



ABB DRIVES FOR HVAC

ACH580-01 drives

Installation, Operation and Maintenance Manual (I, O & M)

ACH580-01 HVAC Drives (1...350 HP, 0.75...250 kW)

ACH580-BCR/BDR (1...350 HP, 0.75...250 kW)

ACH580-PCR/PDR (1...350 HP, 0.75...250 kW)

ACH580-VCR/VDR (1...60 HP, 0.75...45 kW)



Safety instructions

These are the safety instructions which you must obey when you install and operate the drive and do maintenance on the drive. If you ignore the safety instructions, injury, death or damage can occur.

Use of warnings and notes in this manual

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes draw attention to a particular condition or fact, or give information on a subject.

The manual uses these warning symbols:



Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment.



General warning tells about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.



Electrostatic sensitive devices warning tells you about the risk of electrostatic discharge which can cause damage to the equipment.

General safety in installation, start-up and maintenance

These instructions are for all personnel that install the drive and do maintenance work on it.



WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- Use safety shoes with a metal toe cap to avoid foot injury. Wear protective gloves and long sleeves. Some parts have sharp edges.

- Handle the drive carefully.
 - Frames R5...R9: Lift the drive with a lifting device. Use the lifting eyes of the drive.
 - Frames R5...R9: Do not tip the drive over. The drive is heavy and its center of gravity is high. An overturning drive can cause physical injury.



- Beware of hot surfaces. Some parts, such as heatsinks of power semiconductors, remain hot for a while after disconnection of the electrical supply.
- Keep the drive in its package or protect it otherwise from dust and burr from drilling and grinding until you install it.
- Vacuum clean the area below the drive before the start-up to prevent the drive cooling fan from drawing the dust inside the drive.
- Do not cover the air inlet and outlet when the drive runs.
- Make sure that there is sufficient cooling. See the [ACH580 Hardware Manual \(3AXD50000044839\)](#) for more information.

- Before you connect voltage to the drive, make sure that the drive covers are on. Keep the covers on during the operation.
- Before you adjust the drive operation limits, make sure that the motor and all driven equipment can operate throughout the set operation limits.
- Before 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, sub-clause 6.5.3, for example, "THIS MACHINE STARTS AUTOMATICALLY".
- The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors.
- If you have connected safety circuits to the drive (for example, emergency stop and Safe torque off), validate them at the start up. For the validation of the Safe torque off, see [ACH580 HVAC control program firmware manual \(3AXD50000027537 \[English\]\)](#). For the validation of other safety circuits, see the instructions provided with them.

Note:

- If you select an external source for start command and it is on, and the start command is level-triggered, the drive will start immediately after fault reset. See parameters 20.02 Ext1 start trigger type and 20.07 Ext2 start trigger type in [ACH580 HVAC control program firmware manual \(3AXD50000027537 \[English\]\)](#).
- When the control location is not set to Local (text Hand is not shown on the top row of the panel and parameter 19.19 Off mode disable has value Off button disabled), the stop key on the control panel will not stop the drive.

- Frames R1...R5: Do not attempt to repair a malfunctioning drive; contact your local representative for replacement or repair by authorized persons.
- Frames R6...R9: Can be repaired by authorized persons.

Electrical safety in installation, start-up and maintenance

Precautions before electrical work

These warnings are for all personnel who do work on the drive, motor cable or motor.

 **WARNING!** Frames R1 ... R9: 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. Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location.
2. Disconnect all possible voltage sources. Lock and tag.
 - Open the main disconnect at the power supply of the drive.
 - Make sure that reconnection is not possible.
 - Disconnect any external power sources from the control circuits.
 - After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized.
 - Use a multimeter with an impedance of at least 1 Mohm.

- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding terminal (PE) is close to 0 V.

Frames R1...R3: Measure the voltage between the drive UDC+ terminal and grounding terminal (PE) with one multimeter. As there is no UDC- terminal, measure the voltage between the drive T1/U terminal and grounding terminal (PE) with another multimeter. Make sure that the voltage difference between the multimeters is close to 0 V.

Frames R4...R9: Measure the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) and make sure that it is close to 0 V.

6. Install temporary grounding as required by the local regulations.
7. Ask for a permit to work from the person in control of the electrical installation work.

If the drive does not operate according to these steps, refer to the [ACH580 Hardware Manual \(3AXD5000044839\)](#).

Additional instructions and notes

 **WARNING!** Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If the drive will be connected on an IT system (ungrounded or high-resistance-grounded [over 30 ohms]), make sure neither the EMC filter nor the ground-to-phase varistor are connected (metal screws should not be installed). Connections with metal screws in these systems can cause danger or damage. See section [Drive compatibility for various electrical power systems](#) on page 16.

Note: For other systems, connecting the internal EMC filter will reduce the conducted emission.

- If the drive will be connected on a corner-grounded TN system, make sure the EMC filter is not connected (metal screws should not be installed). Connections with metal

screws in these systems can cause danger or damage. See section [Drive compatibility for various electrical power systems](#) on page 16.

Note: For other systems, connecting the internal EMC filter (using metal screws) will reduce the conducted emission.

- Use all ELV (extra low voltage) circuits connected to the drive only within a zone of equipotential bonding, that is, within a zone where all simultaneously accessible conductive parts are electrically connected to prevent hazardous voltages appearing between them. You can accomplish this by a proper factory grounding, that is, make sure that all simultaneously accessible conductive parts are grounded to the protective earth (PE) bus of the building.
- Do not do insulation or voltage withstand tests on the drive or drive modules.

Note:

- The motor cable terminals of the drive are at a dangerous voltage when the input power is on, regardless of whether the motor is running or not.
- The DC and brake resistor terminals (UDC+, UDC-, R+ and R-) are at a dangerous voltage.
- External wiring can supply dangerous voltages to the terminals of relay outputs (RO1, RO2 and RO3).
- The Safe torque off function does not remove the voltage from the main and auxiliary circuits. The function is not effective against deliberate sabotage or misuse.

 **WARNING!** Use a grounding wrist band when you handle the printed circuit boards. Do not touch the boards unnecessarily. The boards contain components sensitive to electrostatic discharge.

Grounding

These instructions are for all personnel who are responsible for the electrical installation, including the grounding of the drive.

 **WARNING!** Obey these instructions. If you ignore them, injury or death, or equipment malfunction can occur, and electromagnetic interference can increase.

- If you are not a qualified electrical professional, do not do grounding work.
 - Always ground the drive, the motor and adjoining equipment to the protective earth (PE) bus of the power supply. This is necessary for the personnel safety. Proper grounding also reduces electromagnetic emission and interference.
 - In a multiple-drive installation, connect each drive separately to the protective earth (PE) bus of the power supply.
 - Make sure that the conductivity of the protective earth (PE) conductors is sufficient. See section [Power cable terminal and lead-through data](#) on page 21. Obey the local regulations.
 - Connect the power cable shields to the protective earth (PE) terminals of the drive.
 - Standard IEC/EN & UL 61800-5-1 (section 4.3.5.5.2.) requires that as the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth (PE) connection. In addition,
 - install a second protective earth conductor of the same cross-sectional area as the original protective earthing conductor,
- or
- install a protective earth conductor with a cross-section of at least 7 AWG (10 mm²) Cu,
- or
- install a device which automatically disconnects the supply if the protective earth conductor breaks.

Additional instructions for Safety Functions

 **WARNING!** Bypass configurations (ACH580-VxR & ACH580-BxR) do not support Safe Torque Off (STO) functionality in bypass mode.

Additional instructions for permanent magnet motor drives

Safety in installation, start-up and maintenance

These are additional warnings concerning permanent magnet motor drives. The other safety instructions in this chapter are also valid.

 **WARNING!** Obey these instructions. If you ignore them, injury or death and damage to the equipment can occur.

- Do not work on a drive when a rotating permanent magnet motor is connected to it. A rotating permanent magnet motor energizes the drive including its power terminals.

Before installation, start-up and maintenance work on the drive:

- Stop the motor.
- Disconnect the motor from the drive with a safety switch or by other means.
- If you cannot disconnect the motor, make sure that the motor cannot rotate during work. Make sure that no other system, like hydraulic crawling drives, can rotate the motor directly or through any mechanical connection like felt, nip, rope, etc.
- Measure that the installation is de-energized.
 - Use a multimeter with an impedance of at least 1 Mohm.
 - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is close to 0 V.
 - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
 - Make sure that the voltage between the drive DC terminals (UDC+, UDC-) and the grounding (PE) terminal is close to 0 V.

- Install temporary grounding to the drive output terminals (T1/U, T2/V, T3/W). Connect the output terminals together as well as to the PE.

Start-up and operation:

- Make sure the motor is not run over the rated speed with dynamic/positive displacement loads.

General safety in operation

These instructions are for all personnel that operate the drive.



WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- Do not control the motor with the line side disconnect at the drive power supply; instead, use the control panel start and stop keys or commands through the I/O terminals of the drive.
- Give a stop command to the drive before you reset a fault. If you have an external source for the start command and the start is on, the drive will start immediately after the fault reset, unless you configure the drive for pulse start. See the [ACH580 HVAC control program firmware manual \(3AXD5000027537 \[English\]\)](#).
- Before you activate automatic fault reset 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.

Note: When the drive is not in the Hand mode, the Off key on the control panel will not stop the drive.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the

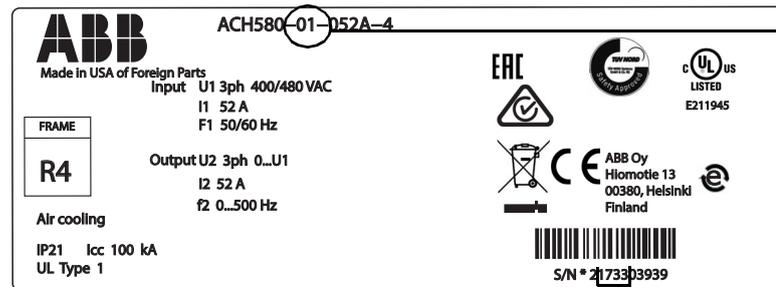
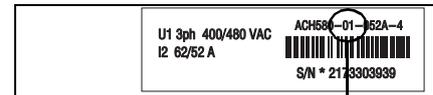
product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Contents

This manual is the Installation, Operation and Maintenance Manual for the ACH580 Drives. Complete technical details are available in the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#). Complete programming information is available in the [ACH580 HVAC control program firmware manual](#), publication number [3AXD50000027537](#).

- To determine the type of your drive, refer to its construction code on either:

- Serial number label attached on upper part of the top mounting plate between the mounting holes.
- Type code label attached to the base frame – on the side of the enclosure.



Construction code

Manufacturing year and week

- According to the construction code, proceed to your drive's installation, operation, diagnostics and maintenance information:
 - 01 (Wall-Mounted Single Drives) – Below.
 - VCR, VDR, BCR, BDR (E-Clipse Bypass) – page [91](#).
 - PCR, PDR (Packaged Drives with Disconnect) – page [137](#).

ACH580-01 Installation

Installation

Study these installation instructions carefully before proceeding. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**



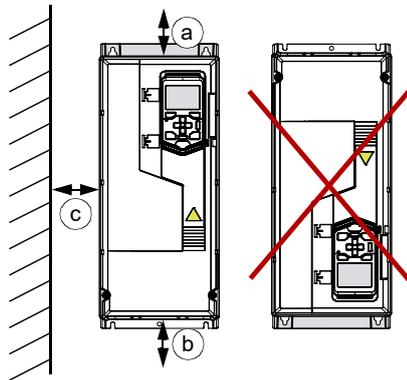
WARNING! Before you begin read [Safety instructions](#) on page 2.

1. Check free space requirements

The drive must be installed on the wall. There are two alternative ways to install it.

Note: Do not install upside down.

Vertically alone



Frame size	Vertical installation - Free space					
	Above (a) ¹⁾		Below (b) ²⁾		Beside (c) ³⁾	
	mm	in	mm	in	mm	in
R1	200	7.87	150	5.91	150	5.91
R2	200	7.87	150	5.91	150	5.91
R3	200	7.87	200	7.87	150	5.91
R4	53	2.09	200	7.87	150	5.91
R5	100	3.94	200	7.87	150	5.91
R6	155	6.10	300	11.81	150	5.91
R7	155	6.10	300	11.81	150	5.91
R8	155	6.10	300	11.81	150	5.91
R9	200	7.87	300	11.81	150	5.91

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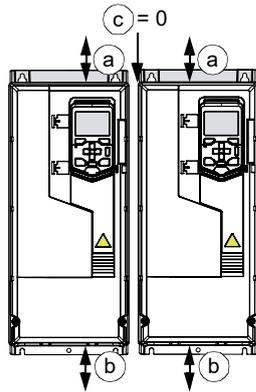
1) Free space above is measured from the frame, not from the hood used in UL (NEMA) Type 12 frames.

Note: The height of the hood for frames R4 and R9 exceeds the requirement of free space above for these frames.

Frame size	R4	R9
Hood height (in)	2.83	9.06
Hood height (mm)	72	230

2) Free space below is measured from the frame, not from the cable box used in frames R1...R2 and R5...R9.

3) Free space between the drive and other objects, e.g. wall.

Vertically side by side

Frame size	Vertical installation side by side - Free space					
	Above (a)		Below (b) ¹⁾		Between (c)	
	mm	in.	mm	in.	mm	in.
R1	200	7.87	200	7.87	0	0
R2	200	7.87	200	7.87	0	0
R3	200	7.87	200	7.87	0	0
R4	200	7.87	200	7.87	0	0
R5	200	7.87	200	7.87	0	0
R6	200	7.87	300	11.81	0	0
R7	200	7.87	300	11.81	0	0
R8	200	7.87	300	11.81	0	0
R9	200	7.87	300	11.81	0	0

1) Free space above is measured from the frame, not from the hood used in UL (NEMA) Type 12 frames.

Note: The height of the hood for frames R4 and R9 exceeds the requirement of free space above for these frames.

2) Free space below is always measured from the drive frame, not from the cable box.

2. Prepare for installation*Lifting R1...R4*

Lift the drive only by the chassis.

Lifting R5...R8

1. Use a pallet truck to move the transport package/enclosure to the installation site.



WARNING! Frames R5...R9: Lift the drive with a lifting device. Use the lifting eyes of the drive. **The drive is heavy and its center of gravity is high. An overturning drive can cause physical injury.**

2. Use a hoist to lift the drive. (Do not place drive in final position until mounting site is prepared.)

Unpack the drive

1. Unpack the drive.
2. Check for any damage and notify the shipper immediately if damaged components are found.
3. Check the contents against the order and the shipping label to verify that all parts have been received.

Tools required

To install the ACH580 you need the following:

- Screwdrivers as appropriate for the mounting hardware used, including a T20 Torx driver for drive cover removal
- Wire stripper
- Tape measure and/or provided mounting template
- Drill
- Frame sizes R5...R9: pallet truck and hoist
- Frame sizes R5...R9: The appropriate crimping tool for power cable lugs.
- Mounting hardware: screws or nuts and bolts. The type, length and quantity of hardware depends on the mounting surface and the frame size:

Frame size	Mounting hardware		Qty
	Metric	Standard	
R1...R2	M5	#10	4
R3	M6	1/4 in.	4
R5	M6	1/4 in.	6
R6...R9	M8	5/16 in.	4



WARNING! Before installing the ACH580, ensure the input power supply to the drive is off.



WARNING! Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.

