DRIVES FOR HVAC

ACH580-01 drives

Quick installation and start-up guide

This guide is applicable to the global product types. There is a separate guide for the North American product types.

Documentation in other languages	Ecodesign information (EU 2019/1781 and SI 2021 No. 745)	About this document

3AXD50000758685 Rev E EN
2025-01-02
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Original instructions.
3AXD50000758685E

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.
- Frames R1…R2, IP21 (UL Type 1): Do not lift the drive by holding it from the cover. The cover can come loose and cause the drive to fall.
- Frames R5…R9: Do not tilt the drive. The drive is heavy and has a high center of gravity. It can topple accidentally.
- Frames R5…R9: Lift the drive with a lifting device. Use the lifting eyes of the drive.

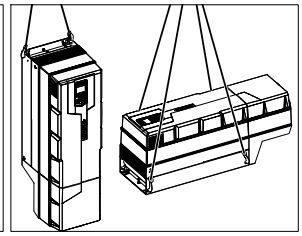
R1…R2



R5…R9



R5…R9



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:

- cable box (frames R1…R2 and R5…R9, IP21 [UL Type 1])
- drive
- mounting template
- control panel
- quick installation and start-up guide
- multilingual residual voltage warning stickers
- hardware and firmware manuals, if ordered
- options in separate packages, if ordered.

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. Refer to Capacitor reforming instructions (3BFE64059629 [English]) or contact ABB technical support.

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). Aluminum cables can only be used for input power cabling in 230 V drives with frame size R5…R8. In UL installations, use only copper conductors.
  - **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 and for drives with option +B056 (IP55, UL Type 12), select a cable rated for at least 75 °C (167 °F).
  - **Size:** Refer to Ratings, 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 Ratings, fuses and typical power cable sizes.

4. Examine the installation site

Examine the site where you will install the drive. Make sure that:
- The installation site is sufficiently ventilated or cooled to remove heat from the drive.
- 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. For the weights, refer to Weights and free space requirements.
- The installation surface, floor and materials near the drive are not flammable.
- There is sufficient free space around the drive for cooling, maintenance, and operation. For the minimum free space requirements, refer to Weights and free space requirements.
- 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.

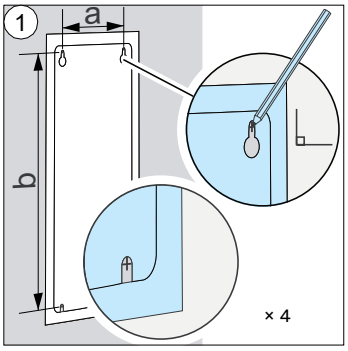
5. Install the drive on the wall

Select fasteners that comply with local requirements applicable to wall surface materials, drive weight and application.

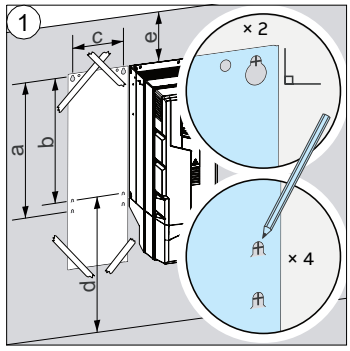
Prepare the installation site

1. Make marks with the help of the mounting template. Remove the mounting template before you install the drive on the wall.
2. Drill the holes and put anchors or plugs into the holes.
3. Install the screws. Leave a gap between the screw head and mounting surface.

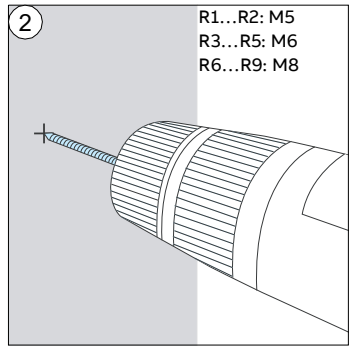
R1…R4



R5…R9

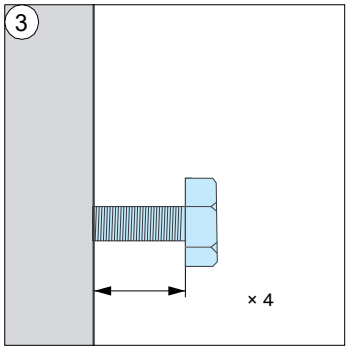


R1…R9

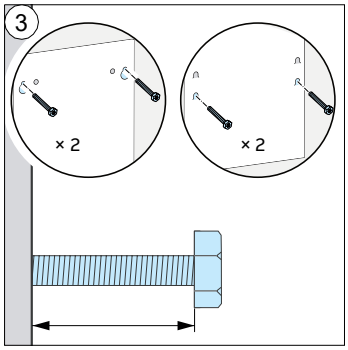


	R1		R2		R3		R4		R5		R6		R7		R8		R9	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
a	98	3.86	98	3.86	160	6.30	160	6.30	612	24.09	571	22.5	623	24.5	701	27.6	718	28.3
b	317	12.48	417	16.42	473	18.62	619	24.37	581	22.87	531	20.9	583	23.0	658	25.9	658	25.9
c	-	-	-	-	-	-	-	-	160	6.30	213	8.4	245	9.7	263	10.3	345	13.6
d >	-	-	-	-	-	-	-	-	200	7.87	300	11.8	300	11.8	300	11.8	300	11.8
e >	-	-	-	-	-	-	-	-	100	3.94	155	6.1	155	6.1	155	6.1	200	7.9

