AC355 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 work on the drive, motor, cable, 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. A 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 manufacturer date is on the type designation label. Refer to Guide for capacitor reforming (MAKEMAX 10130900) (English).

3. Select cables and fuse the power cables
- Select the power cables. Obey the local regulations.
- Input power cable: ABB recommends using 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 cables: In ISC installations, use copper or aluminium cables (if permitted). In US installations, use only copper cables.
- Current rating: max. load current.
- Voltage rating: min. 600 V AC.
- Temperature rating: In ISC installations, select a cable rated for at least 10 °C (50 °F) maximum permissible temperature of conductor in continuous use. In US 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 size in the cable.

4. Examine the installation site
The drive is intended for cabinet installation and has a degree of protection of IP20 / UL open type standards.
Examine the site where you will install the drive. Make sure that:
- The installation site is clean, dust-free, and hot and cold air flows do not interfere with the drive.
- There is sufficient free space around the drive for cooling, maintenance, and operation, and the minimum free space requirements, refer to 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, materials near the drive are not flammable.
- There are no sources of magnetic fields, such as high-current single-conductor cores or contactors coils near the drive. A strong magnetic field can cause interference or inaccurate operation in 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 × 75 mm (0.4 in × 0.95 in)).

- 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堵头 in the holes.
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 on the DIN rail.
2. Mount the drive on the DIN rail like an angle as shown in the figure.
3. Put the drive against the wall.
4. Make sure that the drive correctly is installed.
5. 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 B1-B4: Attach the (optional) clamp 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.

**Warning:** Do not connect the input power cable before you connect it to the drive. Obey the local regulations.

**Warning:** The insulation resistance of an ABB motor must be more than 500 MΩ at 50 °C (122 °F). For the insulation resistance of other motors, refer to the manufacturer's documentation. Misure 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 grounded system
You can connect all drive types to a symmetrically grounded TN-S system (center-grounded way).
Before you connect the drive to a corner-grounded delta system or T system you must disconnect the PE conductor from the EMC filter inputs and grounding grounds. If the drive has a plastic EMC cable (drives with type code U1 PE, V1 PE, W1 PE or W1 PE for shielded cable and grounding clamp). The insulation resistance of an ABB drive is typically 500 MΩ or more (at 50 °C (122 °F)).

9. Connect the power cables
- **Connection diagram (shielded cables)**

- **Warning:** To prevent inductive coupling, keep the signal wires for all input and output signals a minimum of 100 mm (4 in) away from the cable. If you use the start-up assistant, continue with manual setup.

- **Connection procedure (shielded cables)**

  - **Preparation of power cables**

    - 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 grounding conductors (optional) to the grounding terminal. Connect the phase conductors to the US, V5 and W5 terminals.

- **Connection procedure (non-shielded cables)**

  - **Preparation of power cables**

    - 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 grounding conductors (optional) to the grounding terminal. Connect the phase conductors to the US, V5 and W5 terminals.

- **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**
1. Switch on the input power and wait for a moment.
2. Make sure that:
   - the LED is off
   - the green LED is on, but not flashing

**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 examples. All displays are in English, unless the instruction is applicable to the assistant control panel only.

**Connection procedure (manual start-up)**

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

  - **Preparation of power cables**

    - 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 grounding conductors (optional) to the grounding terminal. Connect the phase conductors to the US, V5 and W5 terminals.
DC UNDERVOLT - The intermediate circuit DC voltage is too low.

Speed limits and acceleration/deceleration times:
Direction of motor rotation
1. Go to the Main menu: Press if the drive is in remote control mode (REM).
2. To go to the Main menu, press if the motor is not running.
3. Press keys / until you see "rEF"
4. Press keys / until you see "PAr".
5. Press EXIT.
6. Make sure that the direction of the motor is forward (FWD) or reverse (REV).
7. Press and hold for approximately two minutes.
8. Press keys / until you see "rEF"
9. Press keys / until you see "PAr".
10. … 15 s at zero speed.

