

ABB LOW VOLTAGE DRIVES

# Main switch and EMC C1 filter options (+F278, +F316, +E223), IP55 frames R1 to R5

## ACS580-01, ACH580-01 and ACQ580-01 drives

### Installation instructions

English ..... 3

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## Obey the safety instructions



Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

- If you are not a qualified electrical professional, do not do electrical installation work.
- Do not work on the drive, motor cable or motor when main power is applied. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.
- Do not work on the control cables when power is applied to the drive or to the external control circuits.
- Make sure that debris from borings and grindings does not enter the drive when installing.
- Make sure that the floor below the drive and the wall where the drive is installed are non-flammable.

EN

## Introduction to the supplement

This is a supplement to [ACS580-01 quick installation and start-up guide for global \(IEC\) product types \(3AXD50000527052 \[English\]\)](#), [ACH580-01 quick installation and start-up guide for global \(IEC\) product types \(3AXD50000758685 \[English\]\)](#) and [ACQ580-01 quick installation and start-up guide for global \(IEC\) product types \(3AXD50000758692 \[English\]\)](#).

To read a manual, go to <https://library.abb.com/> and search for the document number.

The supplement describes how to install

- main switch-disconnector option (+F278)
- EMC C1 filter option (+E223)
- both main switch-disconnector and EMC C1 filter options (+F316)

to ACS580-01, ACH580-01 and ACQ580-01 IP55 (+B056) drives, frame sizes R1...R5.

**Note:** The supplement only applies to the following R1...R3 types: 02A7-4, 03A4-4, 04A1-4, 05A7-4, 07A3-4, 09A5-4, 12A7-4, 018A-4, 026A-4, 033A-4, 039A-4 and 046A-4.

## Operation principle

The EMC C1 filter (+E223 or +F316) is used for EMC compliance, see page 13.

The main switch-disconnector – called main switch in this supplement – (+F278 or +F316) is used for switching off the input power of the drive and disconnecting the drive securely from the AC power line.

### ■ Using the main switch-disconnector

To use the main switch:

1. Stop the drive.
2. Wait until the motor has stopped.

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3. Turn the main switch to the OFF position.
4. Attach a lock to the main switch. This is essential if you must work on the drive, motor or machinery.

**Note:** It is best practice to stop the drive before opening the main switch to the OFF position, even though the switch is dimensioned to withstand the full load current of the drive.



The main switch (+F278 or +F316) does not isolate the input cables and terminals from the input power supply. Before removing the front cover and working on the drive, isolate the input cables from the main supply at the distribution board or by opening the disconnecter of the supply transformer.

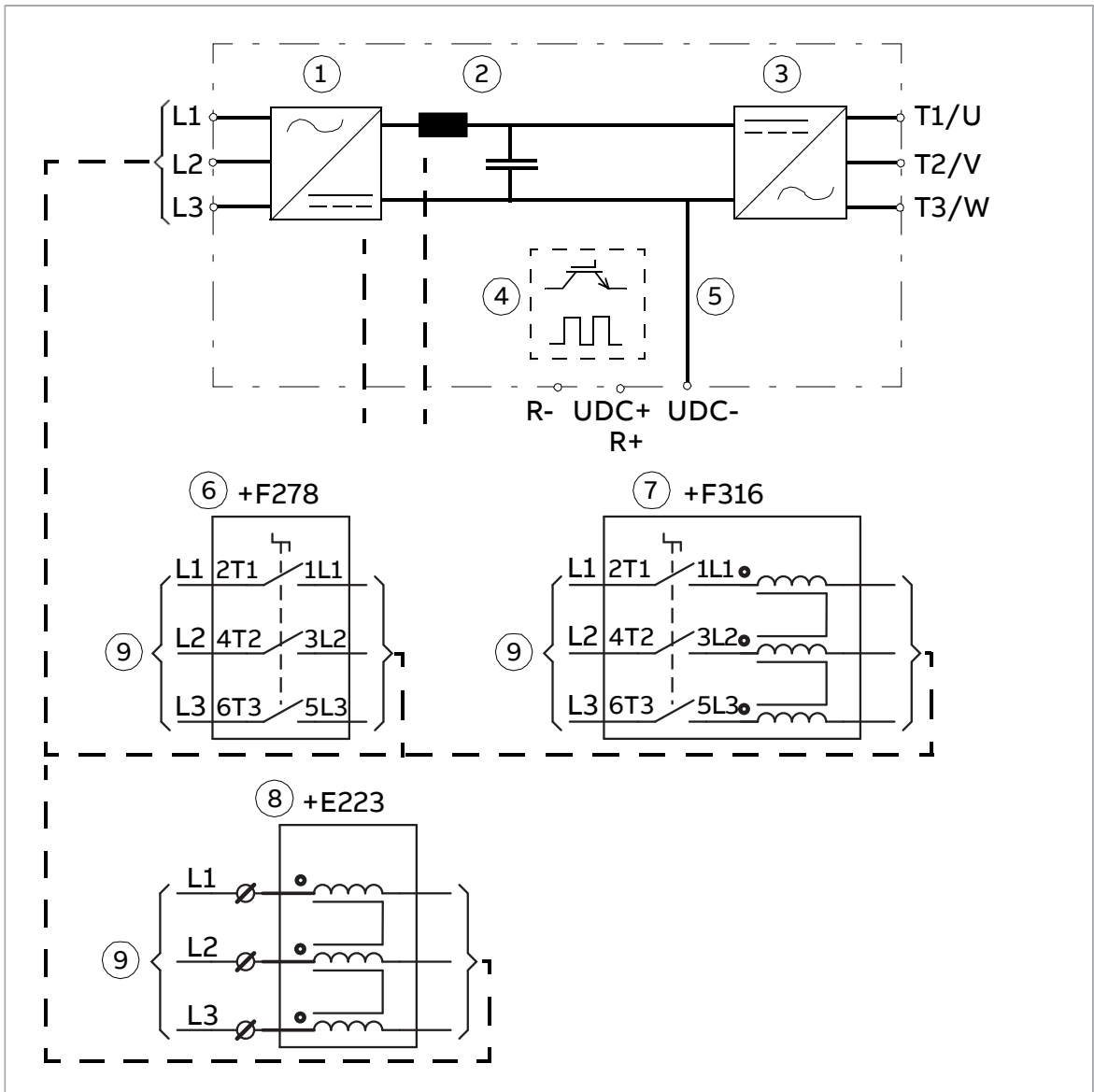
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The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors.