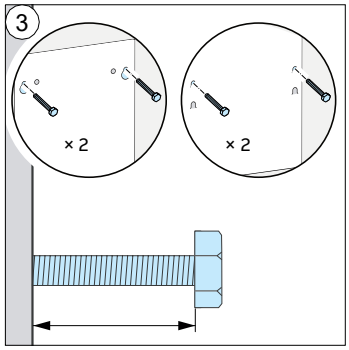
R1…R4



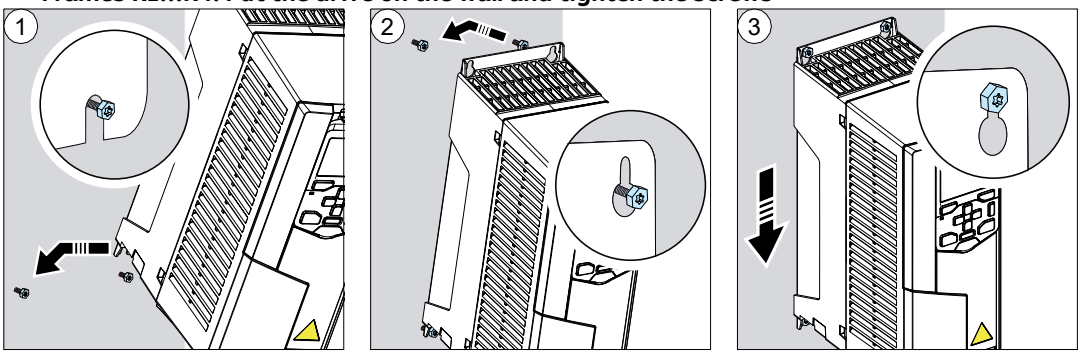
R5



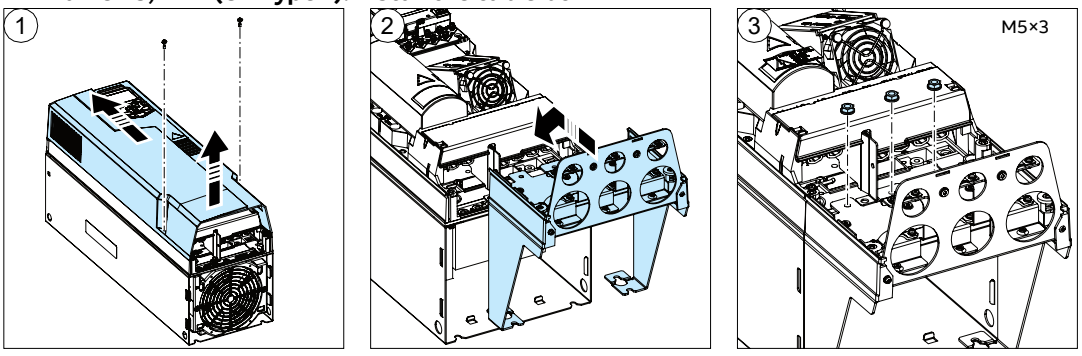
R6…R9

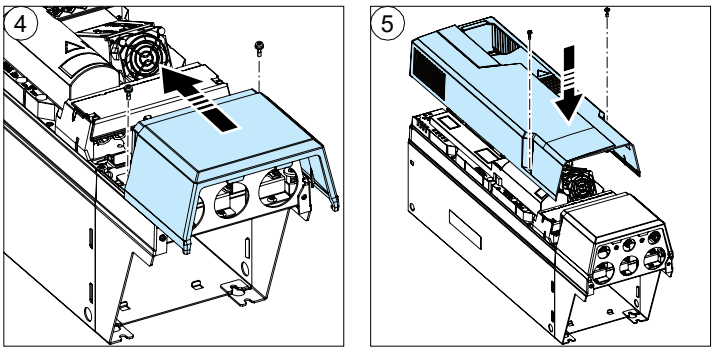


Frames R1…R4: Put the drive on the wall and tighten the screws



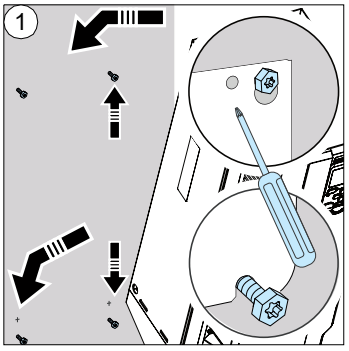
Frame R5, IP21 (UL Type 1): Install the cable box



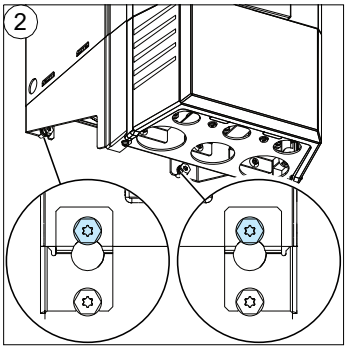


Frames R5…R9: Put the drive on the wall and tighten the screws

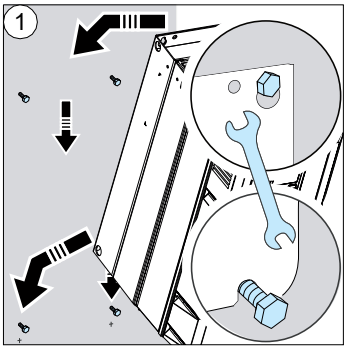
R5



R5

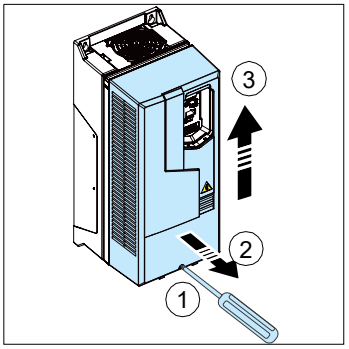


R6…R9

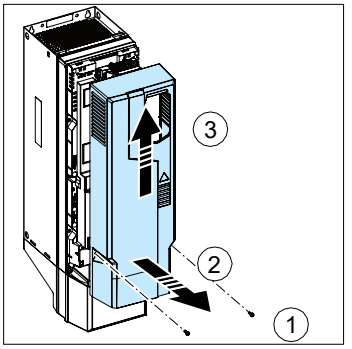


6. Remove the cover(s)

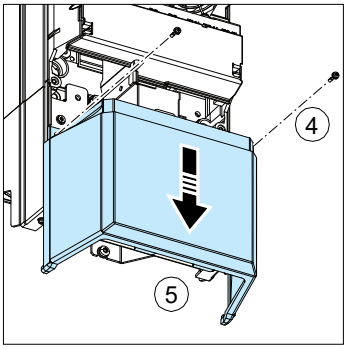
R1…R4, IP21 (UL Type 1)



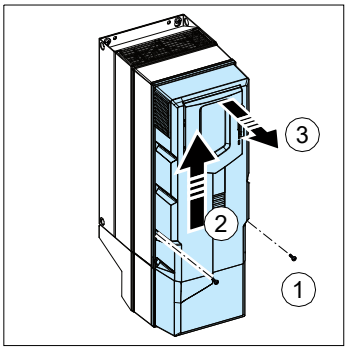
R5, IP21 (UL Type 1)



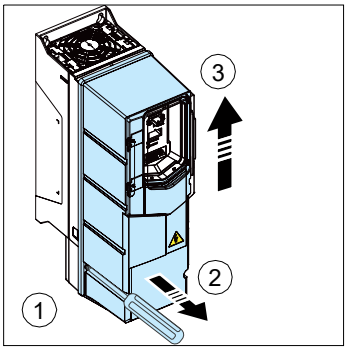
R5, IP21 (UL Type 1)



R6…R9, IP21 (UL Type 1)

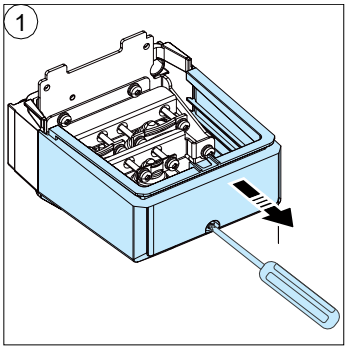


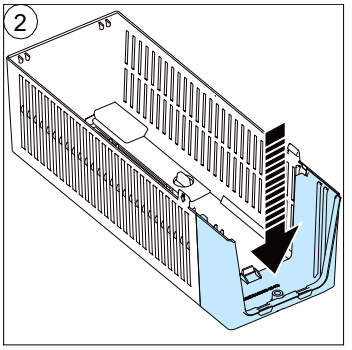
R1…R9, IP55 (UL Type 12)

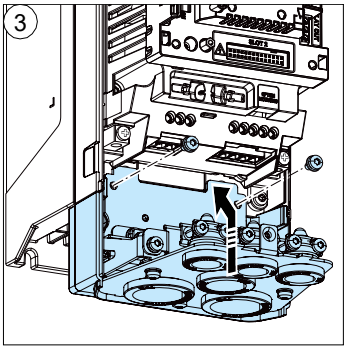


7. Frames R1…R2 and R6…R9, IP21 (UL Type 1): Install the cable box

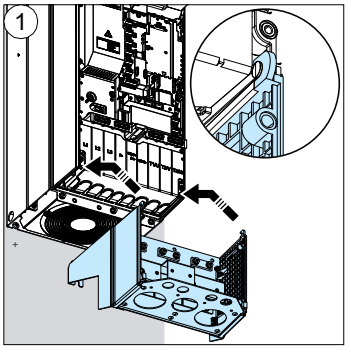
R1…R2

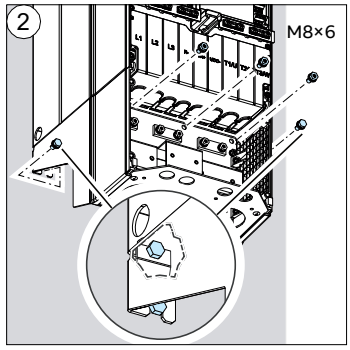






R6…R9





8. Attach a residual voltage warning sticker to the drive in the local language

Frames R1…R4: to the control panel mounting platform, Frames R5…R9: next to the control unit.

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

You can connect all drives to a symmetrically grounded TN-S system (center-grounded wye). If you install the drive to a different system, you must disconnect the EMC screw (disconnect the EMC filter) and/or disconnect the VAR screw (disconnect the varistor circuit).

