



ACS180 drives

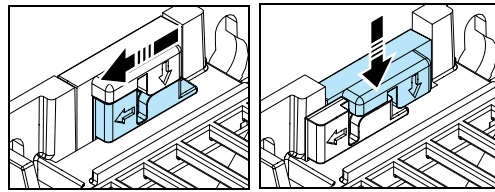
Quick installation and start-up guide



To install the drive to a DIN rail for frame sizes R3 and R4

1. Move the locking part to the left. If necessary, use a flat-head screwdriver.
2. Push and hold the locking button down.
3. Put the top tabs of the drive onto the top edge of the DIN rail.
4. Put the drive against the bottom edge of the DIN rail.
5. Release the locking button.
6. Move the locking part to the right.
7. Make sure that the drive is correctly installed.

To remove the drive, open the locking part and lift the drive from the DIN rail.



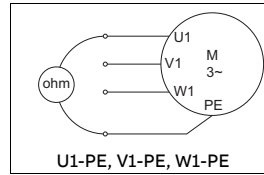
6. Measure the insulation resistance

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

Input power cable: Before you connect the input power cable, measure the insulation of the input power cable. 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 T1/U, T2/V and T3/W.
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.



7. 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). The drive is delivered with the EMC and VAR screws installed. The material of the screws (plastic or metal) depends on the product variant. The table shows when to remove the metal EMC screw (disconnect the internal EMC filter) or metal VAR screw (disconnect the varistor circuit).

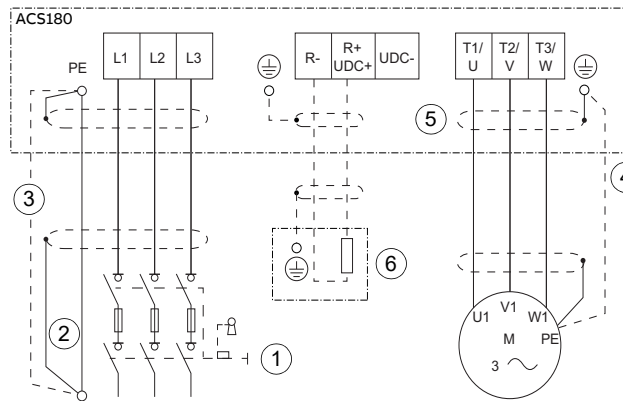
| Screw label | Factory default screw material | Grounding systems | | |
|-------------|--------------------------------|---|---|---|
| | | Symmetrically grounded TN-S systems (center-grounded wye) | Corner-grounded delta, midpoint-grounded delta and TT systems | IT systems (ungrounded or high-resistance grounded) |
| EMC | Metal | Do not remove | Remove | Remove |
| | Plastic ¹⁾ | Do not remove ²⁾ | Do not remove | Do not remove |
| VAR | Metal | Do not remove | Do not remove | Remove |
| | Plastic | Do not remove | Do not remove | Do not remove |

1) Drives sold in North America have a plastic EMC screw.

2) Can install the metal screw (included in the drive delivery) to connect the internal EMC filter.

8. Connect the power cables

Connection diagram (shielded cables)

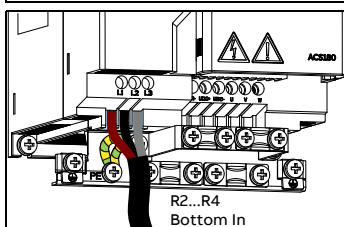
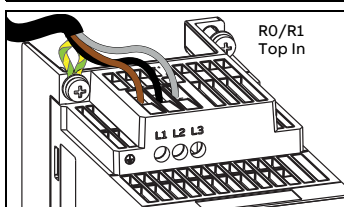
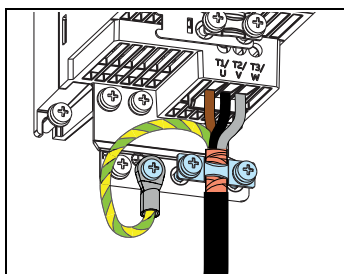


1. Disconnecting device.
2. Two protective earth (ground) conductors. Drive safety standard IEC/EN61800-5-1 requires two PE conductors, if the cross-sectional area of the PE conductor is less than 10 mm² Cu or 16 mm² Al. For example, you can use the cable shield in addition to the fourth conductor.
3. 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.
4. 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.
5. 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.
6. Brake resistor and resistor cable (optional, for frame R2...R4 only).

