

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 gualified 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, rotect the drive from dust, debris and moisture. Make sure that these items are included:

- clamping plates, clamps and screws ٠
- fieldbus option ground plate
- panel cover
- ٠ 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]).

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 uses and typical power (

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.

- 3.
- 4. To remove the drive.

6. Attach the clamping plates

- 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.

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

- Make sure that the motor cable is connected to the motor and disconnected
- Use a voltage of 1000 V DC to measure the

conductor and the protective earth conductor. The insulation resistance of an ABB motor must be more than 100 Mohm (at 25 $^{\circ}$ C/77 $^{\circ}$ 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.

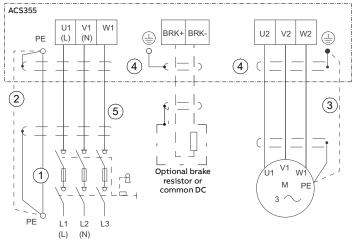
8. Make sure that the drive is compatible with the grounding system

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 2. the line side, if the conductivity of the fourth conductor or shield does not meet the requirements for the PE conductor. 3. 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 P 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 4. cable 5. 1-phase drives: Connect phase to U1 and neutral to V1. Keep W1 disconnected.

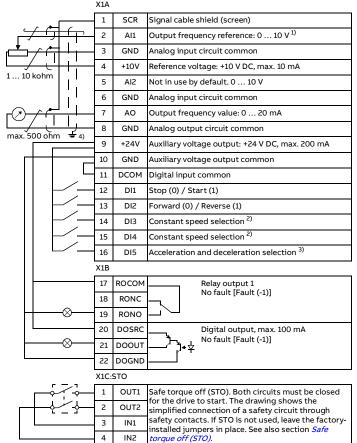
- 2. Strip the motor cable. Ground the cable shield under the grounding clamp. Twist the motor cable shield into a bundle, mark it accordingly and connect it to the grounding terminal. Connect the phase conductors to the U2, V2 and W2 terminals
- 3. If used, connect the brake resistor cable to the BRK+ and BRK- terminals. Use a shielded cable and ground the shield under the grounding clamp
- Mechanically attach the cables on the outside of the drive

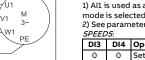
10. Connect the control cables

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 $9902\,\rm is$ set to 1 (ABB STANDARD).





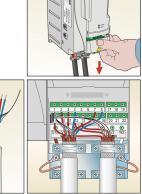
3) 0 = ramp times according to parameters 1) All is used as a speed reference if vector mode is selected. 2) See parameter group *12 CONSTANT* 2202 and 2203. 1 = ramp times according to parameters 2205 and 2206. 4) 360 degree grounding under a clamp.

DI3	DI4	Operation (par.)
0	0	Set speed through Al1
1	0	Speed 1 (1202)
0	1	Speed 2 (1203)
1	1	Speed 3 (1204)

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).

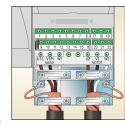
- 1. Remove the terminal cover.
- Strip the outer insulation of the 2 cable and ground the bare shield 360 degrees under the clamp
- 3. Connect the conductors to the correct control terminals.
- 4. For double-shielded cables, twist also the grounding conductors of each pair in the cable together and connect the bundle to terminal SCR (1).
- 5. Mechanically attach the control cables on the outside of the drive
 - 6. 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.
- 8. Slide the terminal cover back into place.

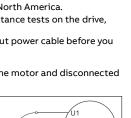




11. Install the control panel, if included in the delivery

12. Start up the drive





U1-PE, V1-PE, W1-PE

R0....R2

the wall Make sure that the drive is correctly installed.

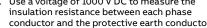
- 2. Put the drive against
- press the release lever on top of the drive.

- 1. Attach the clamping

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

Motor and motor cable 1.

from the drive output terminals U2, V2 and W2.



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 weight
- The installation surface, floor and materials near the drive are not flammable.
- There are no sources of strong magnetic fields, such as high-current singlecore 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 = $35 \text{ mm} \times 7.5 \text{ mm} [1.4 \text{ in} \times 0.3 \text{ in}]$).

Do not install the drive upside down. Make sure that the cooling air exhaust is above the cooling air inlet.

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.