Frame size	Symmetrically grounded TN-S systems (center-grounded wye)	Corner-grounded delta and midpoint-grounded delta systems	IT systems (ungrounded or high-resistance grounded)	TT systems [1) 2)]
R1…R3 **R4 v2**	Do not disconnect EMC or VAR screw.	Disconnect EMC screw. Do not disconnect VAR screw.	Disconnect EMC and VAR screws.	Disconnect EMC and VAR screws.
R4…R5	Do not disconnect EMC or VAR screw.	**Note:** The drive is not evaluated for use on these systems by IEC standards.	Disconnect EMC screws (2 pieces) and VAR screw.	Disconnect EMC screws (2 pieces) and VAR screw.
R6…R9	Do not disconnect EMC or VAR screw.	Do not disconnect EMC AC or VAR screws. Disconnect EMC DC screw.	Disconnect EMC screws (2 pieces) and VAR screw.	Disconnect EMC screws (2 pieces) and VAR screw.

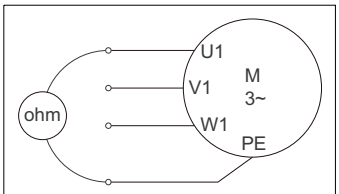
1) A residual current device must be installed in the supply system.

2) ABB does not guarantee the EMC category or the operation of the ground leakage detector built inside the drive.

10. Measure the insulation resistance of the power cables and the motor

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

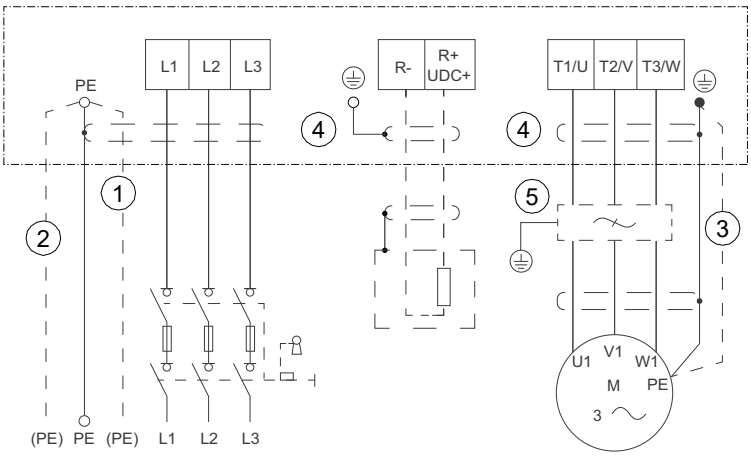
Measure the insulation resistance of the motor cable and motor when the cable is disconnected from the drive. Measure the insulation resistance between each phase conductor and the PE conductor. Use a measuring voltage of 1000 V DC. The insulation resistance of an ABB motor must be more than 100 Mohm (reference value at 25 °C [77 °F]). For the insulation resistance of other motors, see the manufacturer's instructions. Moisture inside the motor decreases the insulation resistance. If you think that there is moisture inside the motor casing, dry the motor and do the measurement again.



U1-PE, V1-PE, W1-PE

11. Connect the power cables

Connection diagram (shielded cables)



Frames R1…R3 have a built-in brake chopper. If necessary, you can connect a brake resistor to terminals R- and UDC+/R+. The brake resistor is not included in the drive delivery.

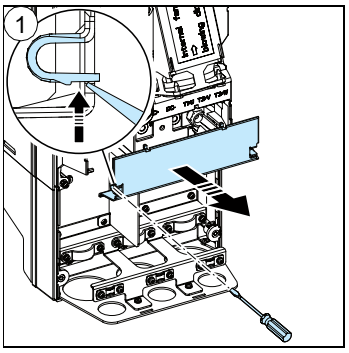
In frames R4…R9, you can connect an external brake chopper to terminals UDC+ and UDC-. The brake chopper is not included in the drive delivery.

1. Two protective earth (ground) conductors. Drive safety standard IEC/EN 61800-5-1 requires two PE conductors if the cross-sectional area of the PE conductor is less than 10 mm^2 Cu or 16 mm^2 Al. For example, you can use the cable shield in addition to the fourth conductor.
2. 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.
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 PE conductor in the cable.
4. 360° 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.
5. If necessary, install an external filter (du/dt, common mode, or sine filter). Filters are available from ABB.

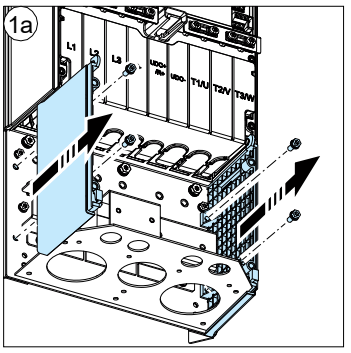
Connection procedure

1. Frames R5…R9: Remove the shroud(s) on the power cable terminals.
   Frames R6…R9: Remove the side plates (a). Remove the shroud (b), then make the necessary holes for the cables. In frames R8…R9, if you install parallel cables, also make the necessary holes in the lower shroud.

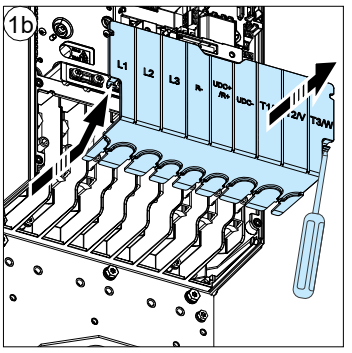
R5



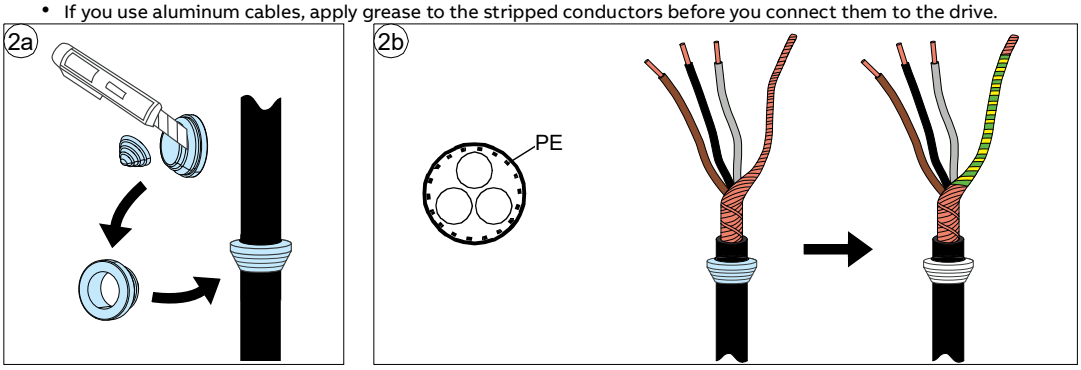
R6…R9



R6…R9

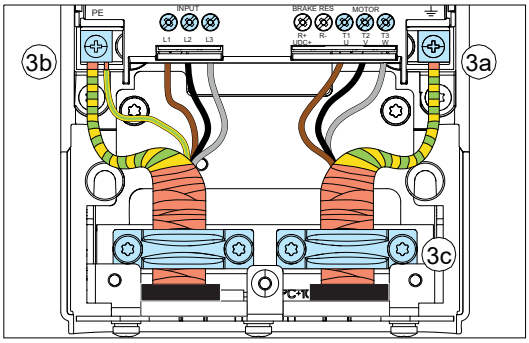


2. Prepare the power cables:
   - Remove the rubber grommets from the cable entry.
   - Cut a sufficient hole in the rubber grommet. Slide the grommet onto the cable (a).
   - Prepare the ends of the input power cable and motor cable as illustrated in the figure (b).
   - Slide the cables through the holes in the cable entry and attach the grommets to the holes.
   - If you use aluminum cables, apply grease to the stripped conductors before you connect them to the drive.