Connection procedure (shielded cables)

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

1. Attach the residual voltage warning sticker in the local language to the drive.
2. Strip the motor cable.
3. Ground the motor cable shield under the grounding clamp.
4. Twist the motor cable shield into a bundle, mark it and connect it to the grounding terminal.
5. Connect the phase conductors of the motor cable to terminals T1/U, T2/V and T3/W.
6. If you use a brake resistor, connect the brake resistor cable to terminals R- and UDC+. Use a shielded cable and ground the shield under the grounding clamp.
7. Make sure that the R- and UDC+ terminal screws are tightened. Do this step also if you do not connect cables to the terminals.
8. Strip the input power cable.
9. If the input power cable has a shield, ground the shield under the grounding clamp. Then twist the shield into a bundle, mark it and connect it to the grounding terminal.
10. Connect the PE conductor of the input power cable to the grounding terminal. If necessary, use a second PE conductor.
11. In 3-phase drives, connect the phase conductors of the input power cable to terminals L1, L2 and L3. In 1-phase drives, connect the phase and neutral conductors to terminals L and N.
12. Mechanically attach the cables on the outside of the drive.

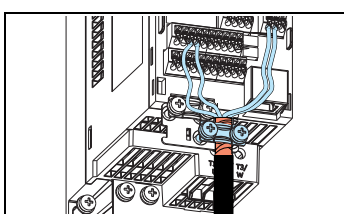


9. Connect the control cables

Connection procedure

Do the connections according to the default control connections of the application macro that you select. Keep the signal wire pairs twisted as near to the terminals as possible to prevent inductive coupling.

1. Strip a part of the outer shield of the control cable for grounding.
2. Use a 360-degree grounding clamp to connect the outer shield to the grounding tab.



3. Strip the control cable conductors.

4. Connect the conductors to the correct control terminals. Insert the conductor into a push-in terminal. To release, pull the conductor with pushing the open/close button all the way down firmly with a flathead screwdriver.
5. Mechanically attach the control cables on the outside of the drive.

Default I/O connections (ABB standard macro)

The ABB standard macro is the default macro. The connection diagram for the ABB standard macro is shown below.

| Terminals | | Descriptions |
|---|-------------|---|
| Digital I/O | | |
| 21 | 24 V | Aux. +24 V DC, max 200 mA |
| 22 | DGND | Aux. voltage output common |
| 8 | DI1 | Stop (0) / Start (1) |
| 9 | DI2 | Forward (0) / Reverse (1) |
| 10 | DI3 | Constant speed selection 1 |
| 11 | DI4 | Constant speed selection 2 |
| 12 | DCOM | Digital input common |
| 18 | DO | Running |
| 19 | DO COM | Digital output common |
| 20 | DO SRC | Digital output auxiliary voltage |
| Analog I/O | | |
| 14 | AI1/DI5 | Speed reference (0...10V) |
| 13 | AGND | Analog input circuit common |
| 15 | AI2 | Not used |
| 16 | AGND | Analog output circuit common |
| 17 | AO | Output frequency (0...20mA) |
| 23 | 10V | Ref. voltage +10 V DC |
| 24 | SCREEN | Signal cable shield (screen) |
| Safe torque off (STO) (only on ACS180-04S) | | |
| 1 | S+ | Safe torque off (STO). Both circuits must be closed for the drive to start. The drawing shows the simplified connection of a safety circuit through safety contacts. If STO is not used, leave the factory-installed jumpers in place. See also section Safe torque off (STO) . |
| 2 | SGND | |
| 3 | S1 | |
| 4 | S2 | |
| Relay output | | |
| 5 | NC | No fault [Fault (-1)] |
| 6 | COM | |
| 7 | NO | |
| EIA-485 Modbus RTU | | |
| 25 | B+ | Embedded Modbus RTU (EIA-485) |
| 26 | A- | |
| 27 | AGND | |
| 28 | SHIELD | |
| Jumper | | |
| J1 | Termination | Modbus Termination ON-OFF |
| J2 | Comm.Mode | Communication Mode Selection |