Flange Mounting

Frame size	Kit
R1	3AXD50000105311
R2	3AXD50000105328
R3	3AXD50000105335
R4	3AXD50000031460
R5	3AXD50000031461
R6	3AXD50000018852
R7	3AXD50000018853
R8	3AXD50000018854
R9	3AXD50000018855

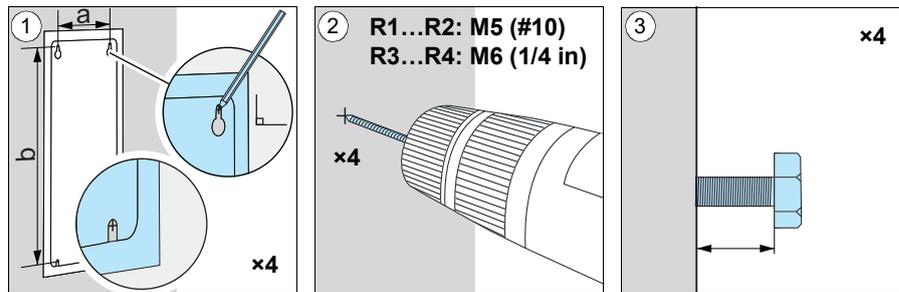
Further information is in *Supplement: Flange mounting kit installation*, 3AXD50000201877.

3. Install the drive

Installing the drive vertically, frames R1...R4

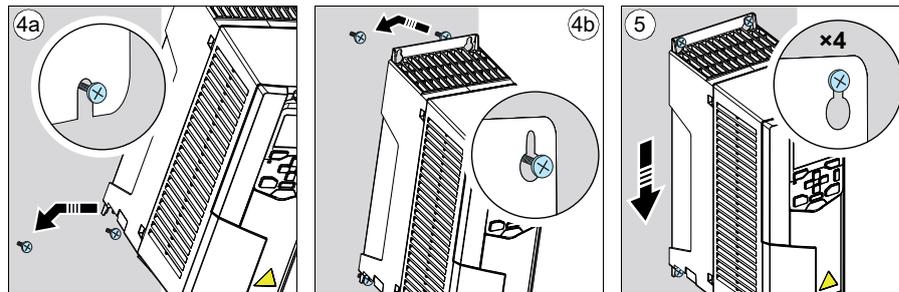
The figures show frame R3 as an example.

1. Mark the hole locations using the mounting template included in the package. Do not leave the mounting template under the drive. The drive dimensions and hole locations are also shown in the drawings in the [ACH580 Hardware manual](#), publication number [3AXD5000044839](#).
2. Drill the mounting holes.
3. Insert anchors or plugs into the holes and start the bolts into the anchors or plugs. Use long enough bolts to make them carry the weight of the drive.



	R1		R2		R3		R4	
	in.	mm	in.	mm	in.	mm	in.	mm
a	3.86	98	3.86	98	6.30	160	6.30	160
b	12.48	317	16.42	417	18.62	473	24.37	619
Weight IP21 (UL (NEMA) Type 1)	lb	kg	lb	kg	lb	kg	lb	kg
	10.1	4.6	14.6	6.6	26.0	11.8	41.9	19.0
Weight IP55 (UL (NEMA) Type 12)	lb	kg	lb	kg	lb	kg	lb	kg
	10.6	4.8	15.0	6.8	28.7	13.0	44.1	20.0

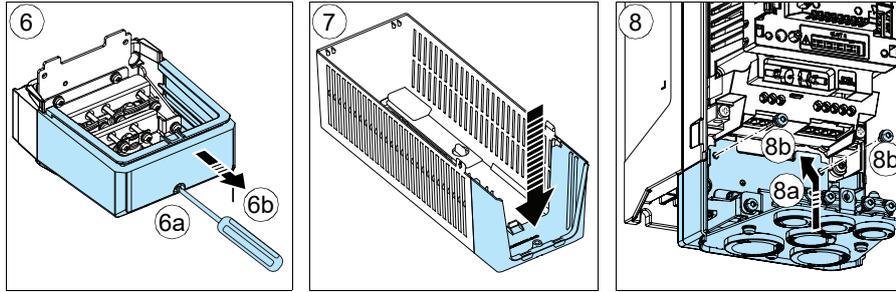
4. Position the drive onto the bolts on the wall.
5. Tighten the bolts in the wall securely.



Install the cable box, frames R1...R2

6. Remove the screw (6a) and lift the cover off (6b) from the separate cable box.
7. Attach the cable box cover to the front cover.

- Install the cable box to the frame. Position the cable box (8a) and tighten the screws (8b).

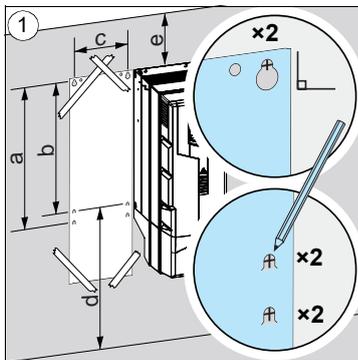


Note: Install the hood to UL (NEMA) Type 12 drives after you have installed the drive electrically and reinstalled covers.

Installing the drive vertically, frame R5

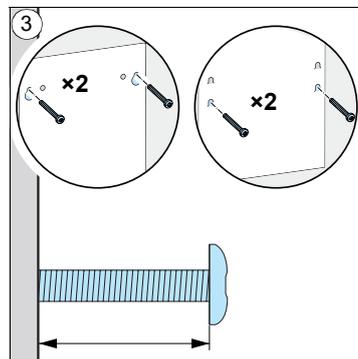
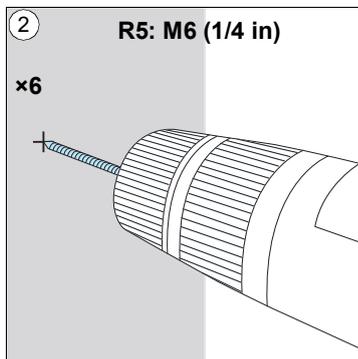
- Mark the hole locations using the mounting template included in the package. Do not leave the mounting template under the drive. The drive dimensions and hole locations are also shown in the drawings in the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).
- Drill the mounting holes.
- Insert anchors or plugs into the holes. Start the two upper bolts and the two lowest bolts into the anchors or plugs.

Use long enough bolts to make them carry the weight of the drive.



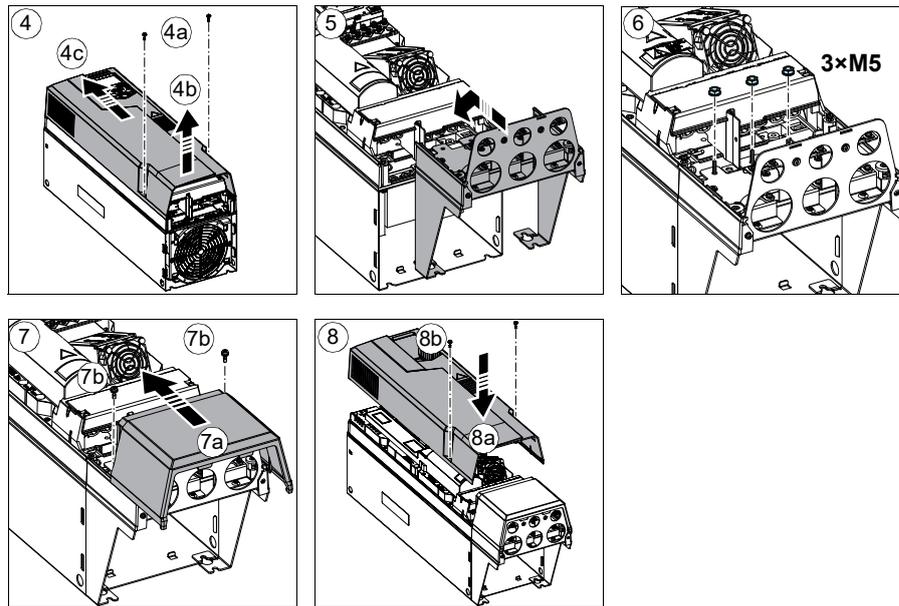
	R5 IP21 (UL (NEMA))		R5 IP55 (UL (NEMA))	
	in.	mm	in.	mm
a	24.09	612	24.09	612
b	22.87	581	22.87	581
c	6.30	160	6.30	160
d >	7.87	200	7.87	200
e >	3.94	100	3.94	100

⚠	R5 IP21 (UL (NEMA))		R5 IP55 (UL (NEMA))	
	lb	kg	lb	kg
	62.4	28.3	64.0	29.0

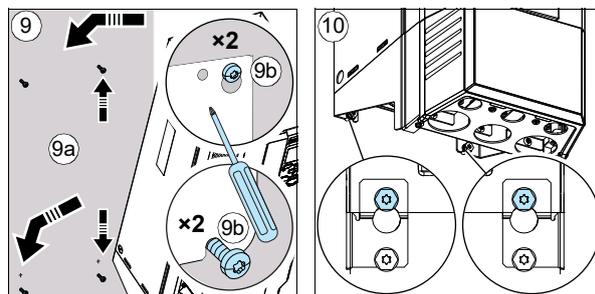


IP21 (UL (NEMA) Type 1)

4. Remove the front cover: Remove the fastening screws (4a) with a T20 Torx screwdriver and lift the cover from the bottom upwards (4b) and then to the top side (4c).
5. Attach the cable box to the drive frame.
6. Tighten the box nuts.
7. Slide the box cover from the bottom (7a) and tighten the retaining screws (7b).
8. Put the tabs at the top of the front cover in their counterparts on the housing and then press at the bottom (8a) and tighten the retaining screws (8b).

**IP21 (UL (NEMA) Type 1), IP55 (UL (NEMA) Type 12)**

9. Position the drive onto the four bolts on the wall. Lift the drive with another person or with a lifting device as it is heavy. Tighten the bolts in the wall securely.
10. Tighten the two remaining bolts securely.



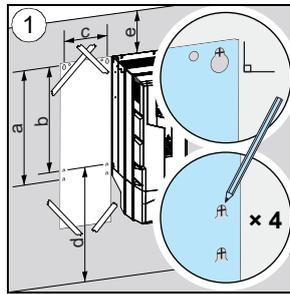
Note: Install the hood on UL (NEMA) Type 12 drives after you have installed the drive electrically and reinstalled covers.

Installing the drive vertically, frames R6...R9

1. Mark the hole locations for the six mounting holes using the mounting template included in the package. Do not leave the mounting template under the drive.

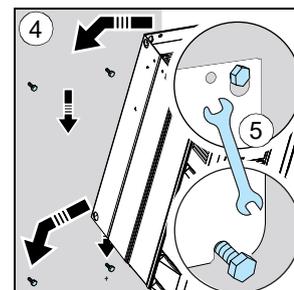
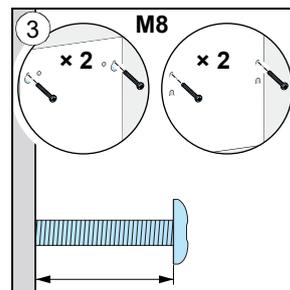
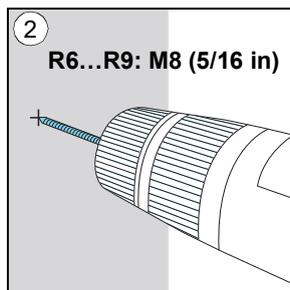
The drive dimensions and hole locations are also shown in the drawings in the [ACH580 Hardware manual](#), publication number [3AXD5000044839](#).

Note: You can use only two bolts instead of four to attach the lower part of the drive.



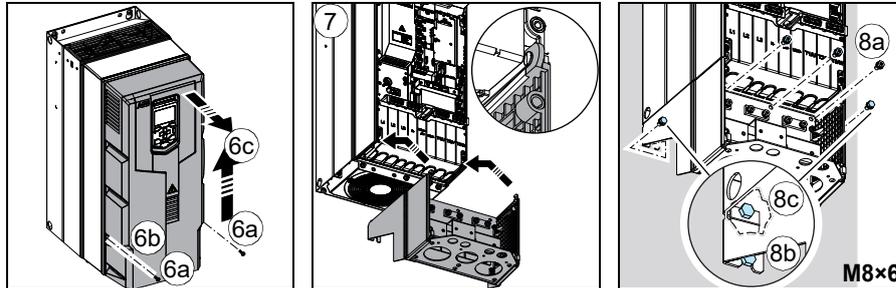
	R6		R7		R8		R9	
	in.	mm	in.	mm	in.	mm.	in.	mm
a	22.5	571	24.5	623	27.6	701	28.3	718
b	20.9	531	23.0	583	25.9	658	25.9	658
c	8.4	213	9.7	245	10.4	263	13.6	345
d	11.8	300	11.8	300	11.8	300	11.8	300
e	6.1	155	6.1	155	6.1	155	7.9	200
IP21, UL (NEMA) Type 1	lb	kg	lb	kg	lb	kg	lb	kg
	93.5	42.4	119.1	54.0	152.2	69.0	213.9	97.0
IP55, UL (NEMA) Type 12	lb	kg	lb	kg	lb	kg	lb	kg
	94.8	43.0	123.5	56.0	169.8	77.0	227.1	103.0

2. Drill the mounting holes.
3. Insert anchors or plugs into the holes and start the bolts into the anchors or plugs.
Use a sufficient number of bolts that are long enough to make them carry the weight of the drive.
4. Position the drive onto the bolts on the wall. Lift the drive with a lifting device with another person as it is heavy.
5. Tighten the top two bolts in the wall securely.

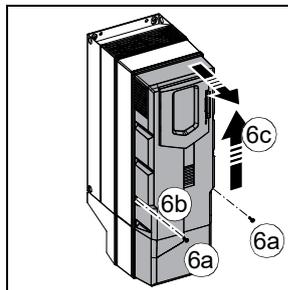


IP21 (UL (NEMA) Type 1)

6. Remove the front cover: Remove the fastening screws (a), with a T20 Torx screwdriver, move the cover to the top side (b) and then up (c).
7. Attach the cable box to the drive frame.
8. Tighten the box bolts: three at the top (8a) and two at the bottom (8b). Also tighten the bottom bolts started in step 3 (8c).

**IP55 (UL (NEMA) Type 12)**

9. Remove the front cover: Remove the fastening screws (a), with a T20 Torx screwdriver, move the cover to the top side (b) and then up (c).



Note: Install the hood on UL (NEMA) Type 12 drives after you have installed the drive electrically and reinstalled covers.

Installing the drive vertically side by side

Install the drive following the steps in the appropriate section [Installing the drive vertically, frames R1...R4](#) (page 11), or [Installing the drive vertically, frame R5](#) (page 12) or [Installing the drive vertically, frames R6...R9](#) (page 14).

4. Install wiring



WARNING! Ensure the motor is compatible for use with the ACH580. The ACH580 must be installed by a competent person. If in doubt, contact your local ABB sales or service office.



WARNING! If the drive will be connected on an IT (ungrounded) system, make sure neither the EMC filter nor the ground-to-phase varistor are connected. If the drive will be connected on a corner-grounded TN system, make sure you have not connected the EMC filter. See [Drive compatibility for various electrical power systems](#) on page 16.

Checking the insulation of the assembly



WARNING! Do not make any voltage tolerance or insulation resistance tests on any part of the drive as testing can damage the drive. The drive has been tested at the factory.

1. Check the insulation of the input cable according to local regulations before connection to the drive. Minimum cable temperature rating of 167 °F (75 °C) must be used.
2. With the motor cable connected to the motor, but NOT to the drive output terminals T1/U, T2/V and T3/W, measure the insulation resistance between the phase conductors and between each phase conductor and the Protective Earth (PE) conductor, using a measuring voltage of 1000 V DC. The insulation resistance must exceed 100 Mohm at 25 °C.

Ground connections

For personnel safety, proper operation and to reduce electromagnetic emission/pick-up, the drive and the motor must be grounded at the installation site.

- Conductors must be adequately sized as required by safety regulations.
- Power cable shields must be connected to the drive PE terminal in order to meet safety regulations.
- Power cable shields are suitable for use as equipment grounding conductors only when the shield conductors are adequately sized as required by safety regulations.
- In multiple drive installations, do not connect drive terminals in series.

