control of the line-side converter is performed via the motor-side converter RMIO board as shown in the block diagram below.

Block diagram: reference select

The figure below shows the parameters for DC and reactive power reference selection in the ACQ800 Pump Control Program. AMC table contains actual values and parameters of the line converter.



Type code

The type code of the drive is indicated on the type designation label, attached on the cabinet door. The type code contains information on the specifications and configuration of the drive. The first digits from left express the basic configuration (e.g. ACQ800-37-460-5). The optional selections are given thereafter, separated by + signs (e.g. +E202). The main selections are described below.

Frame sizes R6, R7i and R8i

Selection	Alternatives
Product series	ACQ800 product series
Type	37 = cabinet-mounted Default configuration: IP21 (UL Type 1); line contactor (not for frame R6); RDCO-03 DDCS Communication Option; CDP-312R Control Panel; regenerative braking; EMC/RFI filtering for 2nd Environment (except frame R6); common mode filtering (except frame R6); Standard Control Program; top entry/exit of cables; coated circuit boards; set of English manuals.
Size	Refer to *Technical data: IEC ratings*.
Voltage range (nominal rating in **bold**)	5 = 380/400/415/440/460/480/**500** V AC
+ options	
I/O options	Refer to *ACQ800 Ordering Information* (code: 64556568 [English]).
Fieldbus adapter	
Control program	
Degree of protection	B053 = IP22 (UL Type 1) B054 = IP42 (UL Type 1) B055 = IP54 (UL Type 12)
Construction	C129 = UL Listed
Cabling	H350 = Bottom entry (with +C129) H352 = Bottom exit (with +C129)
Auxiliary voltage	G304 = 115 V AC – Standard with +C129 and +C134
Starter of auxiliary motor fan	M600 = 1 to 1.6 A (1 pc) M601 = 1.6 to 2.5 A (1 pc) M602 = 2.5 to 4 A (1 pc) M603 = 4 to 6.3 A (1 pc) M604 = 6.3 to 10 A (1 pc) – Not for frame R6 M605 = 10 to 16 A (1 pc) – Not for frame R6

Mechanical installation

What this chapter contains

This chapter describes the mechanical installation procedure of the drive.

General

See chapter *Technical data* for allowable operating conditions and requirements for free space around the unit.

The unit should be installed in an upright vertical position.

The floor that the unit is installed on should be of non-flammable material, as smooth as possible, and strong enough to support the weight of the unit. The floor flatness must be checked with a spirit level before the installation of the cabinets into their final position. The maximum allowed deviation from the surface level is 5 mm in every 3 m (0.25 in per 12.5 ft). The installation site should be levelled, if necessary, as the cabinet is not equipped with adjustable feet.

The wall behind the unit should be of non-flammable material.

Provide the drive with the amount of fresh **cooling air** given in *Technical data*.

Note: Very wide cabinet line-ups (> 4200 mm/165 in) are delivered as shipping splits.

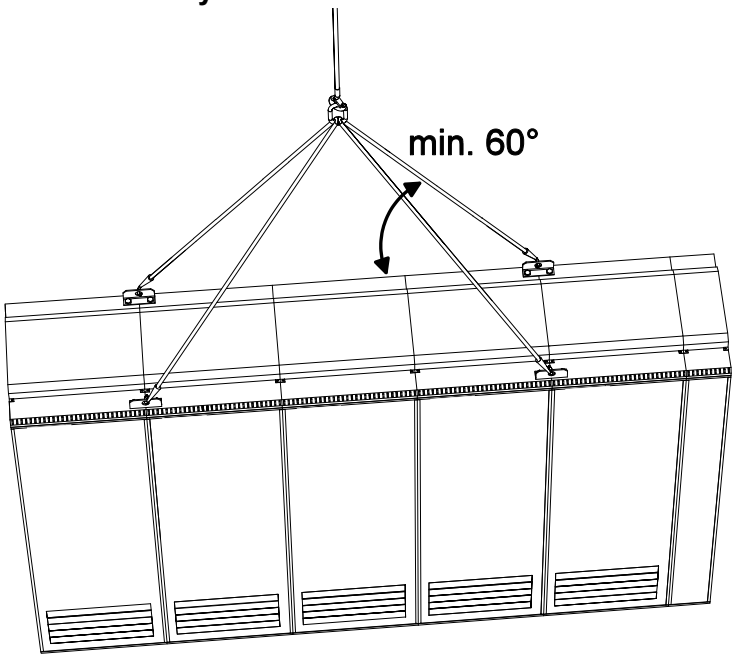
Required tools

The tools required for moving the unit to its final position, fastening it to the floor and tightening the connections are listed below.

- crane, fork-lift or pallet truck (check load capacity!); iron bar, jack and rollers
- Pozidrive and Torx (2.5–6 mm) screwdrivers for the tightening of the frame screws
- torque wrench
- set of wrenches or sockets for joining shipping splits.

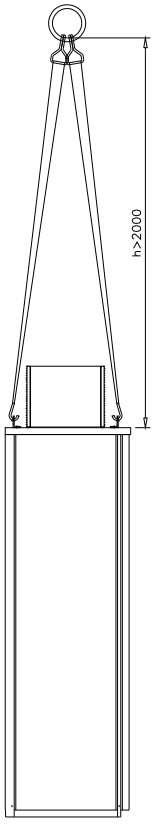
Moving the unit

…by crane



Use the steel lifting lugs attached to the top of the cabinet. Insert the lifting ropes or slings into the holes of the lifting lugs.

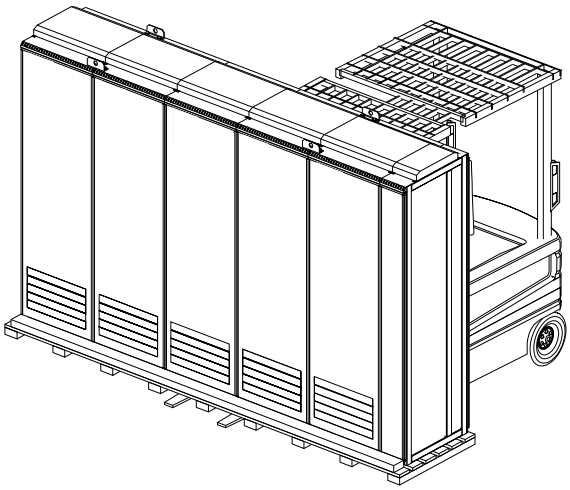
The lifting lugs can be removed (not mandatory) once the cabinet is in its final position. **If the lifting lugs are removed, the bolts must be refastened to retain the degree of protection of the cabinet.**



IP54 units

Allowed minimum height of lifting ropes or slings for IP54 units is 2 m (6.6 ft).

…by fork-lift or pallet truck



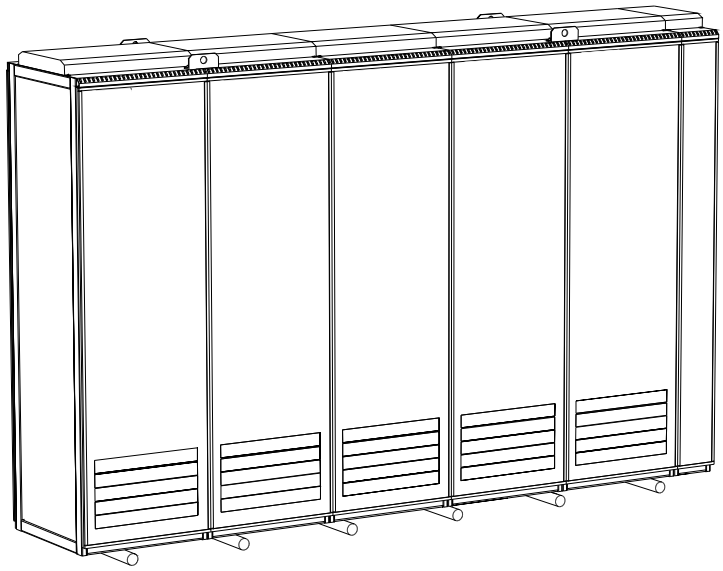
The center of gravity may be quite high. So be careful when transporting the unit. Tilting the cabinets must be avoided.

The units are to be moved only in the upright position.

If using a pallet truck, check its load capacity before attempting to move the unit.

…on rollers

(Not allowed with Marine versions)

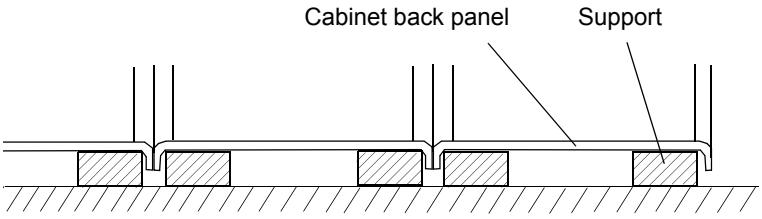


Remove the wooden bottom frame which is part of the shipment.

Lay the unit on the rollers and move it carefully until close to its final location.

Remove the rollers by lifting the unit with a crane, fork-lift, pallet truck or jack as described above.

Laying the unit on its back



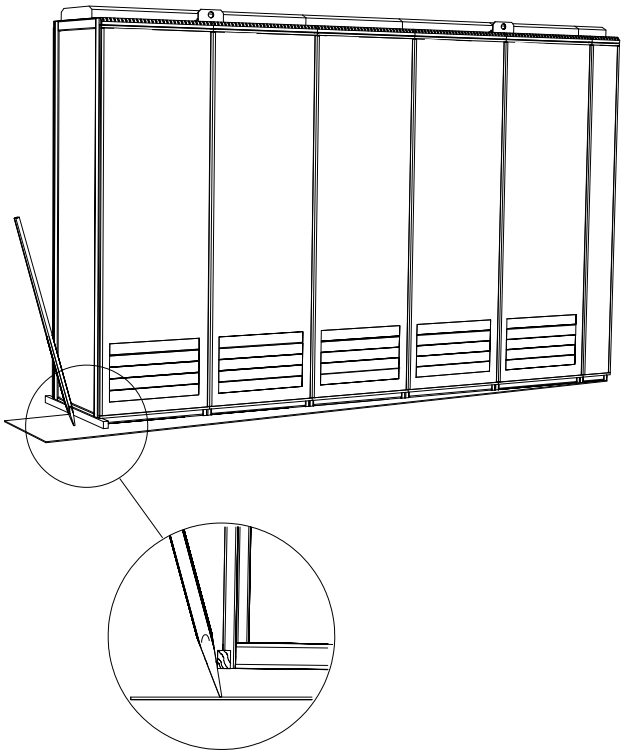
If the cabinet needs to be laid on its back, it must be supported from below beside the cubicle seams as shown.

Notes:

• Transportation of a unit on its back is only allowed if the unit is equipped for such transportation at the factory.

• Never lay or transport an R8i unit on its back.

Final placement of the unit



The cabinet can be moved into its final position with an iron bar and a wooden piece at the bottom edge of the cabinet. Care is to be taken to properly place the wooden piece so as not to damage the cabinet frame.

Before installation

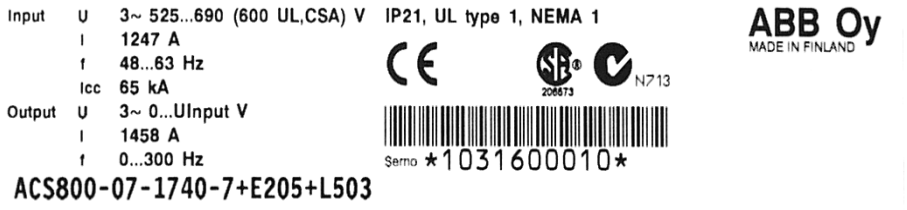
Delivery check

The drive delivery contains:

- drive cabinet line-up
- optional modules (if ordered) installed into the control rack at the factory
- ramp for extracting supply and inverter modules from the cabinet
- hardware manual
- appropriate firmware manuals and guides
- optional module manuals
- delivery documents.

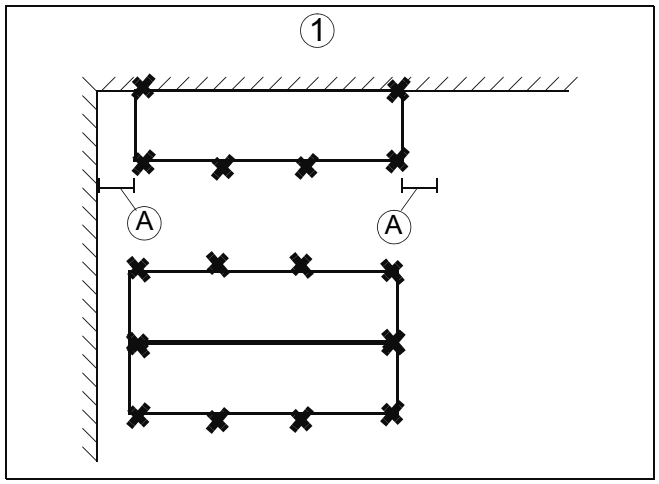
Check that there are no signs of damage. Before attempting installation and operation, check the information on the type designation label of the drive to verify that the unit is of the correct type. The label includes an IEC and NEMA rating, C-UL US, and CSA markings, a type code and a serial number, 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.

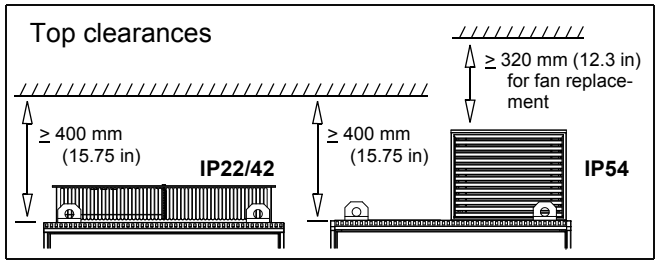
The type designation label is located on the supply unit door.

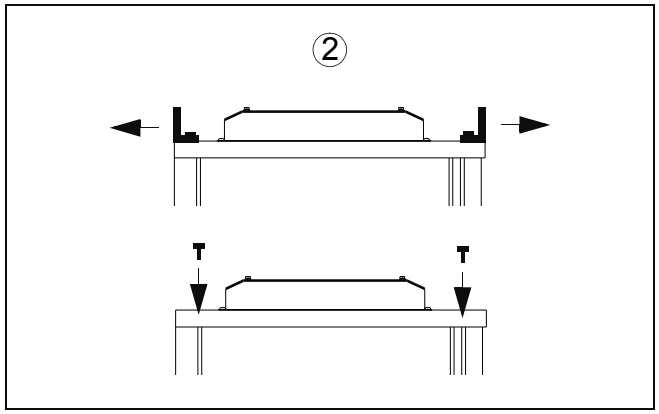


Each power module (i.e. supply and inverter module) is also individually labelled.

Installation procedure







See detailed instructions in the following few pages.

(1) The cabinet can be installed with its back against a wall, or back-to-back with another unit. Fasten the unit (or first shipping split) to the floor with fastening clamps or through the holes inside the cabinet. See section *Fastening the cabinet to the floor.*

Note: A clearance of 400 mm (15.75 in) minimum above the basic roof level of the cabinet (see inset on left) is required.

Note: Leave some space at the left-hand and right-hand sides of the line-up (A) to allow the doors to open sufficiently.

Note: Any height adjustment must be done before fastening the units or shipping splits together. Height adjustment can be done by using metal shims between the bottom frame and floor.

(2) Remove the lifting bars (if present). In marine units, also replace the lifting lugs with L-profiles (see below). Use the original bolts to block any unused holes.

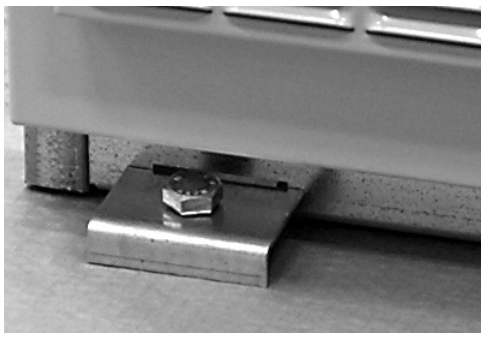
Fastening the cabinet to the floor

The cabinet is to be fastened to the floor by using clamps along the edge of the cabinet bottom, or by bolting the cabinet to the floor through the holes inside.

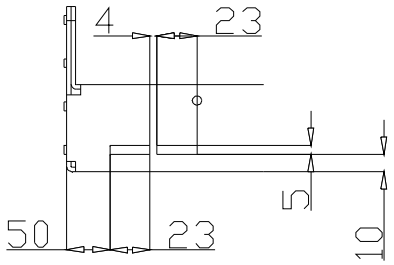
Clamping

Insert the clamps into the twin slots along the front and rear edges of the cabinet frame body and fasten them to the floor with a bolt. The recommended maximum distance between the clamps is 800 mm (31.5 in).

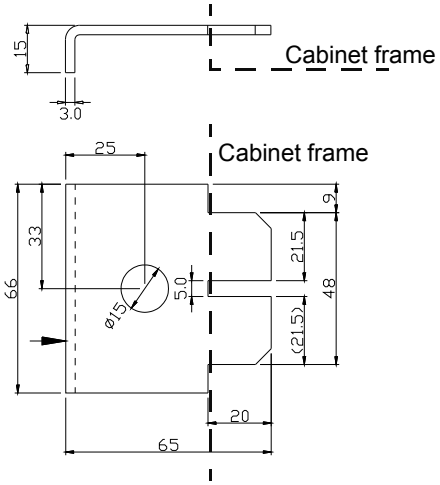
If there is not enough working space behind the cabinet for mounting, replace the lifting lugs at the top with L-brackets (not included) and fasten the top of the cabinet to the wall.



Slot detail, front view (dimensions in mm)

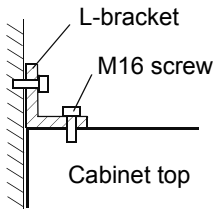


Clamp dimensions (in mm)



Distances between slots

Cubicle Width (mm)	Distance in mm and (inches)
300	150 (5.9 in)
400	250 (9.85 in)
600	450 (17.7 in)
700	550 (21.65 in)
800	650 (25.6 in)

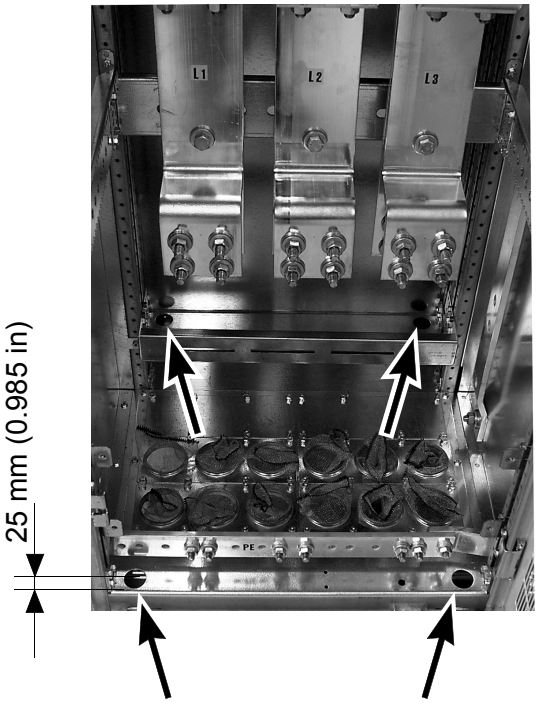


Fastening the cabinet at the top with L-brackets (side view)

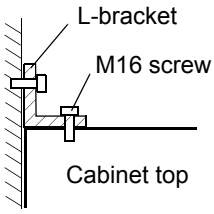
Holes inside the cabinet

The cabinet can be fastened to the floor using the fastening holes inside the cabinet, if they are accessible. The recommended maximum distance between the fastening points is 800 mm (31.5 in).

If there is not enough working space behind the cabinet for mounting, replace the lifting lugs at the top with L-brackets (not included) and fasten the top of the cabinet to the wall.



Fastening holes inside the cabinet (arrowed)



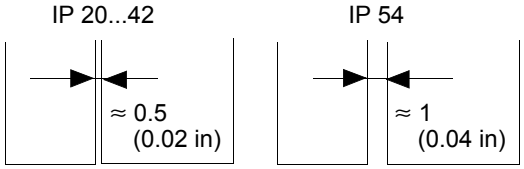
Fastening the cabinet at the top with L-brackets (side view)

Distances between fastening holes

Bolt size: M10 to M12 (3/8 in to 1/2 in).

Cubicle Width	Distance between holes Outer Ø31 mm (1.22 in)
300	150 mm (5.9 in)
400	250 (9.85 in)
600	450 (17.7 in)
700	550 (21.65 in)
800	650 (25.6 in)

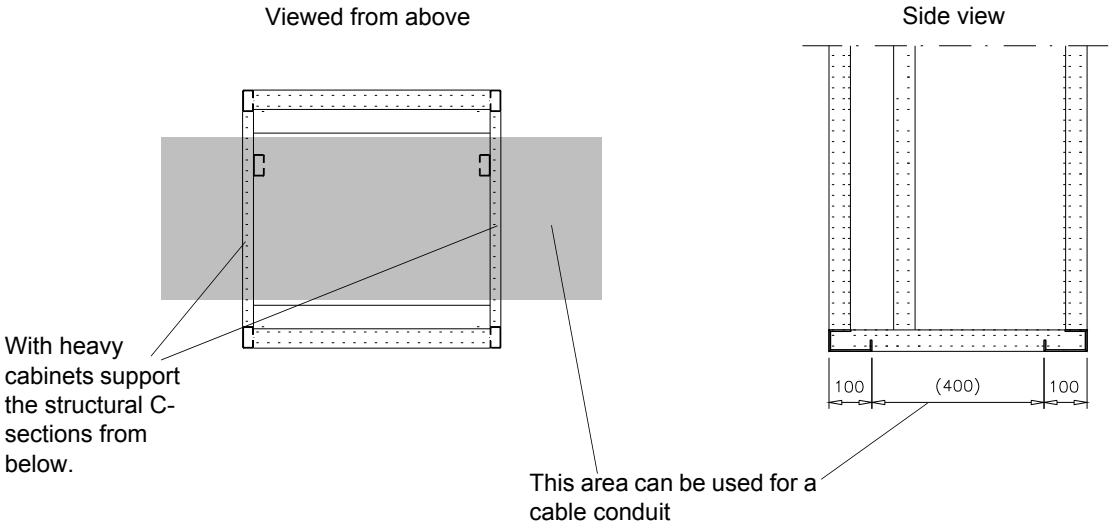
Added width:
Side panels of the cabinet: 15 mm (0.6 in)
Back panel of the cabinet: 10 mm (0.4 in)
Gap between cubicles (mm):



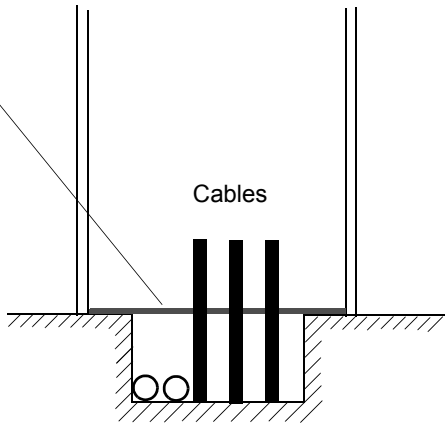
Miscellaneous

Cable conduit in the floor below the cabinet

A cable conduit can be constructed below the 400 mm (15.75 in) wide middle part of the cabinet. The cabinet weight lies on the two 100 mm (3.94 in) wide transverse sections which the floor must carry.



