

ABB component drives

User's manual

ACS150 drives (0.37...4 kW, 0.5...5 hp)



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List of related manuals

Drive manuals

	Code (English)
<i>ACS310 User's Manual</i>	1), 2) 3AFE68576032

Option manuals and guides

<i>MUL1-R1 Installation instructions for ACS150, ACS310, ACS320, ACS350 and ACS355</i>	1), 2) 3AFE68642868
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<i>MFDT-01 FlashDrop user's manual</i>	1), 2) 3AFE68591074
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Maintenance manuals

<i>Guide for capacitor reforming in ACS50, ACS55, ACS150, ACS310, ACS350, ACS355, ACS550, ACH550 and R1-R4 OINT-/SINT-boards</i>	2) 3AFE68735190
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¹⁾ Delivered as a printed copy with the drive or optional equipment.

²⁾ Available in the Internet.

All manuals are available in PDF format on the Internet. See section [Further information](#) on the inside of the back cover.

ACS150 drives
0.37...4 kW
0.5...5 hp

User's manual

3AFE68576032 Rev C
EN
EFFECTIVE: 2011-01-01

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Safety

What this chapter contains

The chapter contains safety instructions that 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, motor or driven equipment. Read the safety instructions before you work on the drive.

Use of warnings

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. The warning symbols are used as follows:



Electricity warning warns of hazards from electricity 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.

Safety in installation and maintenance

These warnings are intended for all who work on the drive, motor cable or motor.

Electrical safety



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

Only qualified electricians are allowed to install and maintain the drive!

- Never work on the drive, motor cable or motor when input power is applied. After disconnecting the input power, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you start working on the drive, motor or motor cable.

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

1. There is no voltage between the drive input phases U1, V1 and W1 and the ground.
 2. There is no voltage between terminals BRK+ and BRK- and the ground.
- 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 carry dangerous voltage even when the input power of the drive is switched off.
 - Do not make any insulation or voltage withstand tests on the drive.

- Disconnect the internal EMC filter when installing the drive on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohms] power system), otherwise the system will be connected to ground potential through the EMC filter capacitors. This may cause danger or damage the drive. See page 40. **Note:** When the internal EMC filter is disconnected, the drive is not EMC compatible.
- Disconnect the internal EMC filter when installing the drive on a corner-grounded TN system, otherwise the drive will be damaged. See page 40. **Note:** When the internal EMC filter is disconnected, the drive is not EMC compatible.
- All ELV (extra low voltage) circuits connected to the drive must be used within a zone of equipotential bonding, ie within a zone where all simultaneously accessible conductive parts are electrically connected to prevent hazardous voltages appearing between them. This is accomplished by a proper factory grounding.

Note:

Even when the motor is stopped, dangerous voltage is present at the power circuit terminals U1, V1, W1 and U2, V2, W2 and BRK+ and BRK-.

General safety



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



- The drive is not field repairable. Never attempt to repair a malfunctioning drive; contact your local ABB representative or Authorized Service Center for replacement.
 - Make sure that dust from drilling does not enter the drive during the installation. Electrically conductive dust inside the drive may cause damage or lead to malfunction.
 - Ensure sufficient cooling.
-

Safety in start-up and operation



These warnings are intended for all who plan the operation, start up or operate the drive.



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

- 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 if dangerous situations can occur. When activated, these functions reset the drive and resume operation after a fault.
- Do not control the motor with an AC contactor or disconnecting device (disconnecting means); use instead the control panel start and stop keys  and  or external commands (I/O). The maximum allowed number of charging cycles of the DC capacitors (that is, power-ups by applying power) is two per minute and the maximum total number of chargings is 15 000.

Note:

- If an external source for start command is selected and it is ON, the drive starts immediately after an input voltage break or fault reset unless the drive is configured for 3-wire (a pulse) start/stop.
- When the control location is not set to local (LOC not shown on the display), the stop key on the control panel does not stop the drive. To stop the drive using the control panel, press the LOC/REM key  and then the stop key .