Drive compatibility for various electrical power systems

When the drive is installed on the electrical power system, configure the EMC and VAR screws to provide the proper electromagnetic compatibility (EMC) and minimize disturbances on that network. Identify the electrical power system prior to installation. See [Identifying different types of electrical power systems](#).



WARNING! Do not install the drive with the EMC filter(s) or VAR circuit enabled to an electrical power system that the filter is not rated for or unknown. This can cause danger and/or damage the drive.

NOTE: When the internal EMC filter(s) is disconnected, the EMC protection of the drive is considerably reduced.

Identifying different types of electrical power systems:

The power network can be determined with a RMS multimeter. Once identified, the EMC and VAR screws may be properly configured for that power system.

Table: Power system identification

U_{L-L}	U_{L1-G}	U_{L2-G}	U_{L3-G}	Electrical power system type	Figure
X	0.58x	0.58x	0.58x	TN System (Symmetrically grounded wye)	A
X	1.0x	1.0x	0	Corner-grounded Delta System (non-symmetrical)	B
X	0.866x	0.5x	0.5x	Midpoint-grounded Delta System (non-symmetrical)	C
X	Varying level versus time	Varying level versus time	Varying level versus time	IT System (ungrounded or high-resistance-grounded [>30 ohms]) non-symmetrical	D
X	Varying level versus time	Varying level versus time	Varying level versus time	TT System (the protective earth connection for the customer is provided by a local earth electrode, and there is another independently installed at the generator.)	E

1. Input voltage line to line (U_{L-L})
2. Input voltage line 1 to ground (U_{L1-G})
3. Input voltage line 2 to ground (U_{L2-G})
4. Input voltage line 3 to ground (U_{L3-G})

T - Terra (ground)

N - Neutral

C - Combined

S - Separate

I - Isolated

TN-S = Tera Neutral - Separate

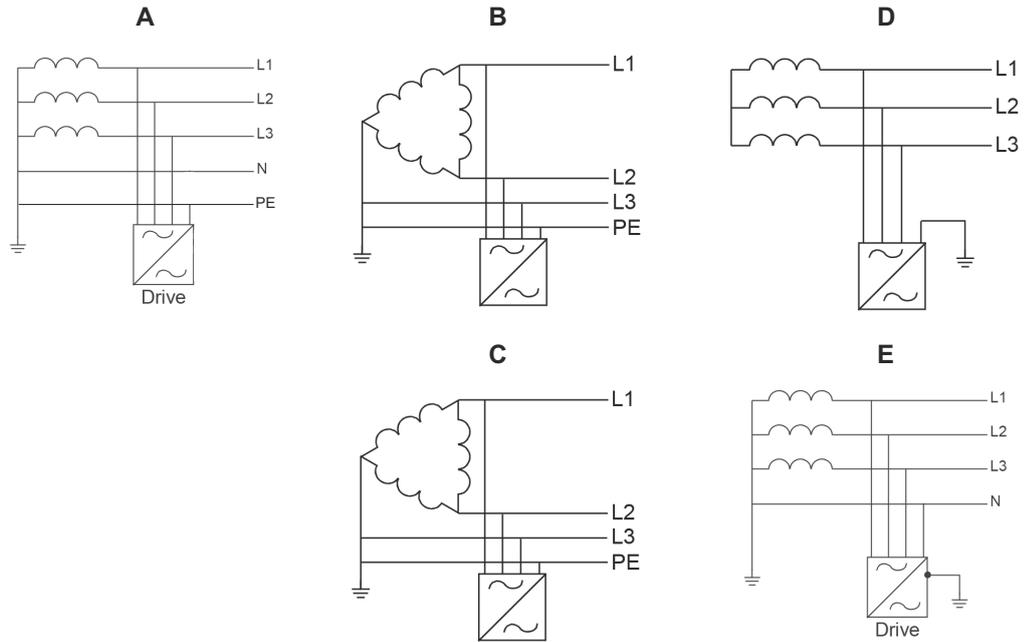
Earth and Neutral have separate conductors (3 wire single phase L, N, E).

IT = Isolated Neutral

Earth is either ungrounded or high-resistive (>30 ohms) non-symmetrical earth path.

TT = Tera Tera

Earth at source and Earth a Destination (no earth conductor between source and consumer, the soil is used as the earth return path).



Default EMC and VAR screws material

The following tables show the default material based on the drive frame and manufactured location. (North America or except North America). See section for data nameplate.

ACH580-01

Frame	Default screw material (North America)		
	EMC (DC)	EMC (AC)	VAR
R1...R3	Nylon	N/A	Metal
R4...R5	Nylon	Nylon	Metal
R6...R9*	Nylon	Nylon	Metal

Frame	Default screw material (except North America)		
	EMC (DC)	EMC (AC)	VAR
R1...R3	Nylon	N/A	Metal
R4...R5	Nylon	Metal	Metal
R6...R9*	Nylon	Metal	Metal

Note: *The R7 has no EMC (DC) screw for 600V.

EMC/VAR screw type selection for various electrical power networks

The following describes the purpose of the EMC filter and the varistor (VAR) and how to configure based on the electrical power systems the drive will be connected.

WARNING! Disconnect EMC filter and VAR circuits when power network is unknown.

EMC Filter

The EMC filter(s) in the drive reduces the electromagnetic noise produced by the drive. Electromagnetic noise could interfere with or affect other electrical products. The EMC filter(s) needs to be configured prior to installing the drive on the electrical power system to provide the proper EMC protection.

Varistor

The varistor (VAR) is a Metal Oxide Varistor (MOV), which is used to protect the sensitive electronics in the drive caused by transient overvoltage conditions. The ground-to-phase varistor needs to be configured prior to installing the drive on the electrical power system to provide proper protection.

Replacement parts kits and torque values shown below.

Screw kit, Hardware R1-R4, R6-R9 part number: 3AXD50000561261

Qty	Description	Location	Bit size	Torque
1	Screw, M4x12, COMBI, Torx, T20 Steel	EMC/VAR	T20	1.5 Nm
1	Screw, M4x12, PZ1, Nylon	EMC/VAR	PZ1	Hand tighten

Screw kit, Hardware R5 part number: 3AXD50000561278

Qty	Description	Location	Bit size	Torque
1	Screw, M5x16, COMBI, Torx, T20 Steel	EMC (AC)/VAR	T20	3.0 Nm
1	Screw, M6x16, PZ1, Nylon	EMC (AC)/VAR	PZ1	Hand Tighten
1	Screw, M5x35, COMBI, Torx, T20 Steel	EMC (DC)	T20	3.0 Nm
1	Screw, M6x35, PZ1, Nylon	EMC (DC)	PZ1	Hand Tighten

ACH580-01 North America

		TN system or Corner-grounded Delta system	TN system	Corner-grounded delta (B) and Mid-point- grounded delta (C)	IT system	TT system
Frame	Connection	Default Figures A and B	Figure A	Figures B and C	Figure D	Figure E
R1...R3	EMC (DC)	Nylon	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾	Nylon ¹⁾
	VAR	Metal	Metal	Metal	Nylon ¹⁾	Nylon ¹⁾
R4 ³⁾	EMC (DC)	Nylon	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾	Nylon ¹⁾
	EMC (AC)	Nylon	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾	Nylon ¹⁾
	VAR	Metal	Metal	Metal	Nylon ¹⁾	Nylon ¹⁾
R5 ³⁾	EMC (DC)	Nylon	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾	Nylon ¹⁾
	EMC (AC)	Nylon	Metal ²⁾	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾
	VAR	Metal	Metal	Metal	Nylon ¹⁾	Nylon ¹⁾
R6...R9	EMC (DC)	Nylon	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾	Nylon ¹⁾
	EMC (AC)	Nylon	Metal ²⁾	Metal ²⁾	Nylon ¹⁾	Nylon ¹⁾
	VAR	Metal	Metal	Metal	Nylon ¹⁾	Nylon ¹⁾

Bold represents change from default material.

1) Metal screw must be not used.

2) Optional, for greater noise filtering.

3) Frames R4 and R5 are evaluated for use on corner-grounded delta networks by UL standards. R4 and R5 frames may not be used on IEC installations with corner grounded networks.

ACH580-01 except North America

		TN system	IT system	TT system
Frame	Connection	Default Figures A	Figure D	Figure E
R1...R3	EMC (DC)	Metal	Nylon ¹⁾	Nylon
	VAR	Metal	Nylon	Nylon
R4 ³⁾	EMC (DC)	Metal	Nylon ¹⁾	Nylon
	EMC (AC)	Metal	Nylon	Nylon
	VAR	Metal	Nylon	Nylon
R5 ³⁾	EMC (DC)	Metal	Nylon ¹⁾	Nylon
	EMC (AC)	Metal	Nylon	Nylon
	VAR	Metal	Nylon	Nylon
R6...R9	EMC (DC)	Metal	Nylon ¹⁾	Nylon
	EMC (AC)	Metal	Nylon	Nylon
	VAR	Metal	Nylon	Nylon

Bold represents change greater from default material.

1) Optional, for greater noise filtering.

3) Frames R4 and R5 are evaluated for use on corner-grounded delta networks by UL standards. R4 and R5 frames may not be used on IEC installations with corner grounded networks.

Power cable terminal and lead-through data

Input, motor, resistor and DC cable lead-throughs, maximum wire sizes (per phase) and terminal screw sizes.

Frame size	Cable lead-throughs			L1, L2, L3, T1/U, T2/V, T3/W terminals ¹⁾				Grounding terminals ¹⁾	
	Per cable type	Max cable dia.		Min wire size (solid/stranded)		Max wire size (solid/stranded)		Max wire size	
		pcs	in.	mm	AWG	mm ²	AWG	mm ²	AWG
R1	1	1.18	30	14	2.1	10	6/4	6/6	16/16
R2	1	1.18	30	14	2.1	6	16/16	6/6	16/16
R3	1	1.18	30	14	2.1	2	35/25	2/2	35/35
R4	1	1.77	45	14	2.1	1	50	2/2	35/35
R5	1	1.77	45	14	2.1	2/10	70	2)	2)
R6	1	1.77	45	4	25	300 MCM	150	2)	2)
R7	1	2.13	54	3/0	95	500 MCM	240	2)	2)
R8	2	1.77	45	2×1/0	2×50	2×300 MCM	2×150	2)	2)
R9	2	2.13	54	2×3/0	2×95	2×500 MCM	2×240	2)	2)

1) Screwdrivers: R1 - Slot 4 mm and PH1; R2 - 4.5 mm and PH2; R3, R4 - PH2

2) Either cable lug (R5) or clamp (R6...R9) is used for grounding.

Frame size	Cable lead-throughs			R+, R-, UDC+ and UDC- terminals ¹⁾						
	Per cable type	Max cable dia.		Min wire size (solid/stranded)		Max wire size (solid/stranded)		Hardware	Torque	
		pcs	in.	mm	AWG	mm ²	AWG	mm ²	M...	lb-ft
R1	1	0.906	23	14	2.1	10	6/4	1)	0.4	1.2...1.5
R2	1	0.906	23	14	2.1	6	16/16	1)	1.1	1.2...1.5
R3	1	0.906	23	14	2.1	2	35/25	1)	3.3	2.5...4.5
R4	1	1.54	39	14	2.1	1	50	1)	3.0	4.0
R5	1	1.54	39	14	2.1	2/10	70	M5	4.1	5.6
R6	1	1.77	45	4	25	300 MCM	150	M8	22.1	30
R7	1	2.13	54	3/0	95	500 MCM	240	M10	29.5	30
R8	2	1.77	45	2×1/0	2×50	2×300 MCM	2×150	M10	29.5	40
R9	2	2.13	54	2×3/0	2×95	2×500 MCM	2×240	M12	51.6	70

1) Screwdrivers: R1 - Slot 4 mm and PH1; R2 - 4.5 mm and PH2; R3, R4 - PH2

Note: Minimum wire size does not necessarily have enough current capability for full load. Make sure the installation complies with local laws and regulations.

Maximum recommended motor cable length

Operational functionality and motor cable length

The drive is designed to operate with optimum performance with the following maximum motor cable lengths.

Note: Conducted and radiated emissions of these motor cable lengths do not comply with EMC requirements.

Frame size	Maximum motor cable length, 4 kHz ^{1, 2}			
	Scalar control		Vector control	
	m	ft	m	ft
Standard drive, without external options				
R1	100	330	100	330
R2	200	660	200	660
R3	300	990	300	990
R4	300	990	300	990
R5	300	990	300	990
R6	300	990	300	990
R7	300	990	300	990
R8	300	990	300	990
R9	300	990	300	990

- 1) In multimotor systems, the calculated sum of all motor cable lengths must not exceed the maximum motor cable length given in the table.
- 2) Longer motor cables cause a motor voltage decrease which limits the available motor power. The decrease depends on the motor cable length and characteristics. Contact ABB for more information.

Control cable terminal and lead-through data

Imperial control cable lead-throughs, wire sizes and tightening torques (T) are given below.

Frame size	Cable lead-throughs		Control cable entries and terminal sizes			
	Holes	Max cable size	+24V, DCOM, DGND, EXT. 24V terminals		DI, AI/O, AGND, RO, STO terminals	
			Wire size	T	Wire size	T
	pcs	in.	AWG	lb·ft	AWG	lb·ft
R1	3	0.67	24...14	0.4	26...14	0.4
R2	3	0.67	24...14	0.4	26...14	0.4
R3	3	0.67	24...14	0.4	26...14	0.4
R4	4	0.67	24...14	0.4	26...14	0.4
R5	3	0.67	24...14	0.4	26...14	0.4
R6	4	0.67	26...14	0.4	26...14	0.4
R7	4	0.67	26...14	0.4	26...14	0.4
R8	4	0.67	26...14	0.4	26...14	0.4
R9	4	0.67	26...14	0.4	26...14	0.4

Metric control cable lead-throughs, wire sizes and tightening torques (T) are given below.