Prevent the cooling air flow from the cable conduit to the cabinet with 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.

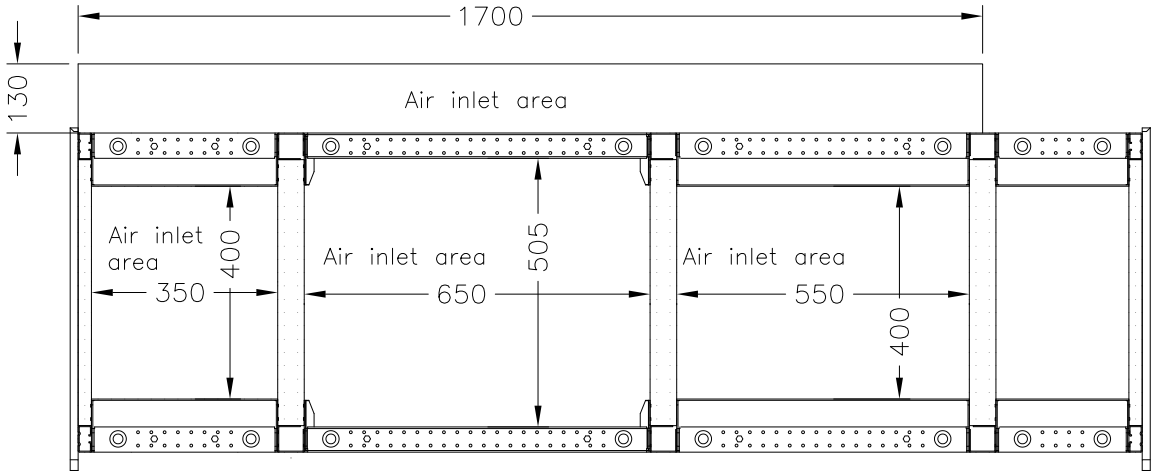


Cooling air intake through bottom of cabinet

Units with air intake through the bottom of the cabinet are intended for installation on an air duct in the floor. The required air inlets in the floor are as listed below. Refer also to the dimensional drawings delivered with the unit.

- for DSU supply cubicles: ***w*** × 505 mm (19.88 in), where ***w*** equals cubicle width – 50 mm (1.97 in)
- for ISU supply cubicles, inverter unit cubicles, control cubicles: ***w*** × 400 mm (15.75 in), where ***w*** equals cubicle width – 50 mm (1.97 in)
- ***w*** × 130 mm (5.12 in) at the back of the cabinet line-up, where ***w*** equals the total width of adjacent cubicles with air inlets. This area may or may not be consistent through the width of the whole line-up.

Example



Input fuse cubicle	**Diode supply cubicle**	**Inverter cubicle**	**Common motor terminal cubicle**
Cubicle width: 400 mm	Cubicle width: 700 mm	Cubicle width: 600 mm	(No air inlet required)
Air inlet size:	Air inlet size:	Air inlet size:	
350 × 400 mm	650 × 505 mm	550 × 400 mm	

Notes:

- The plinth of the cabinet must be supported all around.
- The air duct must be able to supply a sufficient volume of cooling air. The minimum air flow values are given in the *Technical data* section of the *Hardware Manual.*
- The cubicles of diode supply units require a larger air inlet area than other cubicles.
- Some cubicles (mainly those without active, heat-generating components) require no air inlet.

Electric welding

It is not recommended to fasten the cabinet by welding.

Cabinets without flat bars at the base

- Connect the return conductor of the welding equipment to the cabinet frame at the bottom within 0.5 m (20 in) of the welding point.

Cabinets with flat bars at the base

- Weld only the flat bar under the cabinet, never the cabinet frame itself.
- Clamp the welding electrode onto the flat bar about to be welded or onto the floor within 0.5 m (20 in) 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 micrometers (3.9 to 7.9 mil); on the flat bars the coating is approximately 20 micrometers (0.8 mil). 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, the cables, the protections, the cable routing and the way of operation for the drive system.

Note: The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

Motor selection and compatibility

1. Select the motor according to the rating tables in chapter *Technical data*. Use 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 to 2 · U_N of the drive
   - motor nominal current is 1/6 to 2 · I_{2hd} of the drive in DTC control and 0 to 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:

If the drive is equipped with …	**… and …**	**… then the motor voltage rating should be …**
diode supply (ACQ800-U1)	no resistor braking is used	U_N
	frequent or long-term brake cycles are used	U_{ACeq1}
IGBT supply (ACQ800-31, ACQ800-37)	DC link voltage is not increased from nominal (through parameter settings)	U_N
	DC link voltage is increased from nominal (through parameter settings)	U_{ACeq2}
U_N = Rated input voltage of drive U_{ACeq1} = U_{DC} / 1.35 U_{ACeq2} = U_{DC} / 1.41 U_{ACeq} = Equivalent AC power source voltage of drive in V AC U_{DC} = Maximum DC link voltage of drive in V DC. For resistor braking, U_{DC} = 1.21 × nominal DC link voltage. For units with IGBT supply: see the parameter value. **Note:** Nominal DC link voltage is U_N × 1.35 or U_N × 1.41 in V DC.		

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 1: When the supply voltage is 440 V and the drive has a diode supply and operates in motor mode only, the maximum peak voltage at the motor terminals can be approximated as follows: 440 V × 1.35 × 2 = 1190 V. Check that the motor insulation system withstands this voltage.

   Example 2: When the supply voltage is 440 V and the drive is equipped with an IGBT supply, the maximum peak voltage in the motor terminals can be approximated as follows: 440 V × 1.41 × 2 = 1241 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 cause 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 this 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:

- du/dt filtering (protects motor insulation system and reduces bearing currents).
- common mode filtering (CMF) (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 fiber 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 µs 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 µs 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 filtering at the output of the drive (+E205)
CMF	common mode filtering (+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.

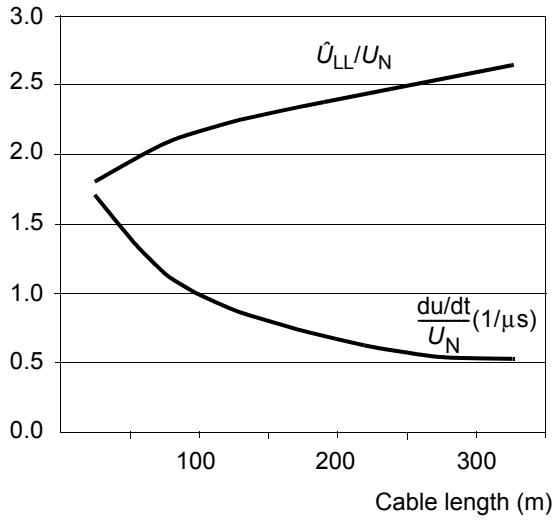
Example: Motor insulation requirement for a 400 V application must be selected as if the drive were supplied with 480 V.

Note 7: *Drives with an IGBT supply unit*

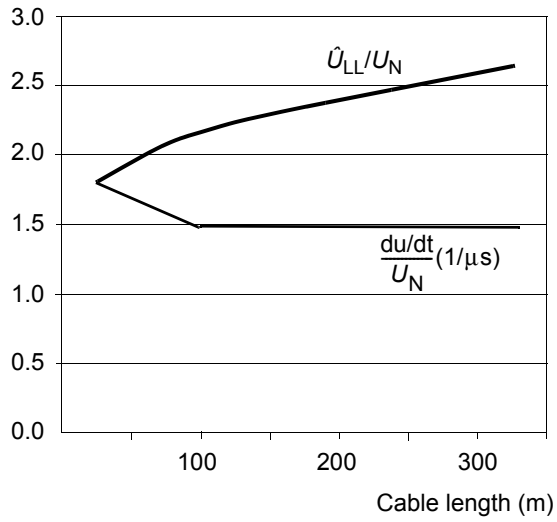
If voltage is raised by the drive (this is a parameter selectable function for special applications only), select the motor insulation system according to the increased intermediate circuit DC voltage level, especially in the 500 V supply voltage range.

Note 8: *Calculating the rise time and the peak line-to-line voltage*

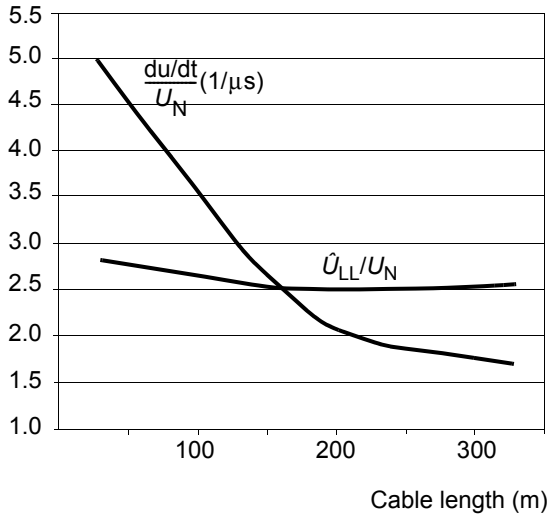
The peak line-to-line voltage at the motor terminals generated by the drive as well as the voltage rise time depend on the cable length. The requirements for the motor insulation system given in the table are “worst case” requirements covering installations with 30 m (98 foot) and longer cables. The rise time can be calculated as follows: $\triangle t = 0.8 \cdot \hat{U}_{LL}/(du/dt)$. Read $\hat{U}_{LL}$ and du/dt from the diagrams below. Multiply the values of the graph by the supply voltage (U_N). In case of drives with an IGBT supply unit or resistor braking, the $\hat{U}_{LL}$ and du/dt values are approximately 20% higher.



With du/dt Filter (R6 and R7i)



With du/dt Filter (R8i and nxR8i)



Without du/dt Filter (all frame sizes)

Note 9: *Sine filters*

Sine filters protect the motor insulation system. Therefore, a du/dt filter can be replaced with a sine filter. The peak phase-to-phase voltage with a sine filter is approximately 1.5 × U_N.

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

Supply (AC line) cable short-circuit protection

Always protect the input cable with fuses. In networks with a short-circuit withstand of 65 kA or less, standard gG fuses can be used. No fuses need be installed at the drive input.

If the drive is supplied through busbars, fuses must be installed at the drive input. In networks with a short-circuit withstand of less than 50 kA, standard gG fuses are sufficient. If the network has a short-circuit withstand of 50 to 65 kA, aR fuses are required.

Size the fuses according to local safety regulations, appropriate input voltage and the rated current of the drive. **Check that the operating time of the fuses is below 0.5 seconds.** For fuse ratings, see *Technical data*.

WARNING! Circuit breakers are not capable of providing sufficient protection because they are inherently slower than fuses. Always use fuses with circuit breakers.

Earth fault (Ground fault) protection

Both the supply unit and the inverter unit are equipped with an internal earth fault protective function to protect the drive against earth faults in the drive, motor and motor cable. (This is not a personal safety or a fire protection feature.) Both earth fault protective functions can be disabled by a parameter.

See the *ACQ800 Ordering Information* (code: 64556568 [English], available on request) for other available earth fault protection options.

Selecting the power cables

General rules

Dimension the supply (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* on page *61.*
- 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 V AC cable is accepted for up to 500 V AC.

We recommend shielded symmetrical multicore cables for input cabling. Single-core cables are also allowed, but unshielded single-core cables are not on IT (ungrounded) networks.

WARNING! Do not use unshielded single-core supply cables in IT (ungrounded) networks. A dangerous voltage can become present on the non-conductive outer sheath of the cable. This can cause injury or death.

Symmetrical shielded cable must be used for motor cabling; see section *Alternative power cable types* on page *60*.

Note: When continuous conduit is employed, shielded cable is not required.

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
$16 < S \leq 35$	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.

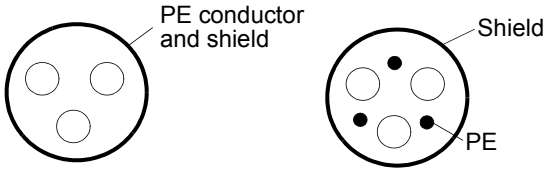
Note: The cabinet configuration of the drive may require multiple supply and/or motor cabling. Refer to the connection diagrams in *Electrical installation*.

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

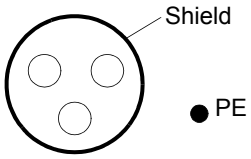
Alternative power cable types

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

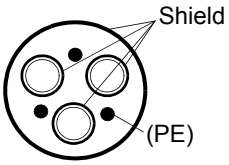
Recommended: Symmetrical shielded cable (three phase conductors, concentric or otherwise symmetrical PE conductor, overall shield)



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

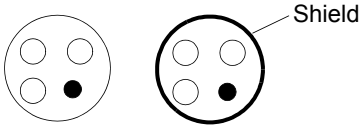


Not allowed: Symmetrical cable with individual shields for each phase conductor



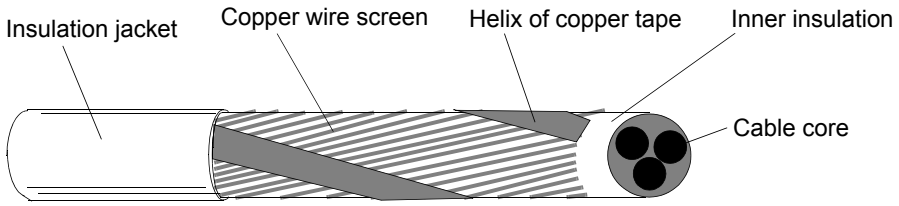
Not allowed for motor cabling: Separate cables for each phase and PE

Not allowed for motor cabling with phase conductor cross-section larger than 10 mm^2 (motor power > 30 kW): Asymmetric cable



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 the 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 V AC cable is accepted for up to 500 V AC. 1000 V AC cable is required above 500 V AC (below 600 V AC). 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. When conduit is employed, type MC continuous corrugated aluminum armor cable or shielded cable is not required. A dedicated ground cable is always required.

Note: Do not run motor wiring from more than one drive in the same conduit.

Armored cable / shielded power cable

6-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, Lapp Kabel (ÖLFLEX) and Pirelli, among others.

Power factor compensation capacitors

Power factor compensation is not needed with AC drives. However, if a drive is to be connected in a system with compensation capacitors installed, note the following restrictions.

WARNING! Do not connect power factor compensation capacitors to the motor cables (between the drive and the motor). They are not intended for use with AC drives and can cause permanent damage to the drive or themselves.

If there are power factor compensation capacitors in parallel with the 3-phase input of the drive:

1. Do not connect a high-power capacitor to the power line while the drive is connected. The connection will cause voltage transients that may trip or even damage the drive.
2. If capacitor load is increased/decreased step by step when the AC drive is connected to the power line, ensure that the connection steps are low enough not to cause voltage transients that would trip the drive.
3. Check that the power factor compensation unit is suitable for use in systems with AC drives i.e. harmonic generating loads. In such systems, the compensation unit should typically be equipped with a blocking reactor or harmonic filter.

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 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 cables, or in another way connect the shields of the cables 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 an output contactor (in DTC motor control mode)

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 *Firmware Manual* of the drive for the required parameter settings.) Otherwise, the contactor will be damaged.

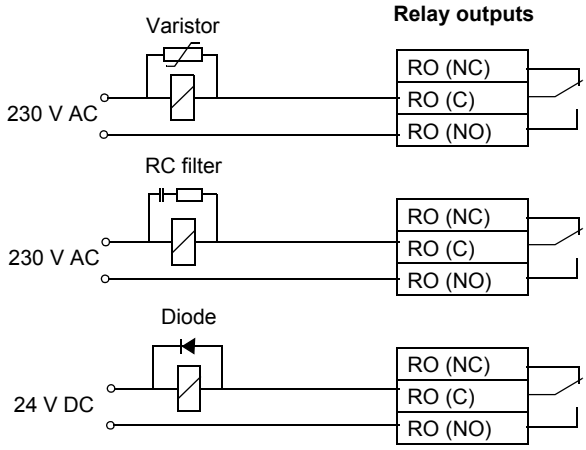
In scalar control, the contactor can be opened with the drive running.

Relay output contacts and inductive loads

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

The relay contacts of 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 the protective components at the terminal block.

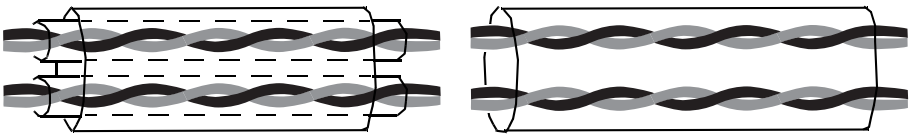


Selecting the control cables

All control cables must be shielded.

Use a double-shielded twisted pair cable (see figure a) for analog 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 analog 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
Double-shielded twisted pair cable

b
Single-shielded twisted multipair cable

Run analog 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 V DC and 115 / 230 V AC signals in the same cable.

Relay cable

The cable type with braided metallic screen (e.g. ÖLFLEX by Lapp Kabel) 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 m (10 ft). The cable type tested and approved by ABB is used in control panel option kits.

Coaxial cable (for use with Advant Controllers AC 80/AC 800)

- 75 ohm
- RG59, diameter 7 mm or RG11, diameter 11 mm
- Maximum cable length: 300 m (1000 ft)

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 analog 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 the *Firmware Manual*.

Installation sites above 2000 m (6562 ft)

WARNING! Wear appropriate protection when installing, operating or servicing the RMIO board wiring and optional modules attached to the board. The Protective Extra Low Voltage (PELV) requirements stated in EN 61800-5-1 are not fulfilled at altitudes above 2000 m (6562 ft).

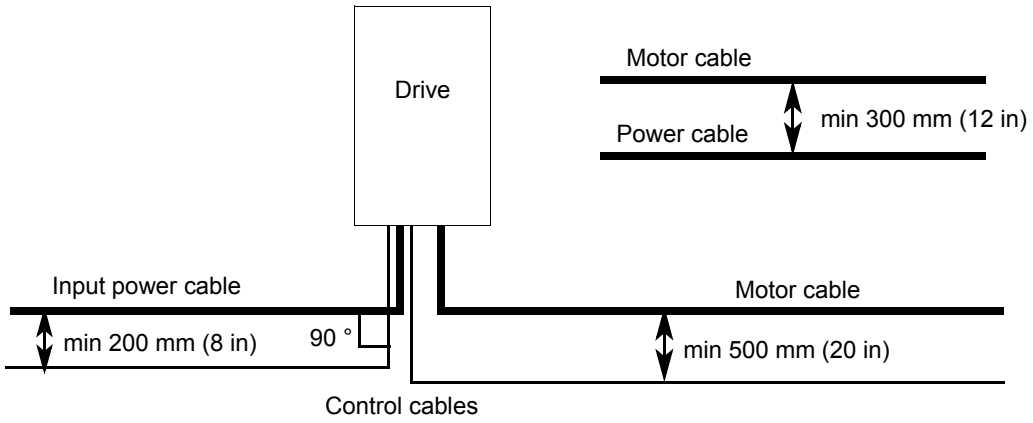
Routing the cables

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.

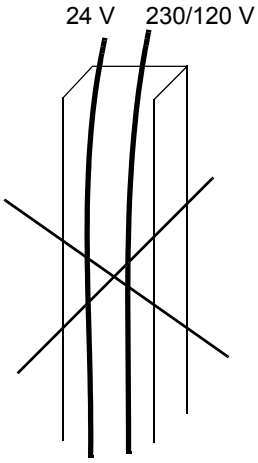
Where control cables must cross power cables make sure they are arranged at an angle as near to 90 degrees as possible. Do not run extra cables through the drive.

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.

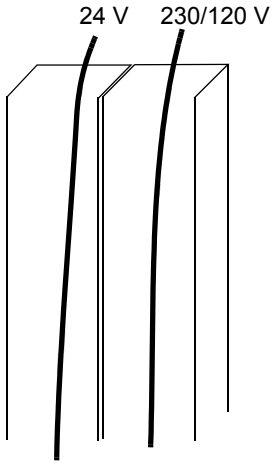
A diagram of the cable routing is below.



Control cable ducts



Not allowed unless the 24 V cable is insulated for 230 V (120 V) or insulated with an insulation sleeving for 230 V (120 V).



Lead 24 V and 230/120 V control cables in separate ducts into the inside of 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.

WARNING! During the installation procedure, inverter modules may have to be temporarily extracted from the cabinet. The modules have a high center of gravity. In order to minimize the danger of toppling over, keep the support legs (if provided) of the modules extended whenever maneuvering the modules outside the cabinet.

Option coding

Some instructions contained within this chapter are intended for drives equipped with certain options, marked with “plus codes” (e.g. +H359). The options included in a drive are listed on its type code label. An option code listing is included in this manual on page *40*.

Before installation

Checking the insulation of the assembly

Drive

Do not make any voltage tolerance or insulation resistance tests (e.g. hi-pot or megger) on any part of the drive as testing can damage the drive. Every drive has been tested for insulation between the main circuit and the chassis at the factory. Also, there are voltage-limiting circuits inside the drive which cut down the testing voltage automatically.

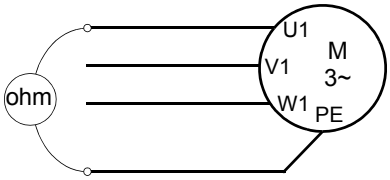
Supply cable

Check the insulation of the supply (input) cable according to local regulations before connecting to the drive.

Motor and motor cable

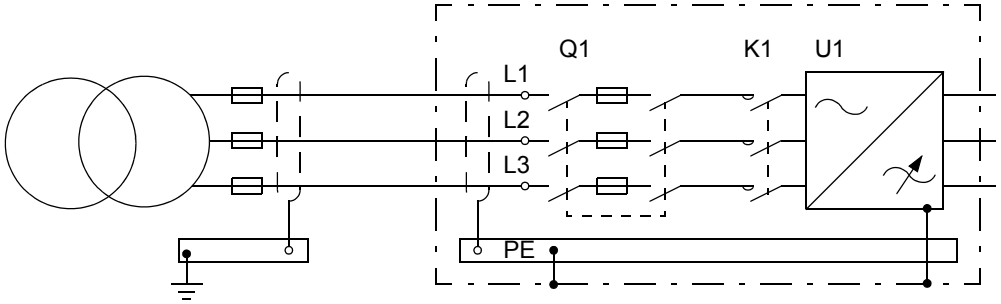
Check the insulation of the motor and motor cable as follows:

1. Check that the motor cable is connected to the motor, and 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 conductor using a measuring voltage of 500 V DC. The insulation resistance of an ABB motor must exceed 100 Mohm (reference value at 25 °C or 77 °F). For the insulation resistance of other motors, please consult the manufacturer's instructions. **Note:** Moisture inside the motor casing will reduce the insulation resistance. If moisture is suspected, dry the motor and repeat the measurement.



Input power connection – Frame R6

Connection diagram



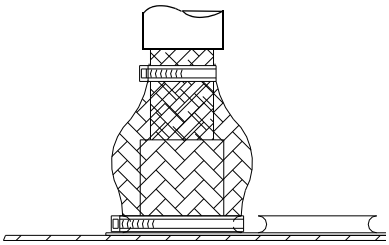
Connection procedure

Note: Before making the cable connections, check that the input of the auxiliary voltage transformer (T10) is selected correctly according to the supply voltage.

