

ACS355 drives

Quick installation and start-up guide



Safety instructions

WARNING! Obey these instructions. 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 or maintenance work.

- Do not do work on the drive, motor cable, motor, or control cables when the drive is connected to the input power. Before you start the work, isolate the drive from all dangerous voltage sources and make sure that it is safe to start the work. Always wait for 5 minutes after disconnecting the input power to let the intermediate circuit capacitors discharge.
- Do not do work on the drive when a rotating permanent magnet motor is connected to it. A rotating permanent magnet motor energizes the drive, including its input and output terminals.

1. Unpack the delivery

Keep the drive in its package until you are ready to install it. After unpacking, protect the drive from dust, debris and moisture. Make sure that these items are included:

- clamping plates, clamps and screws
 - fieldbus option ground plate
 - panel cover
 - mounting template, integrated into the package
 - quick installation and start-up guide
 - possible options (extension modules, control panels).
- Make sure that there are no signs of damage to the items.

2. Reform the capacitors

If the drive has not been powered up for a year or more, you must reform the DC link capacitors. The manufacturing date is on the type designation label. Refer to [Guide for capacitor reforming \(3AFE68735190 \[English\]\)](#).

3. Select the cables and fuses

- Select the power cables. Obey the local regulations.
 - Input power cable:** ABB recommends to use symmetrical shielded cable (VFD cable) for the best EMC performance.
 - Motor cable:** Use symmetrical shielded cable (VFD cable) for the best EMC performance. Symmetrical shielded cable also reduces bearing currents, wear, and stress on motor insulation.
 - Power cable types:** In IEC installations, use copper or aluminum cables (if permitted). In UL installations, use only copper cables.
 - Current rating:** max. load current.
 - Voltage rating:** min. 600 V AC.
 - Temperature rating:** In IEC installations, select a cable rated for at least 70 °C (158 °F) maximum permissible temperature of conductor in continuous use. In UL installations, select a cable rated for at least 75 °C (167 °F).
 - Size:** Refer to [Fuses and typical power cable sizes](#) for the typical cable sizes and to [Terminal data for the power cables](#) for the maximum cable sizes.
- Select the control cables. Use double-shielded twisted-pair cable for analog signals. Use double-shielded or single-shielded cable for the digital, relay and I/O signals. Do not run 24 V and 115/230 V signals in the same cable.
- Protect the drive and input power cable with the correct fuses. Refer to [Fuses and typical power cable sizes](#).

4. Examine the installation site

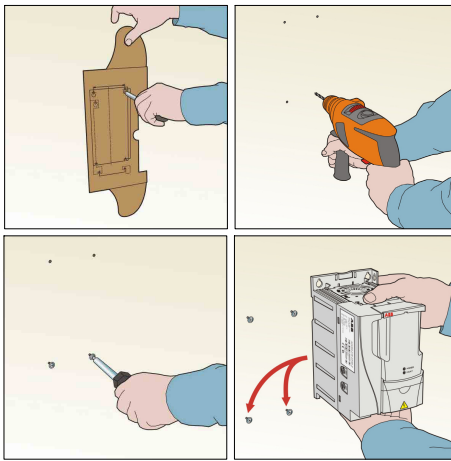
- The drive is intended for cabinet installation and has a degree of protection of IP20 / UL open type as standard.
- Examine the site where you will install the drive. Make sure that:
- The installation site is sufficiently ventilated and hot air does not recirculate.
 - There is sufficient free space around the drive for cooling, maintenance, and operation. For the minimum free space requirements, refer to [Free space requirements](#).
 - The ambient conditions meet the requirements. Refer to [Ambient conditions](#).
 - The installation surface is as close to vertical as possible and strong enough to support the weight of the drive. Refer to [Dimensions and weights](#).
 - The installation surface, floor and materials near the drive are not flammable.
 - There are no sources of strong magnetic fields, such as high-current single-core conductors or contactor coils near the drive. A strong magnetic field can cause interference or inaccuracy in the operation of the drive.