Frame size	Cable lead-throughs		Control cable entries and terminal sizes			
	Holes	Max cable size	+24V, DCOM, DGND, EXT. 24V terminals		DI, AI/O, AGND, RO, STO terminals	
			Wire size	T	Wire size	T
	pcs	mm	mm ²	N·m	mm ²	N·m
R1	3	17	0.2...2.5	0.5...0.6	0.14...1.5	0.5...0.6
R2	3	17	0.2...2.5	0.5...0.6	0.14...1.5	0.5...0.6
R3	3	17	0.2...2.5	0.5...0.6	0.14...1.5	0.5...0.6
R4	4	17	0.2...2.5	0.5...0.6	0.14...1.5	0.5...0.6
R5	3	17	0.2...2.5	0.5...0.6	0.14...1.5	0.5...0.6
R6	4	17	0.14...2.5	0.5...0.6	0.14...2.5	0.5...0.6
R7	4	17	0.14...2.5	0.5...0.6	0.14...2.5	0.5...0.6
R8	4	17	0.14...2.5	0.5...0.6	0.14...2.5	0.5...0.6
R9	4	17	0.14...2.5	0.5...0.6	0.14...2.5	0.5...0.6

UL (NEC) ratings at $U_N = 208\text{ V}$

Type	Output ratings	Heat dissipation	Air flow	Frame size
	A	W	ft ³ /min	
ACH580-01-04A6-2	4.6	45	25	R1
ACH580-01-06A6-2	6.6	55	25	R1
ACH580-01-07A5-2	7.5	66	25	R1
ACH580-01-011A-2	10.6	84	25	R1
ACH580-01-017A-2	16.7	133	25	R1
ACH580-01-024A-2	24.2	174	59	R2
ACH580-01-031A-2	30.8	228	59	R2
ACH580-01-046A-2	46.2	322	105	R3
ACH580-01-059A-2	59.4	430	105	R3
ACH580-01-075A-2	74.8	525	170	R4
ACH580-01-088A-2	88	619	82	R5
ACH580-01-114A-2	114	835	82	R5
ACH580-01-143A-2	143	1035	256	R6
ACH580-01-169A-2	169	1251	265	R7
ACH580-01-211A-2	211	1521	265	R7
ACH580-01-273A-2	273	2061	324	R8

UL (NEC) ratings at $U_N = 460\text{ V}$

Type	Output ratings	Heat dissipation	Air flow	Frame size
	A	W	ft ³ /min	
ACH580-01-02A1-4	2.1	45	25	R1
ACH580-01-03A0-4	3	55	25	R1
ACH580-01-03A5-4	3.5	66	25	R1
ACH580-01-04A8-4	4.8	84	25	R1
ACH580-01-07A6-4	7.6	133	25	R1
ACH580-01-012A-4	12	174	25	R1
ACH580-01-014A-4	14	228	59	R2
ACH580-01-023A-4	23	322	59	R2
ACH580-01-027A-4	27	430	105	R3
ACH580-01-034A-4	34	525	105	R3
ACH580-01-044A-4	44	619	105	R3
ACH580-01-052A-4	52	835	79	R4
ACH580-01-065A-4	65	1024	79	R4
ACH580-01-077A-4	77	1024	79	R4
ACH580-01-096A-4	96	1510	82	R5
ACH580-01-124A-4	124	1476	256	R6
ACH580-01-156A-4	156	1976	265	R7

Type	Output ratings	Heat dissipation	Air flow	Frame size
	A	W	ft ³ /min	
ACH580-01-180A-4	180	2346	265	R7
ACH580-01-240A-4	240	3336	324	R8
ACH580-01-302A-4	302	4836	677	R9
ACH580-01-361A-4	361	6036	677	R9
ACH580-01-414A-4	414	6036	677	R9

UL (NEC) ratings at $U_N = 575 V$

Type	Output ratings	Heat dissipation	Air flow	Frame size
	A	W	ft ³ /min	
ACH580-01-02A7-6	2.7	66	59	R2
ACH580-01-03A9-6	3.9	84	59	R2
ACH580-01-06A1-6	6.1	133	59	R2
ACH580-01-09A0-6	9	174	59	R2
ACH580-01-011A-6	11	228	59	R2
ACH580-01-017A-6	17	322	59	R2
ACH580-01-022A-6	22	430	105	R3
ACH580-01-027A-6	27	525	105	R3
ACH580-01-032A-6	32	619	105	R3
ACH580-01-041A-6	41	835	82	R5
ACH580-01-052A-6	52	1024	82	R5
ACH580-01-062A-6	62	1240	82	R5
ACH580-01-077A-6	77	1510	82	R5
ACH580-01-099A-6	99	2061	265	R7
ACH580-01-125A-6	125	2466	265	R7
ACH580-01-144A-6	144	3006	324	R8
ACH580-01-192A-6	156	4086	677	R9
ACH580-01-242A-6	242	4896	677	R9
ACH580-01-271A-6	271	4896	677	R9

Definitions

- U_N Output voltage of the drive.
- I Continuous rms output current, allowing 110% overload for 1 minute every 10 minutes.
- P Typical motor power

Fuses

Note: The UL listed fuses in the table are the required branch circuit protection. Fuses are to be provided as part of the installation.

- Fuses are not included in the purchased drive and must be provided by others.
- Fuses with higher current rating than specified must not be used.
- Fuses with lower current rating than specified may be used if they are of the same class and voltage rating. It is the user's responsibility to verify that lower current rated fuses are compliant with local regulations and appropriate for the application.
- Drive fuses must be used to maintain the drive UL listing. Additional protection can be used. Refer to local codes and regulations.

208...240 volt, fuse requirements

ACH580-01-	Input current A	UL			
		Maximum current	Voltage rating	Bussmann type 1	UL class
3-phase UN = 208 V					
04A6-2	4.6	15	600	KTK-R-15 or JJS-15	CC or T
06A6-2	6.6	15	600	KTK-R-15 or JJS-15	CC or T
07A5-2	7.5	15	600	KTK-R-15 or JJS-15	CC or T
10A6-2	10.6	15	600	KTK-R-15 or JJS-15	CC or T
017A-2	16.7	30	600	KTK-R-30 or JJS-30	CC or T
024A-2	24.2	40	600	JJS-40	T
031A-2	30.8	40	600	JJS-40	T
046A-2	46.2	80	600	JJS-80	T
059A-2	59.4	80	600	JJS-80	T
075A-2	74.8	100	600	JJS-100	T
088A-2	88	150	600	JJS-150	T
114A-2	114	150	600	JJS-150	T
144A-2	143	200	600	JJS-200	T
169A-2	169	250	600	JJS-250	T
211A-2	211	300	600	JJS-300	T
273A-2	273	400	600	JJS-400	T
1) ABB does not require Bussmann brand fuses. Fuses which meet the appropriate UL class type, current rating, and are rated at 600V, 200 kA may be used.					

380...480 volt, fuse requirements

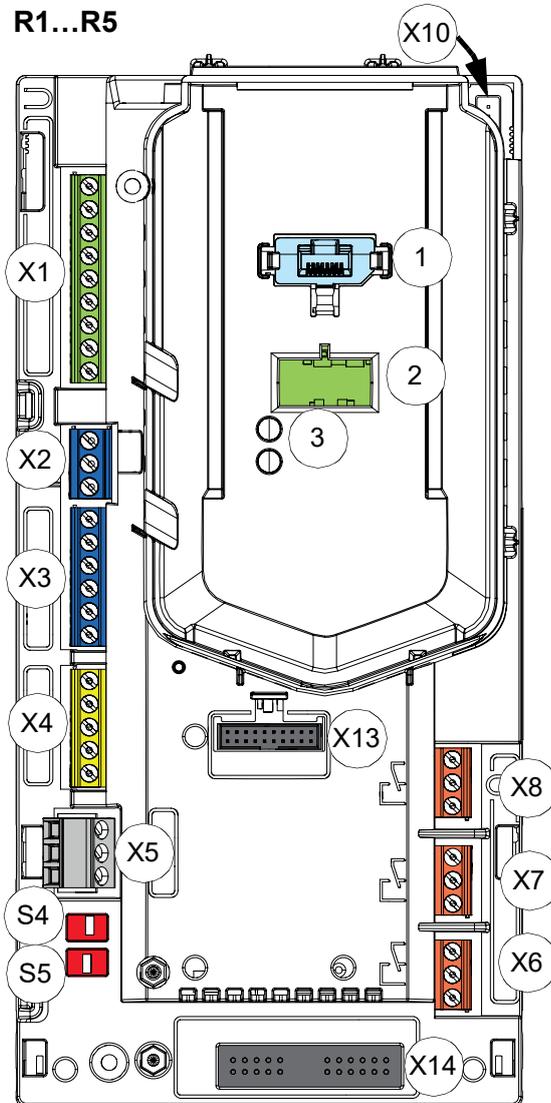
ACH580-01-	Input current A	UL			
		Maximum current	Voltage rating	Bussmann type 1	UL class
3-phase UN = 460 V					
02A1-4	2.1	15	600	JJS-15	T
03A0-4	3.0	15	600	JJS-15	T
03A5-4	3.5	15	600	JJS-15	T
04A8-4	4.8	15	600	JJS-15	T
07A6-4	7.6	15	600	JJS-15	T
012A-4	12.0	15	600	JJS-15	T
014A-4	14.0	30	600	JJS-30	T
023A-4	23.0	30	600	JJS-30	T
027A-4	27.0	40	600	JJS-40	T
034A-4	34.0	60	600	JJS-60	T
044A-4	44.0	60	600	JJS-60	T
052A-4	52.0	80	600	JJS-80	T
065A-4	62.0	100	600	JJS-100	T
077A-4	77.0	100	600	JJS-100	T
096A-4	100	150	600	JJS-150	T
124A-4	124	200	600	JJS-200	T
156A-4	156	225	600	JJS-225	T
180A-4	180	300	600	JJS-300	T
240A-4	240	350	600	JJS-350	T
302A-4	302	500	600	JJS-500	T
361A-4	361	500	600	JJS-500	T
414A-4	414	600	600	JJS-500	T
1) ABB does not require Bussmann brand fuses. Fuses which meet the appropriate UL class type, current rating, and are rated at 600V, 200 kA may be used.					

500...600 volt, fuse requirements

ACH580-01-	Input current A	UL			
		Maximum current	Voltage rating	Bussmann type 1	UL class
3-phase UN = 460 V					
02A7-6	2.7	15	600	KTK-R-15 or JJS-15	Class CC or T
03A9-6	3.9	15	600	KTK-R-15 or JJS-15	Class CC or T
06A1-6	6.1	15	600	KTK-R-15 or JJS-15	Class CC or T
09A0-6	9	15	600	KTK-R-15 or JJS-15	Class CC or T
011A-6	11	15	600	KTK-R-15 or JJS-15	Class CC or T
017A-6	17	30	600	KTK-R-30 or JJS-30	Class CC or T
022A-6	22	40	600	JJS-40	T
027A-6	27	40	600	JJS-40	T
032A-6	32	40	600	JJS-40	T
041A-6	41	100	600	JJS-100	T
052A-6	52	100	600	JJS-100	T
062A-6	62	100	600	JJS-100	T
077A-6	77	100	600	JJS-100	T
099A-6	99	150	600	JJS-150	T
125A-6	125	200	600	JJS-200	T
144A-6	144	250	600	JJS-250	T
180A-6	180	300	600	JJS-300	T
242A-6	242	400	600	JJS-400	T
271A-6	271	400	600	JJS-400	T
1) ABB does not require Bussmann brand fuses. Fuses which meet the appropriate UL class type, current rating, and are rated at 600V, 200 kA may be used.					

External control connection terminals, frames R1...R5

The layout of the external control connection terminals of the R1 frame is shown below. Layout of the external control connection terminals is identical in frames R1...R5 but the location of the control board with the terminals is different in frames R3...R5.

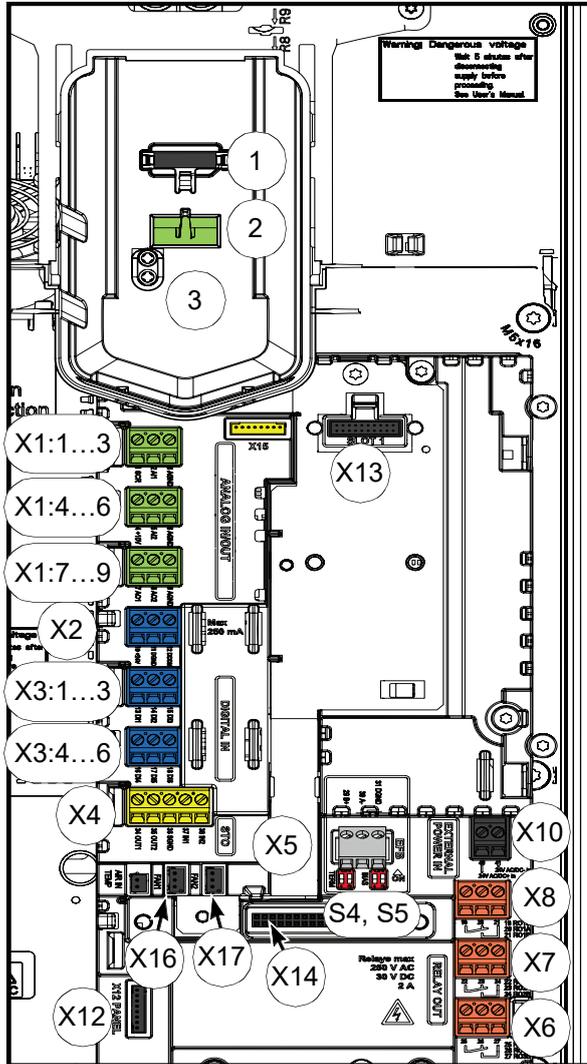


	Description
X1	Analog inputs and outputs
X2	Aux. voltage output
X3	Programmable digital inputs
X4	Safe torque off connection
X5	Embedded fieldbus
X6	Relay output 3
X7	Relay output 2
X8	Relay output 1
X10	Auxiliary fan connection (IP55)
X13	Option slot 1 (fieldbus adapter modules)
X14	Option slot 2 (I/O extension modules)
S4, S5	Termination switch (S4), bias resistor switch (S5), see section Switches on page 43
1	Panel port (control panel connection)
2	Cold configuration connection. This connector is used with the CCA-01 configuration adapter.
3	Power OK and Fault LEDs

External control connection terminals, frames R6...R9

The layout of the external control connection terminals of frames R6...R9 is shown below.

R6...R9



	Description
X1	Analog inputs and outputs
X2	Aux. voltage output
X3	Digital inputs
X4	Safe torque off connection
X5	Connection to embedded EIA-485 fieldbus adapter module
X6	Relay output 3
X7	Relay output 2
X8	Relay output 1
X10	External +24 V AC/DC input connection
X12	Panel connection
X13	Option slot 1 (fieldbus adapter modules)
X14	Option slot 2 (I/O extension modules)
X16	Auxiliary fan 1 connection
X17	Auxiliary fan 2 connection
S4, S5	Termination switch (S4), bias resistor switch (S5), see section Switches on page 43
1	Panel port (control panel connection)
2	Cold configuration connection. This connector is used with the CCA-01 configuration adapter.
3	Power OK and Fault LEDs



WARNING! If installing modules, the +24 V AC cable to the control board ground when the control board is powered using an external 24 V AC supply.

Wiring R1...R2

Note: These are instructions for conduit wiring. For cable wiring, see the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).

Note: In US deliveries, options are already installed at the factory. If installing on site, option slot 1 modules (fieldbus adapter) may be installed by mounting the module on the control board and tightening the mounting screw, which is also the grounding screw. Option slot 2 modules (I/O extension) should not be installed until after the power cables. Refer to Warning and step 8 below.



WARNING! If installing modules, obey the instructions in [Safety instructions](#) on page 2. If you ignore them, injury or death, or damage to the equipment can occur.

Option slot 2 in frames R1...R5 is at U_{DC} potential. You must disconnect power supplies before installing or removing an I/O extension module.