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■ Main circuit diagram of the ACS580-01, ACH580-01 and ACQ580-01 drives



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1	Rectifier
2	DC link
3	Inverter
4	Built-in brake chopper (R-, R+) in frames R1...R3
5	DC connection (UDC+, UDC-) for an external brake chopper in frames R4...R9
6	Main switch (+F278) for IP55 (+B056) frames R1...R5
7	Main switch and EMC C1 filter (+F316) for IP55 (+B056) frames R1...R5
8	EMC C1 filter (+E223) for IP55 (+B056) frames R1...R5
9	Input

## ■ Technical data

See the dimensions of the drive with the main switch and EMC C1 filter options in the technical data in the drive hardware manual.

## Compliance with the EN 61800-3:2004 + A1:2012 with options with EMC C1 filter (+E223 and +F316)

**Note:** To be able to use EMC C1 filter (+E223 or +F316), you must set parameters 97.01 Switching frequency reference and 97.02 Minimum switching frequency to the value of 2 kHz.

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### Conducted emissions

- C1 compliance when using maximum 10 m motor cable
- C2 compliance when using maximum 100 m motor cable
- C3 compliance when using maximum 150 m motor cable.

### Radiated emissions

- • C1 compliance not applicable.
- • C2 compliance when using minimum 5 m motor cable.
- • C3 compliance when using minimum 5 m motor cable.

The conducted and radiated emission limits are complied with the following provisions:

1. The EMC C1 filter is installed as specified in this supplement.
2. The motor and control cables are selected as specified in the Hardware manual of the drive.
3. The drive is installed according to the instructions given in the Quick installation and start-up guide of the drive and this supplement.



In a domestic environment, this product may cause radio interference, in which case supplementary mitigation measures may be required.



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

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A drive with the internal EMC filter connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, examine if you must disconnect the EMC filter. See section Grounding system compatibility check in chapter Electrical installation – IEC or Electrical installation – North America in the drive hardware manual.



Do not install a drive with the EMC filter connected to a system that the filter is not suitable for. This can cause danger, or damage the drive.

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**Note:** When the internal EMC filter is disconnected, the EMC compatibility of the drive is considerably reduced. See section EMC compatibility and motor cable length in section Technical data in the drive Hardware manual.

A drive with the ground-to-phase varistor connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, examine if you must disconnect the varistor. See section Grounding system compatibility check in chapter Electrical installation – IEC or Electrical installation – North America in the drive hardware manual.



Do not install the drive with the ground-to-phase varistor connected to a system that the varistor is not suitable for. It can cause damage to the varistor circuit.

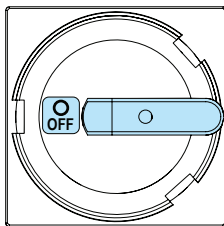
EN

## Installation

### ■ Do according to the quick installation and start-up guide of the drive

- Examine if capacitors need to be reformed.
- Select the power cables.
- Make sure that the cooling is sufficient.
- Protect the drive and input power cable with suitable fuses.
- R1...R2: Open the cover by removing one screw on each side.
- R3: Open the top cover by removing two screws on each side and then the cable box cover by removing two screws on each side.
- R4: Open the top cover by removing three screws on each side and then the cable box cover by removing two screws on each side.
- R5: Open the top cover by removing five screws on each side and the cable box cover by removing two screws on each side.

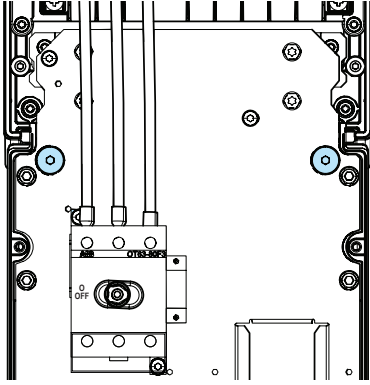
**Note:** If the drive has a main switch (+F278 or +F316), it must be in the OFF position to be able to open the cable box cover.



- Install the drive on the wall.

**Note:** Remove the rubber hole covers before you lift the drive on the wall and put them back to maintain IP55 protection class.