5. Install the drive

You can install the drive with screws, or to a DIN rail (top hat type, width × height = 35 mm × 7.5 mm [1.4 in × 0.3 in]). Do not install the drive upside down. Make sure that the cooling air exhaust is above the cooling air inlet.

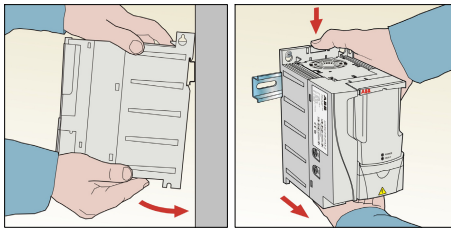
To install the drive with screws

- Cut out the mounting template from the package and use it to mark the locations for the mounting holes.
- Make the holes for the mounting screws and install suitable plugs or anchors.
- Install the mounting screws. Leave a gap between the screw head and mounting surface.
- Place the drive onto the mounting screws.
- Tighten the mounting screws.



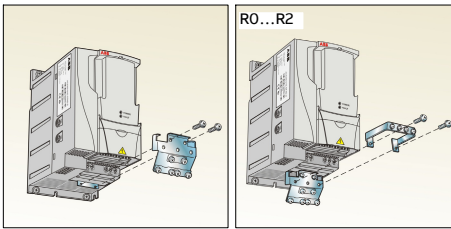
To install the drive to a DIN rail

- Put the top of the drive onto the DIN installation rail at an angle as shown in the figure.
- Put the drive against the wall.
- Make sure that the drive is correctly installed.
- To remove the drive, press the release lever on top of the drive.



6. Attach the clamping plates

- Attach the clamping plate to the plate at the bottom of the drive with the provided screws.
- Frame sizes R0...R2:** Attach the I/O clamping plate to the clamping plate with the provided screws.



7. Measure the insulation resistance

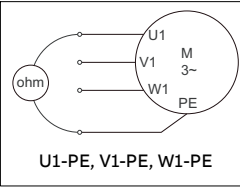
Measuring the insulation is typically not required in North America.

Drive: Do not do voltage tolerance or insulation resistance tests on the drive, because this can cause damage to the drive.

Input power cable: Measure the insulation of the input power cable before you connect it to the drive. Obey the local regulations.

Motor and motor cable:

- Make sure that the motor cable is connected to the motor and disconnected from the drive output terminals U2, V2 and W2.
- Use a voltage of 1000 V DC to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of an ABB motor must be more than 100 Mohm (at 25 °C/77 °F). For the insulation resistance of other motors, refer to the manufacturer's documentation. Moisture in the motor decreases the insulation resistance. If you think that there is moisture in the motor, dry the motor and do the measurement again.

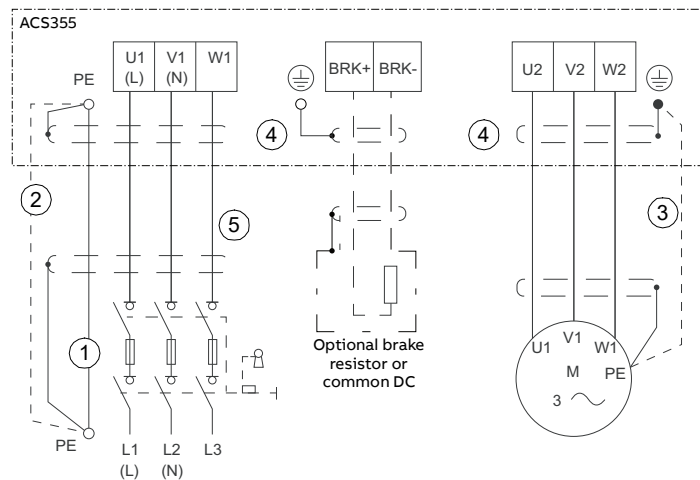


8. Make sure that the drive is compatible with the grounding system

You can connect all drive types to a symmetrically grounded TN-S system (center-grounded wye). Before you connect the drive to a corner-grounded delta system or IT system (ungrounded or high-resistance grounded), remove the metal EMC filter grounding screw. If the drive has a plastic EMC screw (drives with type code ACS355-03U-...), it is not necessary to remove the screw.