1. Open the door of the cabinet.

2. Remove any shrouds that protect the input busbars and cable entries.

3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



4. Connect the cables as follows:

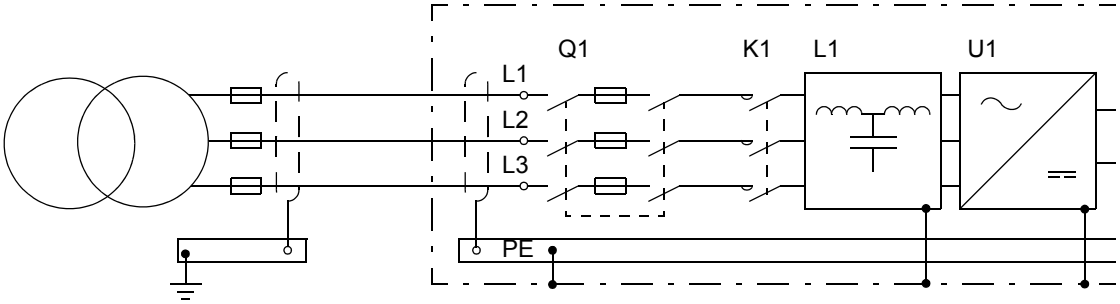
- Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
- Connect the phase conductors to the input power terminals (L1, L2, L3). For the tightening torques, see chapter *Technical data*.

5. Provide support for the cables whenever necessary.

6. Refit all shrouds removed earlier and close the door.

Input power connection – Frame R7i

Connection diagram



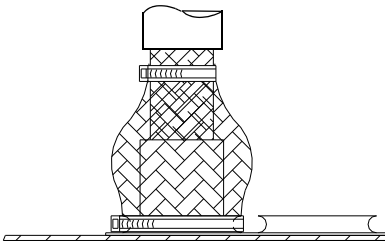
Connection procedure

Note: Before making the cable connections, check that the input of the auxiliary voltage transformer (T10) is selected correctly according to the supply voltage.

1. Open the door of the cabinet.

2. Remove any shrouds that protect the input busbars and cable entries.

3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



4. Connect the cables as follows:

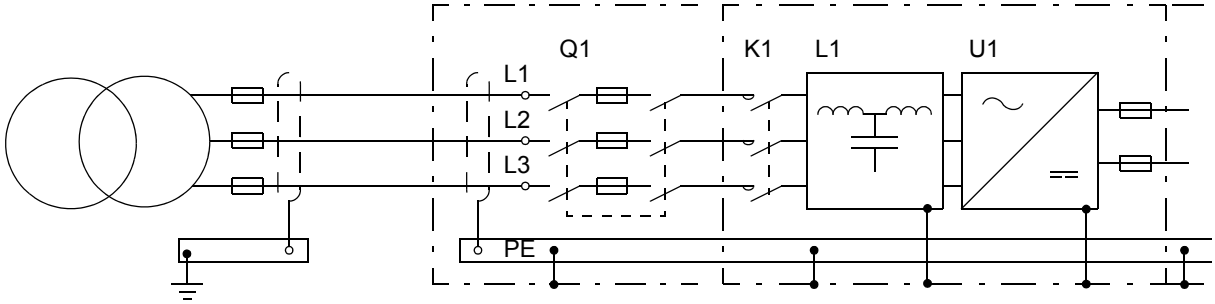
- Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
- Connect the phase conductors to the input power terminals (L1, L2, L3). For the tightening torques, see chapter *Technical data*.

5. Provide support for the cables whenever necessary.

6. Refit all shrouds removed earlier and close the door.

Input power connection – Frame R8i

Connection diagram



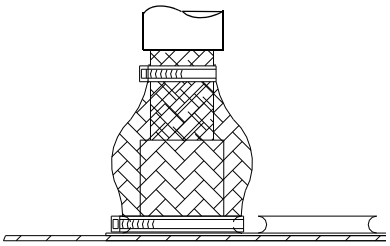
Connection procedure

Note: Before making the cable connections, check that the tap settings of the auxiliary voltage transformer (T10, located in the input/output cubicle) are correct in regard to the supply voltage. See instructions on page 77.

1. Open the door of the input/output cubicle (see section *Cabling direction* starting on page 31).

2. Remove any shrouds that protect the input busbars and cable entries.

3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



4. Connect the cables as follows:

- Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
- Connect the phase conductors to the input power terminals (L1, L2, L3). For the tightening torques, see chapter *Technical data*.

5. Provide support for the cables whenever necessary.

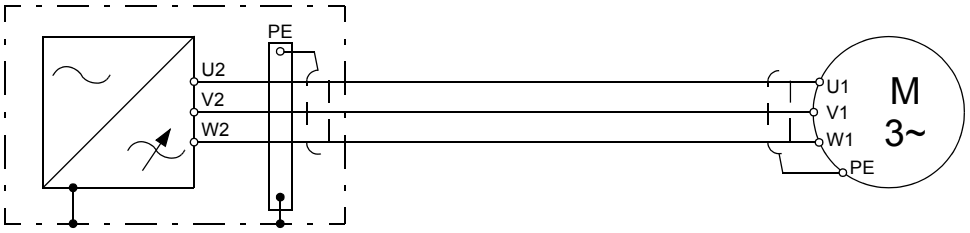
6. Refit all shrouds removed earlier and close the door.

Grounding of shielded single-core input cables

Connect the cable shield to the PE busbar at the transformer side only and insulate the shield at the drive side.

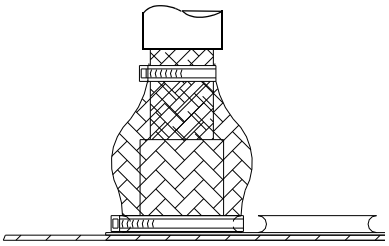
Motor connection – Frame R6

Connection diagram



Connection procedure

1. Open the cabinet door.
2. Remove any shrouds that protect the output busbars and cable entries.
3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



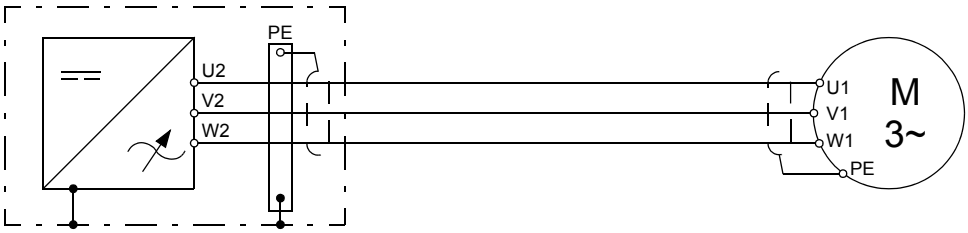
4. Connect the cables as follows:

- Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
- Connect the phase conductors to the output power terminals (U2, V2, W2). For the tightening torques, see chapter *Technical data*.

5. Provide support for the cables whenever necessary.
6. Refit all shrouds removed earlier and close the door.

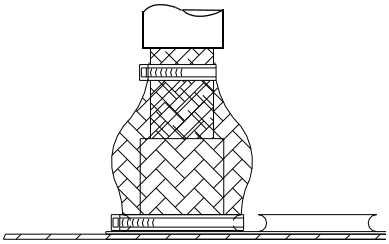
Motor connection – Frame R7i

Connection diagram



Connection procedure

1. Open the cabinet door.
2. Remove any shrouds that protect the output busbars and cable entries.
3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



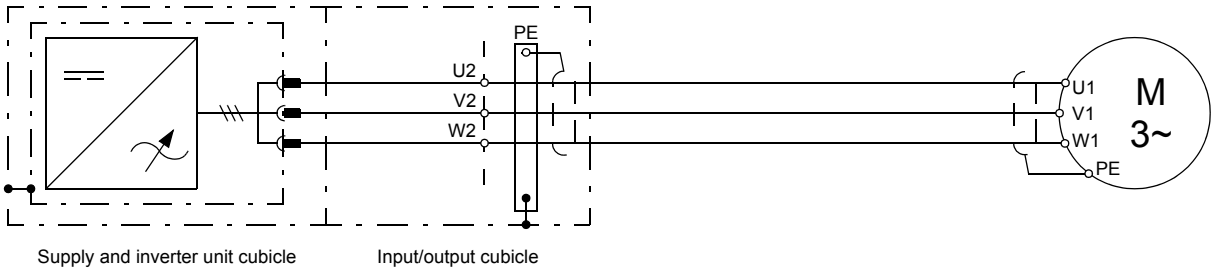
4. Connect the cables as follows:

- Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
- Connect the phase conductors to the output power terminals (U2, V2, W2). For the tightening torques, see chapter *Technical data*.

5. Provide support for the cables whenever necessary.
6. Refit all shrouds removed earlier and close the door.

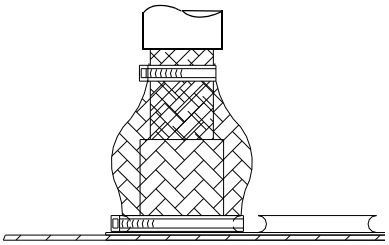
Motor connection – Frame R8i

Connection diagram



Connection procedure

1. Open the door of the input/output cubicle (see section *Cabling direction* starting on page *31*).
2. Remove any shrouds that protect the output busbars and cable entries.
3. Lead the cables into the inside of the cubicle. It is recommended to apply 360° grounding of the cable shields at the entry as shown below.



4. Connect the cables as follows:
   - Twist the cable shields into bundles and connect to cabinet PE (ground) busbar. Connect any separate ground conductors or cables to cabinet PE (ground) busbar.
   - Connect the phase conductors to the output power terminals (U2, V2, W2). For the tightening torques, see chapter *Technical data*.
5. Provide support for the cables whenever necessary.
6. Refit all shrouds removed earlier and close the door.

Control connections

Drive control connections

The control connections are made on the terminal blocks provided in the swing-out frame of the drive. Refer to the circuit diagrams delivered with the drive, and to chapter *Motor control and I/O board (RMIO)*.

Supply unit control connections

The supply unit is controlled using the local control devices optionally mounted on the cabinet door, i.e. the start switch, reset button and emergency stop button. No additional control connections are used or needed. However, it is also possible to

- halt the supply unit by an external emergency stop button (if the unit is equipped with a local emergency stop button, external buttons can be connected in series)
- read a fault indication through a relay output
- communicate with the unit through a serial communication interface.

Refer to the circuit diagrams delivered with the drive for the connection terminals for the external control devices.

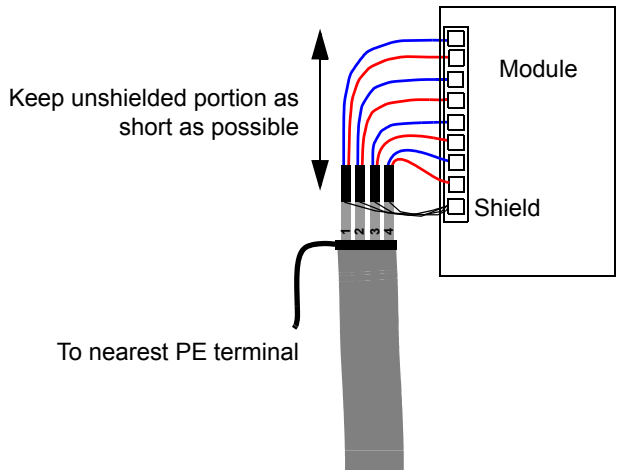
Connection procedure

Open the cabinet door(s).
Remove the locking screws at the edge of the swing-out frame and open the frame.
Remove any shrouds that limit access to the cable lead-throughs and cable trunking.
Run the cables into the inside of the cabinet through the grommets provided.
Top entry units only: If several cables need to be run through one grommet, use Loctite 5221 (cat. no. 25551) under the grommet to seal the cable entry.
Run the cables to the appropriate terminals. Wherever possible, use the existing cable trunking in the cabinet. Use sleeving wherever the cables are laid against sharp edges. When running cables to the swing-out frame, leave some slack in the cable at the hinge to allow the frame to open fully. Tie the cables to the cable supports wherever necessary.
Cut the cables to suitable length. Strip the cables and conductors.
Twist the cable shields into bundles and connect them to the ground terminal nearest to the terminal block. Keep the unshielded portion of the cables as short as possible.
Connect the conductors to appropriate terminals (see chapter *Motor control and I/O board (RMIO)* and the circuit diagrams delivered with the unit).
Refit any shrouds removed earlier. Close the swing-out frame, refasten, and close the cabinet door(s).

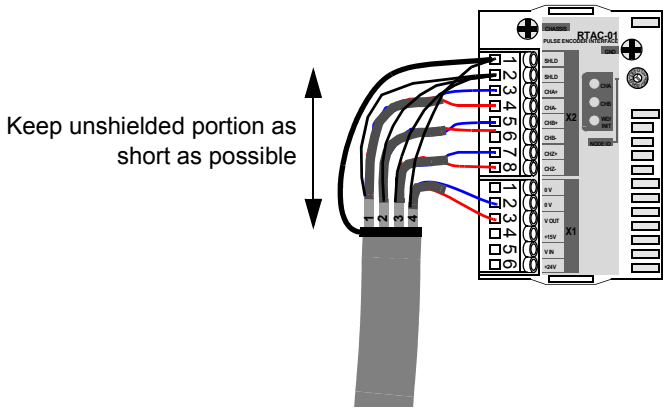
Installation of optional modules and PC

Optional modules (such as fieldbus adapters and I/O extension modules) are inserted into the optional module slot of the RMIO boards (built in the RDCU drive control units) and secured with two screws. The slots on the RMIO boards are described on page *36*. See the appropriate optional module manual for information on the cable connections.

Cabling of I/O and fieldbus modules



Cabling of pulse encoder interface module



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.

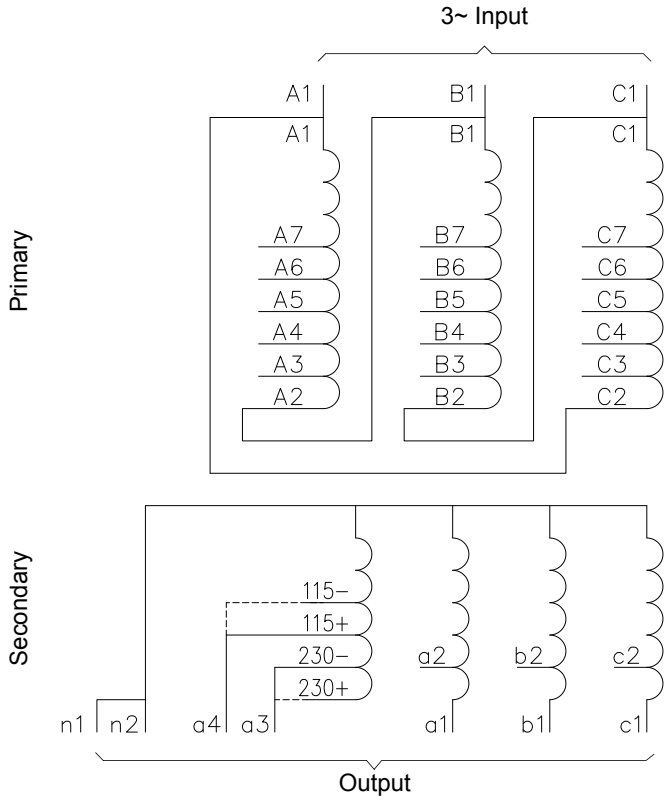
Note 2: Twist the pair cable wires.

Fiber optic links

DDCS fiber optic links are provided by RDCO modules for PC tools, master/follower link, NDIO, NTAC, NAIO, AIMA I/O module adapter and fieldbus adapter modules of type Nxxx. See the *RDCO User's Manual* [3AFE 64492209 (English)] for the connections. Observe color coding when installing fiber 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.

Tap settings of the auxiliary voltage transformer (Frame R8i)



	3~ input				1~ output				3~ output	
Supply voltage	Terminals	Tap settings			Supply voltage	230 V		115 V		400 V (50 Hz)	320 V (60 Hz)
		A1 to...	B1 to…	C1 to…		Terminals	Tap setting	Terminals	Tap setting	Terminals	Terminals
690 V	A1, B1, C1	C2	A2	B2	**690 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
660 V	A1, B1, C1	C2	A2	B2	**660 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2
600 V	A1, B1, C1	C3	A3	B3	**600 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
575 V	A1, B1, C1	C3	A3	B3	**575 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2
525 V	A1, B1, C1	C4	A4	B4	**525 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
500 V	A1, B1, C1	C4	A4	B4	**500 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2
480 V	A1, B1, C1	C5	A5	B5	**480 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
460 V	A1, B1, C1	C5	A5	B5	**460 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2
440 V	A1, B1, C1	C6	A6	B6	**440 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
415 V	A1, B1, C1	C6	A6	B6	**415 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2
400 V	A1, B1, C1	C7	A7	B7	**400 V**	a3, n1	230–	a4, n1	115–	a1, b1, c1	a2, b2, c2
380 V	A1, B1, C1	C7	A7	B7	**380 V**	a3, n1	230+	a4, n1	115+	a1, b1, c1	a2, b2, c2

Motor control and I/O board (RMIO)

What this chapter contains

This chapter shows

- external control connections to the RMIO board for the ACQ800 Pump Control Program
- specifications of the inputs and outputs of the board.

To which products this chapter applies

This chapter applies to ACQ800 units which employ the RMIO-01 board (revision J or later) or the RMIO-02 board (revision H or later).

Note on cabinet-installed ACQ800 drives

The terminals of the RMIO board are optionally wired to terminal block X2. The connections shown below apply also to terminal block X2 (the markings are identical to the ones on the RMIO board).

Terminals of X2 accept cables from 0.5 to 4.0 mm^2 (22 to 12 AWG). The tightening torque for screw terminals is 0.4 to 0.8 Nm (0.3 to 0.6 lb-ft). For disconnecting wires from spring terminals, use a screwdriver 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 terminal labelling

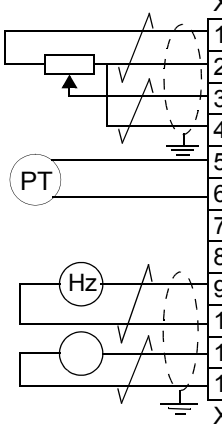
Optional modules (type Rxxx) may have terminal designations that coincide with those on the RMIO board.

External control connections (US)

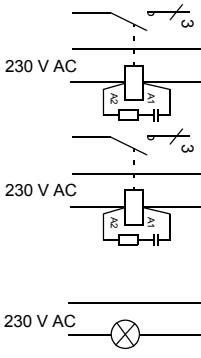
External control cable connections to the RMIO board for the ACQ800 Pump Control Program (PFC TRAD) are shown below. For external control connections of other application macros and programs, see the appropriate *Firmware Manual*.

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 lb-ft)

See *Firmware Manual* for sensor connection instructions.



X20		
1	VREF	Reference voltage -10 VDC
2	GND	1 kohm ≤ R_L ≤ 10 kohm
X21		
1	VREF	Reference voltage 10 VDC
2	GND	1 kohm ≤ R_L ≤ 10 kohm
3	AI1+	External reference 2 (process reference to PI
4	AI1-	controller). 0(2) … 10 V, R_{in} > 200 kohm
5	AI2+	Actual value 1 (process actual value to PI
6	AI2-	controller). 0(4) … 20 mA, R_{in} = 100 ohm
7	AI3+	By default, not in use.
8	AI3-	0(4) … 20 mA, R_{in} = 100 ohm.
9	AO1+	Frequency. 0(4) … 20 mA ≙
10	AO1-	0 … motor nom. speed, R_L ≤ 700 ohm
11	AO2+	Actual 1 (PI controller actual value).
12	AO2-	0(4) … 20 mA ≙
X22		
1	DI1	By default, not in use.
2	DI2	Interlock: motor 1 off/on
3	DI3	Interlock: motor 2 off/on
4	DI4	By default, not in use.
5	DI5	By default, not in use.
6	DI6	Stop/Start
7	+24 V	+24 VDC, max. 100 mA
8	+24 V	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DI IL	Start interlock (0 = stop)
X23		
1	+24 V	Auxiliary voltage output, non-isolated,
2	GND	24 VDC, 250 mA
X25		
1	RO11	Relay output 1
2	RO12	**M1 START**
3	RO13	
X26		
1	RO21	Relay output 2
2	RO22	**M2 START**
3	RO23	
X27		
1	RO31	Relay output 3
2	RO32	**FAULT**
3	RO33	



RMIO board specifications

Analog inputs

	With Pump Control Program two programmable differential current inputs (0 mA / 4 mA to 20 mA, R_{in} = 100 ohm) and one programmable differential voltage input (-10 V / 0 V / 2 V to +10 V, R_{in} > 200 kohm).
	The analog inputs are galvanically isolated as a group.
Isolation test voltage	500 V AC, 1 min
Max. common mode voltage between the channels	±15 V DC
Common mode rejection ratio	≥ 60 dB at 50 Hz
Resolution	0.025 % (12 bit) for the -10 V to +10 V input. 0.5 % (11 bit) for the 0 to +10 V and 0 to 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 V DC, 0, -10 V DC ± 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 V DC ± 10 %, short circuit proof
Maximum current	250 mA (shared between this output and optional modules installed on the RMIO)

Analog 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 Pump Control Program six programmable digital inputs (common ground: 24 V DC, -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 V DC): short circuit proof. An external 24 V DC supply can be used instead of the internal supply.
Isolation test voltage	500 V AC, 1 min
Logical thresholds	< 8 V DC ≙ “0”, > 12 V DC ≙ “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 V DC or 250 V AC, 0.4 A at 120 V DC
Minimum continuous current	5 mA rms at 24 V DC
Maximum continuous current	2 A rms
Isolation test voltage	4 kV AC, 1 minute

DDCS fiber optic link

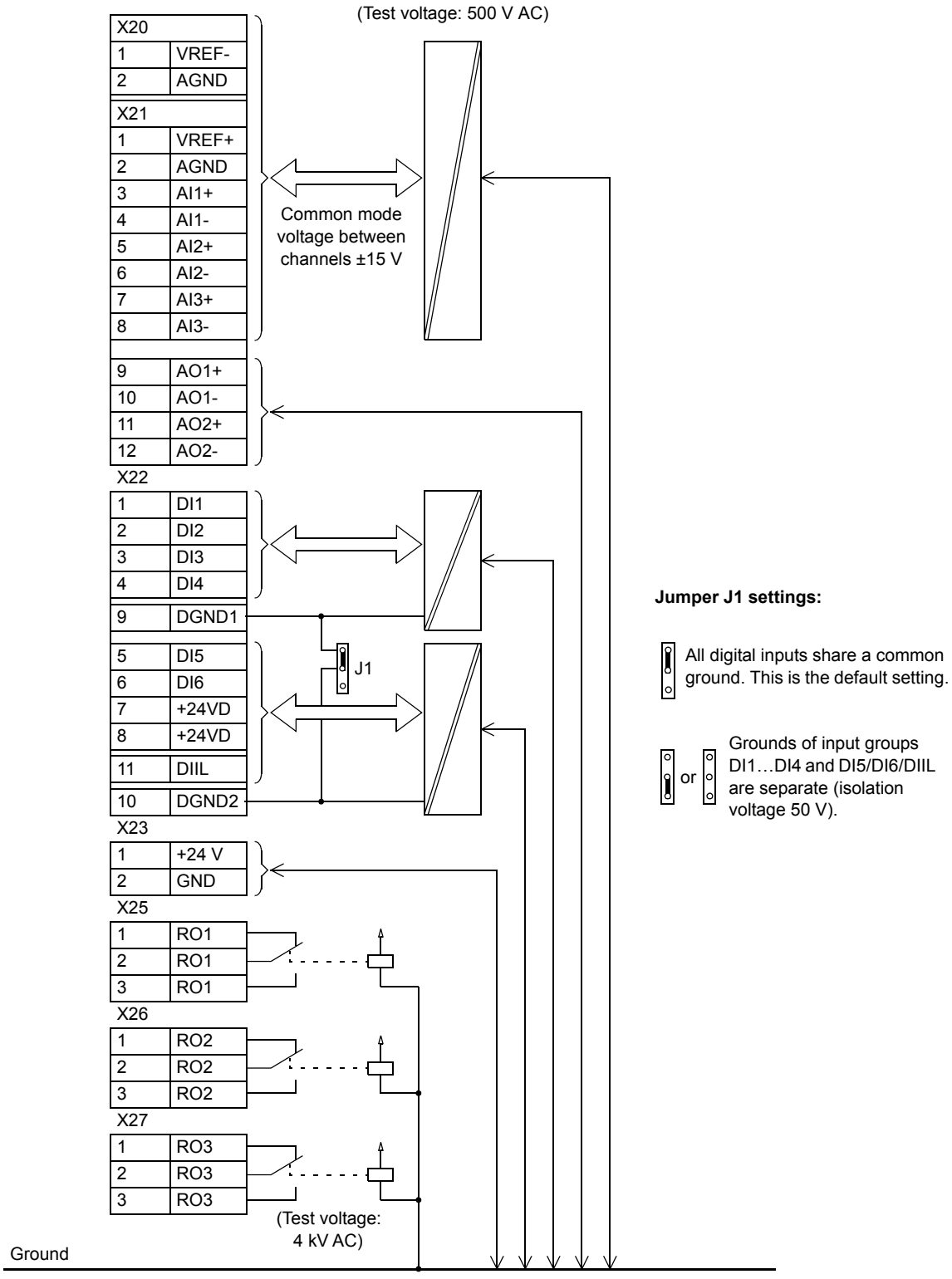
	With communication adapter module RDCO. Protocol: DDCS (ABB Distributed Drives Communication System)

24 V DC power input

Voltage	24 V DC ± 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 61800-5-1 provided that the external circuits connected to the terminals also fulfil the requirements, and that the installation site is below 2000 m (6562 ft) in altitude. For installation at higher altitudes, see page 65.