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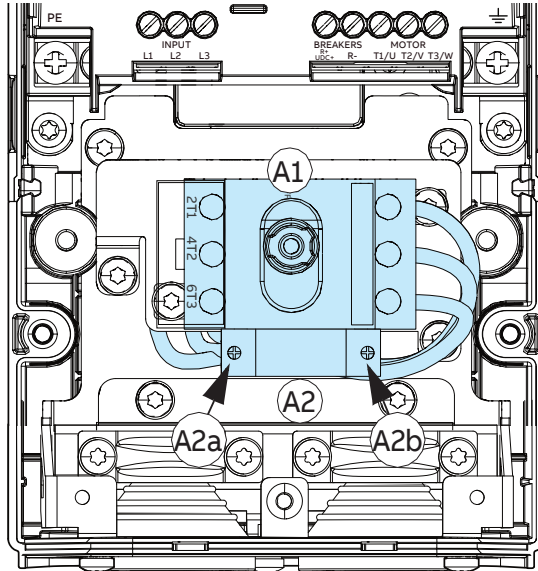
- Measure the insulation of the power cables and the motor.
  - Switch off the power.
  - Attach the warning sticker
  - R5: Remove the shroud on the power cable terminals.
  - Examine the compatibility with IT (ungrounded) and corner-grounded TN systems.
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## ■ R1...R2

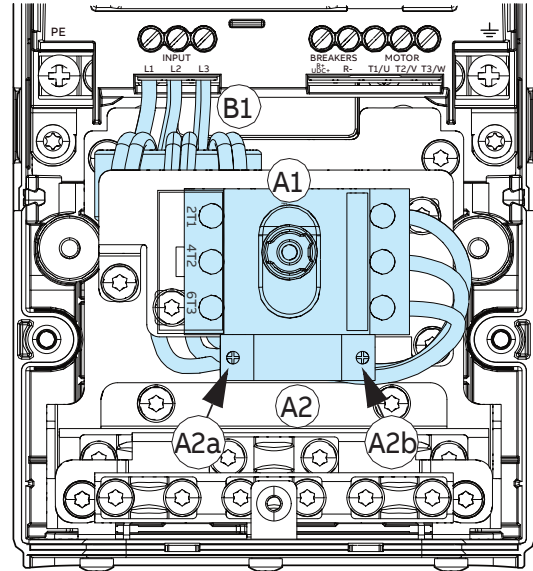
### Option layout

Options are shown with the cover removed in the following figures.

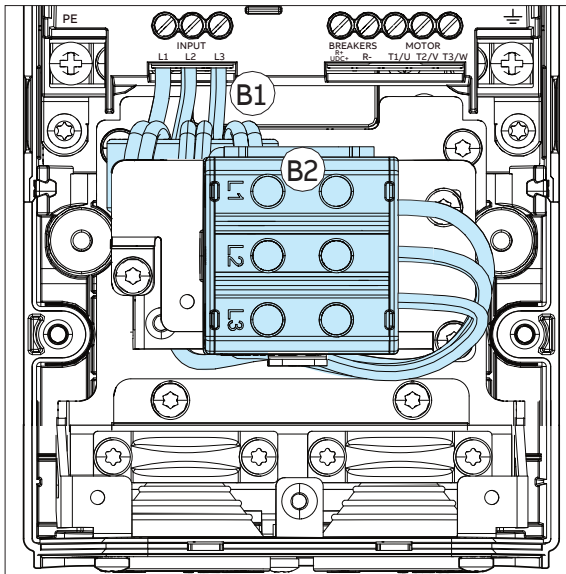
R1...R2, +B056+F278



R1...R2, +B056+F316



R1...R2, +B056+E223



A1	Main switch
A2	Main switch auxiliary contact. Connector 13 on the left (A2a) and connector 14 on the right (A2b).
A3	EMC C1 filter
A4	EMC C1 filter terminal block

### Connect the power cables

See the figures in section R1...R2 Figures on page 261. The figure numbers refer to the step numbers.

1. Remove the rubber grommets from the cable entry.
2. Input cable I: Prepare the input cable according to the quick installation and start-up guide of the drive. To connect the input cable, see the text below and the figures in section R1...R2 Figures on page 261.  
Tighten the screws to the torque given beside figure 2.
  - Ground the shield 360 degrees by tightening the clamp of the power cable grounding shelf onto the stripped part of the cable (2a).

**Note:** Do not yet connect the phase connectors to the main switch or terminal block (2b).

- Connect the twisted shield of the cable and the additional PE conductor of the cable (2c).
3. Remove the two screws of the main switch or terminal block stand platform.
  4. Turn the main switch or terminal block stand platform aside to the left to make room for installing the motor and possible brake resistor cable.
  5. Motor cable: Connect the motor cable according to the quick installation and start-up guide of the drive. See also figure 5 on page 261. Tighten the screws to the torque given beside the figure.
  6. Install the grounding shelf.
  7. Connect the brake resistor cable (if used) according to the quick installation and start-up guide of the drive. Tighten the screws to the torque given beside the figure.
  8. Swing the main switch or terminal block stand platform back to its correct position (8a) and tighten the screws to the torque given in the figure (8b).
  9. +B056+F278, +B056+F316: Remove the finger guard off from the main switch by releasing the clip with a screwdriver (9a) and lifting the finger guard off (9b).
  10. Input cable II: Connect the input cable phase conductors. Figure 10 shows a main switch, but your drive can have a terminal block instead. Tighten the screws to the torque given below figures 10 and 11.
    - +B056+F278, +B056+F316:
      - brown phase conductor to terminal 2T1 of the main switch
      - black phase conductor to terminal 4T2 of the main switch
      - gray phase conductor the terminal 6T3 of the main switch.
    - +B056+E223:
      - brown phase conductor to terminal L1 of the terminal block
      - black phase conductor to terminal L2 of the terminal block
      - gray phase conductor the terminal L3 of the terminal block.
  11. +B056+F278, +B056+F316: Reinstall the finger guard.