9. Connect the power cables

Connection diagram (shielded cables)

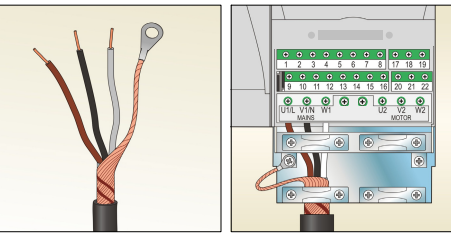


- Two protective earth (ground) conductors. Drive safety standard IEC/EN/UL 61800-5-1 requires two PE conductors, if the cross-sectional area of the PE conductor is less than 10 mm² Cu or 16 mm² Al. For example, you can use the cable shield in addition to the fourth conductor.
- Use a separate grounding cable or a cable with a separate PE conductor for the line side, if the conductivity of the fourth conductor or shield does not meet the requirements for the PE conductor.
- Use a separate grounding cable for the motor side, if the conductivity of the shield is not sufficient, or if there is no symmetrically constructed PE conductor in the cable.
- 360-degree grounding of the cable shield is required for the motor cable and brake resistor cable (if used). It is also recommended for the input power cable.
- 1-phase drives:** Connect phase to U1 and neutral to V1. Keep W1 disconnected.

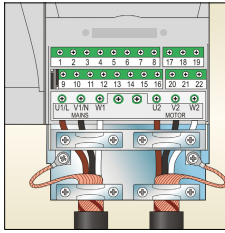
Connection procedure (shielded cables)

For the tightening torques, refer to [Terminal data for the power cables](#).

- Strip the input power cable. Ground the cable shield (if any) under the grounding clamp. Twist the cable shield into a bundle, mark it accordingly and connect it to the grounding terminal. Connect other grounding conductors (PE) to the grounding terminal. Connect the phase conductors to the U1, V1 and W1 terminals.



- Strip the motor cable. Ground the cable shield under the grounding clamp. Twist the motor cable shield into a bundle, mark it accordingly and connect it to the grounding terminal. Connect the phase conductors to the U2, V2 and W2 terminals.
- If you use a brake resistor, connect the brake resistor cable to terminals BRK+ and BRK-. Use a shielded cable and ground the shield under the grounding clamp.
- Make sure that the BRK+ and BRK- terminal screws are tightened. Do this step also if you do not connect cables to the terminals.
- Mechanically attach the cables on the outside of the drive.