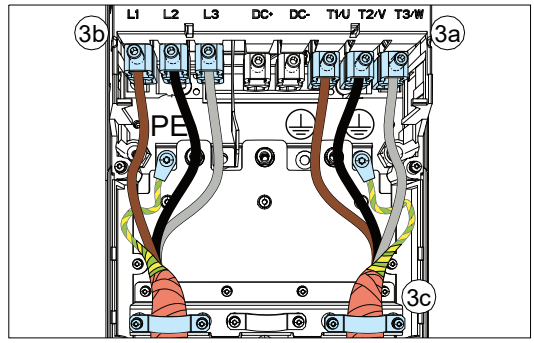
3. Connect the power cables. For the tightening torques, refer to Terminal data for the power cables.
   - Connect the phase conductors of the motor cable to terminals T1/U, T2/V and T3/W. Connect the twisted shield of the cable to the grounding terminal. (a)
   - Connect the input power cable to terminals L1, L2 and L3. Connect the twisted shield of the cable and the additional PE conductor to the grounding terminal. (b)
   - Frames R8…R9: If you use only one conductor, ABB recommends that you put it under the upper pressure plate. If you use parallel power cables, put the first conductor under the lower pressure plate and the second under the upper pressure plate.
   - Frames R8…R9: If you use parallel power cables, install the second grounding shelf for the parallel power cables.
   - Tighten the clamps of the power cable grounding shelf onto the stripped part of the cables (c). Torque the clamps to 1.2 N·m (10.6 lbf·in).
   - If used, connect the brake resistor or brake chopper cables. In frames R1…R2, you must install the grounding shelf before you can connect the brake cables (refer to the next step).
   - Frames R6…R9: After you connect the power cables, install the shroud on the terminals (d).

R1…R4

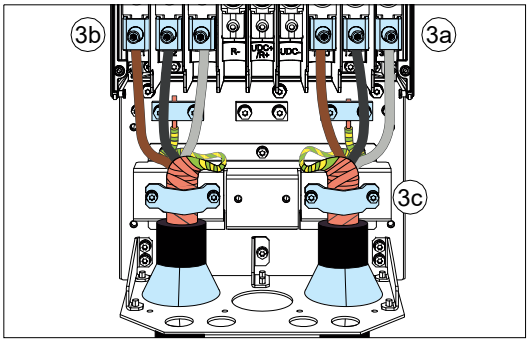


Note: The illustration above shows frames R1…R2. Frames R3…R4 are similar.

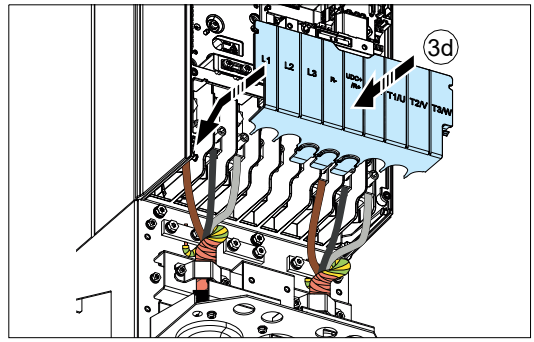
R5



R6…R9

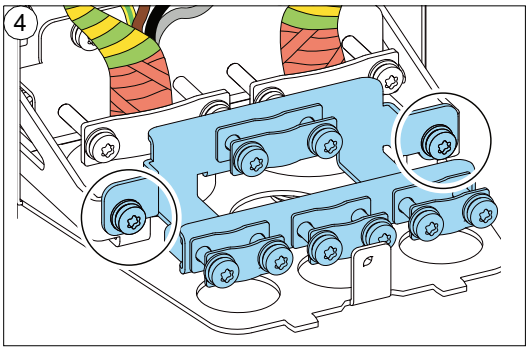


R6…R9

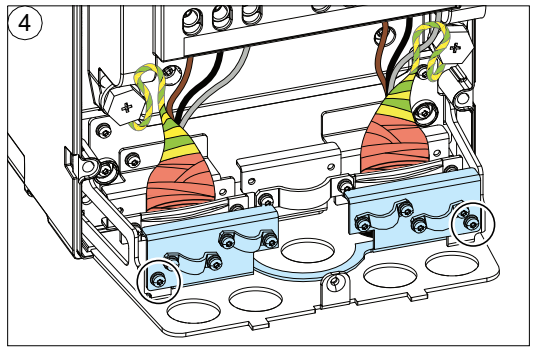


4. Frames R1…R2, R4, R6…R9: Install the grounding shelf. In frames R6…R9, this is the grounding shelf for the control cables.

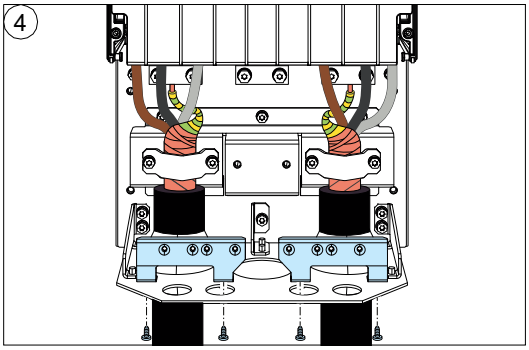
R1…R2



R4

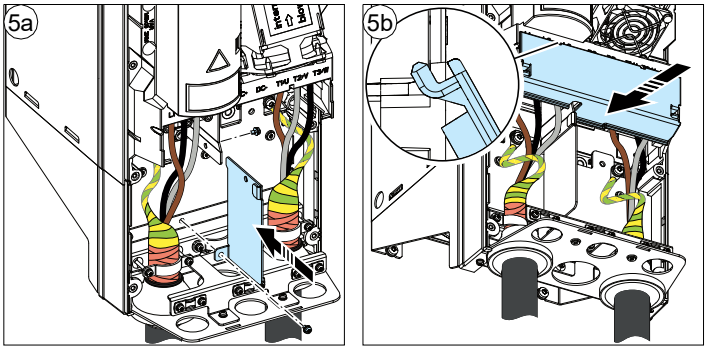


R6…R9

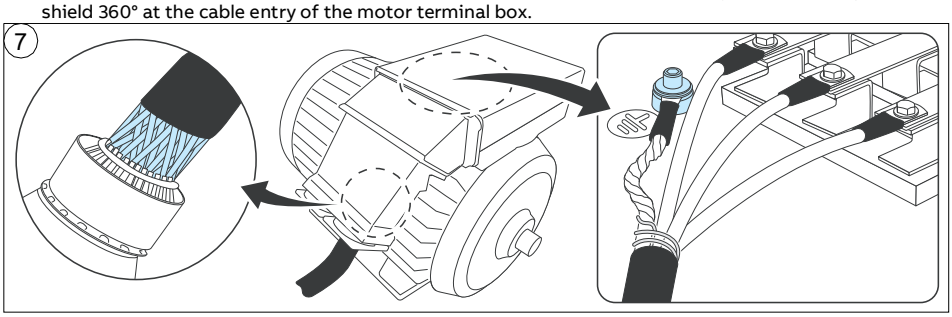


5. Frame R5: Install the cable box plate (a) and shroud (b).

R5



6. Attach the cables outside the drive mechanically.
7. Ground the motor cable shield at the motor end. For minimum radio frequency interference, ground the motor cable shield 360° at the cable entry of the motor terminal box.