**Do according to the quick installation and start-up guide of the drive**

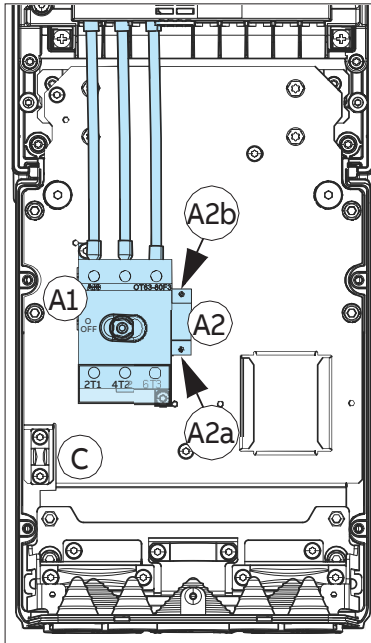
- Connect the control cables.
- Install optional modules if any (according to the drive hardware manual).
- Reinstall cover(s).

## ■ R3...R4

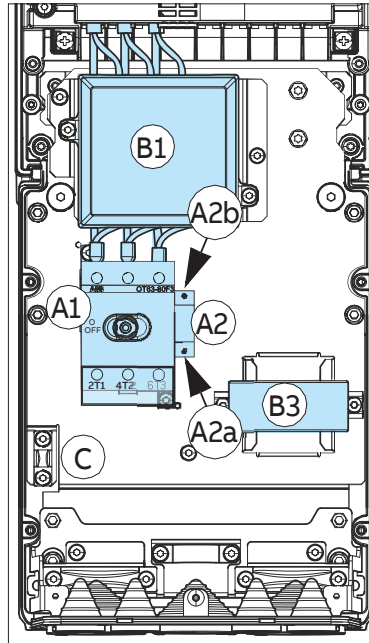
### Option layout

Options are shown with the covers removed in the following figures.

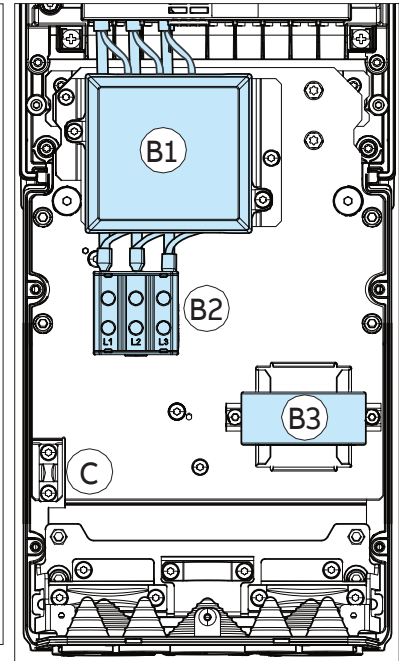
R3...R4, +B056+F278



R3...R4, +B056+F316



R3...R4, +B056+E223



A1	Main switch
A2	Main switch auxiliary contact. Connector 13 at the bottom (A2a) and connector 14 on the top (A2b).
B1	EMC C1 filter
B2	EMC C1 filter terminal block
B3	MC C1 filter toroidal core
C	Grounding terminal for the input cable

### Connect the power cables

See the figures in section R3...R4 Figures on page 262. The figure numbers refer to the step numbers.

1. Remove the rubber grommets from the cable entry.
2. **Motor cable:** Connect the motor cable according to the quick installation and start-up guide of the drive, except the text below in this step. See figure 2 in section R3...R4 Figures on page 262.

**B056+F316, +B056+E223:** Lead the cable through the toroidal core.

**Note:** Do not strip the cable under the clamp (2a), otherwise the toroidal core does not remove interference from the motor cable.

Tighten the screws to the torque given beside the figure.

3. **+B056+F278, +B056+F316:** Remove the finger guard off from the main switch by releasing the clip with a screwdriver (3a) and lifting the finger guard off (3b).

4. **Input cable:** Connect the input cable phase conductors. Figure 4 on page 262 shows a main switch, but your drive can have a terminal block instead. Tighten the screws to the torque given below figures 4 and 5.
- Ground the shield 360 degrees by tightening the clamp of the power cable grounding shelf onto the stripped part of the cable (4a).
  - Connect the twisted shield of the cable to the grounding terminal (4b).
- +B056+F278, +B056+F316:**
- brown phase conductor to terminal 2T1 of the main switch (4c)
  - black phase conductor to terminal 4T2 of the main switch (4d)
  - gray phase conductor the terminal 6T3 of the main switch (4e).
- +B056+E223:**
- brown phase conductor to terminal L1 of the terminal block
  - black phase conductor to terminal L2 of the terminal block
  - gray phase conductor the terminal L3 of the terminal block.
5. **+B056+F278, +B056+F316:** Reinstall the finger guard.
6. **R3:** Connect the brake resistor cable (if used). Lead the conductors under the EMC C1 filter so that they do not make reinstalling the cover difficult. Tighten the screws to the torque given beside the figure.
7. Install the control cable shelf.

**Do according to the quick installation and start-up guide of the drive**

- Connect the control cables.
- Install optional modules if any (according to the drive hardware manual).
- Reinstall cover(s).