1. Install thin-wall conduit clamps for IP21/UL (NEMA) Type 1 or liquid-tight conduit connectors for IP55/UL (NEMA) Type 12 (not supplied). Type 12 has a Pressfit gasket.
 2. Connect conduit runs for input power, motor and control cables to the conduit box. Ensure grommets (pointing down) are inserted into all unused holes.
 3. Route the input power and motor wiring through separate conduits.
 4. Strip wires.
 5. Connect the motor and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
 6. Connect the input power and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
 7. *If brake resistor is used* — Connect the resistor and ground wires. Tighten the screws to torques shown in the Power wiring torque table.
 8. Install option slot 2 modules (I/O extension), if necessary, at this point.
 - A *Frame R1 only:* Install the option mounting.
 - B Put the module carefully into its position on the control board and tighten the mounting screw.
 - C Tighten the grounding screw, which is necessary for proper operation and for fulfilling EMC requirements.
-

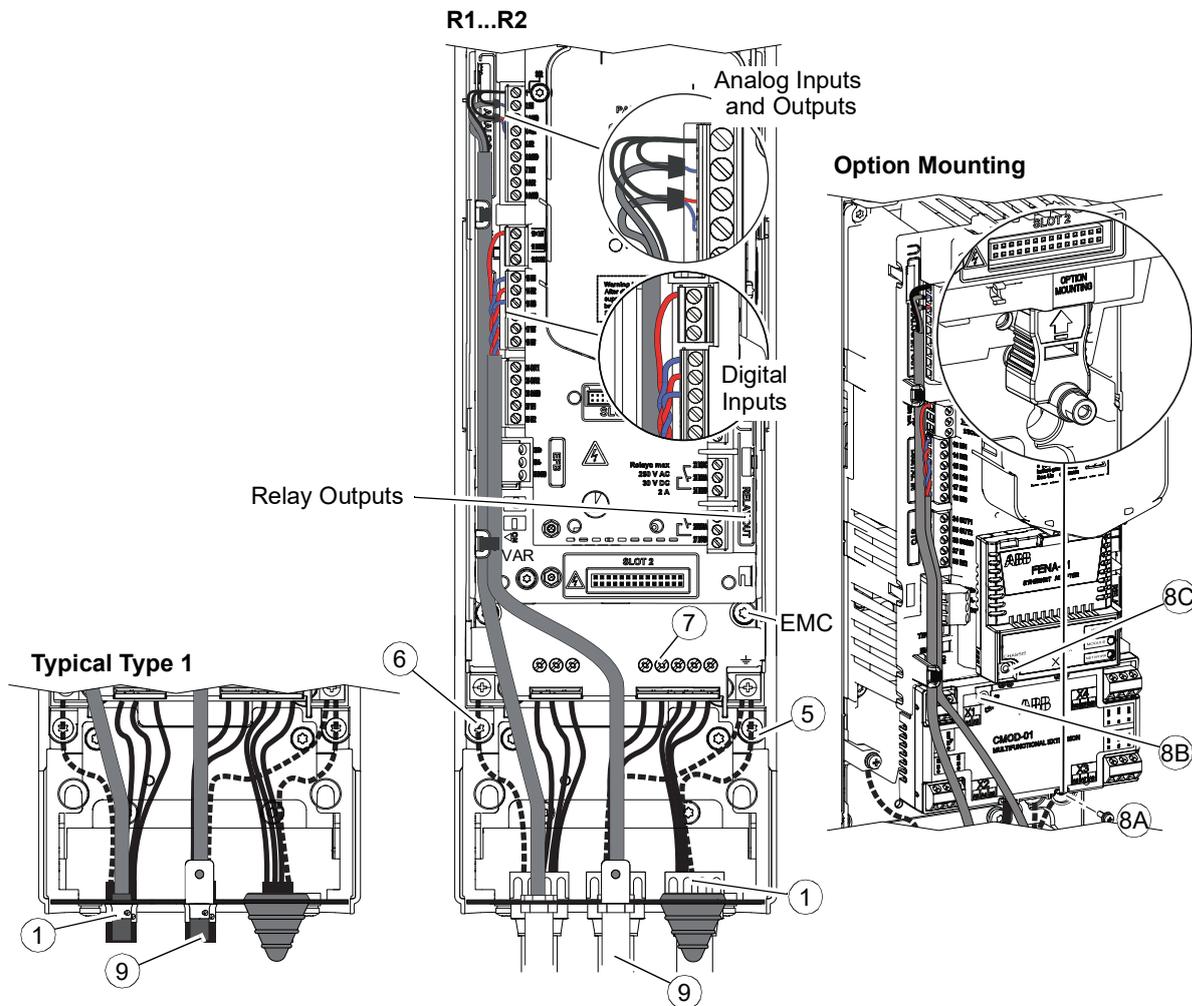
Note: Frame R1 — The module in option slot 2 covers the power terminals. Do not install a module in option slot 2 before you have installed the power cables.

9. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
 10. Strip the control cable sheathing and twist the copper screen into a pig-tail.
 11. Refer to pages [41](#), [42](#) and [43](#). Connect the ground screen pig-tail for digital and analog I/O cables. (Ground only at drive end.)
-

12. Connect the ground screen pig-tail for Embedded fieldbus, EFB (EIA-485) cables at X5. (Ground only at drive end.)
13. Strip and connect the individual control wires to the drive terminals. Tighten the screws to 0.4 lb-ft (0.5...0.6 Nm).



WARNING! To avoid danger or damage to the drive on IT systems and corner grounded TN systems, see section [Drive compatibility for various electrical power systems](#) on page 16.



Power wiring torque table

Frame size	R1		R2	
	lb-ft	Nm	lb-ft	Nm
T1/U, T2/V, T3/W	0.7	1.0	1.1	1.5
L1, L2, L3	0.7	1.0	1.1	1.5
R+, R-	0.7	1.0	1.1	1.5
PE Ground	1.1	1.5	1.1	1.5

Wiring R3

Note: These are instructions for conduit wiring. For cable wiring, see the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).

Note: In US deliveries, options are already installed at the factory. If installing on site, option slot 1 modules (fieldbus adapter) may be installed by mounting the module on the control board and tightening the mounting screw, which is also the grounding screw. Option slot 2 modules (I/O extension) may be installed by mounting the module on the control board and tightening both the mounting screw and the grounding screw. Refer to Warning.



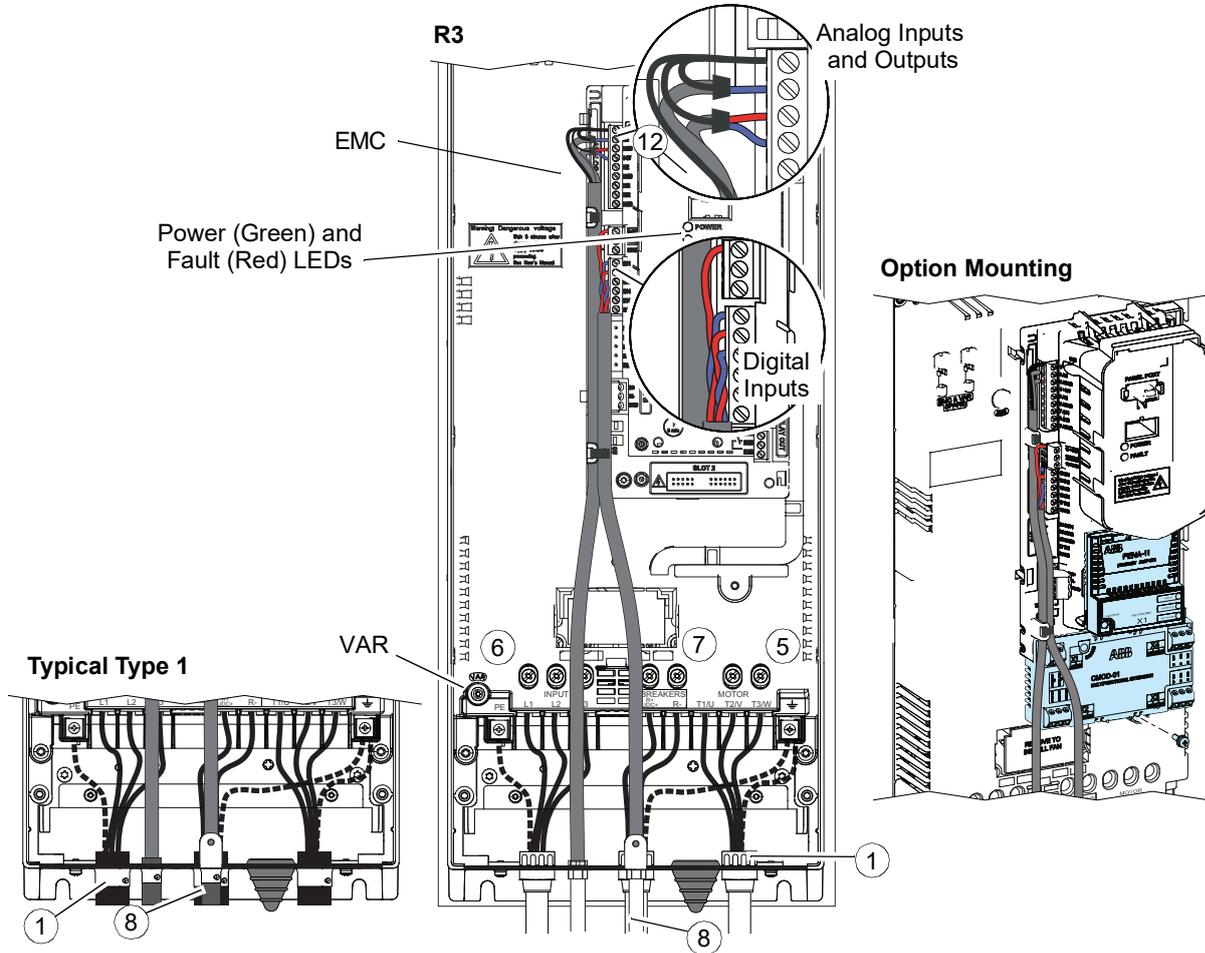
WARNING! If installing modules, obey the instructions in [Safety instructions](#) on page 2. If you ignore them, injury or death, or damage to the equipment can occur.

Option slot 2 in frames R1...R5 is at U_{DC} potential. You must disconnect power supplies before installing or removing an I/O extension module.

1. Install thin-wall conduit clamps for IP21/UL (NEMA) Type 1 or liquid-tight conduit connectors for IP55/UL (NEMA) Type 12 (not supplied). Type 12 has a Pressfit gasket.
2. Connect conduit runs for input power, motor and control cables to the conduit box. Ensure grommets (pointing down) are inserted into all unused holes.
3. Route the input power and motor wiring through separate conduits.
4. Strip wires.
5. Connect the motor and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
6. Connect the input power and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
7. *If brake resistor is used* — Connect the resistor and ground wires. Tighten the screws to torques shown in the Power wiring torque table.
8. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
9. Strip the control cable sheathing and twist the copper screen into a pig-tail.
10. Refer to pages [41](#), [42](#) and [43](#). Connect the ground screen pig-tail for digital and analog I/O cables. (Ground only at drive end.)
11. Connect the ground screen pig-tail for Embedded fieldbus, EFB (EIA-485) cables at X5. (Ground only at drive end.)
12. Strip and connect the individual control wires to the drive terminals. Tighten the screws to 0.4 lb-ft (0.5...0.6 Nm).



WARNING! To avoid danger or damage to the drive on IT systems and corner grounded TN systems, see section [Drive compatibility for various electrical power systems](#) on page 16.



Power wiring torque table

Frame size	R3	
	lb-ft	Nm
T1/U, T2/V, T3/W	2.6	3.5
L1, L2, L3	2.6	3.5
R+, R-	2.6	3.5
PE Ground	1.1	1.5

Wiring R4

Note: These are instructions for conduit wiring. For cable wiring, see the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).

Note: In US deliveries, options are already installed at the factory. If installing on site, option slot 1 modules (fieldbus adapter) may be installed by mounting the module on the control board and tightening the mounting screw, which is also the grounding screw. Option slot 2 modules (I/O extension) may be installed by mounting the module on the control board and tightening both the mounting screw and the grounding screw. Refer to Warning.



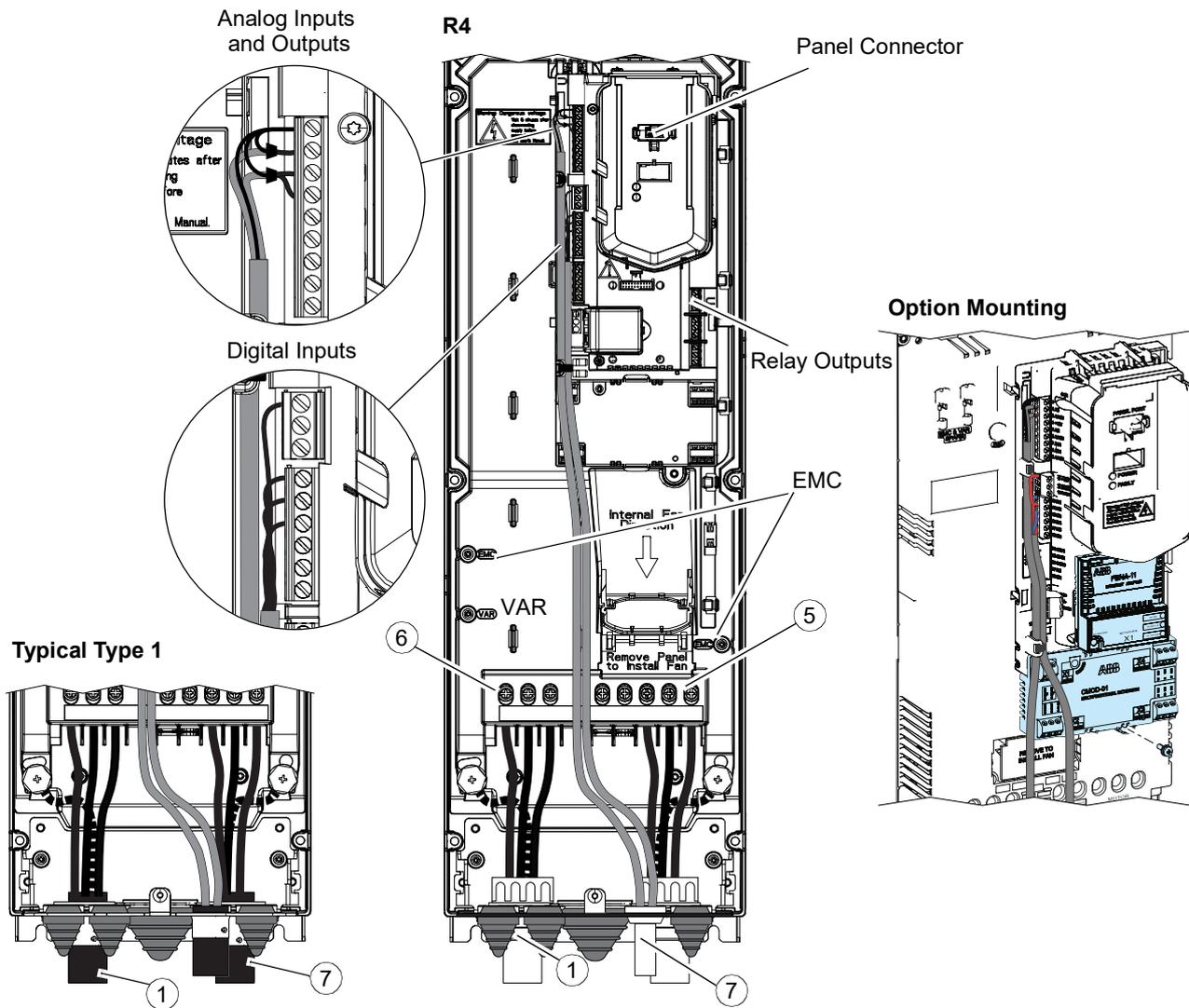
WARNING! If installing modules, obey the instructions in [Safety instructions](#) on page 2. If you ignore them, injury or death, or damage to the equipment can occur.

Option slot 2 in frames R1...R5 is at U_{DC} potential. You must disconnect power supplies before installing or removing an I/O extension module.

1. Install thin-wall conduit clamps for IP21/UL (NEMA) Type 1 or liquid-tight conduit connectors for IP55/UL (NEMA) Type 12 (not supplied). Type 12 has a Pressfit gasket.
2. Connect conduit runs for input power, motor and control cables to the conduit box. Ensure grommets (pointed down) are inserted into all unused holes.
3. Route the input power and motor wiring through separate conduits.
4. Strip wires.
5. Connect the motor and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
6. Connect the input power and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
7. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
8. Strip the control cable sheathing and twist the copper screen into a pig-tail.
9. Refer to pages [41](#), [42](#) and [43](#). Connect the ground screen pig-tail for digital and analog I/O cables. (Ground only at drive end.)
10. Connect the ground screen pig-tail for Embedded fieldbus, EFB (EIA-485) cables at X5. (Ground only at drive end.)
11. Strip and connect the individual control wires to the drive terminals. Tighten the screws to 0.4 lb-ft (0.5...0.6 Nm).



WARNING! To avoid danger or damage to the drive on IT systems and corner grounded TN systems, see section [Drive compatibility for various electrical power systems](#) on page 16.