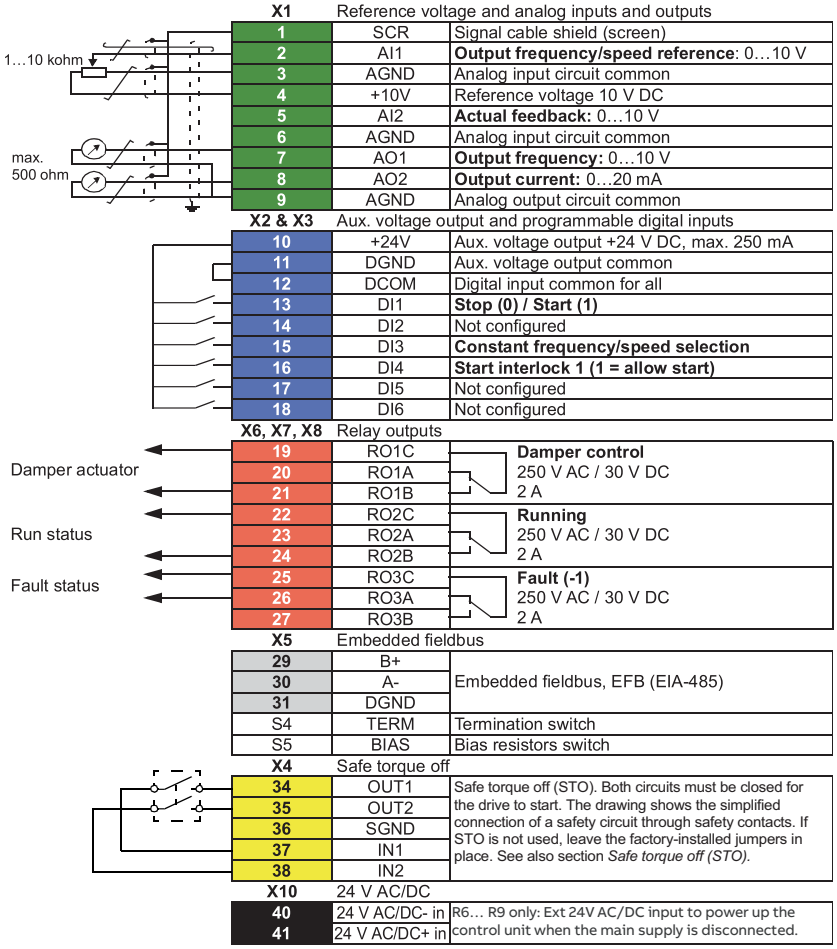


12. Connect the control cables

Make the connections according to the application. Keep the signal wire pairs twisted as near to the terminals as possible to prevent inductive coupling.

1. Cut a hole into the rubber grommet and slide the grommet onto the cable.
2. Ground the outer shield of the cable 360° under the grounding clamp. Keep the cable unstripped as close to the terminals of the control unit as possible. Ground also the pair-cable shields and grounding wire at the SCR terminal.
3. Tie all control cables to the provided cable tie mounts.

Default I/O connections (HVAC default configuration)



X1		Reference voltage and analog inputs and outputs	
	1	SCR	Signal cable shield (screen)
	2	AI1	**Output frequency/speed reference**: 0…10 V
	3	AGND	Analog input circuit common
	4	+10V	Reference voltage 10 V DC
	5	AI2	**Actual feedback:** 0…10 V
	6	AGND	Analog input circuit common
	7	AO1	**Output frequency:** 0…10 V
	8	AO2	**Output current:** 0…20 mA
	9	AGND	Analog output circuit common
X2 & X3		Aux. voltage output and programmable digital inputs	
	10	+24V	Aux. voltage output +24 V DC, max. 250 mA
	11	DGND	Aux. voltage output common
	12	DCOM	Digital input common for all
	13	DI1	**Stop (0) / Start (1)**
	14	DI2	Not configured
	15	DI3	**Constant frequency/speed selection**
	16	DI4	**Start interlock 1 (1 = allow start)**
	17	DI5	Not configured
	18	DI6	Not configured
X6, X7, X8		Relay outputs	
	19	RO1C	**Damper control** 250 V AC / 30 V DC 2 A
	20	RO1A	
	21	RO1B	
	22	RO2C	**Running** 250 V AC / 30 V DC 2 A
	23	RO2A	
	24	RO2B	
	25	RO3C	**Fault (-1)** 250 V AC / 30 V DC 2 A
	26	RO3A	
	27	RO3B	
X5		Embedded fieldbus	
	29	B+	Embedded fieldbus, EFB (EIA-485)
	30	A-	
	31	DGND	
	S4	TERM	Termination switch
	S5	BIAS	Bias resistors switch
X4		Safe torque off	
	34	OUT1	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)*.
	35	OUT2	
	36	SGND	
	37	IN1	
	38	IN2	
X10		24 V AC/DC	
	40	24 V AC/DC- in	R6… R9 only: Ext 24V AC/DC input to power up the control unit when the main supply is disconnected.
	41	24 V AC/DC+ in	

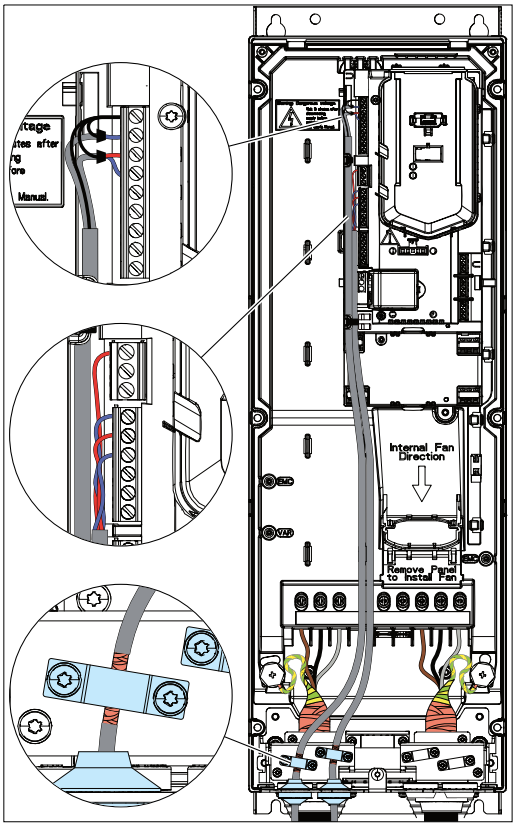
Total load capacity of the auxiliary voltage output +24V (X2:10) is 6.0 W (250 mA / 24 V DC).

Terminals	Wire size	Tightening torque
+24V, DGND, DCOM, B+, A-, DGND, Ext. 24V	0.2 … 2.5 mm^2 (24 … 14 AWG)	0.5 … 0.6 N·m (5 lbf·in)
DI, AI, AO, AGND, RO, OUT, IN, SGND	0.14 … 1.5 mm^2 (26 … 16 AWG)	

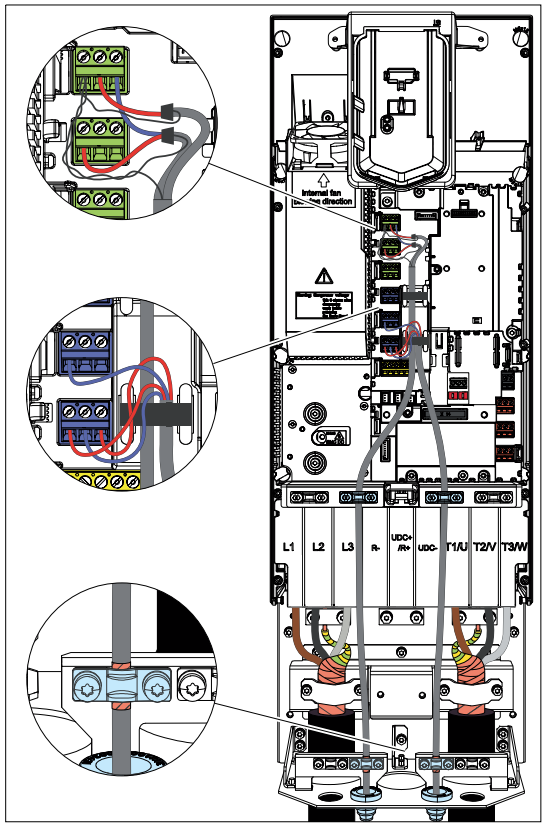
Control cable installation examples

This section shows examples for routing the control cables in frames R4 and R6…R9. Frames R1…R3 and R5 are similar to frame R4.