Isolation and grounding diagram



Installation checklist and start-up

What this chapter contains

This chapter contains an installation checklist, a start-up procedure for the drive, and listings of parameters specific to the ACQ800-37.

Installation checklist

Check the mechanical and electrical installation of the drive before start-up. Go through the checklist below together with another person.

WARNING! Only qualified electricians are allowed to commission the drive. Read and follow the *Safety instructions* on the first pages of this manual. Neglecting the safety instructions can cause injury or death.

Check…	
MECHANICAL INSTALLATION	
The ambient operating conditions are allowed. See *Electrical installation, Technical data: IEC ratings* or *Ambient conditions*.	☐
The unit is fixed properly to floor. 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.	☐
The drive is grounded properly.	☐
The supply (input power) voltage matches the nominal input voltage of the drive.	☐
The supply (input power) connection to the input terminals are OK and the phase order is correct.	☐
Appropriate supply (input power) fuses and disconnector are installed.	☐
The motor connections at the output terminals are OK.	☐
The motor cable is routed away from other cables.	☐
Settings of the auxiliary voltage transformer.	☐
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.	☐
Supply (input power) voltage cannot be applied to the output of the drive (with a bypass connection).	☐
All shrouds are in place.	☐

Start-up procedure

	Action	Additional information
	**WARNING!** Ensure that the disconnector of the supply transformer is locked to open position, i.e. no voltage is, or cannot be connected to drive inadvertently. Check also by measuring that there is no voltage connected.	
Basic checks with no voltage connected		
☐	If the unit is equipped with an air circuit breaker, check the current trip limits of the breaker (preset at the factory). *General rule* Ensure the selectivity condition is fulfilled i.e. the breaker trips at a lower current than the protection device of the supplying network, and that the limit is high enough not to cause unnecessary trips during the intermediate DC circuit load peak at start. *Long-term current limit* As a rule of thumb, this should be set to the rated AC current of the drive. *Peak current limit* As a rule of thumb, this should be set to a value 3-4 times the rated AC current of the drive.	Optional device. See the delivery-specific circuit diagrams.
☐	Check the settings of the relays and breakers/switches of the auxiliary circuits.	Optional devices. See delivery specific circuit diagrams.
☐	Disconnect any unfinished or unchecked 230/115 V AC cables that lead from the terminal blocks to the outside of the equipment.	
Connecting voltage to input terminals and auxiliary circuit		
	**WARNING!** When voltage is connected to the input terminals, voltage may also be connected to the auxiliary circuits of the drive. Make sure that it is safe to apply voltage. Ensure that: • nobody is working on the unit or circuits that are wired from outside into the cabinets • cabinet doors are closed • covers of motor terminal boxes are in place.	
☐	Close the main breaker of the supply transformer.	
☐	Close the auxiliary circuit On/Off switch (Q100) if present.	
Starting the supply unit		
☐	Close the main switch/disconnector (Q1).	
☐	Units with emergency stop: Turn the Start switch on the cabinet door from 0 into START position for 2 seconds, then release the switch and leave it in position 1.	
Checks with the supply unit running		
☐	Check the settings of the earth fault (ground fault) monitoring device (if present).	See chapter *Electrical installation*.

	Action	Additional information
Supply unit (line-side converter) program set-up		
	Parameters of the IGBT supply unit need not be set during the start-up procedure, or in normal use. In case the parameters of the supply unit need to be changed, switch the control panel (optional) to view the line-side converter as described in section *Control panel* on page 38. Alternatively, a PC equipped with a programming tool (e.g. DriveWindow) can be connected to channel CH3 of the inverter unit's RDCU. **Note:** An automatic Line-Side Identification routine is active by default and it is repeated each time the line-side converter receives a start command after the control board (RMIO) is powered. The identification should be performed at least once during the start-up. After this it can be disabled with parameter 99.08 AUTO LINE ID RUN, especially if a quick start is needed. If the phase order is changed after the first start, the Line-side Identification routine needs to be repeated. **Note:** It is recommended to set parameter 16.15 START MODE to LEVEL • if the motor is started and stopped frequently. This prolongs the life of the charging contactor, • if the drive is equipped with the emergency stop option, • when it is required to start the motor without delay after the start command, or • if the drive is connected to a common DC bus. Otherwise the charging resistors may be damaged. **Note:** The output voltage of the drive can be raised using a parameter setting; for example, it is possible to run a 500 V motor off a 400 V supply. Contact your local ABB representative for more information.	
Inverter control program set-up		
☐	Follow the instructions in the *Firmware Manual* of the inverter unit to start up the drive and to set the drive parameters.	See the *Firmware Manual* of the inverter unit.
On-load checks		
☐	Check that the cooling fans rotate freely in the right direction, and the air flows upwards.	Check visually that the fans rotate in the direction indicated by an arrow on the fan housing.
☐	Check the direction of rotation of the motor.	

ACQ800-37-specific parameters in the IGBT Supply Control Program

The signals and parameters described in the tables below are included in the IGBT Supply Control Program.

Terms and abbreviations

Term	Definition
B	Boolean
C	Character string
Def.	Default value
FbEq	Fieldbus equivalent: the scaling between the value shown on the control panel and the integer used in serial communication
I	Integer
R	Real
T.	Data type (see B, C, I, R)

Parameters

No.	Name/Value	Description	T./FbEq	Def.
16 SYSTEM CTR INPUTS		Parameter lock, parameter back-up etc.		
16.15	START MODE	Selects start mode.	B	EDGE
	LEVEL	Starts converter by level of control command. Control command is selected by parameter 98.01 COMMAND SEL and 98.02 COMM. MODULE. **WARNING!** After a fault reset, the converter will start if the start signal is on.	0	
	EDGE	Starts converter by EDGE of control command. Control command is selected by parameter 98.01 COMMAND SEL and 98.02 COMM. MODULE.	1	
31 AUTOMATIC RESET		Automatic fault reset. Automatic resets are possible only for certain fault types and when the automatic reset function is activated for that fault type. The automatic reset function is not operational if the drive is in local control (L visible on the first row of the control panel display). **WARNING!** If the start command is selected and it is ON, the line converter may restart immediately after automatic fault reset. Ensure that the use of this feature will not cause danger. **WARNING!** Do not use these parameters when the drive is connected to a common DC bus. The charging resistors may be damaged in an automatic reset.		

No.	Name/Value	Description	T./FbEq	Def.
31.01	NUMBER OF TRIALS	Defines the number of automatic fault resets the drive performs within the time defined by parameter 31.02. **Note:** When the value of parameter is not 0 and parameter 98.02 COMM. MODULE is set to INU COM LIM, sending a fault bit of 08.01 MAIN STATUS WORD to inverter side is delayed 1 s to get time for line-converter automatic reset function.	I	0
	0 … 5	Number of the automatic resets	0	
31.02	TRIAL TIME	Defines the time for the automatic fault reset function. See parameter 31.01.	R	30 s
	1.0 … 180.0 s	Allowed resetting time	100 … 18000	
31.03	DELAY TIME	Defines the time that the drive will wait after a fault before attempting an automatic reset. See parameter 31.01.	R	0 s
	0.0 … 3.0 s	Resetting delay	0 … 300	
31.04	OVERCURRENT	Activates/deactivates the automatic reset for the line converter overcurrent fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	
31.05	OVERVOLTAGE	Activates/deactivates the automatic reset for the intermediate link overvoltage fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	
31.06	UNDERVOLTAGE	Activates/deactivates the automatic reset for the intermediate link undervoltage fault.	B	NO
	NO	Inactive	0	
	YES	Active	65535	

Default values of parameters with the ACQ800-37

When the IGBT Supply Control Program is loaded into the ACQ800-37, the following parameters receive the default values given in the table below. Do not change the default values. If they are changed, the drive will not operate properly.

Parameter		Default value
11.01	DC REF SELECT	FIELDBUS
11.02	Q REF SELECT	PARAM 24.02
70.01	CH0 NODE ADDR	120
70.19	DDCS CH0 HW CONN	RING
70.20	CH3 HW CONNECTION	RING
71.01	CH0 DRIVEBUS MODE	NO
98.01	COMMAND SEL	MCW
98.02	COMM. MODULE	INU COM LIM

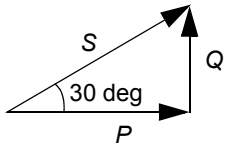
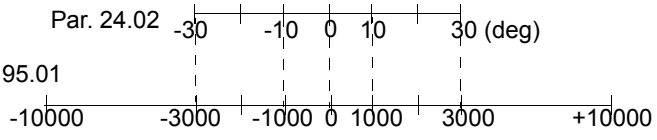
ACQ800-37-specific parameters in the inverter control program

The actual signals and parameters described in this section are included in the most commonly used inverter control program, ACQ800 Pump Control Program.

Terms and abbreviations

Term	Definition
Actual signal	Signal measured or calculated by the drive. Can be monitored by the user. No user setting possible.
FbEq	Fieldbus equivalent: The scaling between the value shown on the control panel and the integer used in serial communication.
Parameter	A user-adjustable operation instruction of the drive.

Actual signals and parameters of the supply unit control program visible also in the inverter control program

No.	Name/Value	Description	FbEq	Def.
09 ACTUAL SIGNALS		Signals from the supply unit (line-side converter).		
09.12	LCU ACT SIGNAL 1	Line-side converter signal selected by par. 95.08 LCU PAR1 SEL.	1 = 1	106
09.13	LCU ACT SIGNAL 2	Line-side converter signal selected by par. 95.09 LCU PAR2 SEL.	1 = 1	110
95 HARDWARE SPECIF		Line-side converter references and actual signal selections.		
95.06	LCU Q PW REF	Reactive power reference for the line-side converter i.e. the value for par. 24.02 Q POWER REF2 in the IGBT Supply Control Program. Scaling example 1: 10000 equals to a value of 10000 of parameter 24.02 Q POWER REF2 and 100% of par. 24.01 Q POWER REF (i.e. 100% of the converter nominal power given in par. 04.06 CONV NOM POWER) when par. 24.03 Q POWER REF2 SEL is set to PERCENT. Scaling example 2: Par. 24.03 Q POWER REF2 SEL is set to kVAr. A value of 1000 of par. 95.06 equals to 1000 kVAr of par. 24.02 Q POWER REF2. Value of par. 24.01 Q POWER REF is then 100 · (1000 kVAr divided by converter nominal power in kVAr)%. Scaling example 3: Par. 24.03 Q POWER REF2 SEL is set to PHI. A value of 10000 of par. 95.06 equals to a value of 100 deg of parameter 24.02 Q POWER REF2 which is limited to 30 deg. The value of par. 24.01 Q POWER REF will be determined approximately according to the following equation where *P* is read from actual signal 1.09 POWER: $\cos 30 = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}}$  Positive reference 30 deg denotes capacitive load. Negative reference 30 deg denotes inductive load. 		0
	-10000 ... +10000	Setting range.	1 = 1	
95.07	LCU DC REF	DC voltage reference for line converter i.e. the value for parameter 23.01 DC VOLT REF.		0
	0 … 1100	Setting range in volts.	1 = 1 V	
95.08	LCU PAR1 SEL	Selects the line converter address from which actual signal 9.12 LCU ACT SIGNAL 1 is read.		106
	0 … 10000	Parameter index.	1 = 1	
95.09	LCU PAR2 SEL	Selects the line converter address from which actual signal 9.13 LCU ACT SIGNAL 2 is read.		110
	0 … 10000	Parameter index.	1 = 1	

Maintenance

What this chapter contains

This chapter contains preventive maintenance instructions.

Safety instructions

Only a qualified electrician is allowed to perform the maintenance.

Before starting work inside the cabinet,

- isolate the drive from the power supply (note that any switch-disconnector installed in the drive does not switch off the voltage from the input terminals)
- wait for 5 minutes to let the intermediate circuit capacitors discharge
- open the cabinet doors
- ensure there is no dangerous voltage present by measuring the voltage of the input terminals and the intermediate circuit terminals.

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 action	Instruction
Every year of storage	Capacitor reforming	See *Converter module capacitor reforming instructions* (Code: 3BFE 64059629 [English]) and *Capacitors*.
Every 6 to 12 months (depending on dustiness of environment)	Heatsink temperature check and cleaning	See *Heatsinks*.
Every year (IP22 and IP42 units)	Air filter check; replacement if necessary	See *Checking and replacing the air filters*.
Every year (IP54 units)	Air filter replacement	
Every 3 years (Frame R8i units)	Quick connector check and cleaning	See *Quick connectors (Frame R8i)*.
Every 6 years	Cabinet cooling fan replacement	See *Cooling fans*.
	Power module cooling fan replacement	See *Cooling fans*.
	LCL filter cooling fan replacement	See *Cooling fans*.
Every 9 years	Capacitor replacement	See *Capacitors*.

Consult your local ABB Service representative for more details on the maintenance. On the Internet, go to http://www.abb.com/drivesservices.

Checking and replacing the air filters

1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Open the cabinet doors.
3. Check the air filters and replace if necessary (see chapter *Technical data* for the correct filter types). The inlet (door) filters can be accessed by removing the fastener(s) at the top of the grille, then lifting the grille and pulling it away from the door. The outlet (roof) filter in IP54 units has a similar mechanism.
4. Check the cleanliness of the cabinet. Clean the interior of the cabinet if necessary using a soft brush and a vacuum cleaner.
5. Close the cabinet doors.

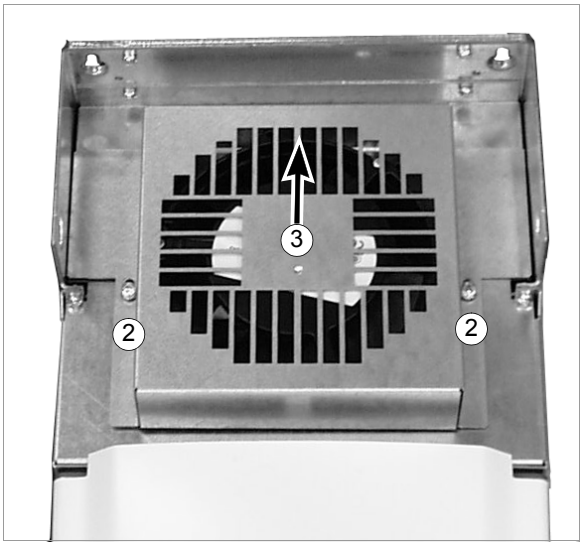
Quick connectors (Frame R8i)

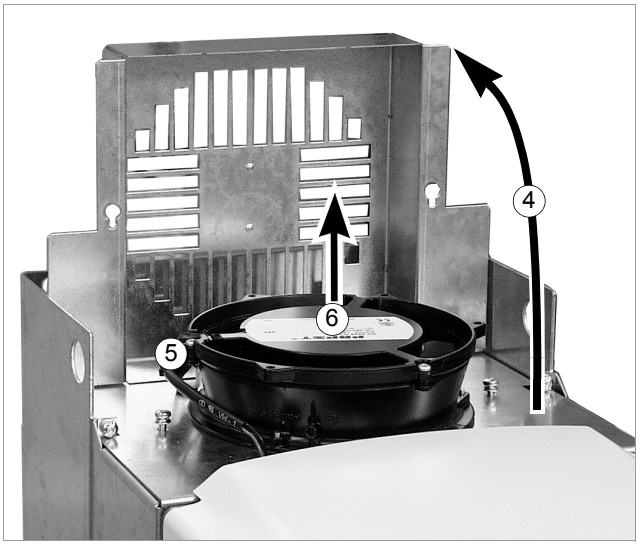
1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Open the cabinet doors.
3. Extract a supply module or inverter module from the cabinet. See section *Power module replacement (Frame R8i)* on page *104*. Obey the safety instructions when you handle the heavy module!
4. Check the tightness of the cable connections at the quick connector. Use the tightening torque table in chapter *Technical data*.
5. Clean all contact surfaces of the quick connector and apply a layer of suitable joint compound (e.g. Isoflex® Topas NB 52 from Klüber Lubrication) onto them.
6. Re-insert the supply/inverter module.
7. Repeat steps 3 to 6 for all remaining supply and inverter modules.
8. On frame R8i units (with ALCL-1x-x LCL filter), repeat steps 3 to 6 for the LCL filter module.

Cooling fans

Supply/Inverter module cooling fan replacement (Frame R6)

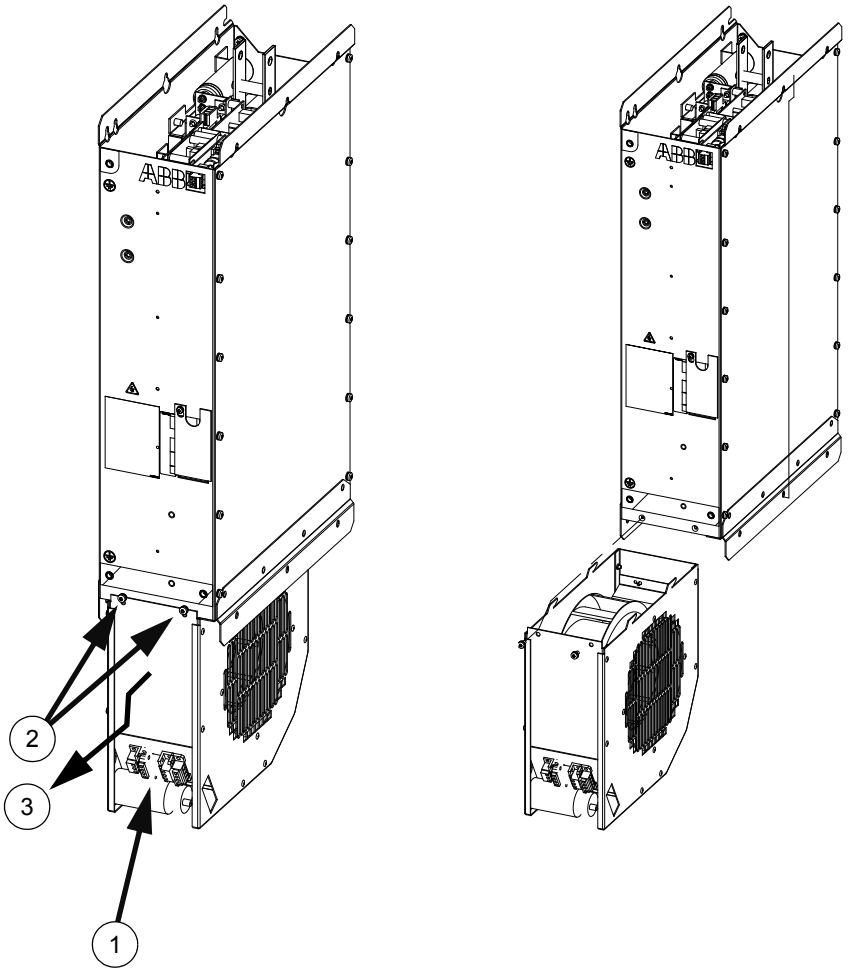
1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Loosen the fastening screws of the fan housing.
3. Push the fan housing backwards.
4. Lift the fan housing up (out of the way).
5. Disconnect the fan supply wires (detachable connector).
6. Remove the fan.
7. Install the new fan in reverse order.





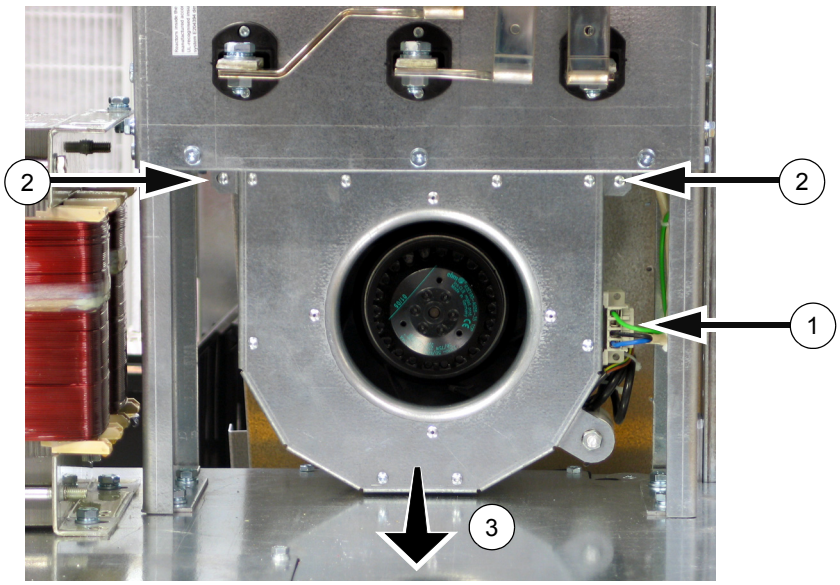
Supply/Inverter module cooling fan replacement (Frame R7i)

1. Disconnect the wire plug.
2. Remove the two screws holding the fan unit.
3. Pull the fan unit slightly towards the front of the cubicle, then downwards to free it.
4. Install the new fan in reverse order.