Note: UDC+ and UDC- terminals are used for external brake chopper units.

Power wiring torque table

Frame size	R4	
	lb-ft	Nm
T1/U, T2/V, T3/W	3.0	4.0
L1, L2, L3	3.0	4.0
UDC+ and UDC-	3.0	4.0
PE Ground	2.1	2.9

Wiring R5

Note: These are instructions for conduit wiring. For cable wiring, see the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).

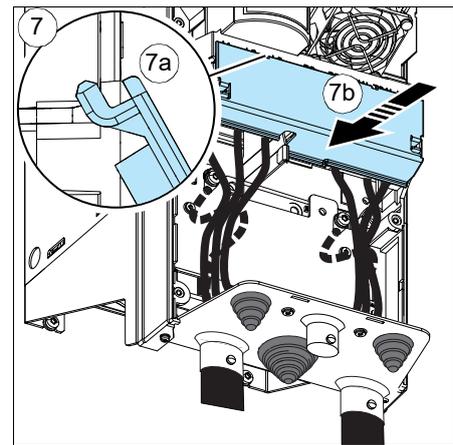
Note: In US deliveries, options are already installed at the factory. If installing on site, option slot 1 modules (fieldbus adapter) may be installed by mounting the module on the control board and tightening the mounting screw, which is also the grounding screw. Option slot 2 modules (I/O extension) may be installed by mounting the module on the control board and tightening both the mounting screw and the grounding screw. Refer to Warning.



WARNING! If installing modules, obey the instructions in [Safety instructions](#) on page 2. If you ignore them, injury or death, or damage to the equipment can occur.

Option slot 2 in frames R1...R5 is at U_{DC} potential. You must disconnect power supplies before installing or removing an I/O extension module.

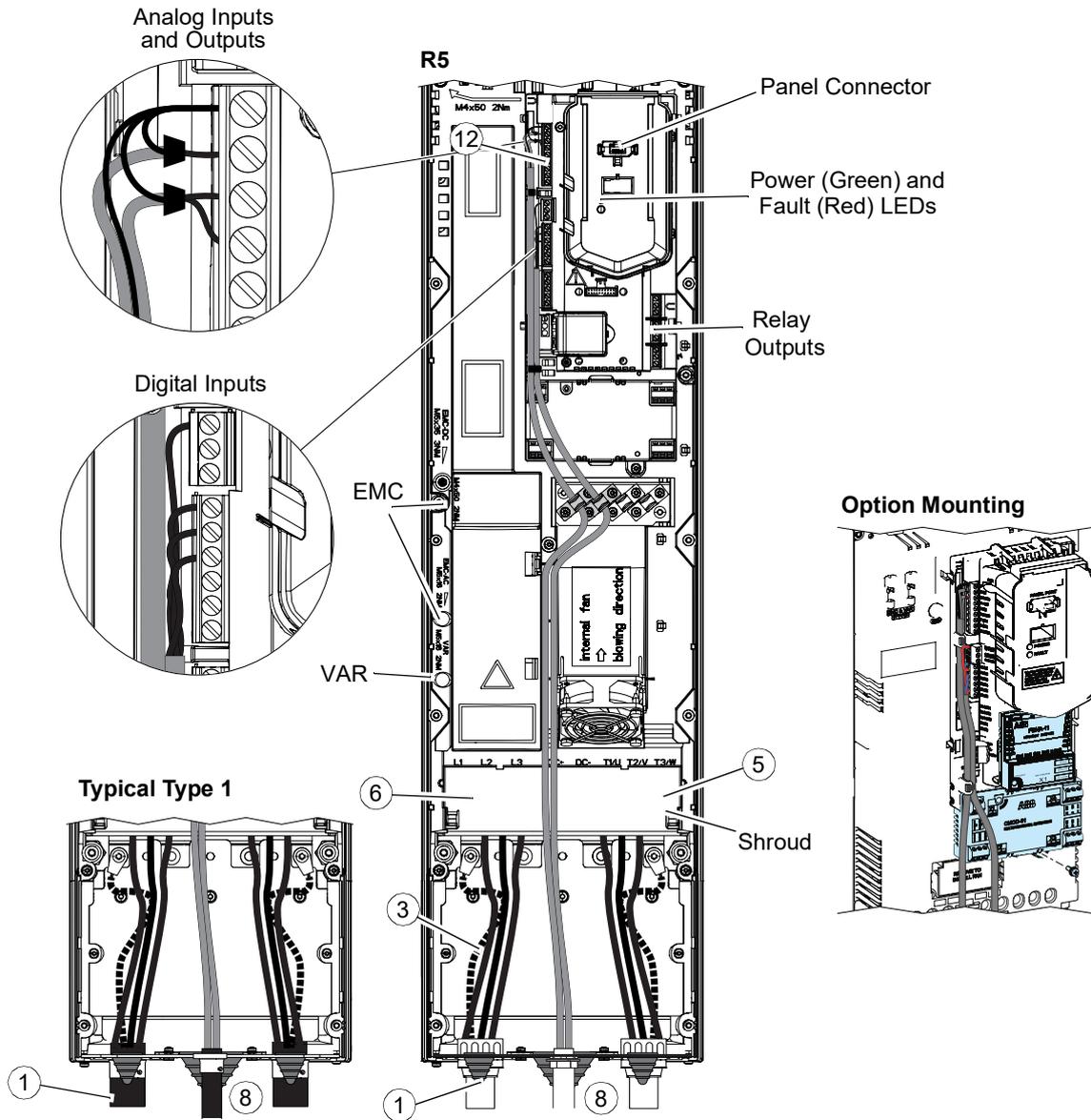
1. Install thin-wall conduit clamps for IP21/UL (NEMA) Type 1 or liquid-tight conduit connectors for IP55/UL (NEMA) Type 12 (not supplied). Type 12 has a Pressfit gasket.
2. Connect conduit runs for input power, motor and control cables to the conduit box. Ensure grommets (pointing down) are inserted into all unused holes.
3. Route the input power and motor wiring through separate conduits.
4. Strip wires.
5. Connect the motor and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
6. Connect the input power and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
7. Reinstall the shroud on the power terminals by putting the tabs at the top of the shroud in their counterparts on the drive frame and then pressing the shroud in place.
8. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
9. Strip the control cable sheathing and twist the copper screen into a pig-tail.
10. Refer to pages 41, 42 and 43. Connect the ground screen pig-tail for digital and analog I/O cables. (Ground only at drive end.)
11. Connect the ground screen pig-tail for Embedded fieldbus, EFB (EIA-485) cables at X5. (Ground only at drive end.)



12. Strip and connect the individual control wires to the drive terminals. Tighten the screws to 0.4 lb-ft (0.5...0.6 Nm).



WARNING! To avoid danger or damage to the drive on IT systems and corner grounded TN systems, see section [Drive compatibility for various electrical power systems](#) on page 16.



Note: UDC+ and UDC- terminals are used for external brake chopper units.

Power wiring torque table

Frame size	R5	
	lb-ft	Nm
T1/U, T2/V, T3/W	4.1	5.6

Frame size	R5	
	lb-ft	Nm
L1, L2, L3	4.1	5.6
UDC+ and UDC-	4.1	5.6
PE Ground	1.6	2.2

Wiring R6...R9

Note: These are instructions for conduit wiring. For cable wiring, see the [ACH580 Hardware manual](#), publication number [3AXD50000044839](#).

Note: In US deliveries, options are already installed at the factory. If installing on site, see the appropriate option module manual for specific installation and wiring.

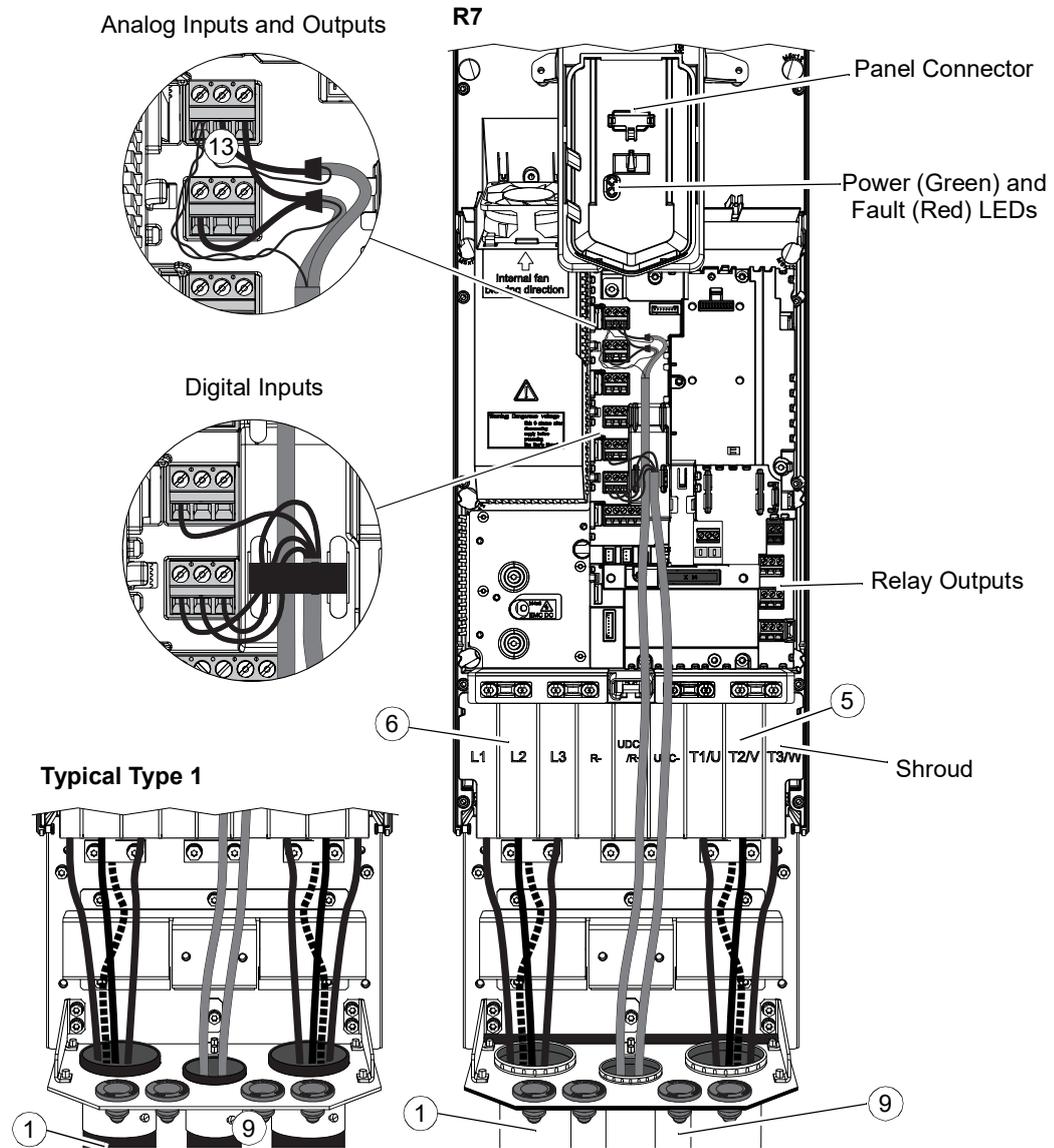
1. Install thin-wall conduit clamps for IP21/UL (NEMA) Type 1 or liquid-tight conduit connectors for IP55/UL (NEMA) Type 12 (not supplied). Type 12 has a Pressfit gasket.
 2. Connect conduit runs for input power, motor and control cables to the conduit box. Ensure grommets (pointing down) are inserted into all unused holes.
 3. Route the input power and motor wiring through separate conduits.
 4. Strip wires.
 5. Connect the motor and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
-

Note: *Frames R8...R9* — If you connect only one conductor to the connector, we recommend that you put it under the upper pressure plate.

6. Connect the input power and ground wires to the drive terminal. Tighten the screws to torques shown in the Power wiring torque table.
 7. *Frames R8...R9* — If parallel cables are used, install the parallel power cables.
 8. Reinstall the shroud on the power terminals and the conduit box side plates.
 9. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
 10. Strip the control cable sheathing and twist the copper screen into a pig-tail.
 11. Refer to pages [41](#), [42](#) and [43](#). Connect the ground screen pig-tail for digital and analog I/O cables. (Ground only at drive end.)
 12. Connect the ground screen pig-tail for Embedded fieldbus, EFB (EIA-485) cables at X5. (Ground only at drive end.)
 13. Strip and connect the individual control wires to the drive terminals. Tighten the screws to 0.4 lb-ft (0.5...0.6 Nm).
-



WARNING! To avoid danger or damage to the drive on IT systems and corner grounded TN systems, see section *Drive compatibility for various electrical power systems* on page 16.

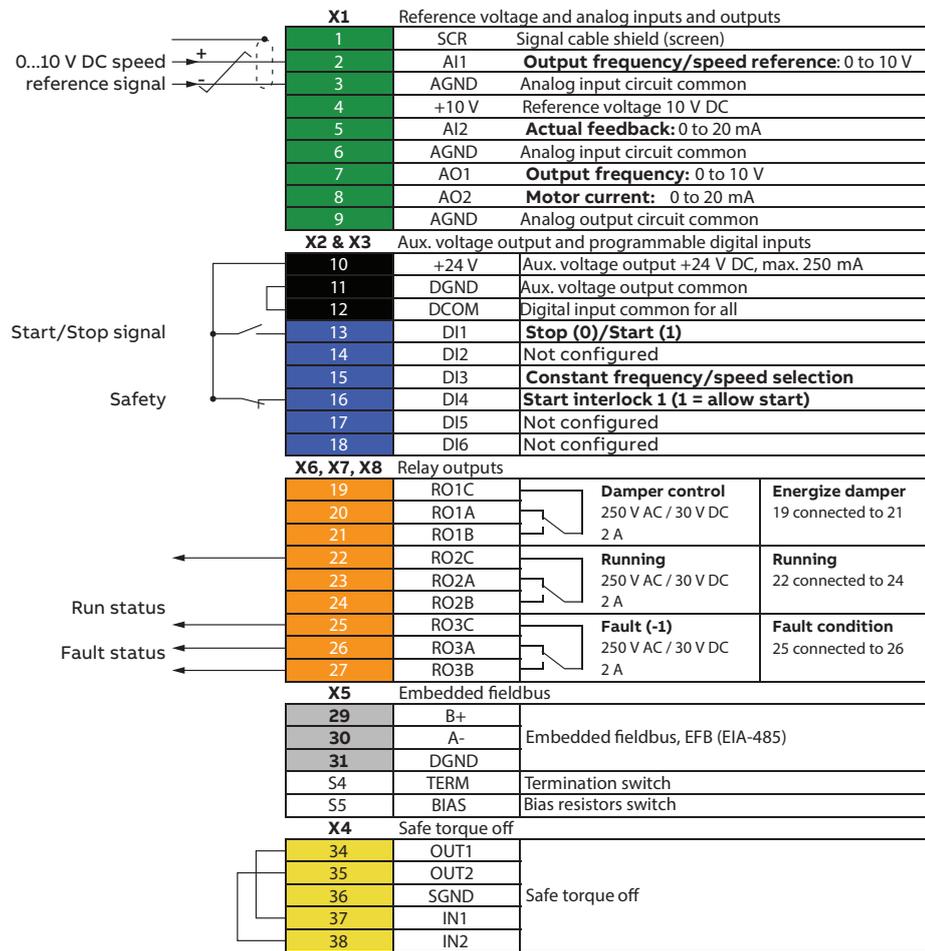


Note: UDC+ and UDC- terminals are used for external brake chopper units.