Introduction to the manual

What this chapter contains

The chapter describes applicability, the target audience and purpose of this manual. It describes the contents of this manual and refers to a list of related manuals for more information. It also contains a flowchart of steps for checking the delivery, installing and commissioning the drive. The flowchart refers to chapters/sections in this manual.

Applicability

The manual is applicable to the ACS150 drive firmware version 1.35b or later. See parameter [3301 FIRMWARE](#) on page [115](#).

Target audience

The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

This manual is written for readers worldwide. Both SI and imperial units are shown. Special US instructions for installations in the United States are given.

Purpose of the manual

This manual provides information needed for planning the installation, installing, commissioning, using and servicing the drive.

Contents of this manual

The manual consists of the following chapters:

- [Safety](#) (page [11](#)) gives safety instructions you must follow when installing, commissioning, operating and servicing the drive.
- [Introduction to the manual](#) (this chapter, page [15](#)) describes applicability, target audience, purpose and contents of this manual. It also contains a quick installation and commissioning flowchart.
- [Operation principle and hardware description](#) (page [19](#)) describes the operation principle, layout, type designation label and type designation information. It also shows a general diagram of power connections and control interfaces.
- [Mechanical installation](#) (page [23](#)) tells how to check the installation site, unpack, check the delivery and install the drive mechanically.
- [Planning the electrical installation](#) (page [29](#)) tells how to check the compatibility of the motor and the drive and select cables, protections and cable routing.

- [Electrical installation](#) (page 39) tells how to check the insulation of the assembly and the compatibility with IT (ungrounded) and corner-grounded TN systems as well as connect power cables and control cables.
- [Installation checklist](#) (page 49) contains a checklist for checking the mechanical and electrical installation of the drive.
- [Start-up and control with I/O](#) (page 51) tells how to start, stop, change the direction of the motor rotation and adjust the motor speed through the I/O interface.
- [Control panel](#) (page 57) describes the control panel keys, LED indicators and display fields and tells how to use the panel for control, monitoring and changing the settings.
- [Application macros](#) (page 69) gives a brief description of each application macro together with a wiring diagram showing the default control connections. It also explains how to save a user macro and how to recall it.
- [Actual signals and parameters](#) (page 79) describes actual signals and parameters. It also lists the default values for the different macros.
- [Fault tracing](#) (page 127) tells how to reset faults and view fault history. It lists all alarm and fault messages including the possible cause and corrective actions.
- [Maintenance](#) (page 133) contains preventive maintenance instructions.
- [Technical data](#) (page 137) contains technical specifications of the drive, such as ratings, sizes and technical requirements as well as provisions for fulfilling the requirements for CE and other marks.
- [Dimension drawings](#) (page 155) shows dimension drawings of the drive.
- [Appendix: Process PID control](#) (page 161) contains instructions on quick configuration of the process control, gives an application example and describes the PID sleep functionality.
- [Further information](#) (page 169) (inside of the back cover, page 169) tells how to make product and service inquiries, get information on product training, provide feedback on ABB Drives manuals and find documents on the Internet.