## ■ R5

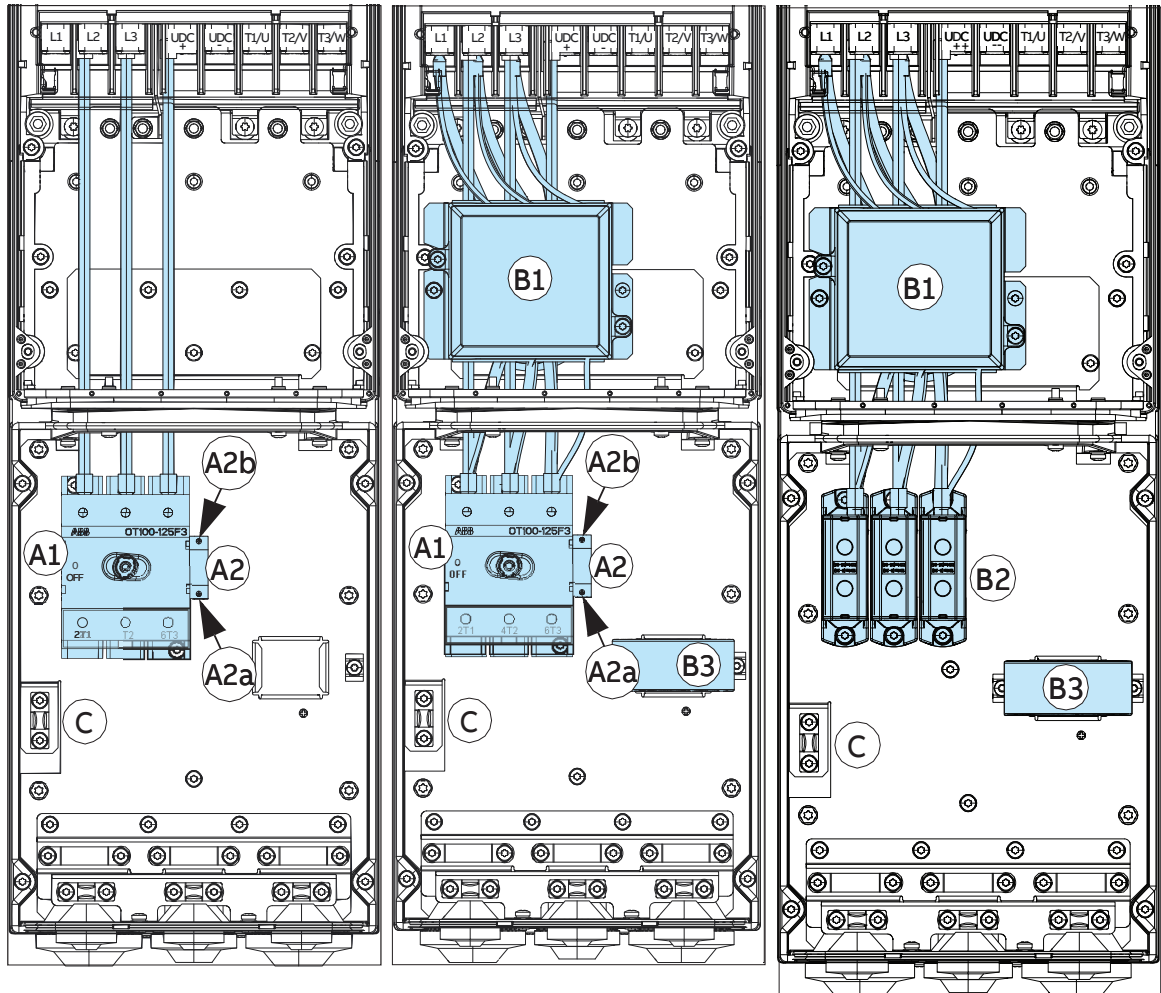
### Option layout

Options are shown with the covers removed in the following figures.

R5, +B056+F278

R5, +B056+F316

R5, +B056+E223



A1	Main switch
A2	Main switch auxiliary contact. Connector 13 at the bottom (A2a) and connector 14 on the top (A2b).
B1	EMC C1 filter
B2	EMC C1 filter terminal block
B3	MC C1 filter toroidal core
C	Grounding terminal for the input cable

### Connect the power cables

See the figures in section R5 Figures on page 262. The figure numbers refer to the step numbers.

1. Remove the rubber grommets from the cable entry.
2. **Motor cable:** Connect the motor cable according to the quick installation and start-up guide of the drive, except the text below in this step. See figure 2 in section R5 Figures on page 262.

B056+F316, +B056+E223: Lead the cable through the toroidal core.

**Note:** Do not strip the cable under the clamp (2a), otherwise the toroidal core does not remove interference from the motor cable.

Tighten the screws to the torque given below figure 3.

3. +B056+F278, +B056+F316: Remove the finger guard off from the main switch by releasing the clip with a screwdriver (3a) and lifting the finger guard off (3b).
4. Input cable: Connect the input cable phase conductors. Figure 4 shows a main switch, but your drive can have a terminal block instead. Tighten the screws to the torque given below figures 4 and 5.
  - Ground the shield 360 degrees by tightening the clamp of the power cable grounding shelf onto the stripped part of the cable (4a).  
Connect the twisted shield of the cable to the grounding terminal (4b).

+B056+F278, +B056+F316:

  - brown phase conductor to terminal 2T1 of the main switch (4c)
  - black phase conductor to terminal 4T2 of the main switch (4d)
  - gray phase conductor the terminal 6T3 of the main switch (4e).

+B056+E223:

  - brown phase conductor to terminal L1 of the terminal block
  - black phase conductor to terminal L2 of the terminal block
  - gray phase conductor the terminal L3 of the terminal block.
5. +B056+F278, +B056+F316: Reinstall the finger guard.

**Do according to the quick installation and start-up guide of the drive**

- Reinstall the shroud on the power terminals.
- Connect the control cables.
- Install optional modules if any (according to the drive hardware manual).
- Reinstall cover(s).

## Auxiliary connector of the main switch (+B056+F278/F316)

ABB recommends that you connect the auxiliary connector of the main switch to the digital input used as the run enable signal (ACS580-01) or the start enable signal (ACH580-01 and ACQ580-01).

## Commission the main switch (+B056+F278/F316)

Make sure that the starting of the motor does not cause any danger. The drive will start automatically at power-up if the external run command is on and the drive is in the remote control mode (Auto mode).

After you have installed the drive with the main switch and commissioned the drive, you must test the main switch.