Power wiring torque table

Frame size	R6		R7		R8		R9	
	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm
T1/U, T2/V, T3/W	22.1	30	29.5	40	29.6	40	51.6	70
L1, L2, L3	22.1	30	29.5	40	29.6	40	51.6	70
UDC+ and UDC-	22.1	30	29.5	30	29.5	40	51.6	70
PE Ground	7.2	9.8	7.2	9.8	7.2	9.8	7.2	9.8

Default control connections for the HVAC default



Notes:

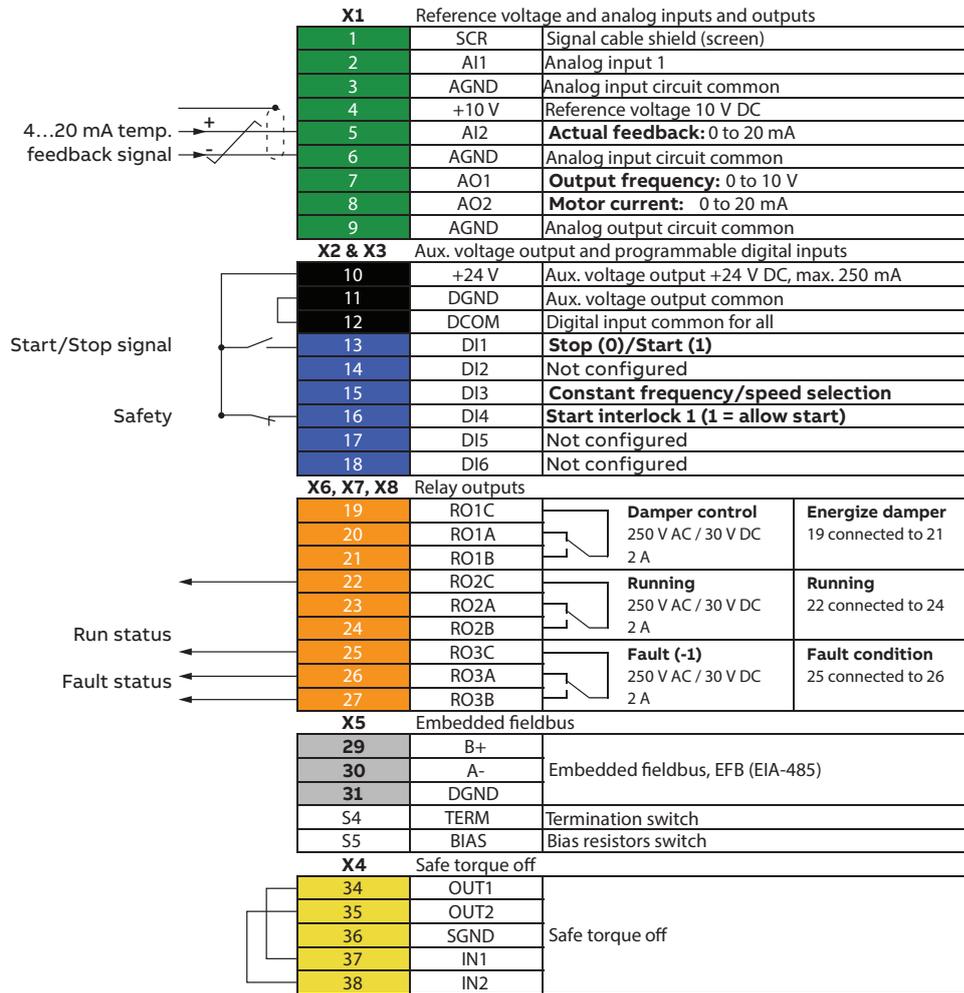
- 1) Ground the outer shield of the cable 360 degrees under the grounding clamp on the grounding shelf for the control cables.
- 2) Connected with jumpers at the factory.
- 3) Only frames R6...R11 have terminals 40 and 41 for external 24 V AC/DC input.

Terminal sizes:

1. R1...R5: 24...14 AWG (0.2...2.5 mm²): Terminals +24V, DGND, DCOM, B+, A-, DGND, Ext. 24V
2. 26...16 AWG (0.14...1.5 mm²): Terminals DI, AI, AO, AGND, RO, STO
3. R6...R9: 26...14 AWG (0.14...2.5 mm²) (all terminals)
4. Tightening torques: 0.4 lb-ft (0.5...0.6 Nm)

HVAC default direct I/O control	
Input Signals	Output signals
• Analog frequency/speed reference (AI1)	• Analog output AO1: Output frequency
• Start/stop selection (DI1)	• Analog output AO2: Motor current
• Constant speed/frequency selection (DI3)	• Relay output 1: Damper control
• Start interlock 1 (DI4)	• Relay output 2: Running
	• Relay output 3: Fault (-1)

Default control connections for the PID control, single motor



- 1) Connected with jumpers at the factory.
- 2) Only frames R6...R9 have terminals 40 and 41 for external 24 V AC/DC input.

Terminal sizes:

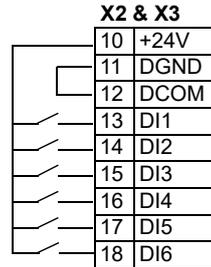
1. R1...R5: 24...14 AWG (0.2...2.5 mm²): Terminals +24V, DGND, DCOM, B+, A-, DGND, Ext. 24V
2. 26...16 AWG (0.14...1.5 mm²): Terminals DI, AI, AO, AGND, RO, STO
3. R6...R9: 26...14 AWG (0.14...2.5 mm²) (all terminals)
4. Tightening torques: 0.4 lb-ft (0.5...0.6 Nm)

PID control, single motor	
Input signals	Output signals
• Setpoint selected from: control panel setpoint/constant setpoint /analog input (AI1)	• Analog output AO1: Output frequency
• PID feedback (AI2)	• Analog output AO2: Motor current
• Start/stop selection (DI1)	• Relay output 1: Damper control
• Constant speed/frequency selection (DI3)	• Relay output 2: Running
• Start interlock 1 (DI4)	• Relay output 3: Fault (-1)

You can wire the digital input terminals for internal or external power supply in either a PNP or NPN configuration.

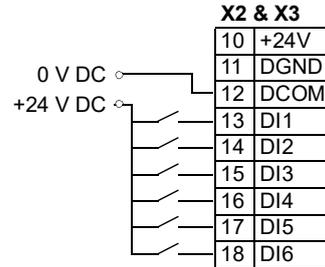
Internal +24 V power supply

PNP connection (source)



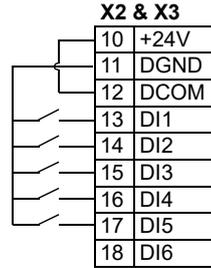
External +24 V power supply

PNP connection (source)



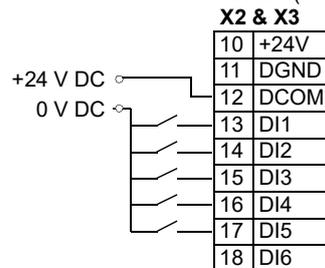
Internal +24 V power supply

NPN connection (sink)



External +24 V power supply

NPN connection (sink)



Note: DI6 is not supported in the NPN configuration.



WARNING! Do not connect the +24 V AC cable to the control board ground when the control board is powered using an external 24 V AC supply.

Communications

Terminals 29...31 provide Embedded fieldbus, EFB (EIA-485) connections used to control or monitor the drive from a fieldbus controller.

Switches

Switch	Description	Position	
S4 (TERM)	EFB link termination. Must be set to the terminated (ON) position when the drive is the first or last unit on the link.		Bus not terminated (default)
			Bus terminated
S5 (BIAS)	Switches on the biasing voltages to the bus. One (and only one) device, preferably at the end of the bus must have the bias on.		Bias off (default)
			Bias on

5. Check installation

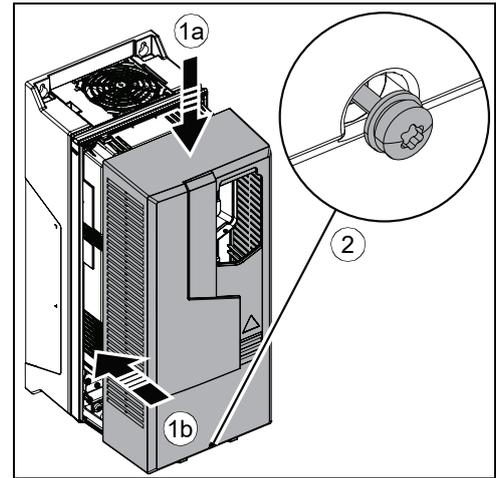
Before applying power, perform the following checks.

<input checked="" type="checkbox"/>	Check that ...
<input type="checkbox"/>	The ambient operating conditions meet the specification.
<input type="checkbox"/>	If the drive will be connected to a corner-grounded TN system: The internal EMC filter is disconnected. (No metal screws.)
<input type="checkbox"/>	If the drive will be connected to an IT (ungrounded) system: The internal EMC filter and the ground-to-phase varistor is disconnected. (No metal screws.)
<input type="checkbox"/>	If the drive has not been powered (either in storage or unused) over one year: The electrolytic DC capacitors in the DC link of the drive have been reformed.
<input type="checkbox"/>	There is an adequately sized protective earth (ground) conductor between the drive and the switchboard.
<input type="checkbox"/>	There is an adequately sized protective earth (ground) conductor between the motor and the drive.
<input type="checkbox"/>	All protective earth (ground) conductors have been connected to the appropriate terminals and the terminals have been tightened.
<input type="checkbox"/>	The supply voltage matches the nominal input voltage of the drive. Check the type designation label.
<input type="checkbox"/>	The input power cable has been connected to appropriate terminals, and the terminals have been properly tightened.
<input type="checkbox"/>	Appropriate supply fuses and disconnector have been installed.
<input type="checkbox"/>	The motor cable has been connected to appropriate terminals and the terminals have been tightened.
<input type="checkbox"/>	The brake resistor cable (if present) has been connected to appropriate terminals, and the terminals have been tightened.
<input type="checkbox"/>	The motor cable (and brake resistor cable, if present) have been properly wired through conduits.
<input type="checkbox"/>	The control cables (if any) have been connected to the control board.
<input type="checkbox"/>	There are no tools, foreign objects or dust from drilling inside the drive.
<input type="checkbox"/>	Drive and motor connection box covers are in place.
<input type="checkbox"/>	The motor and the driven equipment are ready for start-up.

6. Re-install cover(s)

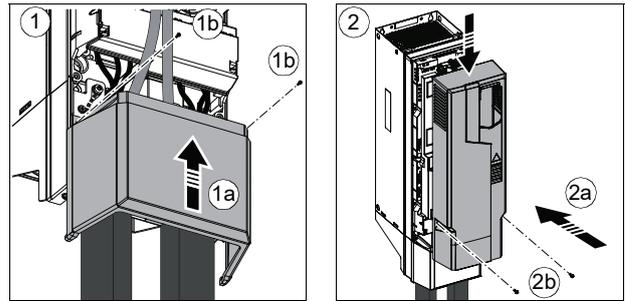
Frames R1...R4

1. Reinstall the cover: Put the tabs on the cover top in their counterparts on the housing (1a) and then press the cover (1b)
2. Tighten the retaining screw at the bottom with a screwdriver.



Frame R5 cover installations

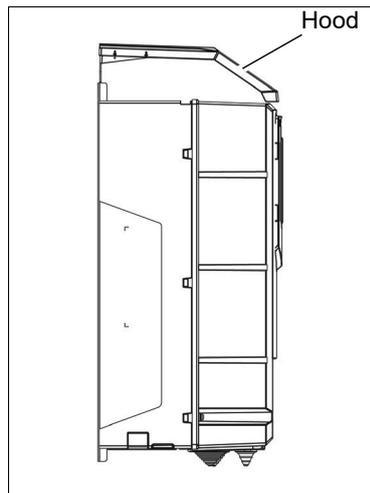
1. Slide the conduit box upwards (1a) and tighten the retaining screws (1b).
2. Install the cover, press it at the bottom (2a) and tighten the retaining screws (2b).



7. Install hood, if applicable

IP 55/UL (NEMA) Type 12, Frame R1...R9

Install the hood by following the instructions provided with the hood kit.



8. Before Start-up

Prepare for start-up by reviewing the following information. The First start assistant walks you through the initial start-up procedure.

Motor data

The motor data on the ratings plate may differ from the defaults in the ACH580. The drive provides more precise control and better thermal protection if you enter the rating plate data.

Before start-up, gather the following from the motor ratings plate:

- Nominal motor current
- Nominal speed
- Voltage
- Nominal frequency
- Nominal power

Default configurations

After initial start-up, you will need to complete the commissioning. This will determine how the drive is controlled, let you make use of default configurations, and allow you to change specific parameters. See [2. Complete commissioning on page 52](#).

The ACH580 can be controlled by two default configurations.

HVAC default direct I/O control – Used for typical I/O controlled BMS applications.

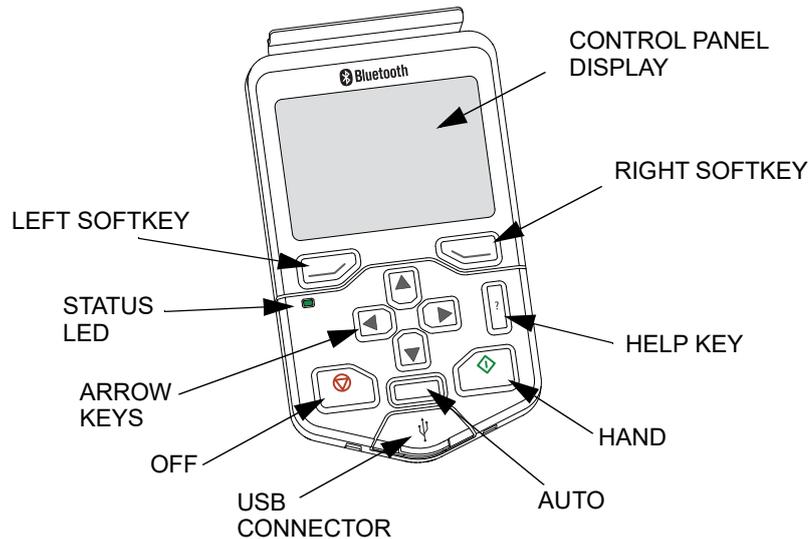
- In the Auto mode, this configuration uses a direct speed reference connected to analog input 1 (AI1).
- In the Hand/Off mode, the speed reference and start command are given through the control panel (operator keypad).
- See the [Default control connections for the HVAC default on page 41](#).

PID control, single motor – Offers quick setup of PID control for keeping flow or pressure constant, requiring feedback from the process given by a feedback signal connected to analog input 2 (AI2).

- You can set a constant setpoint, or, in the Auto mode, you can specify the setpoint to come from analog input 1 (AI1) or from the control panel.
- In the Hand/Off mode, the speed reference and start command come from the control panel.
- In the Hand mode, the speed reference is the direct speed reference and a PID setpoint value.
- See the [Default control connections for the PID control, single motor on page 42](#).

Operation

The ACH580 HVAC control panel features:



Control panel features

Left softkey

The left softkey (☐) is usually used for exiting and canceling. Its function in a given situation is shown by the softkey selection in the bottom left corner of the display.

Holding ☐ down exits each view in turn until you are back in the Home view. This function does not work in special screens.

Right softkey

The right softkey (☐) is usually used for selecting, accepting and confirming. The function of the right softkey in a given situation is shown by the softkey selection in the bottom right corner of the display.

The arrow keys

The up and down arrow keys (▲ and ▼) are used to highlight selections in menus and selection lists, to scroll up and down on text pages, and to adjust values when, for example, setting the time, entering a passcode or changing a parameter value.

The left and right arrow keys (◀ and ▶) are used to move the cursor left and right in parameter editing and to move forward and backward in assistants. In menus, ◀ and ▶ function the same way as ☐ and ☐, respectively.

