


ABB

ABB MACHINERY DRIVES

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

1. Cut out the mounting template from the package and use it to mark the locations for the mounting holes.

2. Make the holes for the mounting screws and install suitable plugs or anchors.

3. Install the mounting screws. Leave a gap between the screw head and mounting surface.

4. Place the drive onto the mounting screws.

5. Tighten the mounting screws.

To install the drive to a DIN rail

1. Put the top of the drive onto the DIN installation rail at an angle as shown in the figure.

2. Put the drive against the wall.

3. Make sure that the drive is correctly installed.

4. To remove the drive, press the release lever on top of the drive.

6. Attach the clamping plates

1. Attach the clamping plate to the plate at the bottom of the drive with the provided screws.

2. 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:**

1. Make sure that the motor cable is connected to the motor and disconnected from the drive output terminals U2, V2 and W2.

2. 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)

ACS355

Diagram showing power cable connections (U1, V1, W1, PE, L1, L2, L3, N) and optional brake resistor connections (BRK+, BRK-).

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

12. Start up the drive

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Entry of start-up data (parameter group 99)

REM

↺

PAR

EDIT

9901

LANGUAGE

ENGLISH

[0]

CANCEL

00:00

SAVE

REM

9903

PAR

FWD

REM

rEF

MENU

FWD

REM

PAr

MENU

FWD

REM

-01-

PAR

FWD

REM

-99-

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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).



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  and  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

9910

PAR

FWD

LOC

PAr

MENU

FWD


LOC


xxx.

Hz

SET

FWD

forward

reverse

LOC

9914

PAR

FWD

Speed limits and acceleration/deceleration times

Set the minimum speed (2001), 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 S1 SAVE.

LOC

9902

PAR

FWD

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

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 <sub>1N</sub>	I <sub>1N</sub> (480 V)	I <sub>1N</sub>	I <sub>1N</sub> (480 V)	I <sub>2N</sub>	I <sub>2,1/10</sub>	I <sub>2max</sub>	P <sub>N</sub>		
x = E/U	A	A	A	A	A	A	A	kW	hp	
1-phase U <sub>N</sub> = 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 <sub>N</sub> = 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 <sub>N</sub> = 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<sub>1N</sub>  
I<sub>1N</sub> (480 V) continuous rms input current (for dimensioning cables and fuses)  
I<sub>2N</sub> continuous rms input current (for dimensioning cables and fuses) for drives with 480 V input voltage  
I<sub>2,1/10</sub> continuous rms current. 50% overload is permitted for one minute every ten minutes.  
I<sub>2max</sub> maximum (50% overload) current permitted for one minute every ten minutes  
P<sub>N</sub> maximum output current. Available for two seconds at start.  
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 <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG
1-phase U <sub>N</sub> = 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 <sup>3)</sup>	25	2.5	10	1.5	14	2.5	10	2.5	12
01x-07A5-2	20/25 <sup>3)</sup>	30	2.5	10	1.5	14	2.5	10	2.5	12
01x-09A8-2	25/35 <sup>3)</sup>	35	6	10	2.5	12	6	10	6	12
3-phase U <sub>N</sub> = 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 <sub>N</sub> = 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

- 1) Use the specified fuses to maintain the IEC/EN/UL 61800-5-1 listing.
- 2) 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.
- 3) 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 <sup>2</sup>	AWG	mm <sup>2</sup>	AWG		mm <sup>2</sup>	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

IP20 / UL open type												
Frame size	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		Below		Sides	
	mm	in	mm	in	mm	in
All	75	3	75	3	0	0

### Markings

The applicable markings are shown on the type designation label.

### Safe torque off (STO)

The drive has a Safe torque off function (STO) in accordance with IEC/EN 61800-5-2. It can be used, for example, as the final actuator device of safety circuits that stop the drive in case of danger (such as an emergency stop circuit).

When activated, the STO function disables the control voltage of the power semiconductors of the drive output stage, thus preventing the drive from generating the torque required to rotate the motor. The control program generates an indication as defined by parameter 3025. If the motor is running when Safe torque off is activated, it coasts to a stop. Closing the activation switch deactivates the STO. Any faults generated must be reset before restarting.

The STO function has a redundant architecture, that is, both channels must be used in the safety function implementation. The safety data given is calculated for redundant use,