1. Power-up the drive by turning the main switch to the ON position.
  2. Start the drive.
  3. Add motor speed a little.
  4. Turn the main switch to the OFF position.
  5. Make sure that the control panel is turned off and that the motor stops. The drive trips on fault 3220 DC link undervoltage.
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**Note:** If the motor stops but the panel is not turned off, the drive is probably connected to an external +24 V auxiliary power supply. If the motor does not stop and the panel is not turned off, the main switch or the drive installation is faulty.

6. Turn the switch to the ON position.
7. Reset fault 3220 DC link undervoltage.
8. Make sure that the drive continues operation normally.

16 Figures

# Figures

## R1...R2 Figures

**R1...R2, +B056+F278/F316/E233**

Frame size	R1		R2	
	N-m	lbf-ft	N-m	lbf-ft
PE	1.5	1.1	1.5	1.1
	1.2	0.9	1.2	0.9

**R1...R2, +B056+F278/F316/E233**

**R1...R2, +B056+F278/F316**

**R1...R2, +B056+F278/F316**

**R1...R2, +B056+F278/F316/E233**

Frame size	R1		R2	
	N-m	lbf-ft	N-m	lbf-ft
R-, R+	1.0	0.7	1.5	1.1
$\perp$	1.5	1.1	1.5	1.1
	1.2	0.9	1.2	0.9

**R1...R2, +B056+F278/F316/E233**

Frame size	R1		R2	
	N-m	lbf-ft	N-m	lbf-ft
T1/U, T2/V, T3/W	1.0	0.7	1.5	1.1
$\perp$	1.5	1.1	1.5	1.1
	1.2	0.9	1.2	0.9

**R1...R2, +B056+F278/F316/E233**

**R1...R2, +B056+F278/F316**

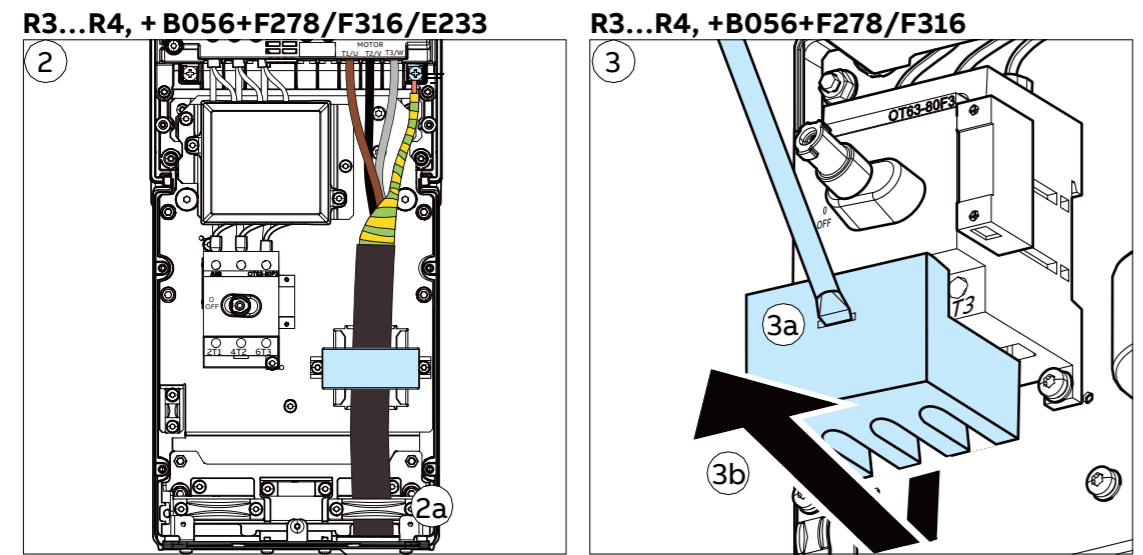
**R1...R2, +B056+F278/F316/E233**

**R1...R2, +B056+F278/F316**

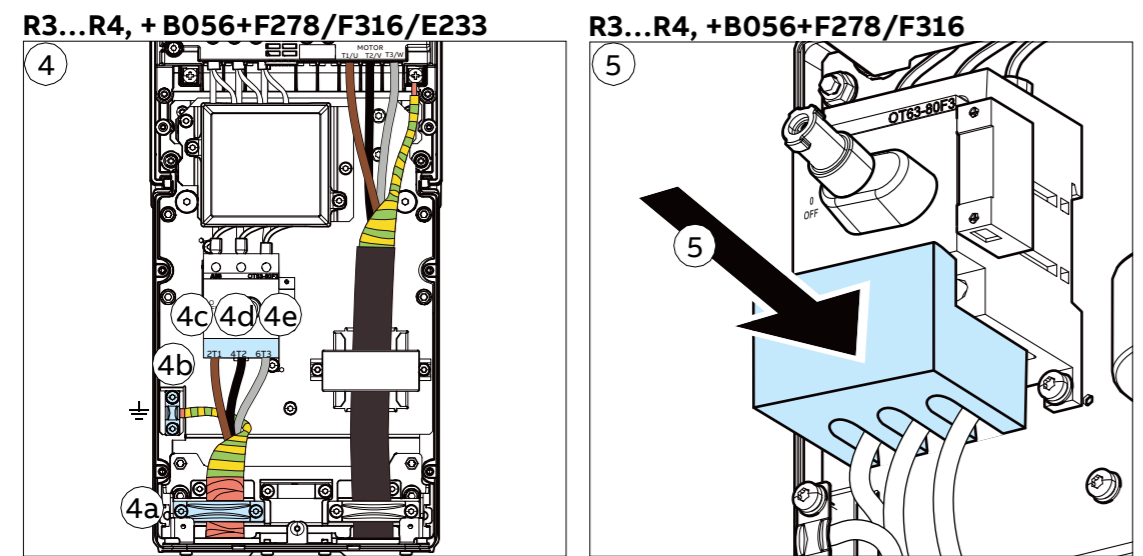
Option	Connector	Conductor size	Frame R1		Frame R2	
			N-m	lbf-ft	N-m	lbf-ft
+B056+F278, +B056+F316	2T1, 4T2, 6T3	2.5...10 mm <sup>2</sup> 1)	0.8	0.6	0.8	0.6
+B056+E223	L1, L2, L3	2.5...6 mm <sup>2</sup>	3	2.2	-	-
		2.5...16 mm <sup>2</sup>	-	-	3	2.2