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

- 1. Switch on the input power and wait for a moment.
- 2. Make sure that:
 - the red LED is off
 - the greed 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.

REM

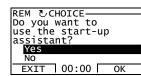
OUTPUT

Power-up

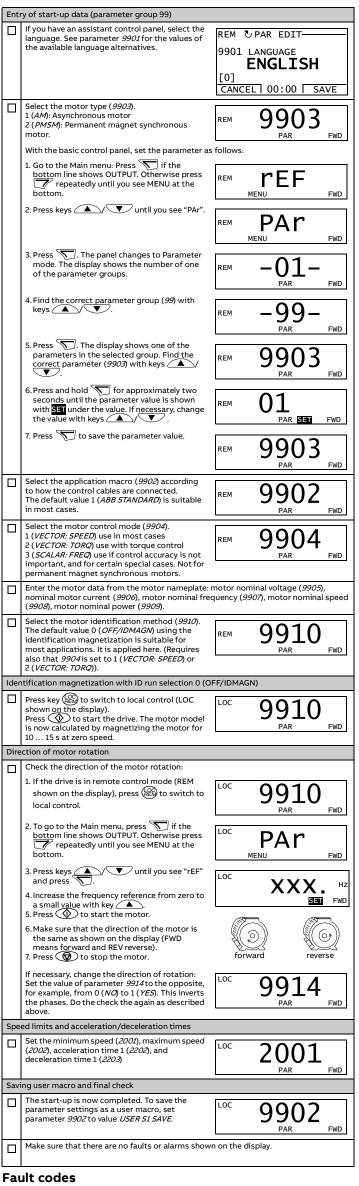
Switch on the input power. The basic control panel powers up into the Output mode

ОО нz
■ FWD

The assistant control panel asks if you want to run the Start-up assistant. If you press $rac{EXIT}{r}$, 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







Fault	6701100	ion								0.1.1.		
0045	STO1 LOS energized short-cird	d. This c cuit.	an be	cause	d by a	damag	led oper	ning con	itact on	channel	1 or a	
0046	STO2 LOS energized short-cire	d. This c									2 or a	
Rating	S											
ACS355	Inp	out		ut wit hoke	:h	Output					Frame size	
x = E/U	4 _N	/ _{1N} (480 V) Α	h _N	(48	LN 20 V) A	/ _{2N}	<i>I</i> _{2,1/10} Α	I _{2max}	F kW	N hp		
1-phase U _N				1 '	<u> </u>	^	^		KW	пр		
01x-02A4-2	1		4.5	.	-	2.4	3.6	4.2	0.37	0.5	RO	
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		-	15		-	9.8	14.7	17.2	2.2	3	R2	
3-phase U _N	1			-	-	2.4	2.6	4.2	0.07	0.5	D 0	
03x-02A4-2 03x-03A5-2		-	2.2 3.5	-	-	2.4 3.5	3.6 5.3	4.2 6.1	0.37	0.5 0.75	R0 R0	
03x-03A3-2			4.2		-	4.7	7.1	8.2	0.55	1	R1	
03x-06A7-2	-	-	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	-	-	21	_		24.4	36.6	42.7	5.5	7.5	R3	
03x-31A0-2	50 69	-	26	+	-	31	46.5	54.3	7.5	10	R4	
03x-46A2-2 3-phase <i>U</i> N		-	41	_	-	46.2	69.3	80.9	11.0	15	R4	
3-phase <i>U</i> _N 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	_	3.0	1.8		.5	1.9	2.9	3.3	0.55	0.75	RO	
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		9.7	6.1	-	.1	7.3	11.0	12.8	3	3	R1	
03x-08A8-4		11	7.7	-	.4	8.8	13.2	15.4	4	5	R1	
03x-12A5-4 03x-15A6-4	19 22	16 18	11 12	-		12.5 15.6	18.8 23.4	21.9 27.3	5.5 7.5	7.5 10	R3 R3	
03x-13A0-4	31	26	12		.5	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	2	6	38	57	66.5	18.5	25	R4	
03x-44A0-4	67	56	38	3	32	44	66	77.0	22.0	30	R4	
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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

				I	P20 / L	JL oper	n type						
Frame	н	1	н	H2		H2 H3		w		D		Weight	
size	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb	
RO	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	

height without fastenings or clamping plate H1

height with fastening and without clamping plate height with fastenings and clamping plate H2 ΗЗ

width

w D depth

Free space requirements

Frame size	Above		Bel	ow	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 safe circuits that stop the drive in case of danger (such as an emergency stop afety 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 \bar{f} unction 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, and does not apply if both channels are not used.