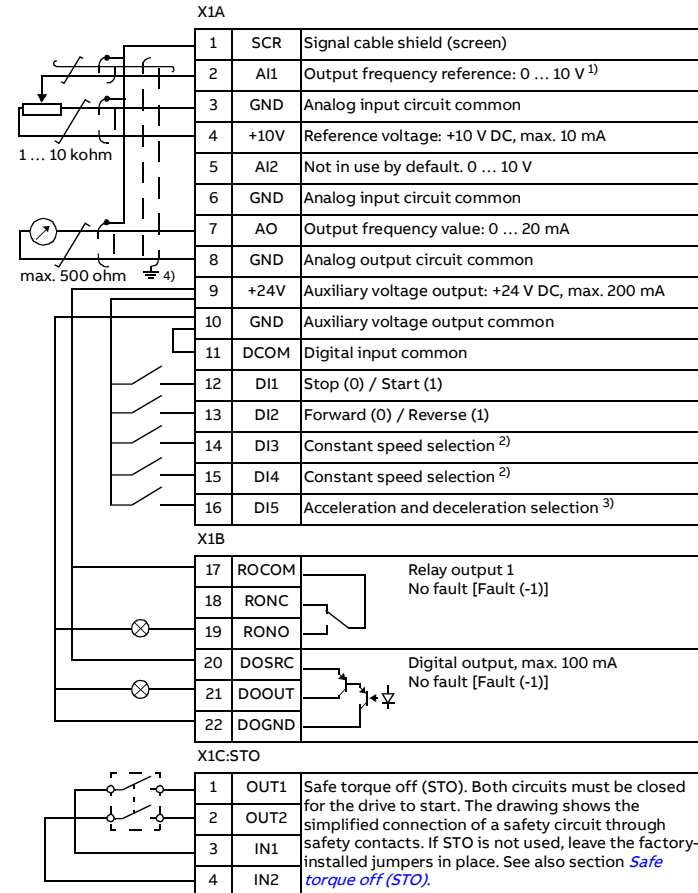


10. Connect the control cables

Do the connections according to the default control connections of the application macro that you select.

Default I/O connections (ABB standard macro)

The diagram shows the I/O connections when parameter 9902 is set to 1 (ABB STANDARD).



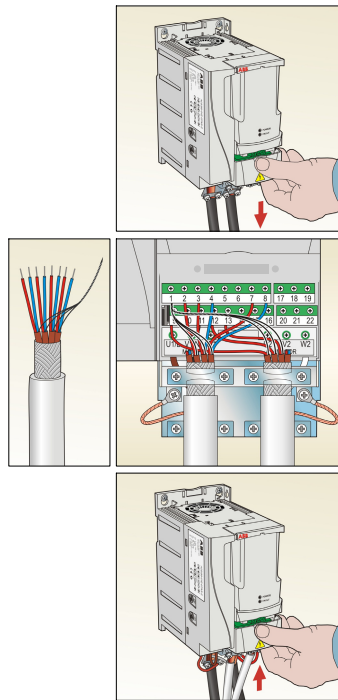
- AI1 is used as a speed reference if vector mode is selected.
- See parameter group 12 CONSTANT SPEEDS.
- 0 = ramp times according to parameters 2202 and 2203, 1 = ramp times according to parameters 2205 and 2206.
- 360 degree grounding under a clamp.

D13	D14	Operation (par.)
0	0	Set speed through AI1
1	0	Speed 1 (I202)
0	1	Speed 2 (I203)
1	1	Speed 3 (I204)

Connection procedure

To prevent inductive coupling, keep the signal wire pairs twisted all the way up to the terminals. The tightening torque for the terminal connections is 0.4 N-m (3.5 lbf-in).

- Remove the terminal cover.
- Strip the outer insulation of the cable and ground the bare shield 360 degrees under the clamp.
- Connect the conductors to the correct control terminals.
- For double-shielded cables, twist also the grounding conductors of each pair in the cable together and connect the bundle to terminal SCR (1).
- Mechanically attach the control cables on the outside of the drive.
- If you will use the optional Safe torque off (STO) function, connect the STO conductors to the correct terminals.
- If necessary, install the optional fieldbus module.
- Slide the terminal cover back into place.



11. Install the control panel, if included in the delivery

12. Start up the drive

WARNING! Make sure that it is safe to start the motor. Disconnect the motor from other machinery, if there is a risk of damage or injury.

Before you start up the drive, make sure that the installation is completed and that you have the motor nameplate data available.

Start up without a control panel

- Switch on the input power and wait for a moment.
 - Make sure that:
 - the red LED is off
 - the green LED is on, but not flashing.
- The drive is now ready for use.

Start up with a control panel (manual start-up)

You can use the basic control panel or the assistant control panel. The displays shown are the basic control panel displays, unless the instruction is applicable to the assistant control panel only.