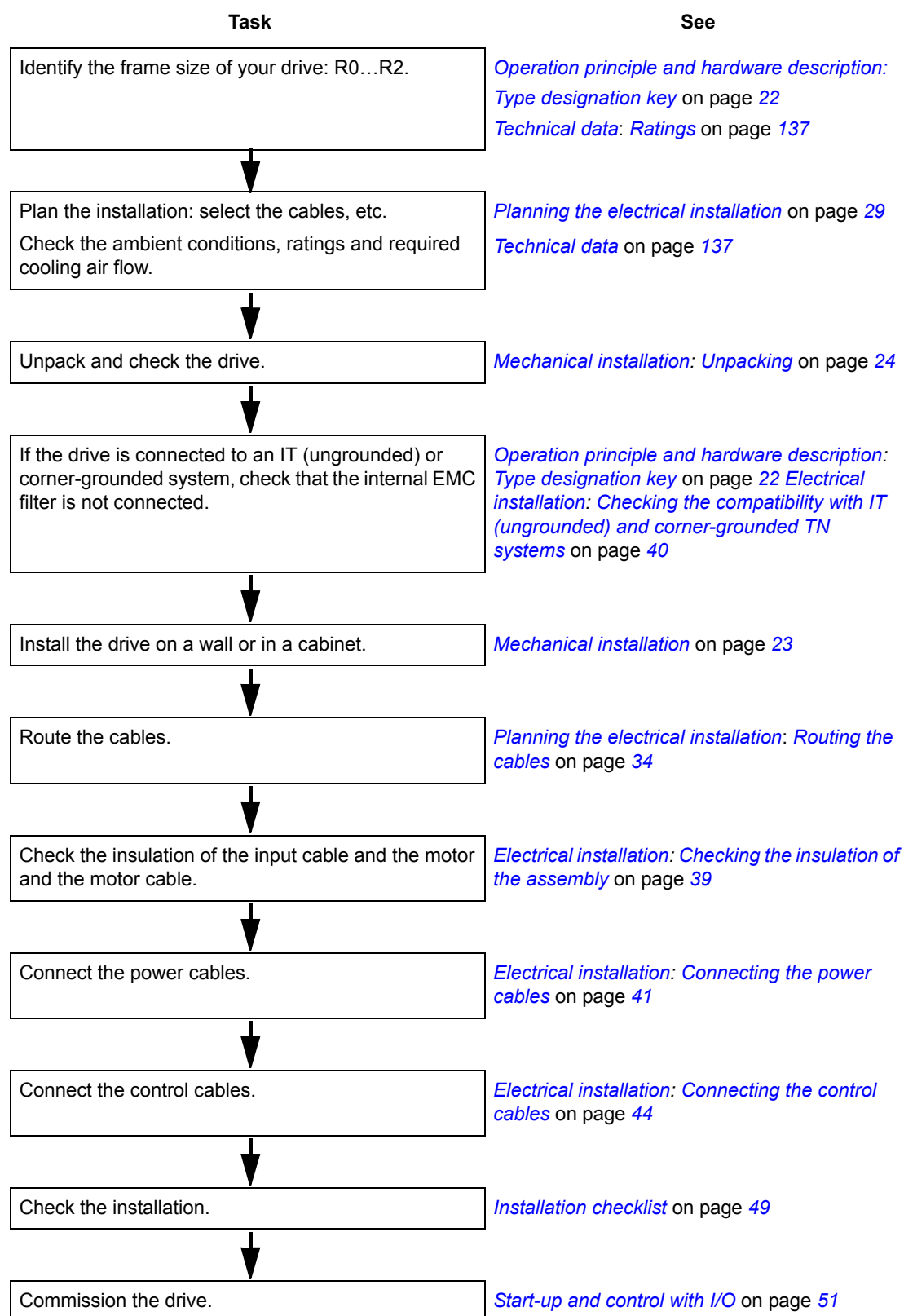
Related documents

See [List of related manuals](#) on page 2 (inside of the front cover).

Categorization according to the frame size

The ACS150 is manufactured in frame sizes R0...R2. Some instructions and other information which only concern certain frame sizes are marked with the symbol of the frame size (R0...R2). To identify the frame size of your drive, see the table in section [Ratings](#) on page 137.

Quick installation and commissioning flowchart



Operation principle and hardware description

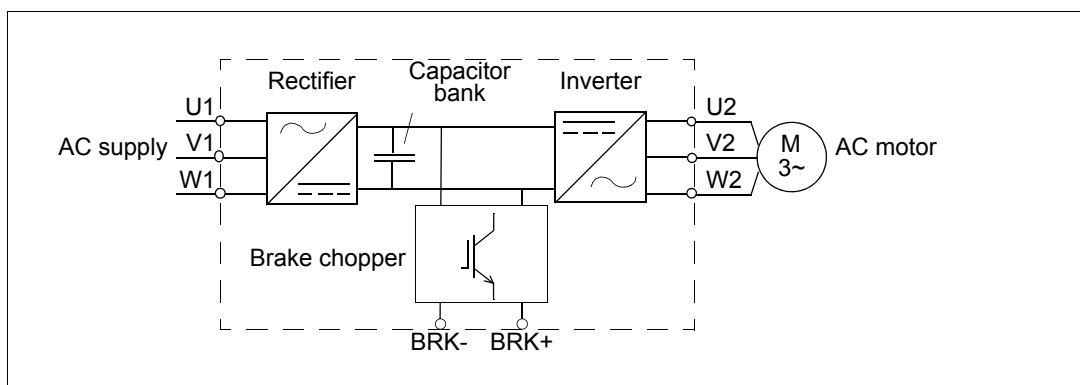
What this chapter contains

The chapter briefly describes the operation principle, layout, type designation label and type designation information. It also shows a general diagram of power connections and control interfaces.