Note: You can select other macros with the control panel. For default IO assignment, see below:

| | Hand/Auto | Alternate | Motor potentiometer |
|-------------------|----------------------------------|-----------------------------------|------------------------------|
| DI1 | Start/Stop (Hand) | Start forward | Start/Stop |
| DI2 | Hand(1)/Auto(0) | Start reverse | Forward/Reverse |
| DI3 | Start/Stop (Auto) | Const speed selection 1 | Speed ref. up |
| DI4 | Fault reset | Const speed selection 2 | Speed ref. down |
| AI1/DI5 | Speed ref.(Hand)(AI1,0...10V) | Fault reset(DI5) | Const speed selection 1(DI5) |
| AI2 | Speed ref.(Auto)(4...20mA) | Speed ref.(0...10V) | not used |
| PID | | Hand/PID | |
| DI1 | Start/Stop | Start/Stop(Hand) | |
| DI2 | Internal setpoint sel 1 | Hand(1)/PID(0) | |
| DI3 | Internal setpoint sel 2 | Start/Stop(PID) | |
| DI4 | Constant speed selection 1 | Constant speed selection 1 | |
| AI1/DI5 | PID set point(AI1, 0...10V) | Hand mode speed ref.(AI1,0...10V) | |
| AI2 | Process feedback(4...20mA) | Process feedback(4...20mA) | |
| 3-wire | | Modbus | |
| DI1 | Start(pulse) | Start/Stop(Hand) | |
| DI2 | Stop(pulse) | Forward/Reverse(Hand) | |
| DI3 | Forward(0)/Reverse(1) | Hand(1)/Modbus(0) | |
| DI4 | Constant speed selection 1 | Fault reset | |
| AI1/DI5 | Constant speed selection 2 (DI5) | Constant speed selection 1(DI5) | |
| AI2 | Speed ref.(0...10V) | Speed ref.(Hand, 0...10V) | |
| All macros | | DO | Running |
| | | RO | Fault(-1) |
| | | AO | Output frequency(0...20mA) |

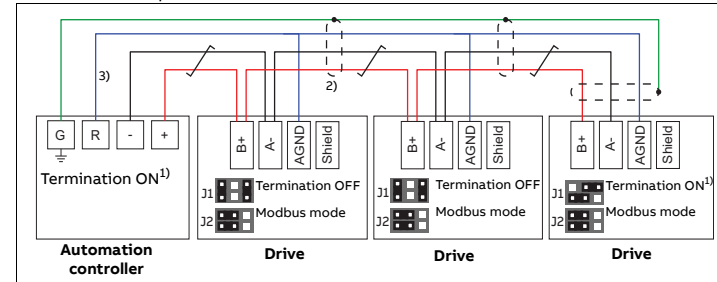
Embedded fieldbus connection

Connect the fieldbus to the EIA-485 Modbus RTU terminal which is on the front of the drive.

To configure Modbus RTU communication with the embedded fieldbus:

1. Connect the fieldbus cables and the necessary I/O signals.
2. Use the jumpers to set the termination and bias settings.
3. Power up the drive and set the necessary parameters.

A connection example is shown below.