<p>Power-up</p> <p><input type="checkbox"/> Switch on the input power. The basic control panel powers up into the Output mode.</p> <p>The assistant control panel asks if you want to run the Start-up assistant. If you press the Start-up assistant is not run. If you do not run the Start-up assistant, continue with manual start-up as described below for the basic control panel.</p>	<p>REM OUTPUT 0.0 Hz FWD</p> <p>REM CHOICE Do you want to use the start-up assistant?</p> <p>Yes NO</p> <p>EXIT 00:00 OK</p>
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Entry of start-up data (parameter group 99)

If you have an assistant control panel, select the language. See parameter 9901 for the values of the available language alternatives.

REM **PAR EDIT**
9901 LANGUAGE
ENGLISH
[0]
CANCEL 00:00 SAVE

Select the motor type (9903).
1 (AM): Asynchronous motor
2 (PMSM): Permanent magnet synchronous motor.

With the basic control panel, set the parameter as follows:

1. Go to the Main menu: Press if the bottom line shows OUTPUT. Otherwise press repeatedly until you see MENU at the bottom.

2. Press keys until you see "PAR".

3. Press . The panel changes to Parameter mode. The display shows the number of one of the parameter groups.

4. Find the correct parameter group (99) with keys .

5. Press . The display shows one of the parameters in the selected group. Find the correct parameter (9903) with keys .

6. Press and hold for approximately two seconds until the parameter value is shown with **SET** under the value. If necessary, change the value with keys .

7. Press to save the parameter value.

REM **9903**
PAR FWD

REM **rEF**
MENU FWD

REM **PAR**
MENU FWD

REM **-01-**
PAR FWD

REM **-99-**
PAR FWD

REM **9903**
PAR FWD

REM **01**
PAR **SET** FWD

REM **9903**
PAR FWD

Select the application macro (9902) according to how the control cables are connected. The default value 1 (ABB STANDARD) is suitable in most cases.

REM **9902**
PAR FWD

Select the motor control mode (9904).
1 (VECTOR: SPEED) use in most cases
2 (VECTOR: TORQ) use with torque control
3 (SCALAR: FREQ) use if control accuracy is not important, and for certain special cases. Not for permanent magnet synchronous motors.

REM **9904**
PAR FWD

Enter the motor data from the motor nameplate: motor nominal voltage (9905), nominal motor current (9906), motor nominal frequency (9907), motor nominal speed (9908), motor nominal power (9909).

Select the motor identification method (9910). The default value 0 (OFF/IDMAGN) using the identification magnetization is suitable for most applications. It is applied here. (Requires also that 9904 is set to 1 (VECTOR: SPEED) or 2 (VECTOR: TORQ)).

REM **9910**
PAR FWD

Identification magnetization with ID run selection 0 (OFF/IDMAGN)

Press key to switch to local control (LOC shown on the display). Press to start the drive. The motor model is now calculated by magnetizing the motor for 10 ... 15 s at zero speed.

LOC **9910**
PAR FWD

Direction of motor rotation

Check the direction of the motor rotation:

1. If the drive is in remote control mode (REM shown on the display), press to switch to local control.

2. To go to the Main menu, press if the bottom line shows OUTPUT. Otherwise press repeatedly until you see MENU at the bottom.

3. Press keys until you see "rEF" and press .

4. Increase the frequency reference from zero to a small value with key .

5. Press to start the motor.

6. Make sure that the direction of the motor is the same as shown on the display (FWD means forward and REV reverse).

7. Press to stop the motor.

If necessary, change the direction of rotation: Set the value of parameter 9914 to the opposite, for example, from 0 (NO) to 1 (YES). This inverts the phases. Do the check the again as described above.

LOC **9914**
PAR FWD

Speed limits and acceleration/deceleration times

Set the minimum speed (2002), maximum speed (2002), acceleration time 1 (2202), and deceleration time 1 (2203)

LOC **2001**
PAR FWD

Saving user macro and final check

The start-up is now completed. To save the parameter settings as a user macro, set parameter 9902 to value USER 51 SAVE.