Operation principle

The ACS150 is a wall or cabinet mountable drive for controlling AC induction motors.

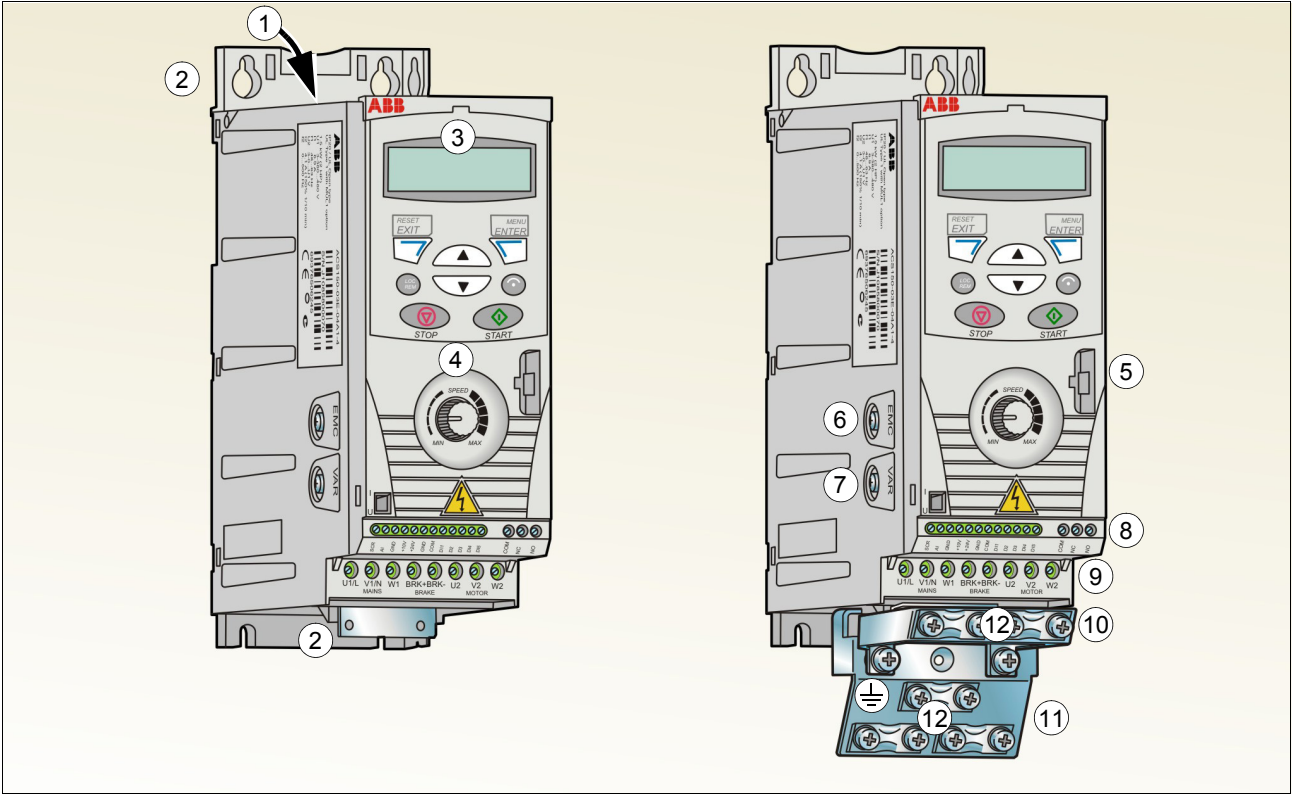
The figure below shows the simplified main circuit diagram of the drive. The rectifier converts three-phase AC voltage to DC voltage. The capacitor bank of the intermediate circuit stabilizes the DC voltage. The inverter converts the DC voltage back to AC voltage for the AC motor. The brake chopper connects the external brake resistor to the intermediate DC circuit when the voltage in the circuit exceeds its maximum limit.