R4



R6…R9



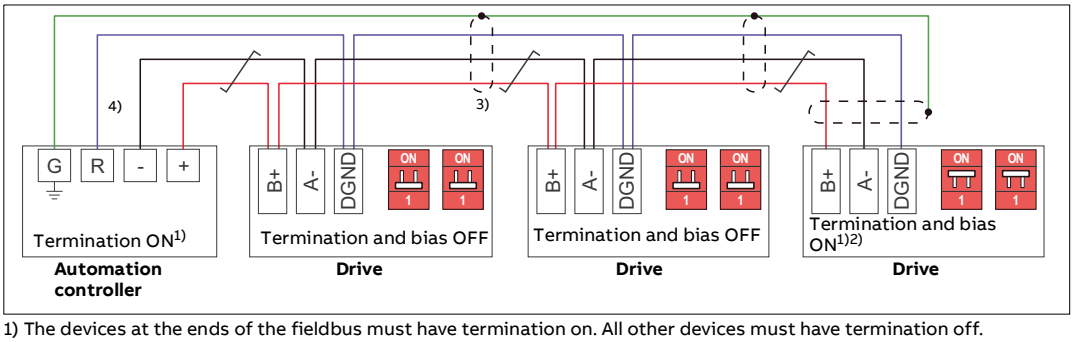
Embedded fieldbus connection

You can connect the drive to a serial communication link with a fieldbus adapter module or the embedded fieldbus interface. The embedded fieldbus interface supports BACnet.

To configure BACnet communication with the embedded fieldbus:

1. Connect the fieldbus cable and the required I/O signals. Use Belden 9842 or equivalent. Belden 9842 is a dual twisted, shielded pair cable with a wave impedance of 120 Ohms.
2. If the drive is at the end of the fieldbus, set the termination switch to ON.
3. Power up the drive and set the required parameters. Refer to Fieldbus communication.

A connection example is shown below.



1) The devices at the ends of the fieldbus must have termination on. All other devices must have termination off.

2) One device must have bias on. It is recommended that this device is at the end of the fieldbus.

3) 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.

4) Connect the signal ground (DGND) conductor to the signal ground reference terminal in the automation controller. If the automation controller does not have a signal ground reference terminal, connect the signal ground to the cable shields through a 100 ohm resistor, preferably near the automation controller.

13. Install optional modules, if included in the delivery

14. Install the cover(s)

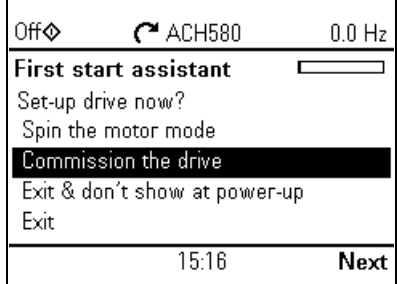
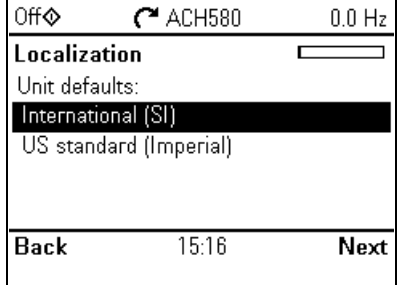
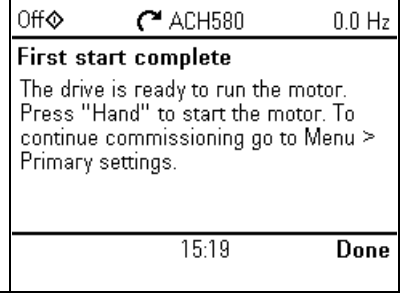
The cover installation procedure is the opposite of the removal procedure. Refer to Remove the cover(s). In frames R6…R9, install the side plates shown in Connection procedure before you install the cover.

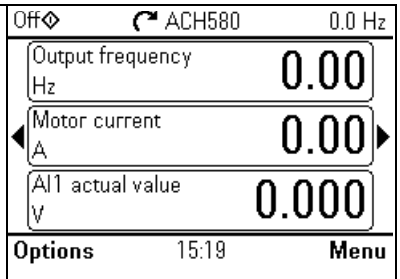
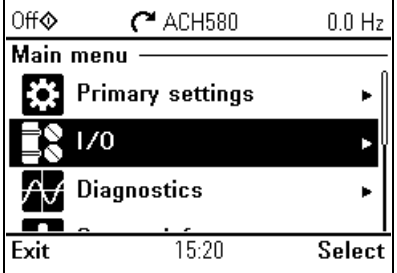
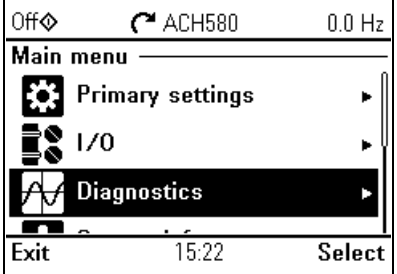
15. Start up the drive

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.

WARNING! If you activate the automatic fault reset or automatic restart functions of the drive control program, make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault or supply break. If these functions are activated, the installation must be clearly marked as defined in IEC/EN 61800-5-1, subclause 6.5.3, for example, “THIS MACHINE STARTS AUTOMATICALLY”.

Use the control panel to do the start-up procedure. The two commands at the bottom of the display show the functions of the two softkeys and located below the display. The commands assigned to the softkeys are different depending on the context. Use the arrow keys, and to move the cursor or change values depending on the active view. Key shows a context-sensitive help page.

1.	Power up the drive. Make sure that you have the motor name plate data available.	
2.	The First start assistant guides you through the first start-up. The assistant begins automatically. Wait until the control panel shows the language selection screen. Select the language you want to use and press **(OK).** **Note:** After you select the language, it takes a few minutes for the control panel to wake up.	
3.	Select **Commission the drive** and press **(Next)**.	
4.	Select the localization you want to use and press **(Next)**.	
5.	To complete the first start assistant, select the values and settings when prompted by the assistant. Continue until the panel shows that the first start is complete. When the panel shows that the first start is complete, the drive is ready for use. Press **(Done)** to enter the Home view.	

6.	The Home view shows the values of the selected signals.	
7.	After the additional adjustments, make sure that the actual I/O wiring matches the I/O use in the control program. In the **Main** menu, select **I/O** and press (**Select**).	
8.	After making the additional adjustments and checking the I/O connections, use the Diagnostics menu to make sure that the setup is functioning correctly. In the Main menu, select **Diagnostics** and press (**Select**) (or).	

Fieldbus communication

To configure the embedded fieldbus communication for BACnet MSTP, you must set at least these parameters:

Parameter	Setting	Description
20.01 Ext1 commands	Embedded fieldbus	Selects fieldbus as the source for the start and stop commands when EXT1 is selected as the active control location.
22.11 Ext1 speed ref1	EFB ref1	Selects a reference received through the embedded fieldbus interface as speed reference 1. Use this parameter for speed control.
28.11 Ext1 frequency ref1	EFB ref1	Selects a reference received through the embedded fieldbus interface as frequency reference 1. Use this parameter for frequency control.
58.01 Protocol enable	BACnet MSTP	Initializes embedded fieldbus communication.
58.40 Device object ID	0…4194303	The Device object ID must be unique across all BACnet devices in the building network.
58.03 Node address	1 (default)	Node address. There must be no two nodes with the same node address online.
58.04 Baud rate	19.2 kbps (default)	Defines the communication speed of the link. Use the same setting as in the master station.
58.05 Parity	8 EVEN 1 (default)	Selects the parity and stop bit setting. Use the same setting as in the master station.
58.06 Communication control	Refresh settings	Validates any changed EFB configuration settings. Use this after changing any parameters in group 58.