1) Copper conductors only

**R3...R4 Figures**

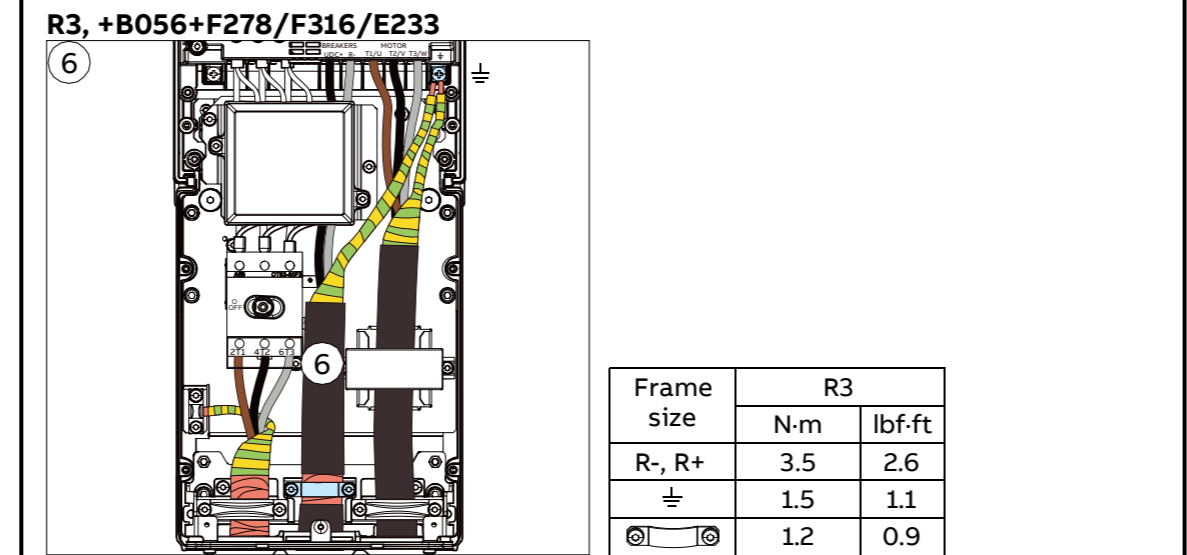


Frame size	R3		R4		R4 v2	
	N-m	lbf-ft	N-m	lbf-ft	N-m	lbf-ft
T1/U, T2/V, T3/W	3.5	2.6	4.0	3.0	5.5	4.0
≡	1.5	1.1	2.9	2.1	2.9	2.1
	1.2	0.9	1.2	0.9	1.2	0.9

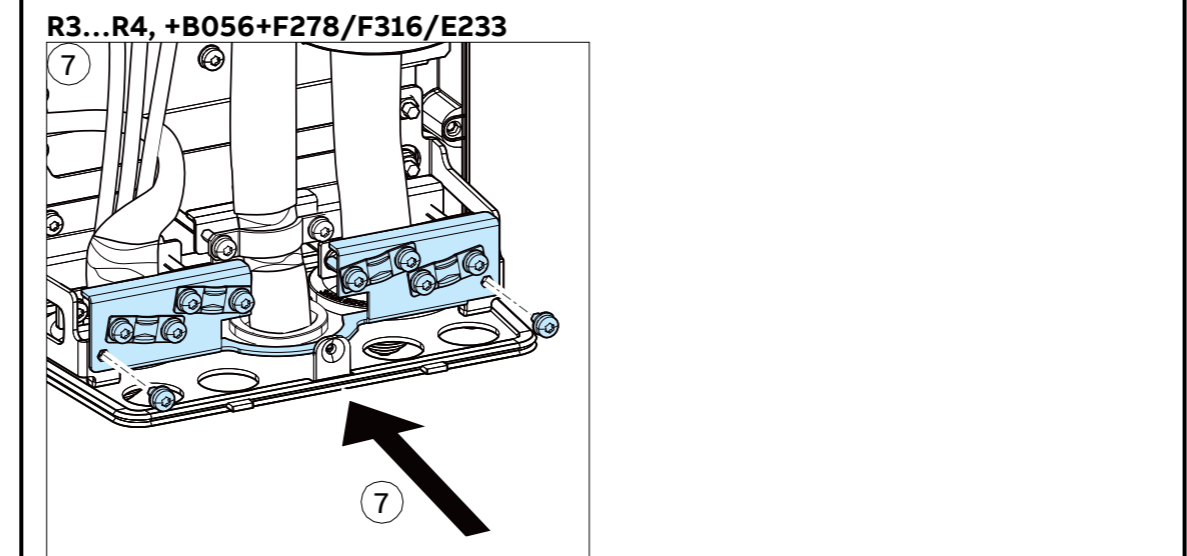


Option	Connector	Conductor size	Frame R3		Frame R4	
			N-m	lbf-ft	N-m	lbf-ft
+B056+F278, +B056+F316	2T1, 4T2, 6T3	2.5...10 mm <sup>2 1)</sup>	2.0	1.5	6.2	4.6
+B056+E223	L1, L2, L3	2.5...16 mm <sup>2</sup>	3	2.2	N/A	
		25...35 mm <sup>2</sup>	6	4.4	N/A	
+B056+E223	L1, L2, L3	4...10 mm <sup>2</sup>	N/A		25	18
		16...50 mm <sup>2</sup>	N/A		10	7.4
N/A	≡	N/A	1.5	1.1	1.5	1.1
N/A		N/A	1.2	0.9	1.2	0.9