Product overview

Layout

The layout of the drive is presented below. The construction of frame sizes R0...R2 varies to some extent.



Without plates (R0 and R1)

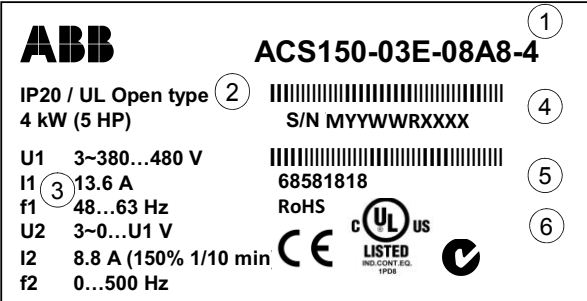
1	Cooling outlet through top cover
2	Mounting holes
3	Integrated control panel
4	Integrated potentiometer

With plates (R0 and R1)

5	FlashDrop connection
6	EMC filter grounding screw (EMC)
7	Varistor grounding screw (VAR)
8	I/O connections
9	Input power connection (U1, V1, W1), brake resistor connection (BRK+, BRK-) and motor connection (U2, V2, W2)
10	I/O clamping plate
11	Clamping plate
12	Clamps

Type designation label

The type designation label is attached to the left side of the drive. An example label and explanation of the label contents are shown below.

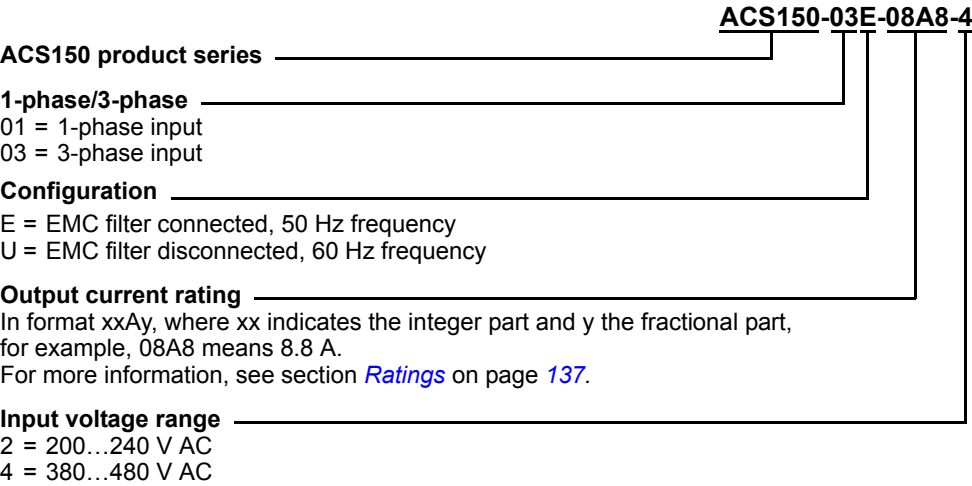


Type designation label

1	Type designation, see section Type designation key on page 22
2	Degree of protection by enclosure (IP and UL/NEMA)
3	Nominal ratings, see section Ratings on page 137 .
4	Serial number of format MYYWWRXXXX, where M: Manufacturer YY: 09, 10, 11, ... for 2009, 2010, 2011, ... WW: 01, 02, 03, ... for week 1, week 2, week 3, ... R: A, B, C, ... for product revision number XXXX: Integer starting every week from 0001
5	ABB MRP code of the drive
6	CE marking and C-Tick, C-UL US and RoHS marks (the label of your drive shows the valid markings)

Type designation key

The type designation contains information on the specifications and configuration of the drive. You find the type designation label attached to the drive. The first digits from the left express the basic configuration, for example ACS150-03E-08A8-4. The explanations of the type designation label selections are described below.