LCL filter module cooling fan replacement (Frame R7i)

1. Disconnect the wire plug (1).
2. Remove the two screws holding the fan unit (2).
3. Pull the fan unit out (3).
4. Install the new fan in reverse order.



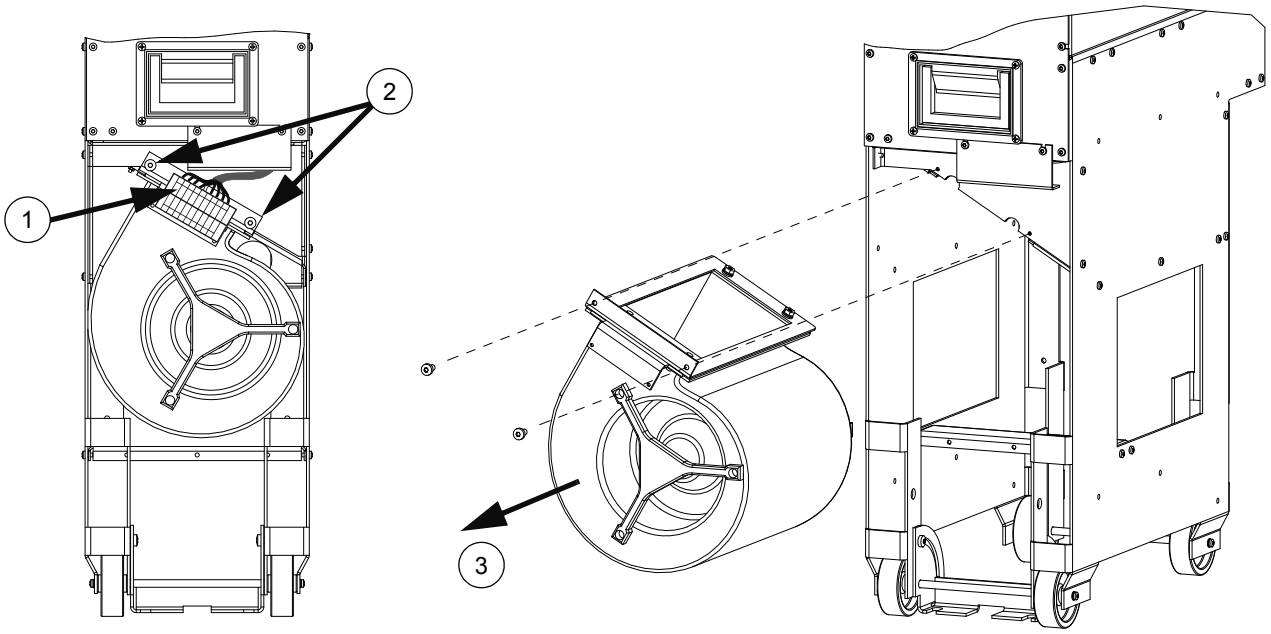
Supply and inverter module cooling fan replacement (Frame R8i)

The actual lifespan of the fan depends on the running time of the fan, ambient temperature and dust concentration. Each supply and inverter module has its own cooling fan. Replacements are available from ABB. Do not use other than ABB specified spare parts.

The supply and inverter control programs keep track of the running times of the cooling fans of the supply and inverter modules respectively. See the *Firmware Manuals* delivered with the drive for the actual signals which indicate the running time.

Module fan replacement procedure

1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Disconnect the fan wiring plug (1).
3. Remove the locking screws (2).
4. Pull the fan out along its sliding rails (3).
5. Install a new fan in reverse order.



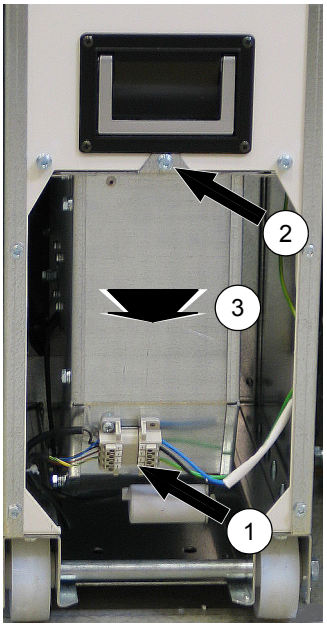
LCL filter cooling fan replacement (Frame R8i)

The actual lifespan of the fan depends on the running time of the fan, ambient temperature and dust concentration. Replacements are available from ABB. Do not use other than ABB specified spare parts.

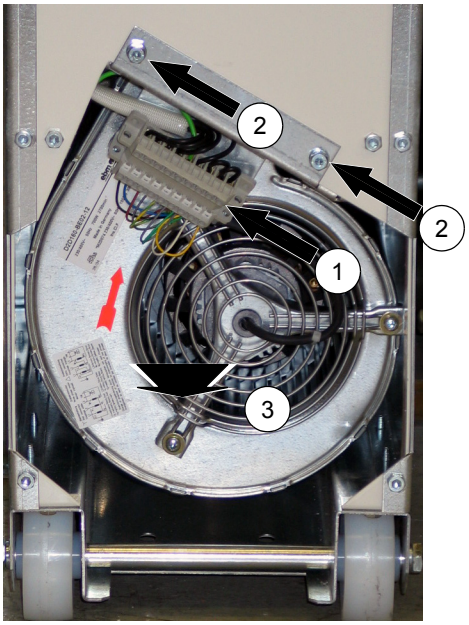
LCL filter fan replacement procedure

1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Disconnect the fan wiring plug (1).
3. Remove the screws of the fan fastening rail/clip (2).
4. Pull the fan out (3).
5. Install a new fan in reverse order.

ALCL-1x



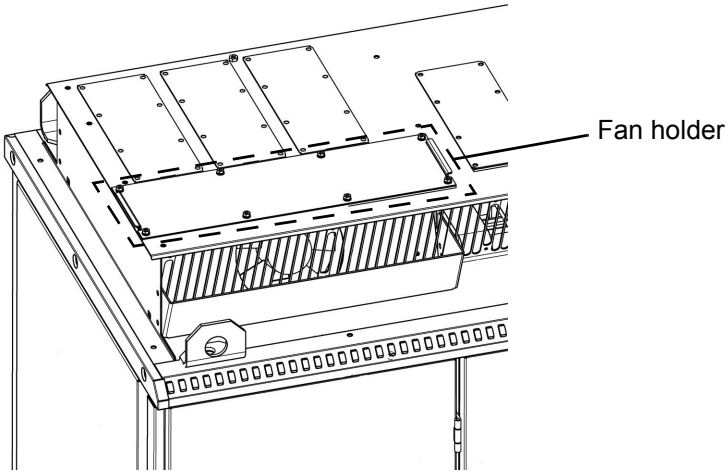
ALCL-2x



Cabinet fan replacement (Frame R6)

1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Open the cubicle door.
3. Remove the shroud covering the top of the cubicle.
4. Disconnect the fan wiring. Make note of the connections at the terminal block.
5. Undo the two fastening screws that secure the fan holder to the cubicle roofplate.
6. Pull out the fan holder plate together with the fan.
7. Remove the four screws that fasten the fan to the holder.
8. Install new fan in reverse order.

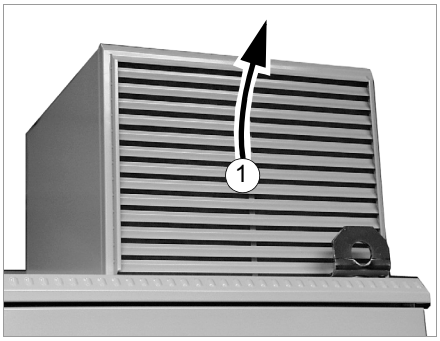
Cabinet fan replacement (Frame R8i with IP21-42)

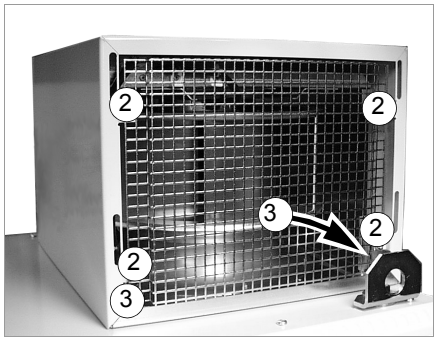


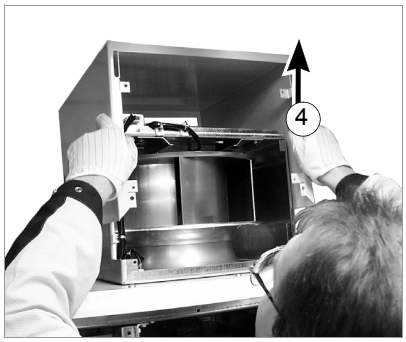
1. Remove the eight screws attaching the fan holder to the cabinet roof.
2. Lift the fan holder until the fan cable can be disconnected.
3. Disconnect the fan cable.
4. Remove the fan from the fan holder.
5. Fasten a new fan to the fan holder.
6. Reconnect the fan cable.
7. Insert the fan holder into the aperture in the cabinet roof. Make sure the gasket is not displaced while doing this.
8. Fasten the eight screws attaching the fan holder.

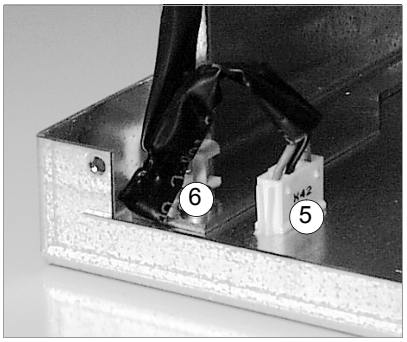
Cabinet fan replacement (Frame R8i with IP54)

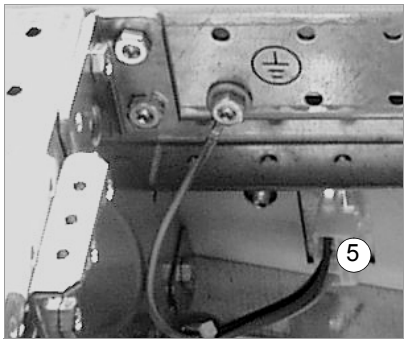
1. Remove the front and back gratings of the fan cubicle by lifting them upwards.
2. Remove the shrouds by undoing the fastening screws.
3. Undo the fastening screws of the side/top cover of the fan.
4. Lift the side/top cover of the fan off.
5. Disconnect the fan supply wire connector from the cabinet 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 fan.
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 centered and rotates freely.

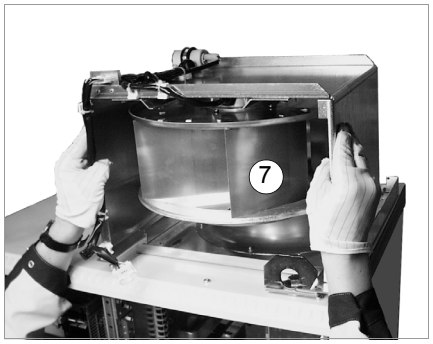


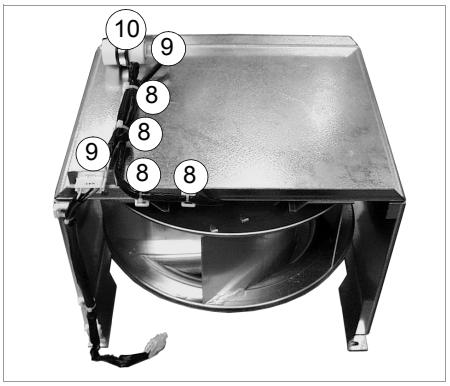


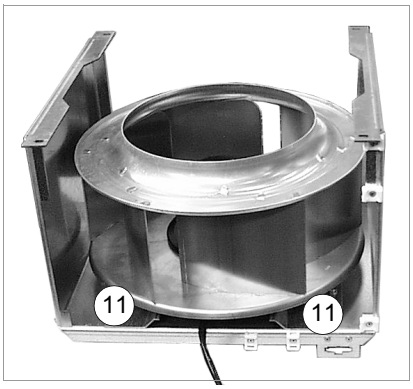


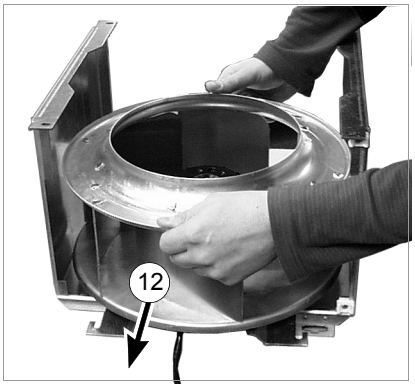












Heatsinks

The heatsink fins of the power modules pick up dust from the cooling air. The module runs into overtemperature warnings and faults if the heatsinks are not clean. In a “normal” environment (not especially dusty nor clean) the heatsinks should be checked annually, in a dusty environment more often.

Whenever necessary, clean the heatsinks as follows:

1. Remove the cooling fan (see section *Cooling fans* on page *96*).
2. 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 the dust from entering adjoining equipment.
3. Refit the cooling fan.

Capacitors

The inverter modules employ several electrolytic capacitors. Their actual lifespan depends 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 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.

Reforming

Reform (re-age) spare part capacitors once a year according to *Converter module capacitor reforming instructions* (code: 64059629 [English], available through your local ABB representative).

Capacitor replacement

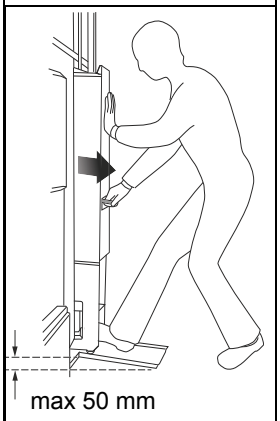
Contact an ABB service representative.

Power module replacement (Frame R8i)

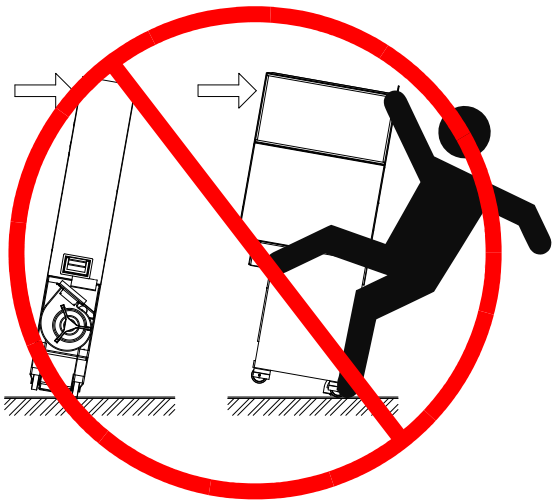
WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Use extreme caution when maneuvering an inverter, supply or filter module that runs on wheels. The modules are heavy and have a high center of gravity. They topple over easily if handled carelessly.
- Do not use the ramp which is supplied with the drive with heights over 50 mm (1.97 in) (the standard plinth height of ABB cabinets). The ramp is designed for a plinth height of 50 mm (1.97 in).

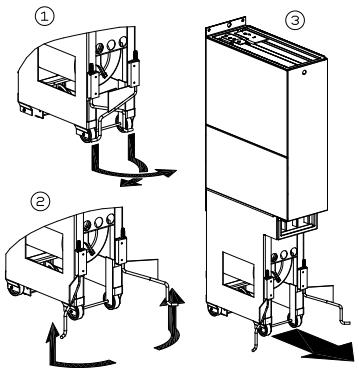
Support the top and bottom of the module while removing!



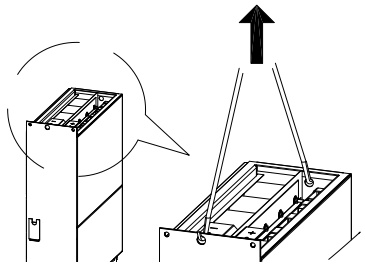
Do not tilt!



Extend the support legs outside the cabinet!

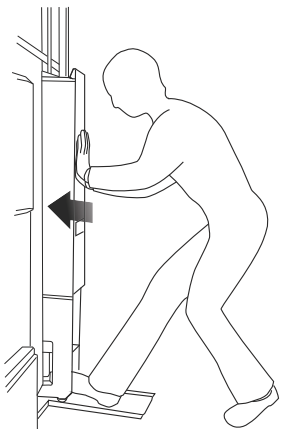


Lift the module by the upper part only using the lifting hole(s) at the top!



Mind your fingers! Keep fingers away from the edges of the front flange of the module!

Support the top and bottom of the module while replacing!



Extracting the module from the cubicle

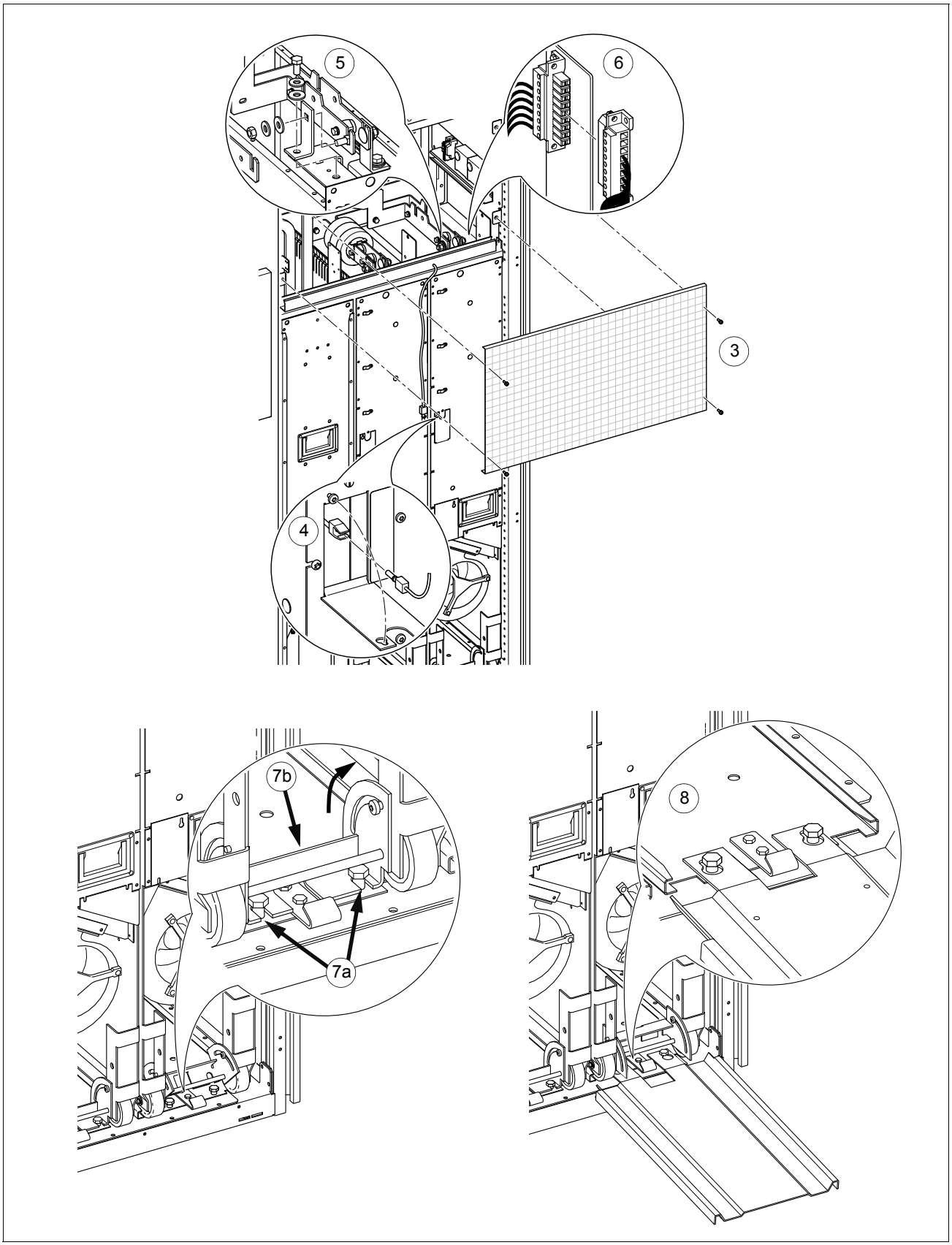
1. Read and repeat the steps in section *Safety instructions* on page *93*.
2. Open the door of the supply and inverter unit cubicle (see section *Cabling direction* starting on page *31*).
3. Remove any shrouds that protect the busbars and cable entries.
4. Open the transparent cover on the front of the module and disconnect the fiber optic cables. Move the cables aside.
5. Remove the L-shaped DC busbars on top of the module – be careful not to drop the screws or busbars inside the module.
6. Disconnect the terminal block (X50) next to the DC busbars.
7. At the base of the module, loosen the two fastening screws (7a) but leave them in place; lift the bracket (7b) into the up position. (Loosen the locking screws on the sides of the bracket a bit, too, if necessary.)
8. Insert the module pull-out ramp under the two screws at the base of the module and tighten.

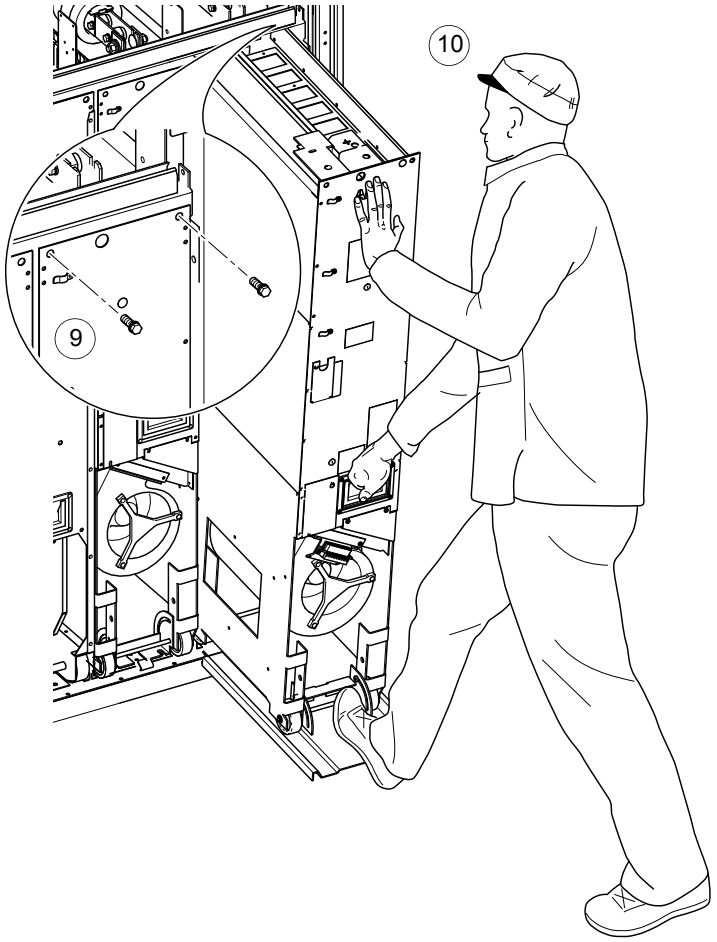
WARNING! Do not use the ramp which is supplied with the drive with heights over 50 mm (1.97 in) (the standard plinth height of ABB cabinets). The ramp is designed for a plinth height of 50 mm (1.97 in).