LOC **9902**
PAR FWD

Make sure that there are no faults or alarms shown on the display.

Fault	Description
0001	OVERCURRENT - The output current is higher than the trip limit.
0002	DC OVERVOLT - The intermediate circuit DC voltage is too high.
0003	DEV OVERTEMP - Drive IGBT temperature is too high.
0004	SHORT CIRC - There is a short-circuit in the motor cable(s) or motor.
0006	DC UNDERVOLT - The intermediate circuit DC voltage is too low.
0009	MOT OVERTEMP - The motor temperature is too high or the start-up data is incorrect.
0016	EARTH FAULT - There is an earth (ground) fault in the motor or motor cable.
0022	SUPPLY PHASE - The intermediate circuit DC voltage oscillates because of a missing input power line phase or a blown fuse.
0044	SAFE TORQUE OFF - The STO function is active. This fault is generated only if the drive is configured with parameter 3025 STO OPERATION to trip on a fault.

Related documents

[ACS355 user's manual](#) [ACS355 manual list](#) [Ecodesign information \(EU 2019/1781\)](#)

3AXD5000622467 Rev C EN 2021-12-01
Original instructions.
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3AXD5000622467C

Fault	Description
0045	STO1 LOST (FFA1) - STO input channel 1 is energized, but channel 2 is de-energized. This can be caused by a damaged opening contact on channel 1 or a short-circuit.
0046	STO2 LOST (FFA2) - STO input channel 2 is energized, but channel 1 is de-energized. This can be caused by a damaged opening contact on channel 2 or a short-circuit.

Ratings

ACS355-...	Input		Input with choke		Output					Frame size	
	I _N	I _N (480 V)	I _N	I _N (480 V)	I _{2N}	I _{2,1/10}	I _{2max}	P _N	kW		hp
x = E/U	A	A	A	A	A	A	A	A	kW	hp	
1-phase U _N = 230 V											
01x-02A4-2	6.1	-	4.5	-	2.4	3.6	4.2	0.37	0.5		R0
01x-04A7-2	11	-	8.1	-	4.7	7.1	8.2	0.75	1		R1
01x-06A7-2	16	-	11	-	6.7	10.1	11.7	1.1	1.5		R1
01x-07A5-2	17	-	12	-	7.5	11.3	13.1	1.5	2		R2
01x-09A8-2	21	-	15	-	9.8	14.7	17.2	2.2	3		R2
3-phase U _N = 230 V											
03x-02A4-2	4.3	-	2.2	-	2.4	3.6	4.2	0.37	0.5		R0
03x-03A5-2	6.1	-	3.5	-	3.5	5.3	6.1	0.55	0.75		R0
03x-04A7-2	7.6	-	4.2	-	4.7	7.1	8.2	0.75	1		R1
03x-06A7-2	12	-	6.1	-	6.7	10.1	11.7	1.1	1.5		R1
03x-07A5-2	12	-	6.9	-	7.5	11.3	13.1	1.5	2		R1
03x-09A8-2	14	-	9.2	-	9.8	14.7	17.2	2.2	3		R2
03x-13A3-2	22	-	13	-	13.3	20.0	23.3	3	3		R2
03x-17A6-2	25	-	14	-	17.6	26.4	30.8	4	5		R2
03x-24A4-2	41	-	21	-	24.4	36.6	42.7	5.5	7.5		R3
03x-31A0-2	50	-	26	-	31	46.5	54.3	7.5	10		R4
03x-46A2-2	69	-	41	-	46.2	69.3	80.9	11.0	15		R4
3-phase U _N = 400/480 V											
03x-01A2-4	2.2	1.8	1.1	0.9	1.2	1.8	2.1	0.37	0.5		R0
03x-01A9-4	3.6	3.0	1.8	1.5	1.9	2.9	3.3	0.55	0.75		R0
03x-02A4-4	4.1	3.4	2.3	1.9	2.4	3.6	4.2	0.75	1		R1
03x-03A3-4	6.0	5.0	3.1	2.6	3.3	5.0	5.8	1.1	1.5		R1
03x-04A1-4	6.9	5.8	3.5	2.9	4.1	6.2	7.2	1.5	2		R1
03x-05A6-4	9.6	8.0	4.8	4.0	5.6	8.4	9.8	2.2	3		R1
03x-07A3-4	12	9.7	6.1	5.1	7.3	11.0	12.8	3	3		R1
03x-08A8-4	14	11	7.7	6.4	8.8	13.2	15.4	4	5		R1
03x-12A5-4	19	16	11	9.5	12.5	18.8	21.9	5.5	7.5		R3
03x-15A6-4	22	18	12	10	15.6	23.4	27.3	7.5	10		R3
03x-23A1-4	31	26	18	15	23.1	34.7	40.4	11	15		R3
03x-31A0-4	52	43	25	20	31	46.5	54.3	15	20		R4
03x-38A0-4	61	51	32	26	38	57	66.5	18.5	25		R4
03x-44A0-4	67	56	38	32	44	66	77.0	22.0	30		R4