Mechanical installation

What this chapter contains

The chapter describes tells how to check the installation site, unpack, check the delivery and install the drive mechanically.

Checking the installation site

The ACS150 may be installed on the wall or in a cabinet. Check the enclosure requirements for the need to use the NEMA 1 option in wall installations (see chapter [Technical data](#) on page 137).

The drive can be mounted in four different ways:

- a) vertical back mounting (all frame sizes)
- b) horizontal back mounting (frame sizes R1...R2)
- c) vertical side mounting (all frame sizes)
- d) vertical DIN rail mounting (all frame sizes).

Check the installation site according to the requirements below. Refer to chapter [Dimension drawings](#) on page 155 for frame details.

Requirements for the installation site

Operation conditions

See chapter [Technical data](#) on page 137 for the allowed operation conditions of the drive.

Wall

The wall should be as close to vertical and even as possible, of non-flammable material and strong enough to carry the weight of the drive.

Floor

The floor/material below the installation should be non-flammable.

Free space around the drive

In vertical mounting, the required free space for cooling above and below the drive is 75 mm (3 in). No free space is required on the sides of the drive, so the drives can be mounted immediately next to each other.

When you install the drive horizontally, you need to have free space both above and below AND on the sides of the drive. For more information, see the figure in section [Horizontally](#) on page 27.

Required tools

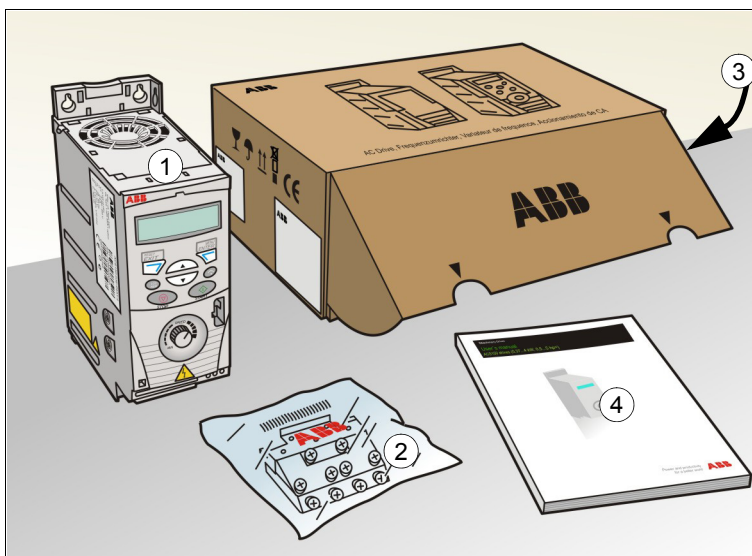
To install the drive, you need the following tools:

- screwdrivers (as appropriate for the mounting hardware used)
- wire stripper
- tape measure
- drill (if the drive is installed with screws/bolts)
- mounting hardware: screws or bolts (if the drive is installed with screws/bolts). For the number of screws/bolts, see section [With screws](#) on page 25.

Unpacking

The drive (1) is delivered in a package that also contains the following items (frame size R0 shown in the figure):

- plastic bag (2) including clamping plate, I/O clamping plate, clamps and screws
- mounting template, integrated into the package (3)
- user's manual (4).



Checking the delivery

Check that there are no signs of damage. Notify the shipper immediately if damaged components are found.

Before attempting installation and operation, check the information on the type designation label of the drive to verify that the drive is of the correct type. See section [Type designation label](#) on page 22.

Installing

The instructions in this manual cover drives with the IP20 degree of protection. To comply with NEMA 1, use the MUL1-R1 option kit, which is delivered with multilingual installation instructions (3AFE68642868).

Install the drive

Install the drive with screws or on a DIN rail as appropriate.

Note: Make sure that dust from drilling does not enter the drive during the installation.