Termination data for the power cables:
frame size: \( \Omega \) mm² AWG mm² N·m lbf·in mm² AWG N·m lbf·in
R² 10 10 2.5 14 0.75 18 2.5 14 2.5 14
R² 6.1 - 3.5 - 3.5 5.3 6.1 0.55 0.75 R0
R² 03x-31A0-2 50 - 26 - 31.4 46.5 54.3 7.5 10 R4
R² 03x-46A2-2 69 - 41 - 46.2 69.3 80.9 11.0 15 R4
R² 03x-09A8-2 14 - 9.2 - 9.8 14.7 17.2 2.2 3 R2
R² 03x-04A7-2 7.6 - 4.2 - 4.7 7.1 8.2 0.75 1 R1
R² 03x-03A5-2 6.1 - 3.5 - 3.5 5.3 6.1 0.55 0.75 R0
R² 03x-08A8-4 20 25 2.5 12 2.5 12 2.5 12 2.5 12
R² 03x-07A3-4 16 20 2.5 12 1.5 14 2.5 12 2.5 12
R² 03x-04A1-4 16 15 2.5 12 0.75 18 2.5 12 2.5 12
R² 03x-24A4-2 63 60 10 8 10 8 10 8 6 10
R² 03x-03A5-2 10 10 2.5 14 0.75 18 2.5 14 2.5 14
R² 03x-09A8-2 14 - 9.2 - 9.8 14.7 17.2 2.2 3 R2
R² 03x-04A7-2 7.6 - 4.2 - 4.7 7.1 8.2 0.75 1 R1
R² 03x-03A5-2 6.1 - 3.5 - 3.5 5.3 6.1 0.55 0.75 R0
R² 03x-08A8-4 20 25 2.5 12 2.5 12 2.5 12 2.5 12
R² 03x-07A3-4 16 20 2.5 12 1.5 14 2.5 12 2.5 12
R² 03x-04A1-4 16 15 2.5 12 0.75 18 2.5 12 2.5 12
R² 03x-24A4-2 63 60 10 8 10 8 10 8 6 10

Safe torque off (STO)
The drive has a Safe torque off function (STO) in accordance with IEC/EN 68052-5. It can be used, for example, as the final actuator device of safety systems in industrial applications. Please also note that stop the drive in case of danger (such as an emergency stop circuit).

When activated, the STO function disable the control-voltage of the power semiconductors of the drive output stage, thus preventing the drive from generating any active power. The drive is allowed to coast to a stop. The closing the emergency 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, and does not apply if both channels are not used.

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

Notes:
• If stopping by coasting is not acceptable, stop the drive and machine using the appropriate stop mode before activating the STO.

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

Wiring
The safety output 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 verify the proper 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
• Minimum voltage at IN1 and IN2 to be interpreted as "1.13 V DC".
• STO reaction time (shortest detectable break): 30 microseconds
• STO response time: 2 ms (typical), 5 ms (maximum)
• Fault detection time: Channels in different states for longer than 200 ms
• Fault detection time: 10 ms
• Fault indication (parameter 3025) delay: < 200 ms
• STO warning indication (parameter 3025) delay: < 200 ms
• Safety integrity level (EN 60204-1): SIL 1
• Performance level (EN ISO 13849-1): PL a

The drive STO is a type A safety component as defined in IEC 60204-1. For the safety data, see the operation manual and the safety section of the drive STO function, refer to the drive hardware manual.

Declarations of Conformity
• CE
• UL
• RCM
• EAC
• SEV
• TÜV Nord

Authorized to compile the technical file: ABB Limited, Daresbury Park, Cheshire, United Kingdom, WA4 4BT.

The following harmonized standards have been applied:
• IEC 61508:2010, parts 1-2
• EN ISO 13849-2:2012

The drive has a CE (Conformité Européenne) mark and is therefore in conformity with the requirements of the EC (European Communities) directives. It also has a Declaration of Conformity to confirm that it is CE marked.

The drive has also been type tested in accordance with the IEC 60204-1. The test results confirm that the drive is classified as a "safety-related component" with a maximum fault rate of less than 10^-6 hours^-1.

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