Other parameters related to the fieldbus configuration:

58.14 Communication loss action	
58.15 Communication loss mode	58.101 Data I/O 1 … 58.114 Data I/O 14
58.16 Communication loss time	

Warnings and faults

Warning	Fault	Name	Description
A2A1	2281	Current calibration	Warning: Current calibration is done at the next start. Fault: Output phase current measurement fault.
A2B1	2310	Overcurrent	The output current is more than the internal limit. This can also be caused by an earth fault or phase loss.
A2B3	2330	Earth leakage	A load unbalance that is typically caused by an earth fault in the motor or the motor cable.
A2B4	2340	Short circuit	There is a short-circuit in the motor or the motor cable.
-	3130	Input phase loss	The intermediate DC circuit voltage oscillates due to missing input power line phase.
-	3181	Wiring or earth fault	Incorrect input and motor cable connection.
A3A1	3210	DC link overvoltage	Intermediate DC circuit voltage is too high.
A3A2	3220	DC link undervoltage	Intermediate DC circuit voltage is too low.
-	3381	Output phase loss	All three phases are not connected to the motor.
-	5090	STO hardware failure	STO hardware diagnostics has detected hardware failure. Contact ABB.
A5A0	5091	Safe torque off	The Safe torque off (STO) function is active.
A7CE	6681	EFB comm loss	Break in embedded fieldbus communication.
A7C1	7510	FBA A communication	Communication lost between drive (or PLC) and fieldbus adapter.
A7AB	-	Extension I/O configuration failure	The installed C-type module is not the same as configured, or there is an error in the communication between the drive and module.
AFF6	-	Identification run	The motor ID run occurs at the next start.
-	FA81	Safe torque off 1	The Safe torque off circuit 1 is broken.
-	FA82	Safe torque off 2	The Safe torque off circuit 2 is broken.

Ratings, fuses and typical power cable sizes

ACH580 -01-...	Nominal ratings						Fuses			Typical power cable sizes, Cu		Frame size
	Input current		Output current		Motor power [1]		gG fuse (IEC 60269)	uR/aR fuse (DIN 43620)	UL class T [2] [3] [4]			
	I_1	I_1 (480 V)	I_2	I_{Ld} (480 V)	P_n	P_{Ld} (480 V)	ABB type	Bussmann type				
	A		A		kW	hp				mm²	AWG	
U_n = 3-phase 230 V												
04A7-2	4.7	-	4.7	-	0.75	1.0	OFAF000H25	170M1563	JJS-15	3×1.5 + 1.5	14	R1
06A7-2	6.7	-	6.7	-	1.1	1.5	OFAF000H25	170M1563	JJS-15	3×1.5 + 1.5	14	R1
07A6-2	7.6	-	7.6	-	1.5	2.0	OFAF000H25	170M1563	JJS-15	3×1.5 + 1.5	14	R1
012A-2	12.0	-	12.0	-	3.0	3.0	OFAF000H25	170M1563	JJS-15	3×1.5 + 1.5	14	R1
018A-2	16.9	-	16.9	-	4.0	5.0	OFAF000H25	170M1563	JJS-30	3×2.5 + 2.5	10	R1
025A-2	24.5	-	24.5	-	5.5	7.5	OFAF000H40	170M1565	JJS-40	3×4.0 + 4.0	8	R2
032A-2	31.2	-	31.2	-	7.5	10.0	OFAF000H40	170M1565	JJS-40	3×6.0 + 6.0	8	R2
047A-2	46.7	-	46.7	-	11.0	15.0	OFAF000H63	170M1566	JJS-80	3×10 + 10	6	R3
060A-2	60	-	60	-	15	20	OFAF000H63	170M1566	JJS-80	3×16 + 16	4	R3
076A-2	76	-	76	-	18.5	25	OFAF000H100	170M1568	JJS-100	3×35 + 16	3	R4 v2
089A-2	89	-	89	-	22	30	OFAF00H125	170M3815	JJS-150	3×35 + 16	2	R5
091A-2	91	-	91	-	22	30	OFAF00H125	170M1569	JJS-150	3×50 + 25	2	R4 v2
115A-2	115	-	115	-	30	40	OFAF00H125	170M3815	JJS-150	3×50 + 25	1/0	R5
144A-2	144	-	144	-	37	50	OFAF0H200	170M3817	JJS-200	3×70 + 35	3/0	R6
171A-2	171	-	171	-	45	60	OFAF0H250	170M5809	JJS-250	3×95 + 50	4/0	R7
213A-2	213	-	213	-	55	75	OFAF1H315	170M5810	JJS-300	3×120 + 70	300 MCM	R7
276A-2	276	-	276	-	75	100	OFAF2H400	170M6810	JJS-400	2×(3×70 + 35)	2×2/0	R8
U_n =3-phase 400 V or 480 V												
02A7-4	2.6	2.1	2.6	2.1	0.75	1.0	OFAF000H4	170M1561	JJS-15	3×1.5 + 1.5	14	R1
03A4-4	3.3	3.0	3.3	3.0	1.1	1.5	OFAF000H6	170M1561	JJS-15	3×1.5 + 1.5	14	R1
04A1-4	4.0	3.4	4.0	3.5	1.5	2.0	OFAF000H6	170M1561	JJS-15	3×1.5 + 1.5	14	R1
05A7-4	5.6	4.8	5.6	4.8	2.2	3.0	OFAF000H10	170M1561	JJS-15	3×1.5 + 1.5	14	R1
07A3-4	7.2	6.0	7.2	6.0	3.0	3.0	OFAF000H10	170M1561	JJS-15	3×1.5 + 1.5	14	R1
09A5-4	9.4	7.6	9.4	7.6	4.0	5.0	OFAF000H16	170M1561	JJS-15	3×2.5 + 2.5	14	R1
12A7-4	12.6	11.0	12.6	12.0	5.5	7.5	OFAF000H16	170M1561	JJS-15	3×2.5 + 2.5	14	R1
018A-4	17.0	14.0	17.0	14.0	7.5	10.0	OFAF000H25	170M1563	JJS-30	3×2.5 + 2.5	12	R2
026A-4	25.0	21.0	25.0	23.0	11.0	15.0	OFAF000H32	170M1563	JJS-40	3×6 + 6	10	R2
033A-4	32.0	27.0	32.0	27.0	15.0	20.0	OFAF000H40	170M1565	JJS-60	3×10 + 10	8	R3
039A-4	38.0	34.0	38.0	34.0	18.5	25.0	OFAF000H50	170M1565	JJS-60	3×10 + 10	8	R3
046A-4	45.0	40.0	45.0	44.0	22.0	30.0	OFAF000H63	170M1566	JJS-60	3×10 + 10	6	R3
062A-4	62	52	62	52	30	40	OFAF000H80	170M1567	JJS-80	3×25 + 16	4	R4
062A-4	62	52	62	52	30	40	OFAF000H80	170M1567	JJS-80	3×25 + 16	4	R4 v2
073A-4	73	65	73	65	37	50	OFAF000H100	170M1568	JJS-100	3×35 + 16	4	R4
073A-4	73	65	73	65	37	50	OFAF000H100	170M1568	JJS-100	3×35 + 16	4	R4 v2
089A-4	89	77	89	77	45	60	OFAF000H100	170M1569	JJS-110	3×50 + 25	3	R4 v2
088A-4	88	77	88	77	45	60	OFAF000H100	170M1569	JJS-110	3×50 + 25	3	R5
106A-4	106	96	106	96	55	75	OFAF00H125	170M3817	JJS-150	3×70 + 35	1	R5
145A-4	145	124	145	124	75	100	OFAF00H160	170M3817	JJS-200	3×95 + 50	2/0	R6
169A-4	169	156	169	156	90	125	OFAF0H250	170M5809	JJS-225	3×120 + 70	3/0	R7