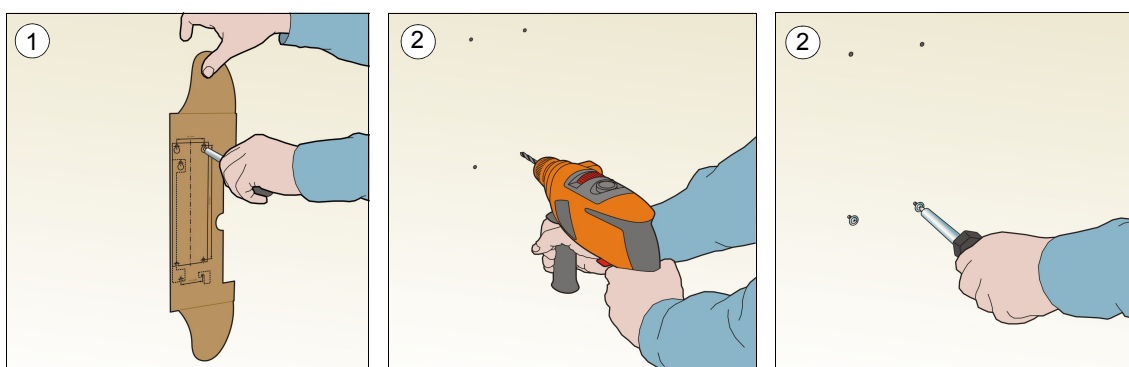
With screws

For installing the drive horizontally, see section [Horizontally](#) on page 27.

1. Mark the hole locations using for example, the mounting template cut out from the package. The locations of the holes are also shown in the drawings in chapter [Dimension drawings](#) on page 155. The number and location of the holes used depend on how the drive is installed:

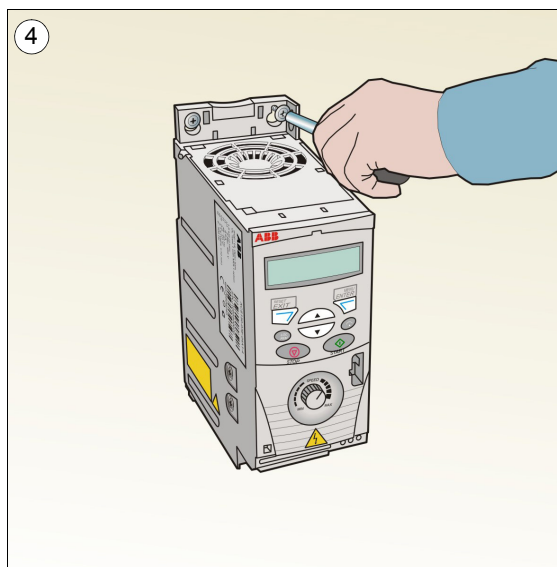
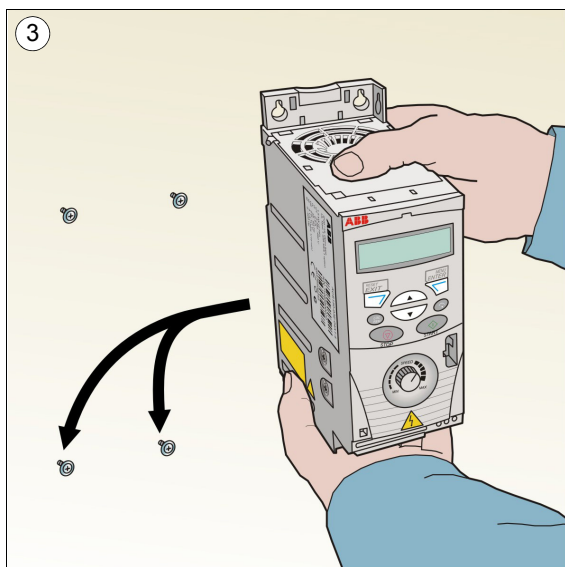
- a) back mounting: four holes
- b) side mounting: three holes; one of the bottom holes is located in the clamping plate.