9. Remove the two module fastening screws at the top.
10. Pull the module carefully out of the cubicle along the ramp.

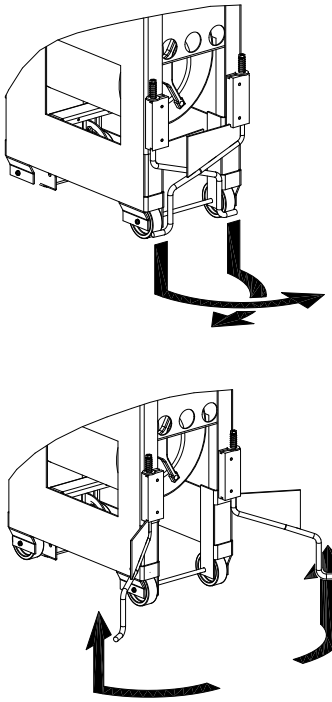
WARNING! Make sure that the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back. Use safety shoes with metal toe cap to avoid foot injury.

11. Extend the support legs of the module. Keep the legs extended until the module is about to be inserted back into the cubicle.


5
6
3
4
7b
7a
8



11 View from back:



Inserting the module into the cubicle

1. Move the module close to the ramp, and then retract the support legs of the module.
2. Push the module up the ramp and back into the cubicle.

WARNING! Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.

3. Fasten the module fixing screws at the top and reconnect the DC busbars.
4. Connect the cables (X50, fiber optic cables).
5. Loosen the fastening screws at the base of the module and remove the pull-out ramp. Flip the module fastening bracket into the down position and tighten the screws.
6. Fasten the shroud and close the cubicle door.

Fault tracing

Faults and warnings displayed by the CDP-312R Control Panel

The control panel will display the warnings and faults of the unit (i.e. supply unit or inverter unit) the panel is currently controlling.

The warnings and faults concerning the inverter unit (motor-side converter) are dealt with in the inverter control program (e.g. Pump Control Program) *Firmware Manual*.

Warning/Fault message from unit not being monitored by control panel

Flashing messages WARNING, ID:2 or FAULT, ID:2 on the control panel display indicate a warning or fault state in the line-side converter when the panel is controlling the motor-side converter:

```
 FAULT, ID:2
ACQ 800 0460_5MR
*** FAULT ***
LINE CONV      (FF51)
```

To display the warning or fault identification text, switch the control panel to view the line-side converter as described in section *Control panel* on page 38.

Conflicting ID numbers

If the ID numbers of the line-side and the motor-side converters are set equal, the control panel stops functioning. To clear the situation:

- Disconnect the panel cable from the RMIO board of the motor-side converter.
- Set the ID number of the line-side converter RMIO board to 2. For the setting procedure, see the inverter control program (e.g. Pump Control Program) *Firmware Manual.*
- Connect the disconnected cable to the RMIO board of the motor-side converter again and set the ID number to 1.

LEDs of the drive

Location	LED	Indication
RMIO board (RDCU drive control unit)	Red	Fault state.
	Green	The power supply on the board is OK.
Control panel mounting platform (with the control panel removed)	Red	Fault state.
	Green	The main + 24 V power supply for the control panel and the RMIO board is OK.
AINT board (visible through the transparent cover on the front of the supply and inverter modules)	V204 (green)	+5 V voltage of the board is OK.
	V309 (red)	Prevention of unexpected start-up 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. ratings, frame sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings, and warranty information.

IEC ratings

The ratings for the ACQ800-37 with a 50 Hz supply are given below. The symbols are described below the table.

ACQ800-37 type	Nominal ratings			No-over-load use	Light-overload use		Heavy-duty use		Heat dissi-pation	Air flow	Noise level
	I_{1N} A	$I_{cont.max}$ A	I_{max} A	$P_{cont.max}$ kW	I_{2N} A	P_N kW	I_{2hd} A	P_{hd} kW	kW	m^3/h	dBA
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V											
ACQ800-37-0070-5	112	120	168	75	114	75	88	55	2.4	500	73
ACQ800-37-0100-5	129	139	234	90	132	90	114	75	2.8	500	73
ACQ800-37-0120-5	145	156	264	110	148 (1	90	125	75	3.4	500	73
ACQ800-37-0170-5	180	200	291	132	192	132	150	90	6	1300	74
ACQ800-37-0210-5	220	245	355	160	235 (2	160	183	110	8	1300	74
ACQ800-37-0260-5	270	302	438	200	289 (3	200	226	132	8	3160	75
ACQ800-37-0320-5	329	365	530	250	350 (4	250	273	160	10	3160	75
ACQ800-37-0400-5	410	455	660	315	437	315	340	200	12	3160	75
ACQ800-37-0460-5	473	525	762	355	504	355	393	250	14	3160	75
ACQ800-37-0510-5	536	595	863	400	571	400	445	315	16	3160	75
ACQ800-37-0610-5	630	700	1016	500	672	450	524	315	20	3160	75

(1) 156 A allowed at 460 V
(2) 240 A allowed at 460 V
(3) 302 A allowed at 460 V
(4) 361 A allowed at 460 V

Symbols

Nominal ratings

I_{1N} Nominal input current

$I_{cont.max}$ Continuous RMS output current. No overloadability at 40 °C (104 °F).

I_{max} Maximum output current. Allowable for 10 seconds at start, otherwise as long as allowed by drive temperature.

Typical ratings for no-overload use

$P_{cont.max}$ Typical motor power. The power ratings apply to most IEC 34 motors at nominal voltage (500 V).

Typical ratings for light-overload use (10% overloadability)

I_{2N} Continuous rms current. 10% overload is allowed for 1 minute every 5 minutes.

P_N Typical motor power. The power ratings apply to most IEC 34 motors at nominal voltage (500 V).

Typical ratings for heavy-duty use (50% overloadability)

I_{2hd} Continuous rms current. 50% overload is allowed for 1 minute every 5 minutes.

P_{hd} Typical motor power. The power ratings apply to most IEC 34 motors at nominal voltage (500 V).

Derating

The load capacity (current and power) decreases if the installation site altitude exceeds 1000 m (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 by 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 × I_{2N} or 0.90 × $I_{cont.max}$.

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 *Drive*Size PC tool. If the installation site is higher than 2000 m (6600 ft) above sea level, please contact your local ABB distributor or office for further information.

NEMA ratings

The ratings for the ACQ800-37 with a 60 Hz supply are given below. The symbols are described below the table.

ACQ800-37 type	Nominal ratings			Normal use		Heavy-duty use		Heat dissipation	Air flow	Noise level
	I_{1N} A	I_{max} A	$P_{cont.max}$ hp	I_{2N} A	P_N hp	I_{2hd} A	P_{hd} hp	kW	ft^3/min	dBA
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, **460** V or 480 V										
ACQ800-37-0070-5	112	168	75	114	75	88	60	2.4	295	73
ACQ800-37-0100-5	129	234	100	132	100	114	75	2.8	295	73
ACQ800-37-0120-5	145	264	125	156	125	125	100	3.4	295	73
ACQ800-37-0170-5	180	291	150	192	150	156	125	6	765	74
ACQ800-37-0210-5	220	355	200	240	200	183	150	8	765	74
ACQ800-37-0260-5	270	438	250	302	250	226	150	8	1860	75
ACQ800-37-0320-5	329	530	300	361	300	273	200	10	1860	75
ACQ800-37-0400-5	410	660	350	437	350	340	250	12	1860	75
ACQ800-37-0460-5	473	762	450	504	400	393	300	14	1860	75
ACQ800-37-0510-5	536	863	500	571	450	445	350	16	1860	75
ACQ800-37-0610-5	630	1016	550	672	550	524	400	20	1860	75

Symbols

Nominal ratings

I_{1N} Nominal input current

I_{max} Maximum output current. Allowable for 10 seconds at start, otherwise as long as allowed by drive temperature.

$P_{cont.max}$ Typical motor power. The power ratings apply to most 4-pole NEMA-rated motors at nominal voltage (460 V).

Normal use (10% overloadability)

I_{2N} Continuous rms current. 10% overload is allowed for 1 minute every 5 minutes.

P_N Typical motor power. The power ratings apply to most 4-pole NEMA-rated motors at nominal voltage (460 V).

Heavy-duty use (50% overloadability)

I_{2hd} Continuous rms current. 50% overload is allowed for 1 minute every 5 minutes.

P_{hd} Typical motor power. The power ratings apply to most 4-pole NEMA-rated motors at nominal voltage (460 V).

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

ACQ800-37 frame sizes and power module types

ACQ800-37 type	Frame size	Supply module(s) used*		LCL filter(s) used		Inverter modules used*	
		Qty	Type	Qty	Type	Qty	Type
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or **500** V							
ACQ800-37-0070-5	R6	1	ACS800-31-0070-5**		N/A		N/A
ACQ800-37-0100-5	R6	1	ACS800-31-0100-5**		N/A		N/A
ACQ800-37-0120-5	R6	1	ACS800-31-0120-5**		N/A		N/A
ACQ800-37-0170-5	R7i	1	ACS800-104-0175-5	1	ALCL-04-5	1	ACS800-104-0175-5
ACQ800-37-0210-5	R7i	1	ACS800-104-0215-5	1	ALCL-05-5	1	ACS800-104-0215-5
ACQ800-37-0260-5	R8i	1	ACS800-104-0320-5+E205	1	ALCL-12-5	1	ACS800-104-0260-5
ACQ800-37-0320-5	R8i	1	ACS800-104-0400-5+E205	1	ALCL-13-5	1	ACS800-104-0320-5
ACQ800-37-0400-5	R8i	1	ACS800-104-0460-5+E205	1	ALCL-14-5	1	ACS800-104-0400-5
ACQ800-37-0460-5	R8i	1	ACS800-104-0610-5+E205	1	ALCL-15-5	1	ACS800-104-0460-5
ACQ800-37-0510-5	R8i	1	ACS800-104-0610-5+E205	1	ALCL-15-5	1	ACS800-104-0610-5
ACQ800-37-0610-5	R8i	1	ACS800-104-0610-5+E205	1	ALCL-15-5	1	ACS800-104-0610-5

*Modules come with delivery-specific options.
**Integrated supply module, LCL filter and inverter module

AC fuses

Notes:

- Larger fuses must not be used.
- Fuses from other manufacturers can be used if they meet the ratings.
- The recommended fuses are for branch circuit protection per NEC as required for UL approval

Drive type	AC fuse information					
	Qty	I_n	aR, IEC		aR, UL Recognized	
			Bussmann	Mersen	Bussmann	Mersen
500 V						
ACQ800-37-0070-5	3	160	170M3814	–	170M3014	–
ACQ800-37-0100-5	3	200	170M3815	–	170M3015	–
ACQ800-37-0120-5	3	250	170M3816	–	170M3016	–
ACQ800-37-0170-5	3	315	170M3817	–	170M3017	–
ACQ800-37-0210-5	3	400	170M5808	–	170M5008	–
ACQ800-37-0260-5	3	450	170M5809	6.9URD2PV0450	170M5059	–
ACQ800-37-0320-5	3	630	170M6810	6.9URD3PV0630	170M6210	–
ACQ800-37-0400-5	3	800	170M8545	6.9URD3PV0800	170M6212	–
ACQ800-37-0460-5	3	1000	170M6814	6.9URD3PV1000	170M6214	–
ACQ800-37-0510-5	3	1000	170M6814	6.9URD3PV1000	170M6214	–
ACQ800-37-0610-5	3	1000	170M6814	6.9URD3PV1000	170M6214	–

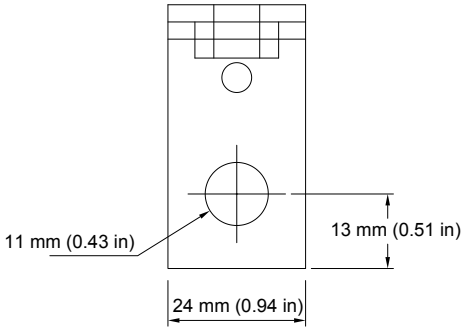
Input power connection

Voltage (U_1)	380/400/415/440/460/480/500 V AC 3-phase ± 10% for 500 V AC units
Short-circuit withstand strength (IEC 60439-1)	Units without grounding switch: Maximum allowable prospective short-circuit current is 65 kA when protected by the fuses given in the fuse tables. Units with grounding switch: Maximum allowable prospective short-circuit current is 50 kA when protected by the fuses given in the fuse tables.
Short-circuit current protection (UL 508A)	The drive is suitable for use on a circuit capable of delivering not more than 100,000 rms symmetrical amperes at 600 V maximum when protected by the fuses given in the fuse tables.
Short-circuit current protection (CSA C22.2 No. 14-05)	The drive is suitable for use on a circuit capable of delivering not more than 65 kA rms symmetrical amperes at 600 V maximum when protected by the fuses given in the fuse tables.
Frequency	48…63 Hz
Imbalance	Max. ± 3% of nominal phase-to-phase input voltage
Voltage dips	Max. 25%
Power factor	$\frac{I_1}{I_{rms}} \cdot \text{cosphi} > 0.98$ cosphi = 1.00 (fundamental at nominal load) I_1 = fundamental input current rms value I_{rms} = total input current rms value
Harmonic distortion	Harmonics are below the limits defined in IEEE519 for all I_{sc}/I_L. Each individual harmonic current fulfils IEEE519 table 10-3 for $I_{sc}/I_L \geq 20$. Current THD and each individual current harmonic fulfil IEC 61000-3-4 table 5.2 for $R_{sce} \geq 66$. The values will be met if the supply network voltage is not distorted by other loads and when the drive operates at the nominal load.
Input power cable lead-throughs	Ø60 mm. For quantity and location, see chapter *Dimensions*.

Input terminals L1/L2/L3 – Frame R6

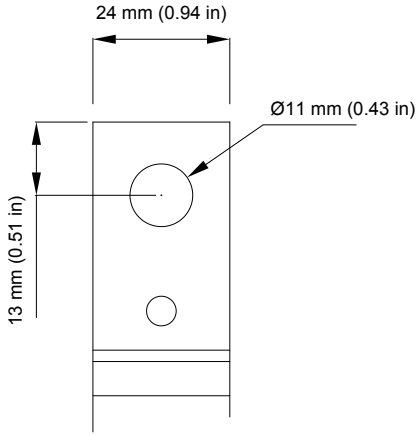
Bottom cable entry/exit

Front view
Bolt size: M10
Tightening torque: 40 Nm (29.5 lb-ft)



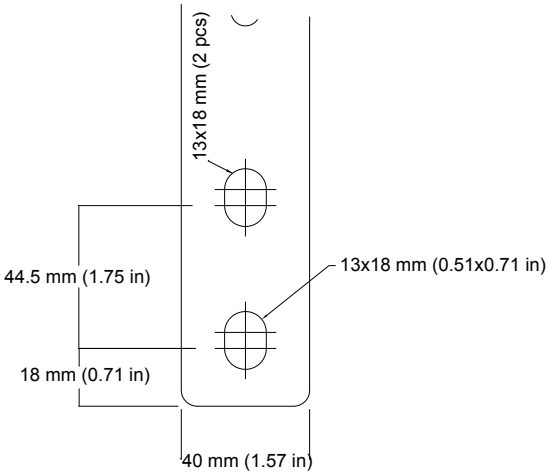
Top cable entry/exit

Front view
Bolt size: M10
Tightening torque: 40 Nm (29.5 lb-ft)



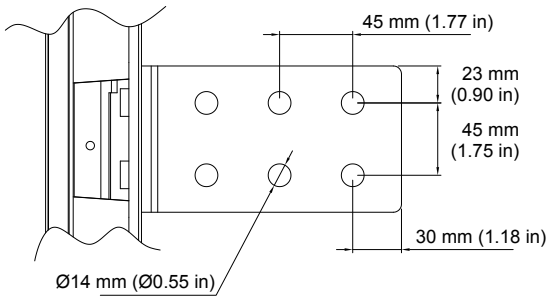
Input terminals L1/L2/L3 – Frame R7i

Side view
Bolt size: M12 or 1/2 in
Tightening torque: 70 Nm (52 lb-ft)



Input terminals L1/L2/L3 – Frame R8i

Front view
Bolt size: M12 or 1/2 in
Tightening torque: 70 Nm (52 lb-ft)



Motor connection

Voltage (U_2)

0 to U_1, 3-phase symmetrical, U_{max} at the field weakening point

Frequency

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

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

where 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

2 × P_{hd}. After approximately 2 minutes at 2 × P_{hd}, the limit is set at $P_{cont.max}$.

Field weakening point

8 to 300 Hz

Switching frequency

2 to 3 kHz (average)

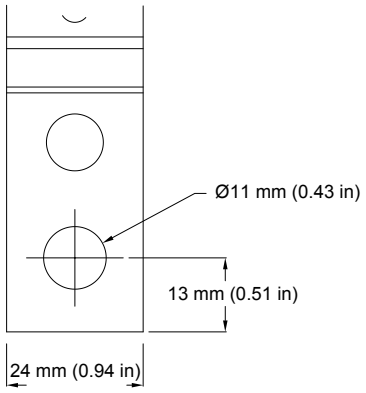
Motor cable lead-throughs

3 × Ø60 mm at each inverter module (units without common motor terminal cubicle)
Units with common motor terminal cubicle: See chapter *Dimensions*.

Output terminals U2/V2/W2 – Frame R6

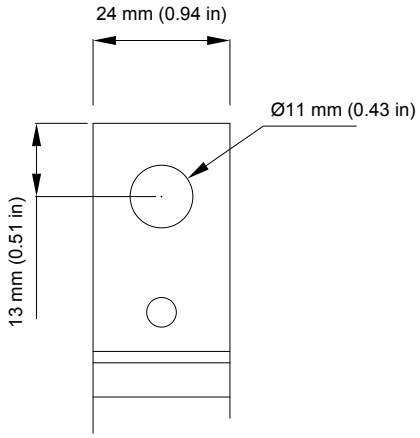
Bottom cable entry/exit

Front view
Bolt size: M10
Tightening torque: 40 Nm (29.5 lb-ft)



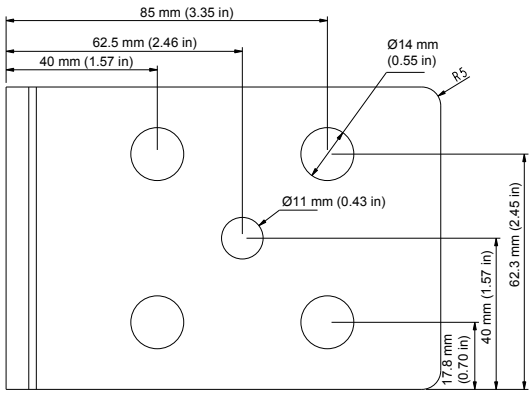
Top cable entry/exit

Front view
Bolt size: M10
Tightening torque: 40 Nm (29.5 lb-ft)



Output terminals U2/V2/W2 – Frame R7i

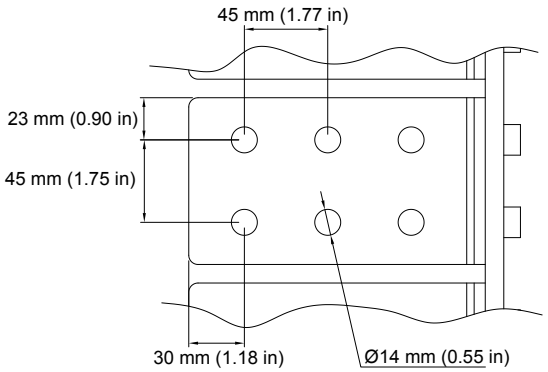
Front view
Bolt size: M12 or 1/2 in
Tightening torque: 70 Nm (52 lb-ft)



Standard output terminals U2/V2/W2 – Frame R8i

Bottom or top exit

Front view
Bolt size: M12 or 1/2 in
Tightening torque: 70 Nm (52 lb-ft)



Maximum recommended motor cable length

100 m (328 ft).

Motor cables up to 300 m (984 ft) long are allowed for frames R6 and R7i, and up to 500 m (1640 ft) long for frame R8i, but then EMC filtering within the specified limits will not be realized.

Efficiency

≥ 97% (at rated current and nominal supply voltage)

Cooling

Method

Internal fans, flow direction from bottom to top

Filter material

	Inlet (door)	Outlet (roof)
IP22/IP42 units	Luftfilter airTex G150	–
IP54 units	Luftfilter airComp 300-50	Luftfilter airTex G150

Free space around the unit

See chapter *Mechanical installation*.

Cooling air flow

See *IEC ratings.*

Degrees of protection

IP21; IP22; IP42; IP54

Ambient conditions

Environmental limits for the drive are given below. The drive must 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	Supply voltage < 600 V AC: max. 4000 m (13 123 ft) **Note:** Above 1000 m (3281 ft), see section *Derating*.	-	-
Air temperature	-15 to +50 °C (5 to 122 °F), no frost allowed. 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 60068-2-27)	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 (thickness approx. 20 µm) steel sheet (thickness 1.5 mm) with polyester thermosetting powder coating (thickness approx. 80 µm) on visible surfaces. color: RAL 7035 (light grey, semigloss).

Busbars Tin- or silver-plated copper

Fire safety of materials (IEC 60332-1) Insulating materials and non-metallic items: Mostly self-extinctive

Packaging Frame: Wood or plywood. Plastic wrapping: 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 are 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.

Tightening torques for power connections

Screw size	Torque
M5	3.5 Nm (2.6 lb-ft)
M6	9 Nm (6.6 lb-ft)
M8	20 Nm (14.8 lb-ft)
M10	40 Nm (29.5 lb-ft)
M12	70 Nm (52 lb-ft)
M16	180 Nm (133 lb-ft)

Applicable standards

The drive complies with the following standards. The compliance with the European Low Voltage Directive is verified according to standards EN 61800-5-1 and EN 60204-1.

- EN 61800-5-1:2007 — Adjustable speed electrical drives. Part 5-1: Safety requirements. Electrical, thermal and energy.
- EN 60204-1:2006 + A1:2009 — 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
  - a supply disconnecting device
  - the drive module into a cabinet.
- EN 60529:1991 (IEC 60529) — Degrees of protection provided by enclosures (IP code)
- IEC 60664-1:2007 — Insulation coordination for equipment within low-voltage systems. Part 1: Principles, requirements and tests.
- EN 61800-3:2004 — Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods.
- UL 508C:2002, Third Edition — UL Standard for Safety, Power Conversion Equipment
- CSA C22.2 No. 14-10 — 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. The CE marking also verifies that the drive, in regard to its safety functions (such as Safe torque off), conforms with the Machinery Directive as a safety component.

Compliance with the European Low Voltage Directive

The compliance with the European Low Voltage Directive has been verified according to standards EN 60204-1 and EN 61800-5-1.

Compliance with the European EMC Directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3:2004) covers requirements stated for drives. See section *Compliance with EN 61800-3:2004* on page *125*.

Compliance with the European Machinery directive

The drive is an electronic product which is covered by the European Low Voltage Directive. However, the drive can be equipped with the Safe torque off function and other safety functions for machinery which, as safety components, are in the scope of the Machinery Directive. These functions of the drive comply with European harmonized standards such as EN 61800-5-2. The declaration of conformity for each function is in the appropriate function-specific manual.