WARNING! The STO function does not disconnect the voltage from the 凸 main and auxiliary circuits of the drive.

Notes:

 If stopping by coasting is not acceptable, stop the drive and machinery using the appropriate stop mode before activating the STO.

• The STO function overrides all other functions of the drive.

Wiring

The safety contacts must open/close within 200 ms of each other. Double-shielded twisted-pair cable is recommended for the connection. The maximum length of the cabling between the switch and the drive control unit is 300 m (1000 ft). Ground the shield of the cable at the control unit only.

Validation

To ensure the safe operation of a safety function, a validation test is required. The test must be carried out by a competent person with adequate expertise and knowledge of the safety function. The test procedures and report must be documented and signed by this person. Validation instructions of the STO function can be found in the drive hardware manual.

Technical data

EU Declarati

Hanufact Address Phone

Frequency of AC\$355

- Minimum voltage at IN1 and IN2 to be interpreted as "1": 13 V DC
- STO reaction time (shortest detectable break): 10 microseconds
- STO response time: 2 ms (typical), 5 ms (maximum) • Fault detection time: Channels in different states for longer than 200 ms
- Fault reaction time: Fault detection time + 10 ms
- STO fault indication (parameter 3025) delay: < 200 ms
- STO warning indication (parameter 3025) delay: < 200 ms
- Safety integrity level (EN 62061): SIL 3
- Performance level (EN ISO 13849-1): PL e

The drive STO is a type A safety component as defined in IEC 61508-2. For the full safety data, exact failure rates and failure modes of the STO function, refer to the drive hardware manual.

Declarations of Conformity

		ABB
on of Conf e 2006/42/EC	ormity	
	ABB Oy Hiomotie 13, 00380 Heisinki, Finland. + 558 19 22 11	
ponalbility that the fo	lowing product:	

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 <i>3025 STO OPERATION</i> to trip on a fault.

ACS355 manual list

Related documents

ACS355 user's manual





3AXD50000622467 Rev B EN 2021-04-20 Original instructions. © Copyright 2021 ABB. All rights reserved.



Ecodesign information (EU 2019/1781)

03x-23A1-4	50	50	10	8	10	8	10	8	6	10	ĺ
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	l
03x-44A0-4	100	100	25	4	25	4	16	4	10	8	

12

10

8

2.5

6

6

10

8

6

6

10

8

2.5

2.5

2.5

12

12

12

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

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6

Frame	U	1, V1, W	1, U2, V2, W	2, BRK+	, BRK-			Р	E		
size		Min. wire size (solid/stranded)		Max. wire size (solid/stranded)		5 5		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	
R0R2	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:

03x-12A5-4

03x-15A6-4

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- 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.

la/are in contormity with all the relevant safety comp listed safety function is used for safety component A	oners requirements of EU Machinery Directive 2006/42/EC, when the another and the sectionality.
The following harmonized standards have been applie	ech.
EN 61800-6-22007	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional
EN 62063.2005	Safety of machinery - Functional safety of safety-related
+ AC 2010 + A1 2013 + A2 2015	electrical, electronic and programmable electronic control systems
EN ISO 13849-12035	Safety of machinery - Safety-related parts of control systems. Part 1: General requirements
EN 190 13840-22012	Safety of machinery – Safety-related parts of the control systems. Part 2: Validation
EN \$0204-12018	Safety of machinery - Gectrical opulpment of machines - Part 2: Ganeral requirements
The following other standards have been applied-	
IEC 61508-2010, parts 1-2	Functional safety of electrical / electronic / programmable electronic safety-related systems
EC 61800-5-22016	Adjustable speed electrical power drive systems - Part S-2. Safety requirements - Functional
The productic) referent in this Declaration of conferen	rity fulfills) the relevant provisions of other European Union Directives way backproscoscopy
which are notified in Single EU Declaration of contain Person authorized to compile the technical file	
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