2. Fix the screws or bolts to the marked locations.



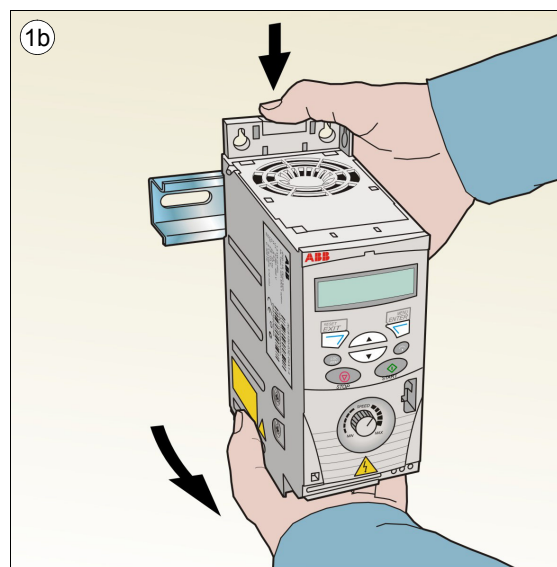
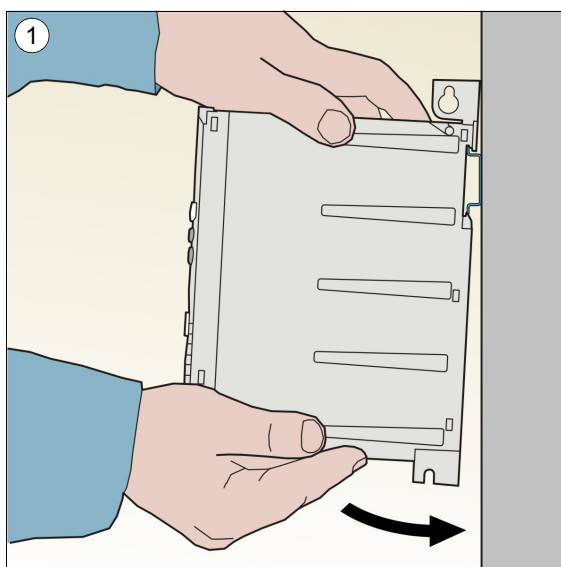
3. Position the drive onto the screws on the wall.

4. Tighten the screws in the wall securely.



On DIN rail

1. Click the drive to the rail. To detach the drive, press the release lever on top of the drive as shown in Figure 1b.



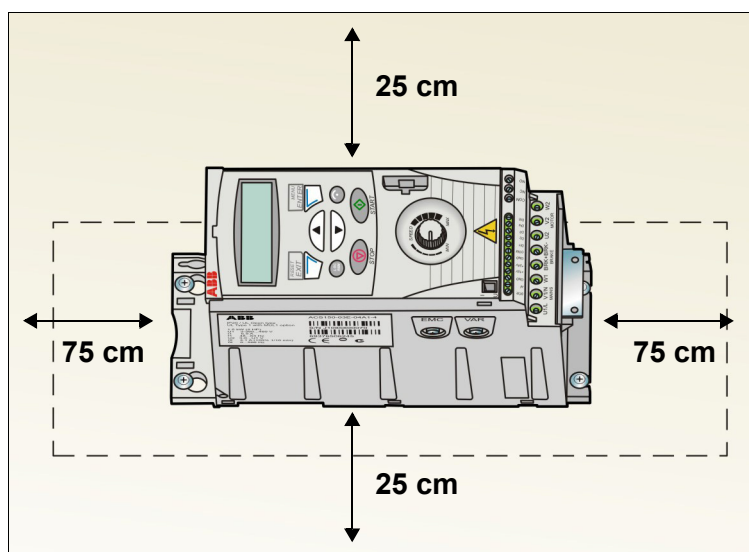
Horizontally

You can install the drive horizontally with screws (**only** back mounting, four holes). For the installation instructions, see section [With screws](#) on page 25.

Note: For the required free space, see the following figure.



WARNING! Horizontal mounting is permitted only for frame sizes R1 and R2 because they include a cooling fan. Position the drive so that the connectors at the bottom of the drive are situated to the right and the fan to the left as shown in the following figure. Do not install frame size R0 horizontally!



Fasten clamping plates

Note: Make sure that you do not throw the clamping plates away as they are required for proper grounding of the power and control cables.

1. Fasten the clamping plate to the plate at the bottom of the drive with the provided screws.
2. Fasten the I/O clamping plate to the clamping plate with the provided screws.