Declaration of Conformity

Declaration of Conformity

(According to Machinery Directive 2006/42/EC)

Manufacturer: ABB Oy, Drives
Address: Hiomotie 13, P.O Box 184, FIN-00381 Helsinki, Finland.

hereby declares that the products:

ACS800-07/ -U7, ACS800-17, ACS800-37, ACS800 multidrives

ACS800-07LC, ACS800-17LC, ACS800-37LC, ACS800LC multidrives

Product safety functions

Safe Torque Off (option codes +Q967, +Q968)

Safe Stop 1 (option code +Q964)

Emergency stop (option codes +Q951, +Q952, +Q963, +Q964)

Safely-Limited Speed (option codes +Q965, +Q966)

Safe Maximum Speed (option codes +Q965, +Q966)

Safe Standstill (option code +Q965)

Safe Direction (option codes +Q965, +Q966)

Fulfil all the relevant safety component requirements of EC Machinery Directive 2006/42/EC, when the listed safety functions are used for safety component functionality.

The following harmonized standards below were used:

EN 61800-5-2: 2007	*Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional*
EN 62061: 2005/ AC: 2010	*Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*
EN ISO 13849-1: 2008/ AC: 2009	*Safety of machinery – Safety-related parts of control systems. Part 1: General requirements*
EN ISO 13849-2: 2008	*Safety of machinery – Safety-related parts of the control systems. Part 2: Validation*
EN 60204-1: 2006/ AC: 2010	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

Other used standards:

IEC 61508 ed. 1	Functional safety of electrical / electronic / programmable electronic safety-related systems

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Declaration of Conformity

(According to Machinery Directive 2006/42/EC)

The products referred in this Declaration of Conformity fulfil the relevant provisions of the Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC. Declaration of conformity according to these directives is available from the manufacturer.

Person authorized to compile the technical file:

Name: Ilpo Kangas
Address: P.O. Box 184, FIN-00381 Helsinki, Finland

Helsinki, 02 Jan 2013

Peter Lindgren
Vice President
ABB Oy

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Compliance with EN 61800-3:2004

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.

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.

Drive of category C2: drive of rated voltage less than 1000 V and intended to be installed and commissioned only by a professional when used in the first environment. **Note:** A professional is a person or organization having necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

Drive of category C3: drive of rated voltage less than 1000 V and intended for use in the second environment and not intended for use in the first environment.

Drive of category C4: drive of rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment.

Category C2

The drive complies with the standard with the following provisions:

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 motor cable length is 100 m (328 ft).

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 (ungrounded) systems. The supply network becomes connected to ground potential through the EMC filter capacitors which may cause danger or damage the unit.

Category C3

The drive complies with the standard with the following provisions:

1. The drive of frame size R6 is equipped with optional EMC filter +E200. (Frame sizes R7i and R8i have EMC filter +E210 as standard equipment, and thus, they meet the Category 3 requirements as default.)

1. The motor and control cables are selected as specified in the *Hardware Manual*.
2. The drive is installed according to the instructions given in the *Hardware Manual*.
3. Maximum motor cable length is 100 m (328 ft).

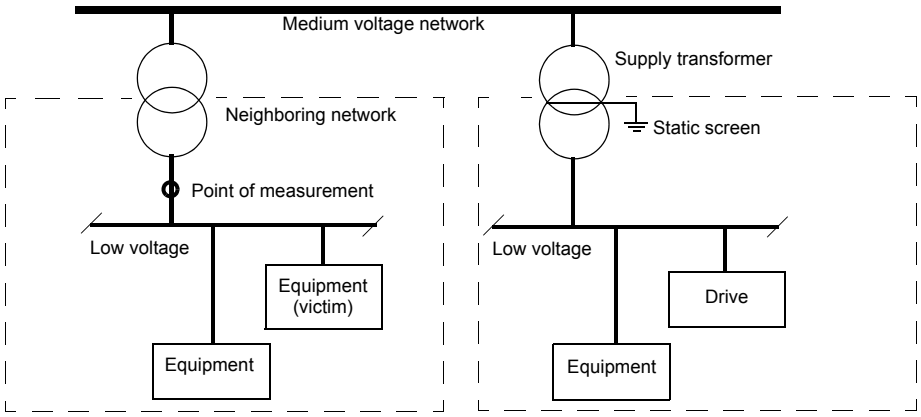
WARNING! A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

Note: It is not allowed to install a drive equipped with EMC filter +E200 on IT (ungrounded) systems. The supply network becomes connected to ground potential through the EMC filter capacitors which may cause danger or damage the unit.

Category C4

If the provisions under *Category C3* cannot be met, the use of the drive in the second environment is also possible if:

1. It is ensured that no excessive emission is propagated to neighboring 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*.

WARNING! A drive of category C4 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

“C-tick” marking

“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 61800-3:2004 – Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods), mandated by the Trans-Tasman Electromagnetic Compatibility Scheme. See section *Compliance with EN 61800-3:2004* on page *125*.

Dimensions

What this chapter contains

This chapter contains tables of cabinet line-ups as well as dimensional drawings of the different frame sizes of the ACQ800-37.

Cabinet line-ups

The drive consists of cubicles built into a cabinet line-up. The tables below show the composition of cabinet line-ups for each frame size and the standard combinations of options. The dimensions are in millimeters.

Notes:

- The side panels increase the total line-up width by 30 mm (1.2 in).
- The standard depth of the cabinet line-up is 650 mm (25.6 in) (excluding door equipment such as switches and air inlet gratings). This is increased by 130 mm (5.1 in) with top entry/exit models as well as units with cooling air intake through the bottom of the cabinet.
- The measurements given apply to 6-pulse-input, non-UL/CSA units. For dimensions of 12-pulse-input or UL/CSA units, contact your local ABB representative.

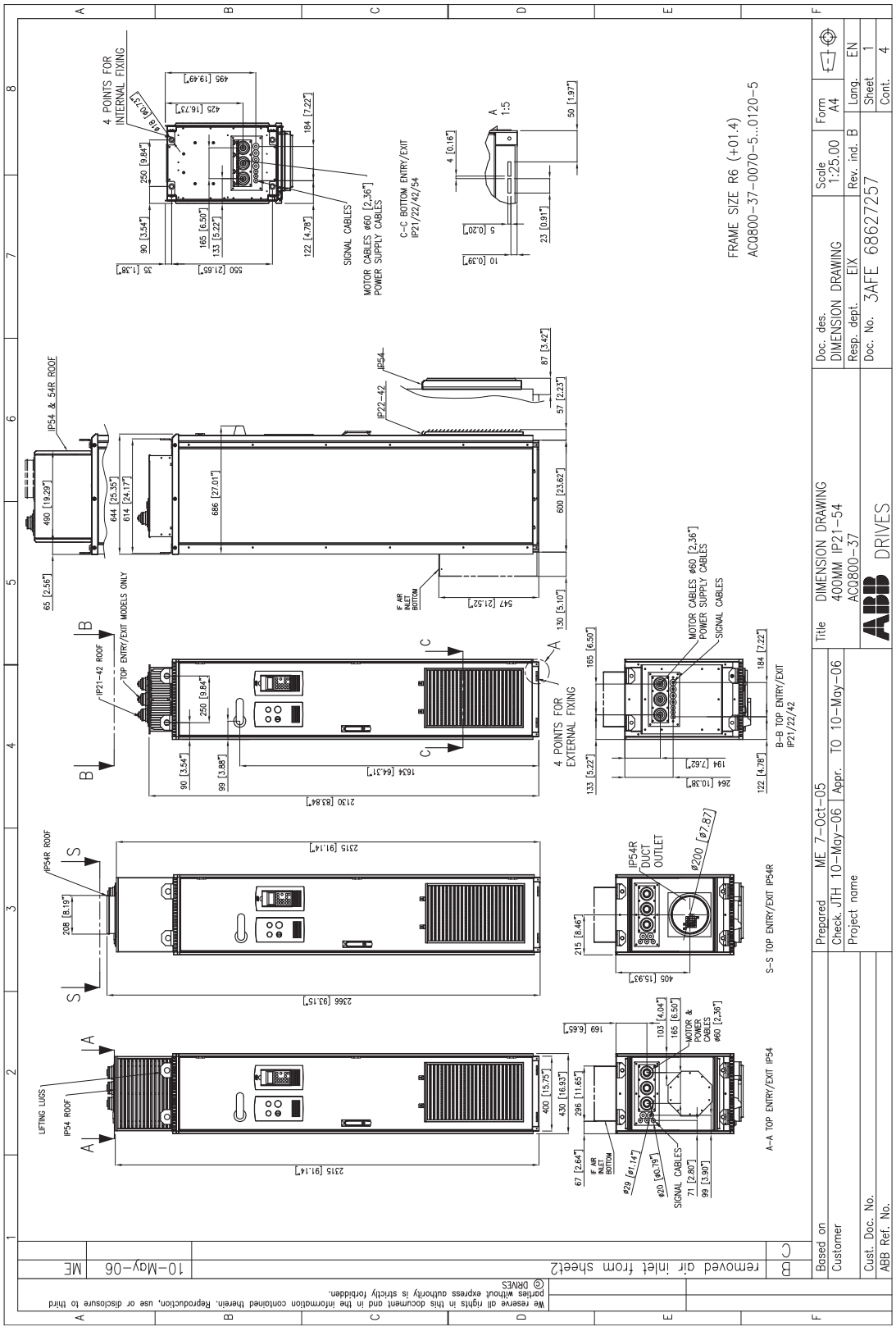
The tables are followed by example dimensional drawings.

R6		
Drive	Line-up width mm (in)	Approx. net weight kg (lb)
400	400 (15.75)	300 (660)

R7i		
Drive	Line-up width mm (in)	Approx. net weight kg (lb)
600	600 (23.62)	400 (880)

R8i			
Input/Output cubicle	Supply and inverter unit cubicle mm (in)	Line-up width mm (in)	Approx. net weight kg (lb)
400	800 (31.50)	1200 (47.24)	950 (2100)

Frame R6


FRAME SIZE R6 (+01.4)
ACQ800-37-0070-5...0120-5
DIMENSION DRAWING
400MM IP21-54
ACQ800-37
ABB DRIVES
Doc. No. 3AFE 68627257
4 POINTS FOR INTERNAL FIXING
SIGNAL CABLES
MOTOR CABLES ø60 [2.36"]
POWER SUPPLY CABLES
C-C BOTTOM ENTRY/EXIT
IP21/22/42/54
IP54 & 54R ROOF
IP22-42
IP54
IP21-42 ROOF
TOP ENTRY/EXIT MODELS ONLY
IF AIR INLET BOTTOM
4 POINTS FOR EXTERNAL FIXING
B-B TOP ENTRY/EXIT
IP21/22/42
IP54R ROOF
IP54R DUCT OUTLET
S-S TOP ENTRY/EXIT IP54R
LIFTING LUGS
IP54 ROOF
A-A TOP ENTRY/EXIT IP54
removed air inlet from sheet2
10-May-06 ME
Prepared ME 7-Oct-05
Check. JTH 10-May-06
Appr. TO 10-May-06
Project name
Based on
Customer
Cust. Doc. No.
ABB Ref. No.
Doc. des. DIMENSION DRAWING
Resp. dept. EIX
Scale 1:25.00
Rev. ind. B
Form A4
Lang. EN
Sheet 1
Cont. 4
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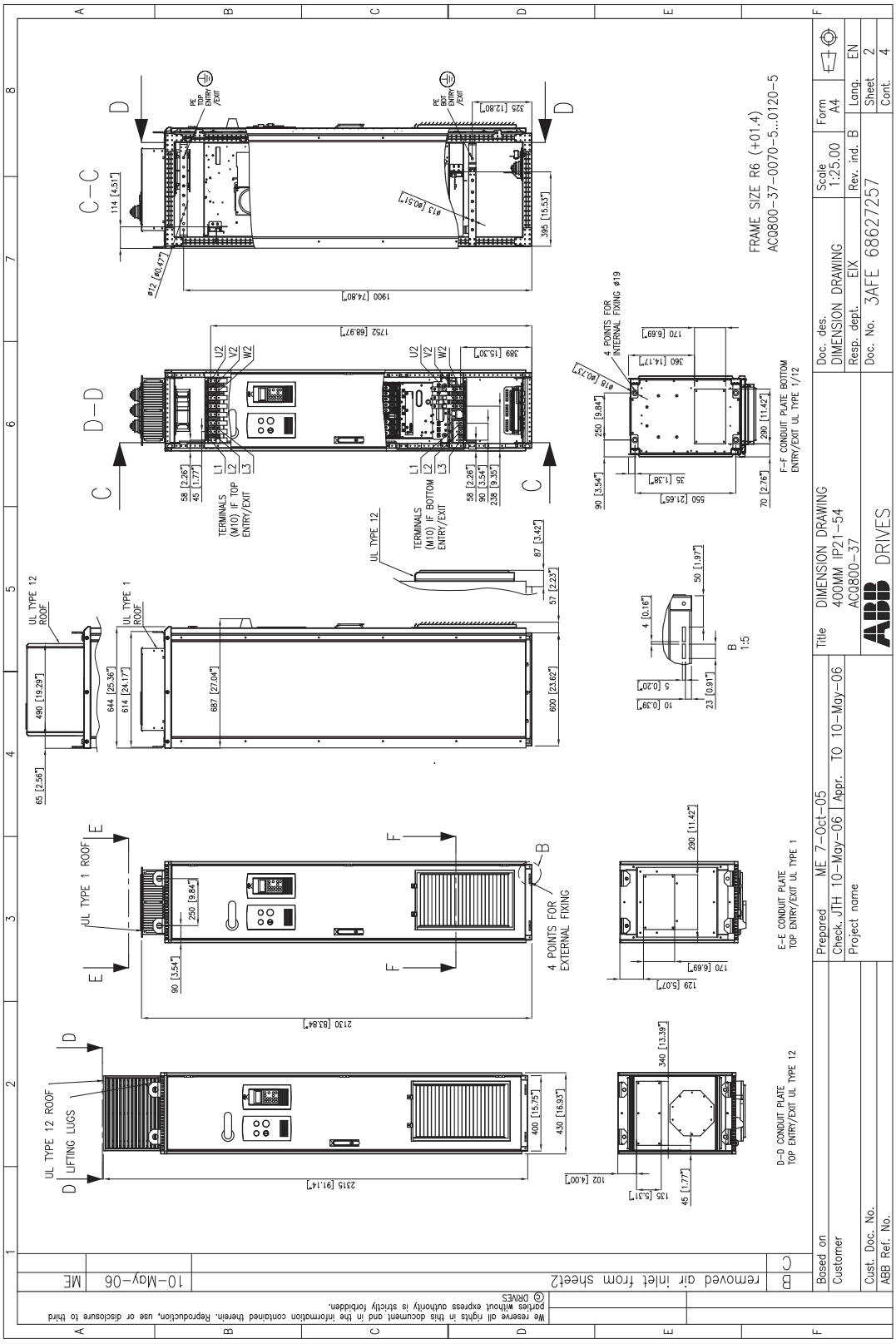
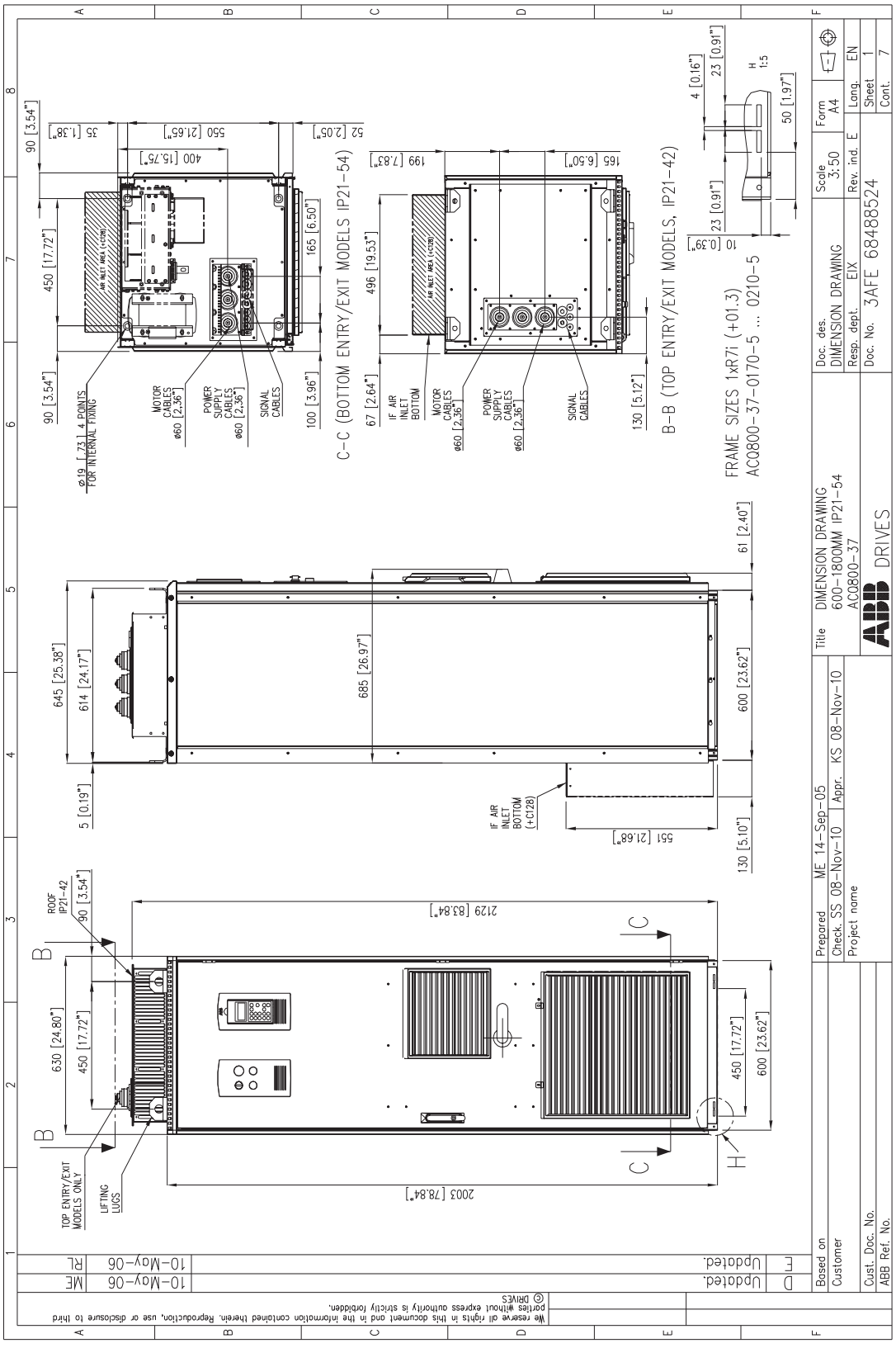
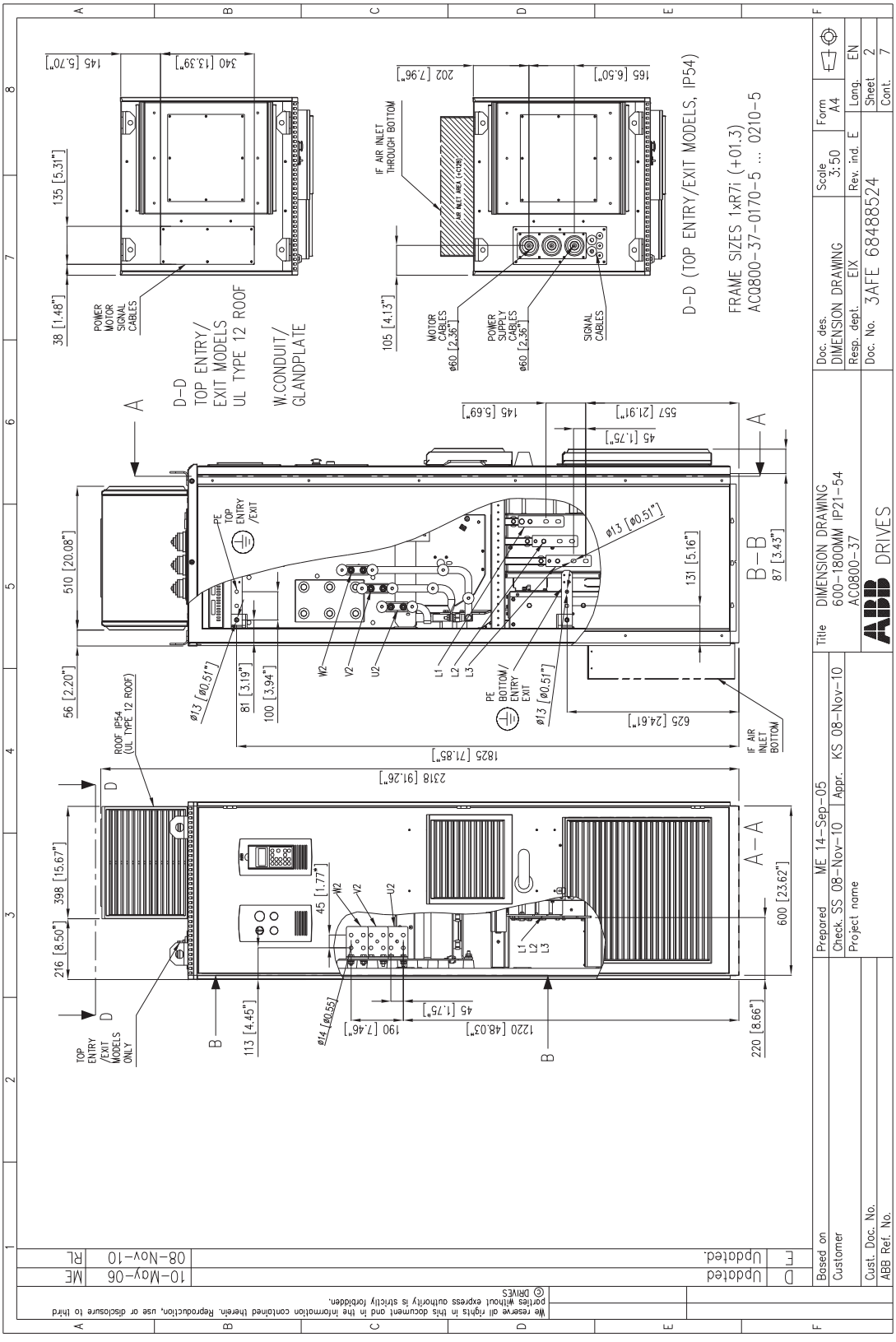
[Frame R6 continued]