I_N continuous rms input current (for dimensioning cables and fuses)
I_N (480 V) continuous rms input current (for dimensioning cables and fuses) for drives with 480 V input voltage
I_{2N} continuous rms current. 50% overload is permitted for one minute every ten minutes.
I_{2,1/10} maximum (50% overload) current permitted for one minute every ten minutes
I_{2max} maximum output current. Available for two seconds at start.
P_N typical motor power (nominal use). The kilowatt ratings apply to most IEC 4-pole motors. The horsepower ratings apply to most NEMA 4-pole motors.

Fuses and typical power cable sizes

ACS355-...	Fuses		Size of conductor (Cu)							
	gG	UL Class T or CC (600 V 1) 2)	Input (U1, V1, W1)		Motor (U2, V2, W2)		PE		Brake (BRK+, BRK-)	
x = E/U	A	A	mm ²	AWG	mm ²	AWG	mm ²	AWG	mm ²	AWG
1-phase U _N = 230 V										
01x-02A4-2	10	10	2.5	14	0.75	18	2.5	14	2.5	14
01x-04A7-2	16	20	2.5	14	0.75	18	2.5	14	2.5	14
01x-06A7-2	16/20 ³⁾	25	2.5	10	1.5	14	2.5	10	2.5	12
01x-07A5-2	20/25 ³⁾	30	2.5	10	1.5	14	2.5	10	2.5	12
01x-09A8-2	25/35 ³⁾	35	6	10	2.5	12	6	10	6	12
3-phase U _N = 230 V										
03x-02A4-2	10	10	2.5	14	0.75	18	2.5	14	2.5	14
03x-03A5-2	10	10	2.5	14	0.75	18	2.5	14	2.5	14
03x-04A7-2	10	15	2.5	14	0.75	18	2.5	14	2.5	14
03x-06A7-2	16	15	2.5	12	1.5	14	2.5	12	2.5	12
03x-07A5-2	16	15	2.5	12	1.5	14	2.5	12	2.5	12
03x-09A8-2	16	20	2.5	12	2.5	12	2.5	12	2.5	12
03x-13A3-2	25	30	6	10	6	10	6	10	2.5	12
03x-17A6-2	25	35	6	10	6	10	6	10	2.5	12
03x-24A4-2	63	60	10	8	10	8	10	8	6	10
03x-31A0-2	80	80	16	6	16	6	16	6	10	8
03x-46A2-2	100	100	25	2	25	2	16	4	10	8
3-phase U _N = 400/480 V										
03x-01A2-4	10	10	2.5	14	0.75	18	2.5	14	2.5	14
03x-01A9-4	10	10	2.5	14	0.75	18	2.5	14	2.5	14
03x-02A4-4	10	10	2.5	14	0.75	18	2.5	14	2.5	14
03x-03A3-4	10	10	2.5	12	0.75	18	2.5	12	2.5	12
03x-04A1-4	16	15	2.5	12	0.75	18	2.5	12	2.5	12
03x-05A6-4	16	15	2.5	12	1.5	14	2.5	12	2.5	12
03x-07A3-4	16	20	2.5	12	1.5	14	2.5	12	2.5	12
03x-08A8-4	20	25	2.5	12	2.5	12	2.5	12	2.5	12
03x-12A5-4	25	30	6	10	6	10	6	10	2.5	12
03x-15A6-4	35	35	6	8	6	8	6	8	2.5	12
03x-23A1-4	50	50	10	8	10	8	10	8	6	10
03x-31A0-4	80	80	16	6	16	6	16	6	10	8
03x-38A0-4	100	100	16	4	16	4	16	4	10	8
03x-44A0-4	100	100	25	4	25	4	16	4	10	8