206A-4	206	180	206	180	110	150	OFAF1H315	170M5810	JJS-300	3×150 + 70	4/0	R7
246A-4	246	240	246	240	132	200	OFAF1H355	170M5812	JJS-400	2×(3×70+35)	2×1/0 or 350 MCM	R8
293A-4	293	260	293	260	160	250	OFAF2H425	170M6812D	JJS-400	2×(3×95+50)	2×2/0	R8
363A-4	363	361	363	361	200	300	OFAF2H500	170M6814D	JJS-500	2×(3×120+70)	2×4/0	R9
430A-4	430	414	430	414	250	350	OFAF3H630	170M8554D	JJS-600	2×(3×150+70)	2×300 MCM	R9
490A-4	450	450	490	454	250	400	OFAF3H630	170M8554D	JJS-600	2×(3×240+120)	2×500 MCM	R9

1) Typical motor power with no overload capacity (nominal use). The kilowatt ratings apply to most IEC 4-pole motors. The horsepower ratings apply to most NEMA 4-pole motors.

2) The recommended branch protection fuses must be used to maintain the IEC/EN/UL 61800-5-1 listing.

3) 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.

4) Refer to Alternate Fuses, MMPs and Circuit Breakers for ABB Drives (3AXD50000645015 [English]) for additional UL fuses and circuit breakers that can be used as branch circuit protection.

Terminal data for the power cables

Frame size	T1/U, T2/V, T3/W, L1, L2, L3, R-, R+/UDC+						PE			
	Min. wire size (solid/stranded)		Max. wire size (solid/stranded)		Tightening torque		Max. wire size (solid/stranded)		Tightening torque	
	mm^2	AWG	mm^2	AWG	N·m	lbf·ft	mm^2	AWG	N·m	lbf·ft
R1	0.2/0.2	24	6/4	10	1.0	0.7	16/16	6	1.5	1.1
R2	0.5/0.5	20	16/16	6	1.5	1.1	16/16	6	1.5	1.1
R3	0.5/0.5	20	35/35	2	3.5	2.6	35/35	2	1.5	1.1
R4	0.5/0.5	20	50	1	4.0	3.0	35/35	2	2.9	2.1
R4 v2	1.5/1.5	20	70	1	5.5	4.0	35/35	2	2.9	2.1
R5	6	6	70	1/0	15	11.1	35/35	-	2.2	1.6
R6	25	4	150	300 MCM	30	22.1	180 [1]	350 MCM [1]	9.8 [1]	7.2 [1]
R7	95	3/0	240	500 MCM	40	29.5	180 [1]	350 MCM [1]	9.8 [1]	7.2 [1]
R8	2×50	2×1/0	2×150	2×300 MCM	40	29.5	2×180 [1]	2×350 MCM [1]	9.8 [1]	7.2 [1]
R9	2×95	2×3/0	2×240	2×500 MCM	70	51.6	2×180 [1]	2×350 MCM [1]	9.8 [1]	7.2 [1]

1) In 400/480/575 V drives, cable lug or cable clamp is used for grounding.

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.
- For UL compliance the R2 frame drive will not accept a size larger conductor.

Weights and free space requirements

This table shows the requirements for the ambient conditions when the drive is in operation (installed for stationary use).

Frame size	Weights				Free space requirements for vertical installation													
					Stand alone										Side by side [1]			
	IP21 (UL Type 1)		IP55 (UL Type 12)		IP21 (UL Type 1)				IP55 (UL Type 12)				All types		All types			
					Above		Below [2]		Above		Below [2]		Sides		Above		Below [2]	
	kg	lb	kg	lb	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
R1	4.6	10.1	4.8	10.6	65	2.56	86	3.39	137	5.39	116	4.57	150	5.91	200	7.87	200	7.87
R2	6.6	14.6	6.8	15.0	65	2.56	86	3.39	137	5.39	116	4.57	150	5.91	200	7.87	200	7.87
R3	11.8	26.0	13.0	28.7	65	2.56	53	2.09	200	7.87	53	2.09	150	5.91	200	7.87	200	7.87
R4	19.0	41.9	20.0	44.1	53	2.09	200	7.87	53	2.09	200	7.87	150	5.91	200	7.87	200	7.87
R4 v2	20.0	44.1	21.0	46.3	53	2.09	200	7.87	53	2.09	200	7.87	150	5.91	200	7.87	200	7.87
R5	28.3	62.4	29.0	64.0	75	2.95	200	7.87	100	3.94	200	7.87	150	5.91	200	7.87	200	7.87
R6	42.4	93.5	43.0	94.8	155	6.10	300	11.8	155	6.10	300	11.8	150	5.91	200	7.87	300	11.8
R7	54	119.1	56.0	123.5	155	6.10	300	11.8	155	6.10	300	11.8	150	5.91	200	7.87	300	11.8
R8	69	152.2	77	169.8	155	6.10	300	11.8	155	6.10	300	11.8	150	5.91	200	7.87	300	11.8
R9	97	214	103*	227.1	200	7.87	300	11.8	200	7.87	300	11.8	150	5.91	200	7.87	300	11.8

1) Without free space on the sides.

2) Measured from the drive frame, not from the cable box.

*108 kg (238 lb) for 490A-4

Ambient conditions

Installation altitude	0 … 4000 m (0 … 13123 ft) above sea level. The output current must be derated at altitudes above 1000 m (3281 ft). The derating is 1% for each 100 m (328 ft) above 1000 m (3281 ft). Above 2000 m (6562 ft), these grounding systems are permitted: TN-S (center-grounded wye), TT, and IT (ungrounded or high-resistance symmetrically grounded). For the installation requirements for corner-grounded systems at this altitude, contact your local ABB representative.
Surrounding air temperature	Operation: -15 … +50 °C (5 … 122 °F). No frost permitted. At temperatures over 40 °C (104 °F), the rated output current must be derated by 1% for each added 1 °C (1.8 °F). For derating exceptions, see the hardware manual. Storage (in the package): -40 … +70 °C (-40 … +158 °F).
Relative humidity	5 … 95%. No condensation permitted. Maximum permitted relative humidity is 60% in the presence of corrosive gases.
Contamination levels (IEC 60721-3-3: 2002)	Chemical gases: Class 3C2. Solid particles: Class 3S2. No conductive dust permitted.
Vibration (IEC 60068-2)	Max. 1 mm (0.04 in) (5 … 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 … 100 Hz) sinusoidal
Shock/Drop (ISTA)	Not permitted

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 31.22. 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, 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 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

- Minimum voltage at IN1 and IN2 to be interpreted as “1”: 13 V DC
- STO reaction time (shortest detectable break): 1 ms
- 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 31.22) delay: < 500 ms
- STO warning indication (parameter 31.22) delay: < 1000 ms
- Safety integrity level (EN 62061): SIL 3
- Performance level (EN ISO 13849-1): PL e

The drive STO is a type B 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.

Markings

The applicable markings are shown on the type designation label of the drive.

CE UL RCM EAC KC EIP WEEE TÜV Nord UKCA CMIM BACnet

Related documents

Document	Code (English)
ACH580-01 (0.75 to 250 kW, 1.0 to 350 hp) hardware manual	3AXD50000044839
ACH580 HVAC control program firmware manual	3AXD50000027537
ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual	3AUA0000085685
Drive composer PC tool user's manual	3AUA0000094606

Declarations of conformity

Link to Declaration of conformity according to EU Machinery Directive 2006/42/EU (3AXD10000437229)

Link to Declaration of conformity according to UK Supply of Machinery (Safety) Regulations 2008 (3AXD10001329521)

Link to Declaration of China RoHS II conformity (3AXD10001497382)