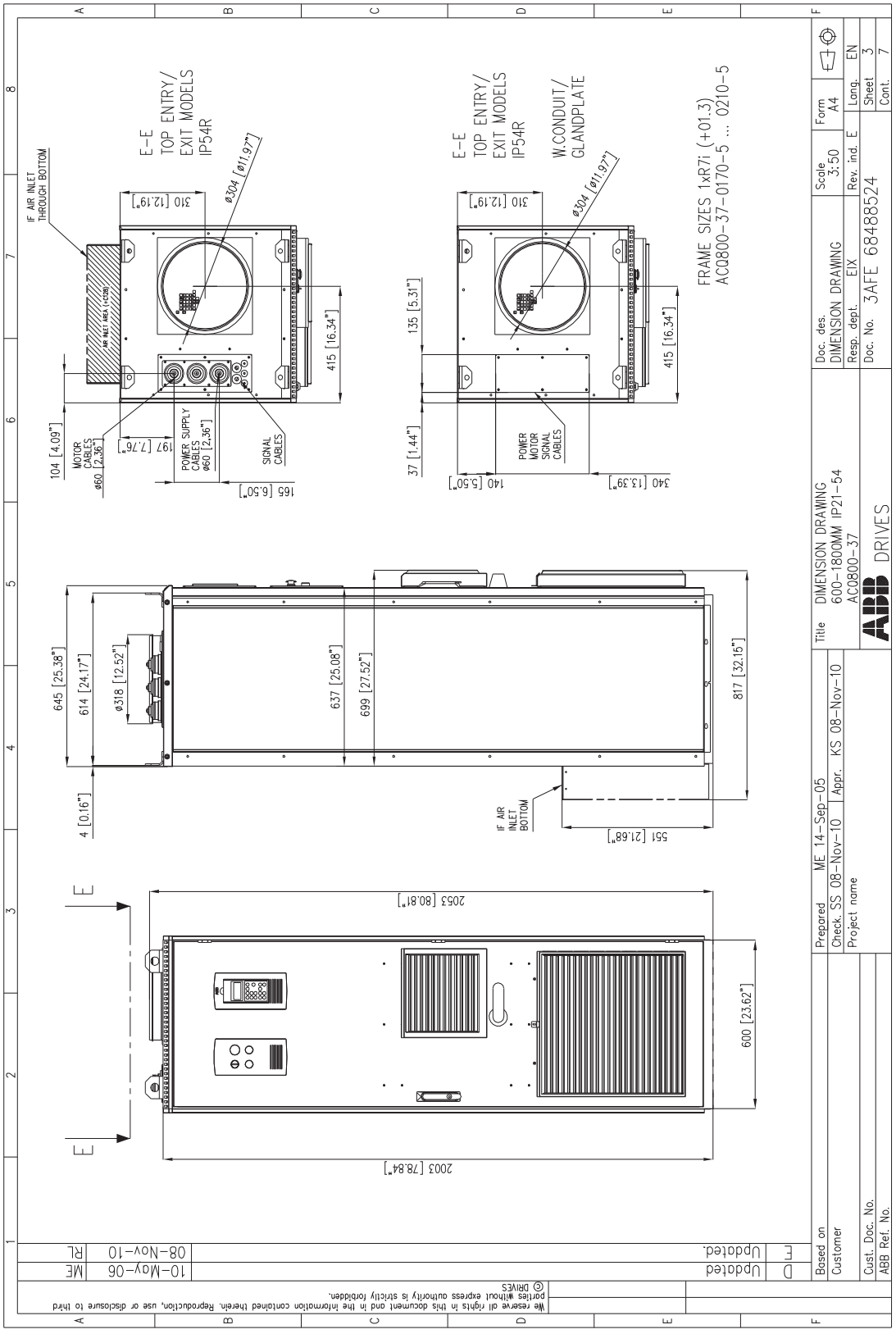
Frame R7i


C-C (BOTTOM ENTRY/EXIT MODELS IP21-54)
B-B (TOP ENTRY/EXIT MODELS, IP21-42)
FRAME SIZES 1xR7i (+01.3)
ACQ800-37-0170-5 ... 0210-5
DIMENSION DRAWING
600-1800MM IP21-54
ACQ800-37
ABB DRIVES
Doc. No. 3AFE 68488524
MOTOR CABLES Ø60 [2.36"]
POWER SUPPLY CABLES Ø60 [2.36"]
SIGNAL CABLES
IF AIR INLET BOTTOM
IF AIR INLET BOTTOM (+C128)
TOP ENTRY/EXIT MODELS ONLY
LIFTING LUGS
ROOF IP21-42
2129 [83.84"]
2003 [78.84"]
685 [26.97"]
551 [21.68"]

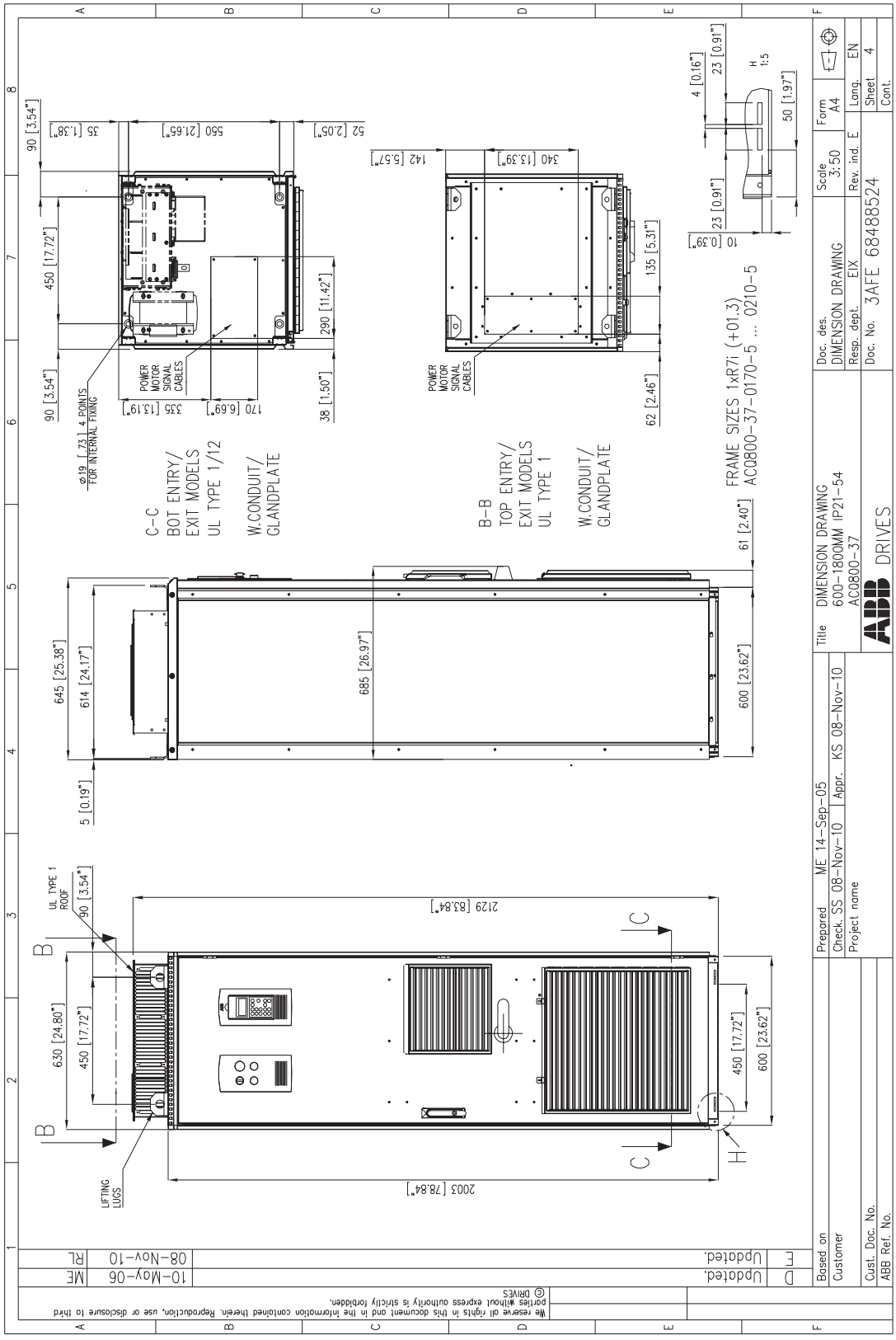
[Frame R7i continued]



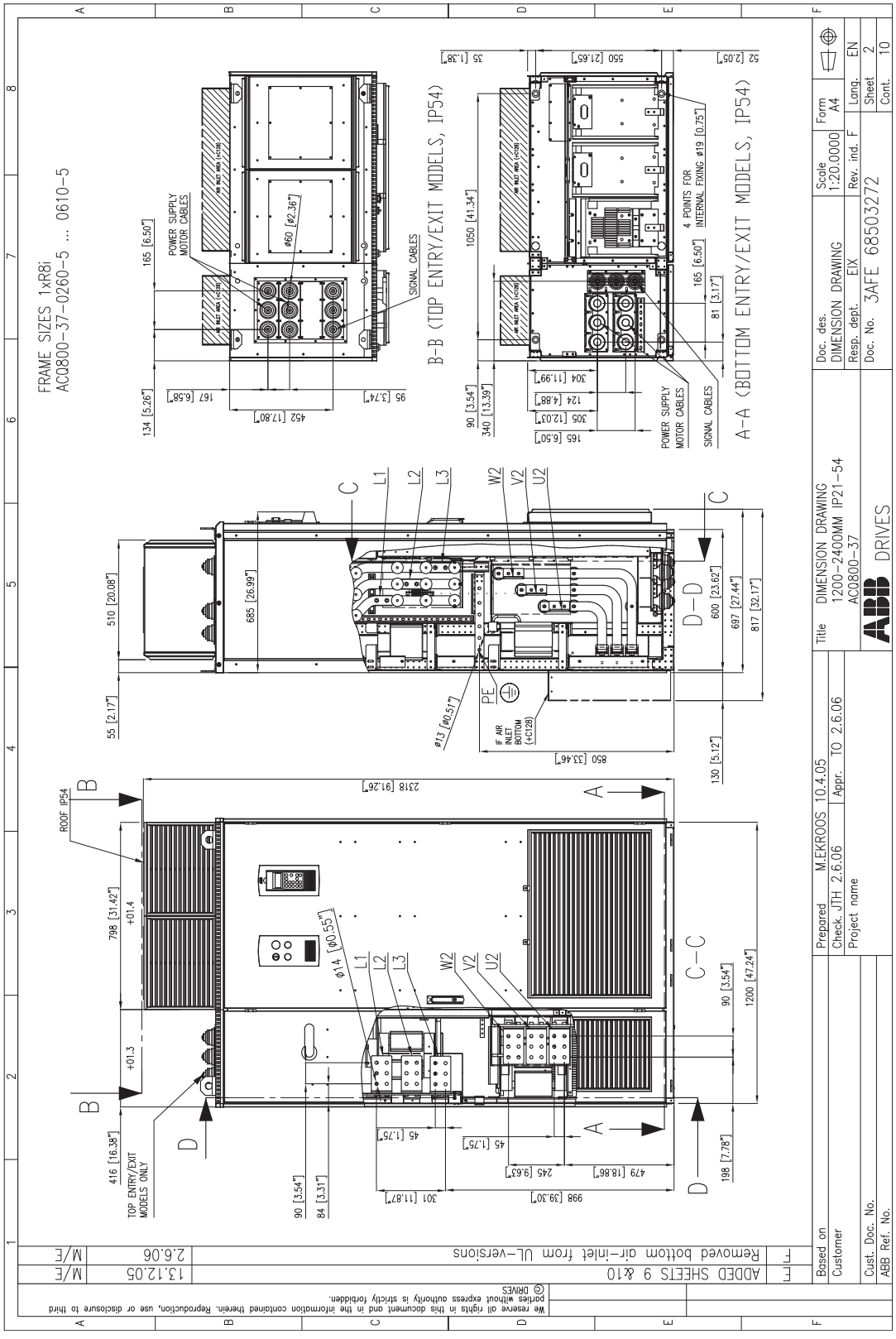
[Frame R7i continued]



[Frame R7i continued]



Frame R8i


FRAME SIZES 1xR8i
ACQ800-37-0260-5 ... 0610-5
B-B (TOP ENTRY/EXIT MODELS, IP54)
A-A (BOTTOM ENTRY/EXIT MODELS, IP54)
C-C
D-D
POWER SUPPLY MOTOR CABLES
SIGNAL CABLES
4 POINTS FOR INTERNAL FIXING ø19 [0.75"]
ROOF IP54
TOP ENTRY/EXIT MODELS ONLY
IF AIR INLET BOTTOM (+C128)
L1
L2
L3
W2
V2
U2
PE
ADDED SHEETS 9 &10
Removed bottom air-inlet from UL-versions
DIMENSION DRAWING
1200-2400MM IP21-54
ACQ800-37
ABB DRIVES
Prepared M.EKROOS 10.4.05
Check JTH 2.6.06
Appr. TO 2.6.06
Project name
Doc. No. 3AFE 68503272
Rev. ind. F
Sheet 2
Cont. 10
Lang. EN
Form A4
Scale 1:20.0000
Based on
Customer
Cust. Doc. No.
ABB Ref. No.
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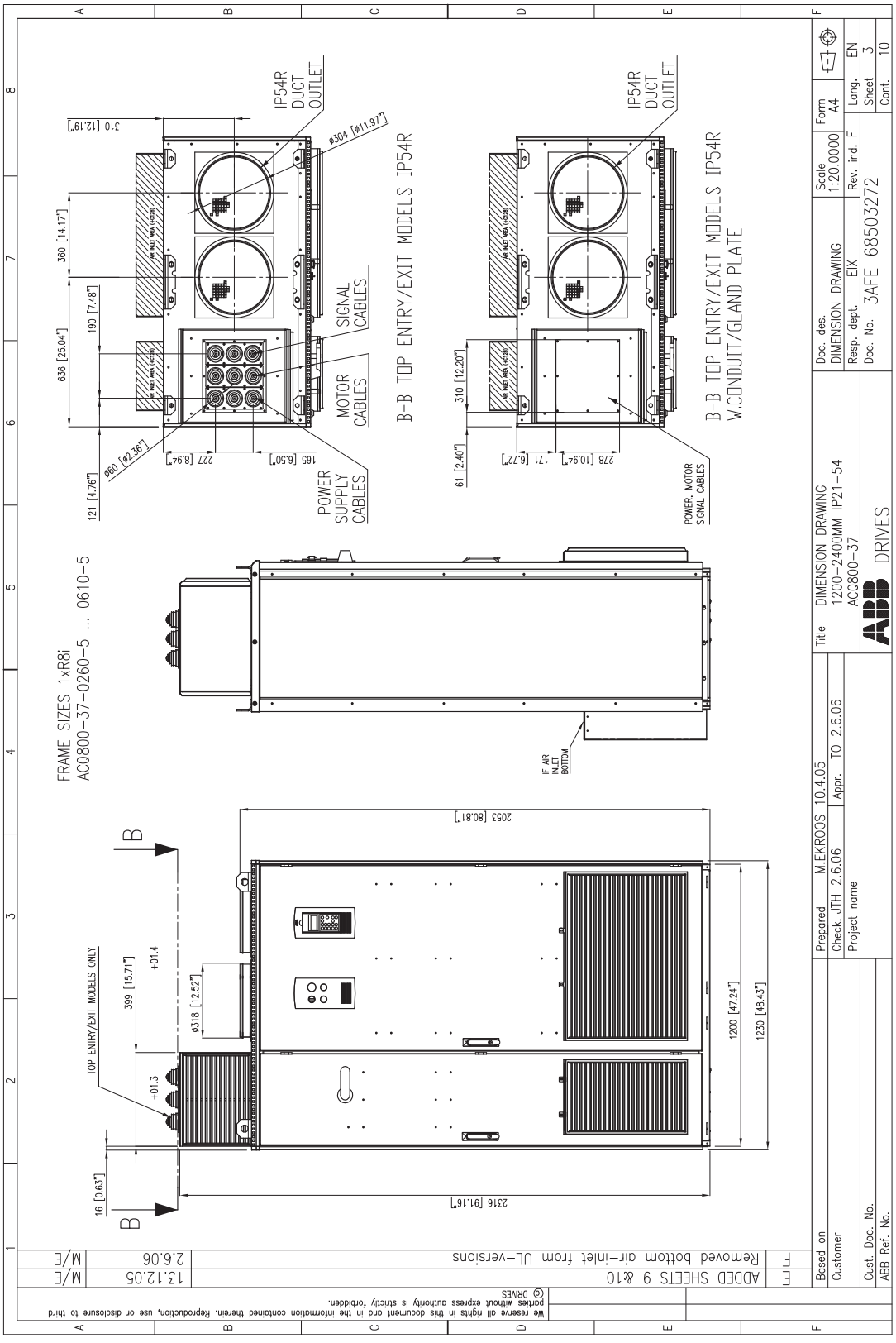
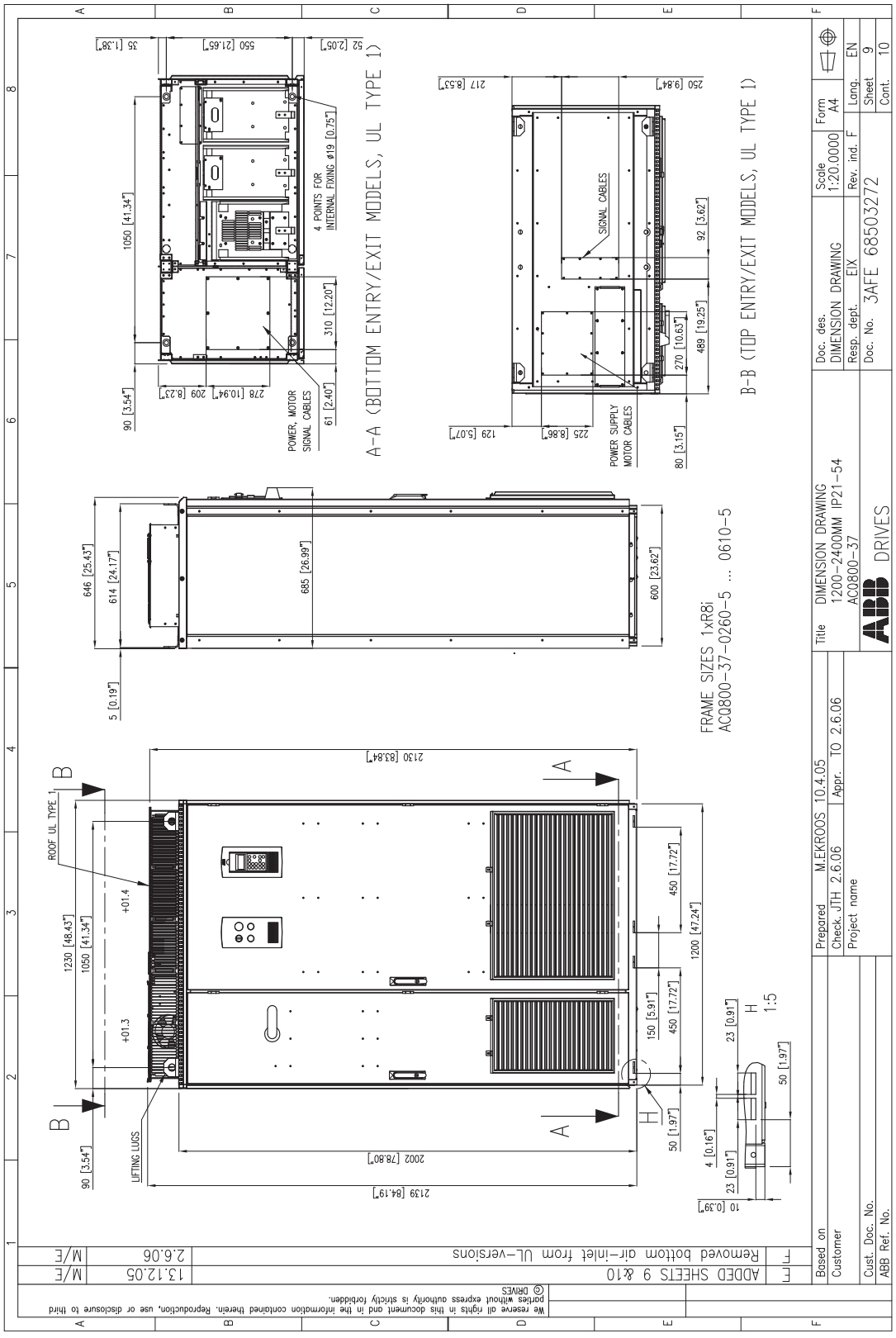
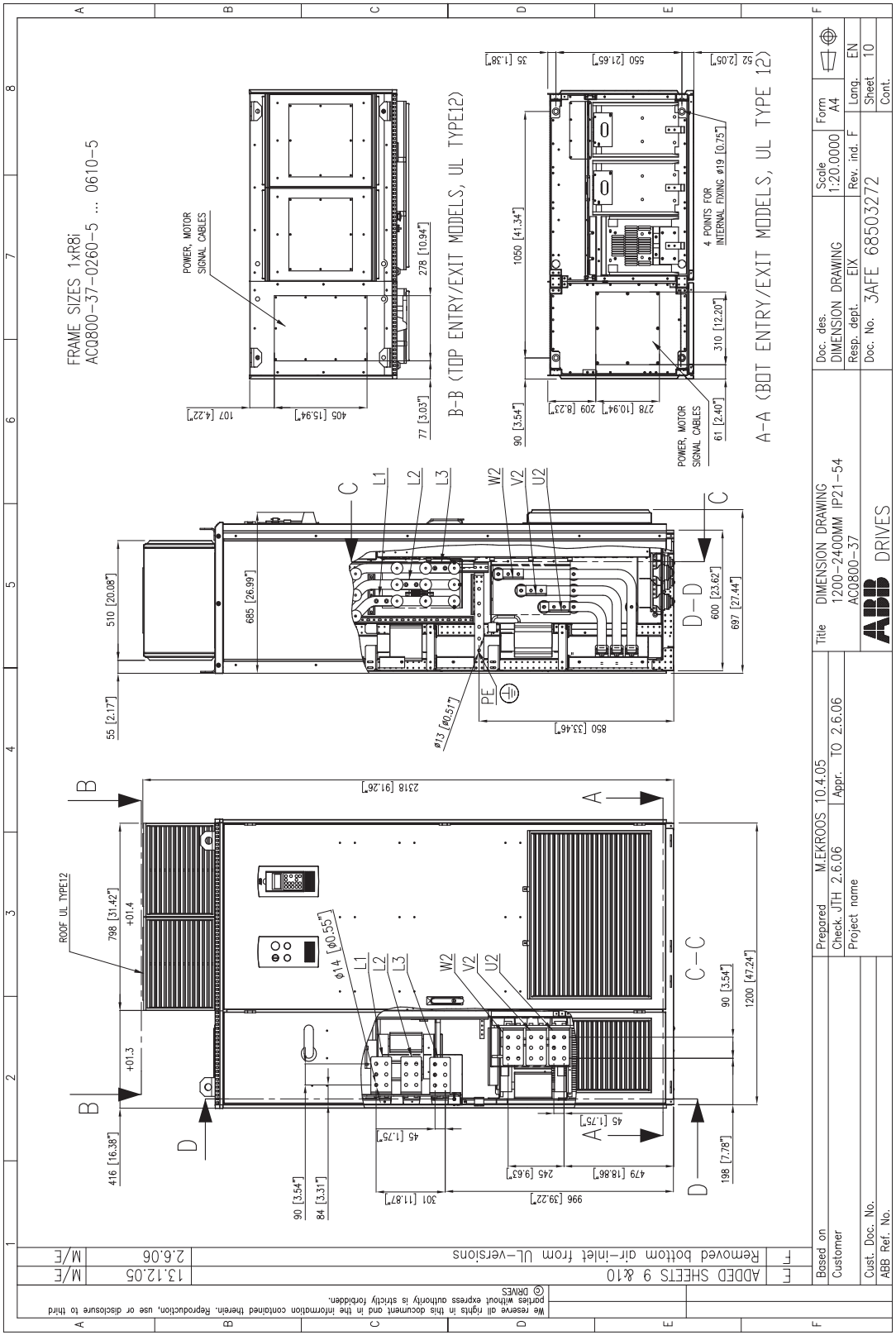
[Frame R8i continued]



[Frame R8i continued]



[Frame R8i continued]



Further information

Product and service inquiries

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

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

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