- Use the specified fuses to maintain the IEC/EN/UL 61800-5-1 listing.
- The drive is suitable for use on a circuit capable of delivering not more than 100000 symmetrical amperes (rms) at 480 V maximum when protected by the fuses given in this table.
- For 50% overload capacity, use the larger fuse alternative.

Terminal data for the power cables

Frame size	U1, V1, W1, U2, V2, W2, BRK+, BRK-				PE					
	Min. wire size (solid/stranded)		Max. wire size (solid/stranded)		Tightening torque		Max. wire size (solid or stranded)		Tightening torque	
	mm ²	AWG	mm ²	AWG	N-m	lbf-in	mm ²	AWG	N-m	lbf-in
R0...R2	0.25/0.2	24	6.0/4.0	10	0.8	7	25	3	1.2	11
R3	0.5	20	16.0/10.0	6	1.7	15	25	3	1.2	11
R4	0.5	20	35.0/25.0	2	2.5	22	25	3	1.2	11

- Notes:**
- The minimum specified wire size does not necessarily have sufficient current carrying capacity at maximum load.
 - The terminals do not accept a conductor that is one size larger than the maximum specified wire size.
 - The maximum number of conductors per terminal is 1.

Ambient conditions

Requirement	During operation (installed for stationary use)
Installation altitude	0 ... 2000 m (0 ... 6562 ft) above sea level. The rated output current must be derated by 1% for each 100 m (328 ft) above 1000 m (3281 ft).
Surrounding air temperature	-10 ... +50 °C (14 ... 122 °F). No frost permitted. The rated output current must be derated by 1% for each 1 °C (1.8 °F) above 40 °C (104 °F).
Relative humidity	0 ... 95%. No condensation permitted. Maximum permitted relative humidity is 60% in the presence of corrosive gases.
Contamination levels	No conductive dust permitted
Shock (IEC 60068-2-27, ISTA 1A)	Not permitted
Free fall	Not permitted

Dimensions and weights

Frame size	IP20 / UL open type											
	H1		H2		H3		W		D		Weight	
	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb
R0	169	6.65	202	7.95	239	9.41	70	2.76	161	6.34	1.2	2.6
R1	169	6.65	202	7.95	239	9.41	70	2.76	161	6.34	1.4	3.0
R2	169	6.65	202	7.95	239	9.41	105	4.13	165	6.50	1.8	3.9
R3	169	6.65	202	7.95	236	9.29	169	6.65	169	6.65	3.1	6.9
R4	181	7.13	202	7.95	244	9.61	260	10.24	169	6.65	5.2	11.5

H1 height without fastenings or clamping plate
H2 height with fastening and without clamping plate
H3 height with fastenings and clamping plate
W width
D depth

Free space requirements

Frame size	Above	
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