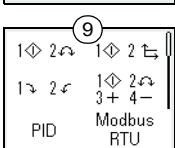
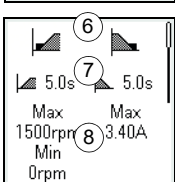
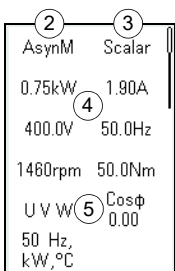
- 1) The devices at the ends of the fieldbus must have termination set to ON. All other devices must have termination set to OFF.
- 2) Attach the cable shields together at each drive, but do not connect them to the drive. Connect the shields only to the grounding terminal in the automation controller.
- 3) Connect the AGND conductor to the signal ground reference terminal in the automation controller.

10. Start up the drive

WARNING! Before you start up the drive, make sure that the installation is completed. Make sure also that it is safe to start the motor. Disconnect the motor from other machinery, if there is a risk of damage or injury.

For information on the user interface, refer to the [ACS180 User interface guide \(3AXD50000606696 \[English\]\)](#).

1. Power up the drive.
2. Select the units (international or US). In the *Motor data* view, set the motor type:
AsynM: Asynchronous motor
PMSM: Permanent magnet synchronous motor
3. Set the motor control mode:
Vector: Speed reference. This is suitable for most cases. The drive does an automatic standstill ID run when the drive is started for the first time.
Scalar: Frequency reference. Do not use this mode for permanent magnet synchronous motors. Use this mode when:
 - The number of motors can change.
 - The nominal motor current is less than 20% of the nominal drive current.
4. Set the nominal motor values.
5. Start the motor and check the direction of rotation. If the direction is incorrect, you can:
 - change the **Phase order** setting, or
 - change the phase order of the motor cable.
- Note:** In vector control mode the drive does an automatic standstill ID run at the first start.
6. In the *Motor control* view, set the start and stop mode.
7. Set the acceleration and deceleration times.
8. Set the maximum and minimum speeds.
9. In the *Control macros* view, select the applicable macro.
10. Tune the drive parameters to the application. You can also use the Assistant control panel (ACS-AP...) or the Drive Composer PC tool.



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:

- drive
- installation accessories (cable clamps, screws, hardware, etc.)
- safety instructions
- multilingual warning sticker sheet (residual voltage warning)
- user interface guide
- quick installation and start-up guide.

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 data is on the type designation label. Refer to [Capacitor reforming instructions \(3BFE64059629 \[English\]\)](#).

3. Select the cables and fuse

- 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 area

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:

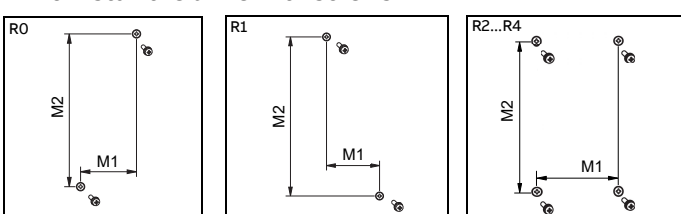
- The installation site is sufficiently ventilated and hot air does not recirculate.
- There is sufficient free space around the drive for cooling, maintenance, and operation. For the minimum free space requirements, refer to [Free space requirements](#).
- The ambient conditions meet the requirements. 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]).

- Install the frame R0 drives upright. The frame R0 drives do not have a fan.
- You can install the frame R1...R4 drives tilted by up to 90 degrees, from vertical to fully horizontal orientation.
- Do not install the drive upside down.
- You can install several drives side by side.

To install the drive with screws



1. Make marks onto the surface for the mounting holes. Refer to [Dimensions and weights](#). Download the mounting template on [library.abb.com](#).
2. Drill the holes for the mounting screws. If necessary, install suitable plugs or anchors into the holes.
3. Install the mounting screws into the holes. Leave a gap between the screw head and installation surface.
4. Put the drive onto the mounting screws.
5. Tighten the mounting screws.