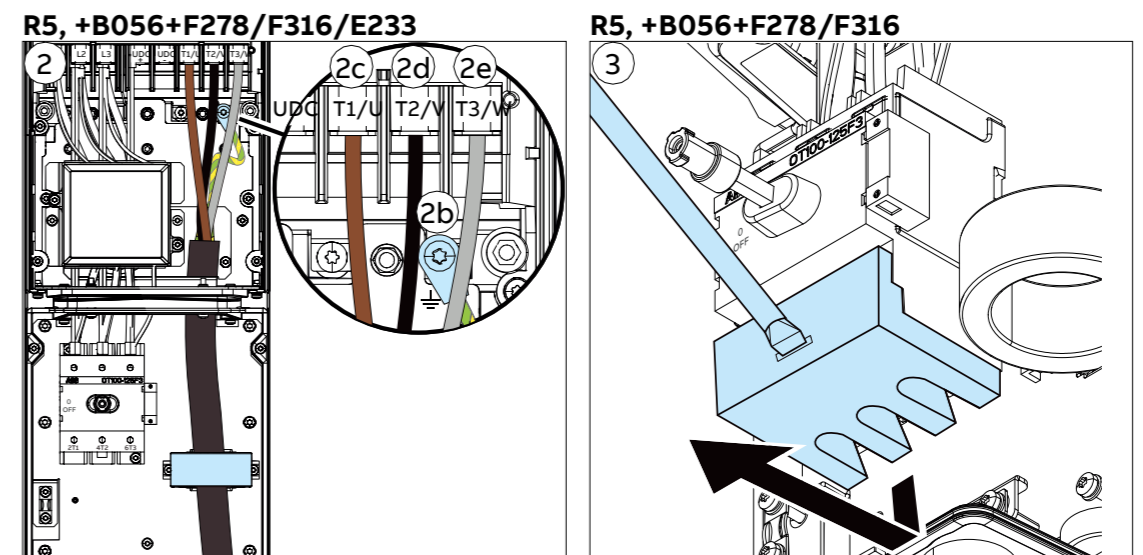
<sup>1)</sup> Copper conductors only



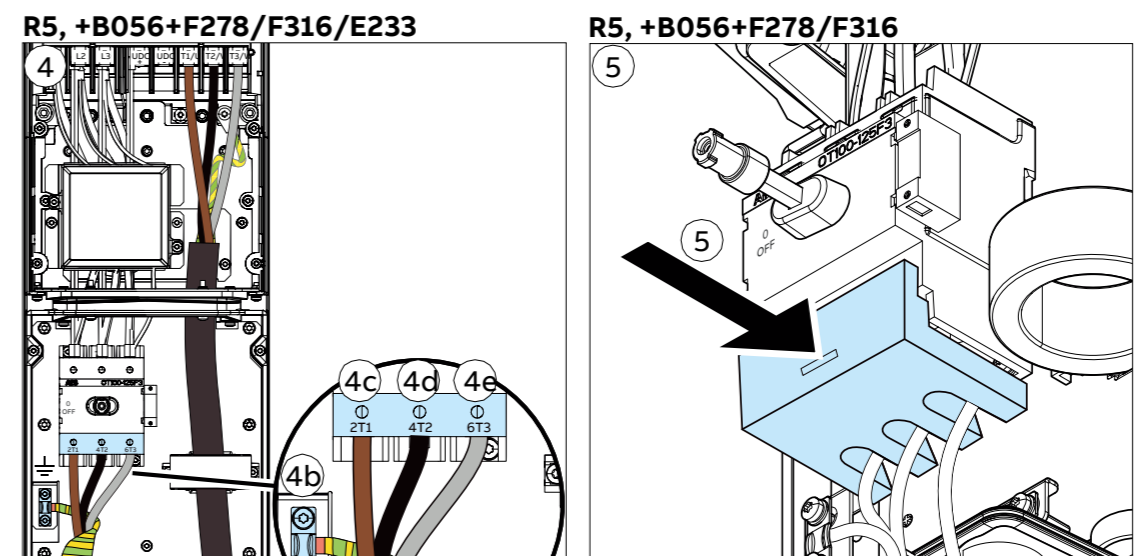
Frame size	R3	
	N-m	lbf-ft
R-, R+	3.5	2.6
≡	1.5	1.1
	1.2	0.9



**R5 Figures**



Frame size	R5	
	N-m	lbf-ft
T1/U, T2/V, T3/W	15	11.1
≡	2.2	1.6
	1.2	0.9



Option	Connector	Conductor size	Frame R5	
			N-m	lbf-ft
+B056+F278, +B056+F316	2T1, 4T2, 6T3	2.5...10 mm <sup>2 1)</sup>	6.2	4.6
+B056+E223	L1, L2, L3	6...25 mm <sup>2</sup>	12	8.6
		35...95 mm <sup>2</sup>	22	16.2
N/A	≡	N/A	1.5	1.1
N/A		N/A	1.2	0.9

<sup>1)</sup> Copper conductors only

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# 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/contact-centers](http://www.abb.com/contact-centers).

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