Help

The help key (?) opens a help page. The help page is context-sensitive, in other words, the content of the page is relevant to the menu or view in question.

Hand, Off and Auto

The ACH580 can be in local or external control. The local control has two modes: Hand and Off.

Hand key ():

- In local control / Off mode: Starts the drive. The drive will switch to the Hand mode.
- In external control: Switches the drive to local control / Hand mode, keeping it running.

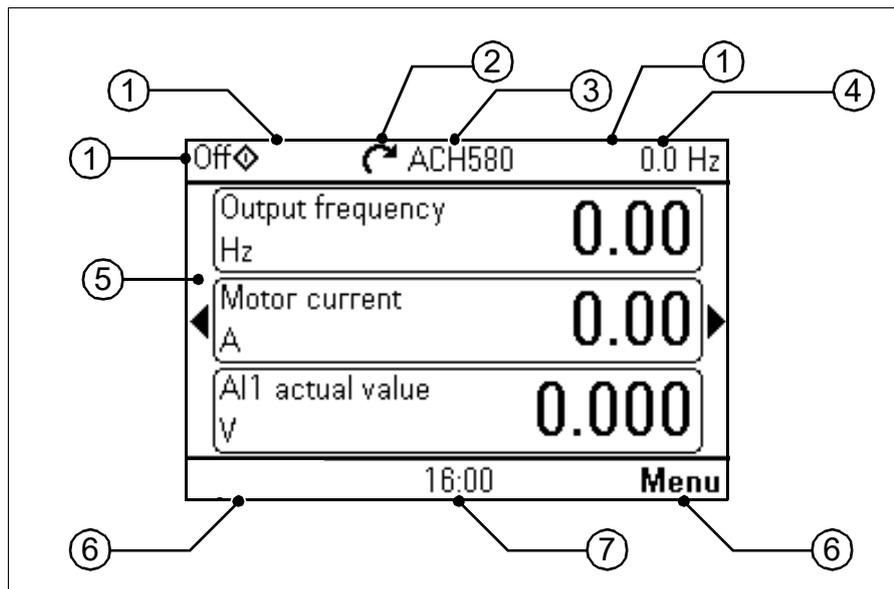
Off key ():

- Stops the drive and switches to the Off mode.

Auto key ():

- In local control: The drive will switch to external control.

Control panel display



1. Control location and related icons
2. Status icon
3. Drive name
4. Reference value
5. Content area
6. Softkey selections
7. Clock

Note: Complete programming information is available in the *ACH580 HVAC control program firmware manual*, publication number 3AXD50000027537.

For initial start-up, follow steps 1 through 4 below.



WARNING! Do not start up the drive unless you are a qualified electrical professional.

Read and obey the instructions in chapter Safety instructions at the beginning of the manual. Ignoring the instructions can cause physical injury or death, or damage to the equipment.



WARNING! Verify there is no active start command on drive terminal DI1 on power up, as this is default run command.

Check that the starting of the motor does not cause any danger.

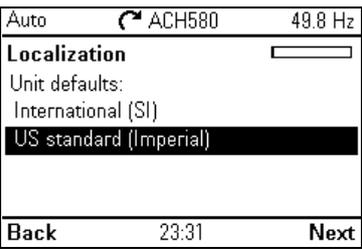
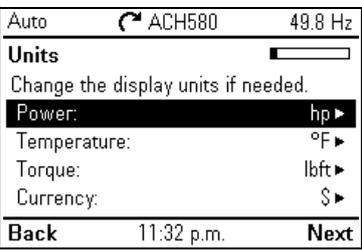
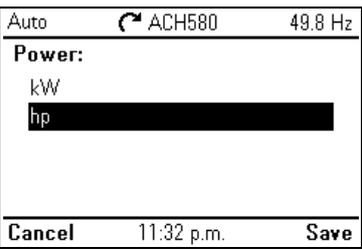
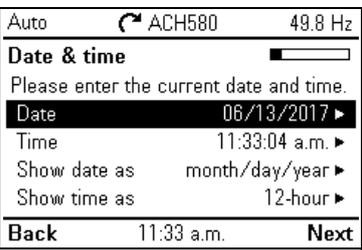
De-couple the driven machine if

- there is a risk of damage in case of an incorrect direction of rotation, or
- a **Normal** ID run is required during the drive start-up, when the load torque is higher than 20% or the machinery is not able to withstand the nominal torque transient during the ID run.

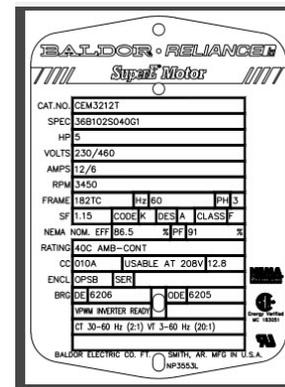
Note: For additional E-Clipse bypass primary settings information please go to page [113](#).

1. Make *First start assistant*-guided settings: Language, motor nominal values, and date and time

1	Have the motor name plate data at hand. Power up the drive.	
2	The First start assistant guides you through the first start-up. The assistant begins automatically. Wait until the control panel enters the view shown on the right. English is pre-loaded. To change the control panel, select the language you want to use by highlighting it and pressing (OK). Note: After you have selected the language, it takes a few minutes to download the language file to the control panel.	
3	Select Commission the ACH580 and press (Next).	

<p>4</p>	<p>Select the localization you want to use and press  (Next).</p>	
<p>5</p>	<p>Change the units shown on the panel if needed. Go to the edit view of a selected row by pressing . Scroll the view with  and . Go to the next view by pressing  (Next).</p>	
<p>6</p>	<p>To select a value in an edit view: Use  and  to select the value. Press  (Save) to accept the new setting, or press  (Cancel) to go back to the previous view without making changes.</p>	
<p>7</p>	<p>Set the date and time as well as date and time display formats. Go to the edit view of a selected row by pressing . Scroll the view with  and . Go to the next view by pressing  (Next).</p>	

Note: Enter the following values exactly as shown on the motor nameplate.



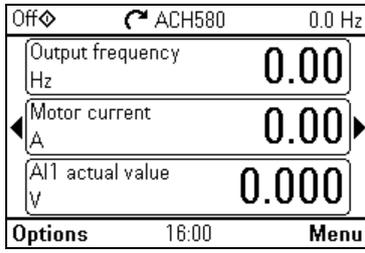
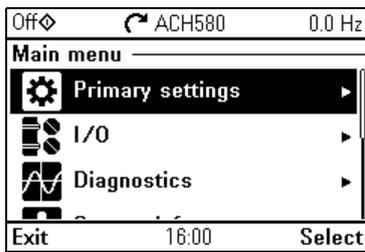
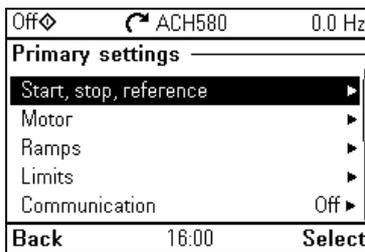
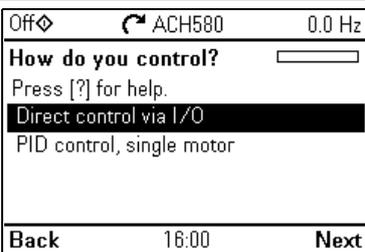
Example of a nameplate of an induction (asynchronous) motor.

<p>8</p>	<p>Check that the motor data is correct. Values are predefined on the basis of the drive size but you should verify that they correspond to the motor.</p> <p>Start with the motor type.</p> <p>Go to the edit view of a selected row by pressing .</p> <p>Scroll the view with and .</p> <p>Motor nominal cos Φ and nominal torque are optional.</p> <p>Press (Next) to continue.</p>	
<p>9</p>	<p>To change a value in an edit view:</p> <p>Use and to move the cursor left and right.</p> <p>Use and to change the value.</p> <p>Press (Save) to accept the new setting, or press (Cancel) to go back to the previous view without making changes.</p>	
<p>10</p>	<p>This step is optional, and requires rotating the motor. Do not do this if it could cause any risk, or if the mechanical setup does not allow it.</p> <p>To do the direction test, select Spin the motor and press (Next).</p>	
<p>11</p>	<p>Press the Hand key on the panel to start the drive.</p>	
<p>12</p>	<p>Check the direction of the motor.</p> <p>If it is forward, select Yes, motor is spinning forward and press (Next) to continue.</p> <p>If the direction is not forward, select No, fix direction and press (Next) to continue.</p>	
<p>13</p>	<p>The first start is now complete and the drive is ready for use.</p> <p>Press (Done) to enter the Home view.</p>	

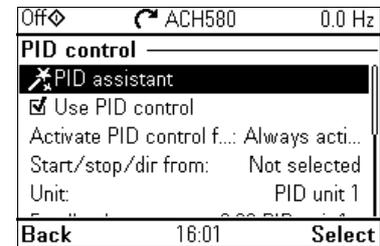
2. Complete commissioning

Default configurations — HVAC and PID Control

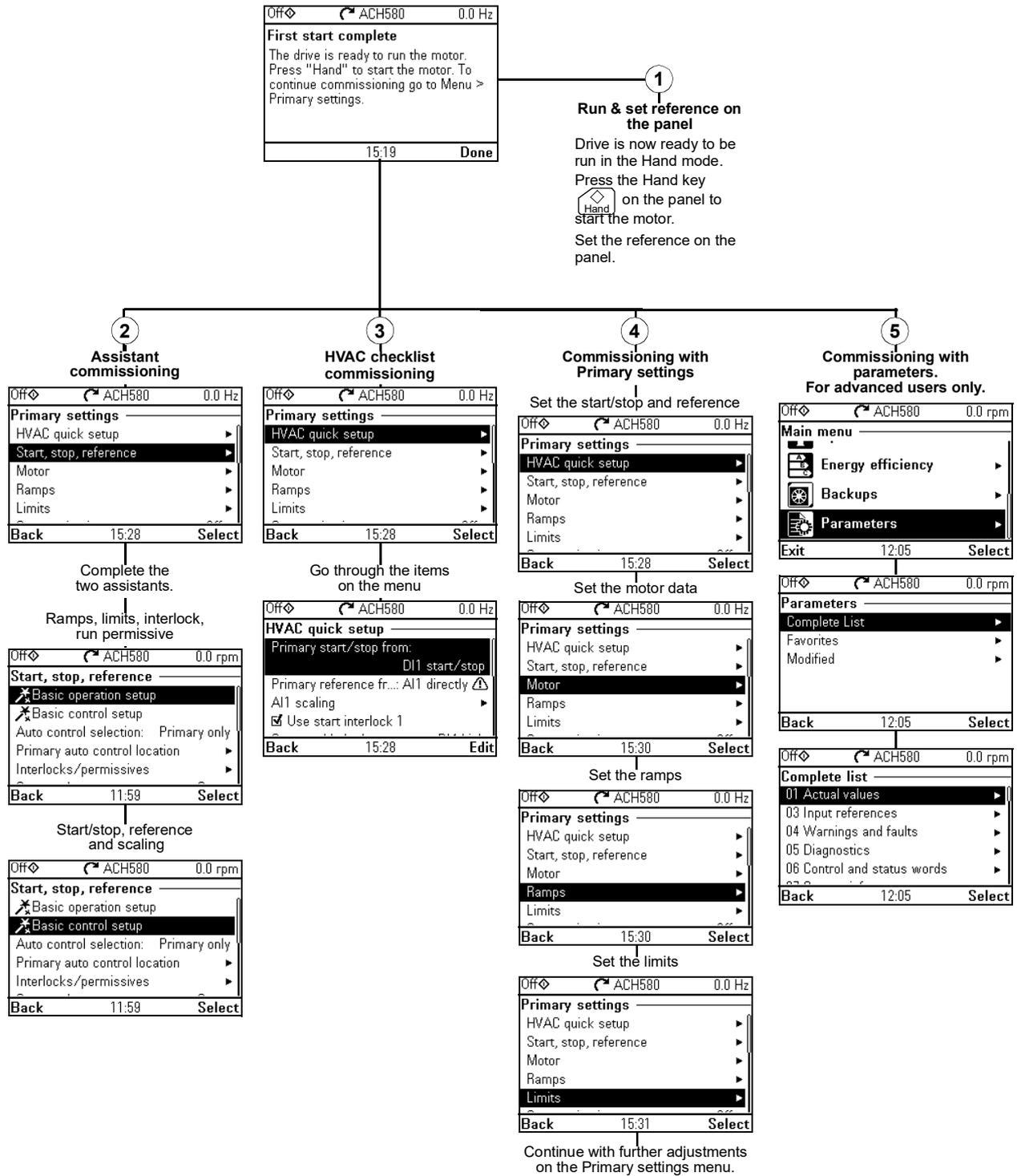
For more information on Default configurations, see pages 41, 42 and 46.

<p>1</p>	<p>Press the Hand key to start the motor. The Home view is shown on the panel. Select Menu (press on the soft key under "Menu").</p>	
<p>2</p>	<p>From the Main menu, select Primary settings.</p>	
<p>3</p>	<p>Select Start, stop, reference and How do you control?</p>	
<p>4</p>	<p>The default configurations are shown on the panel. For HVAC, press Direct control via I/O. For PID Control, press PID control, single motor.</p>	

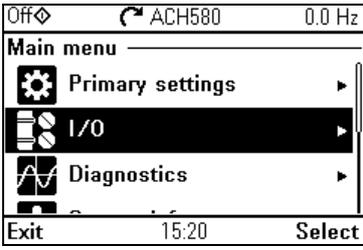
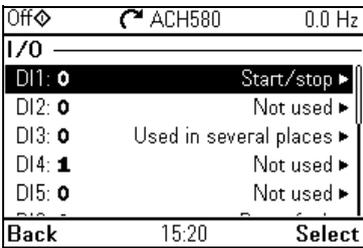
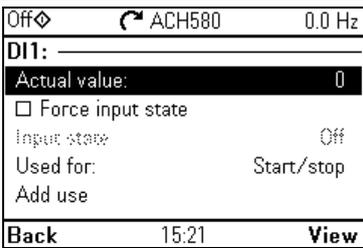
Note: You can adjust Process PI(D) in the PID control submenu of the Primary Settings menu after you have commissioned the drive to use PID control.



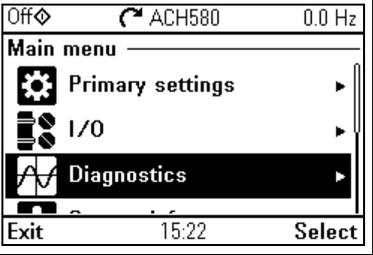
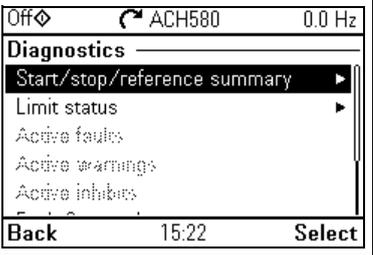
Other ways to complete commissioning



3. Make additional settings in the Primary settings menu – I/O menu

<p>1</p>	<p>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 a I/O and press  (Select) to enter the I/O menu.</p>	 <p>Off  ACH580 0.0 Hz Main menu Primary settings I/O Diagnostics Exit 15:20 Select</p>
<p>2</p>	<p>Select the connection you want to check and press  (Select) (or ).</p>	 <p>Off  ACH580 0.0 Hz I/O DI1: 0 Start/stop DI2: 0 Not used DI3: 0 Used in several places DI4: 1 Not used DI5: 0 Not used Back 15:20 Select</p>
<p>3</p>	<p>To view the details of a parameter that cannot be adjusted via the I/O menu, press  (View).</p>	 <p>Off  ACH580 0.0 Hz DI1: Actual value: 0 <input type="checkbox"/> Force input state Input state Off Used for: Start/stop Add use Back 15:21 View</p>
<p>4</p>	<p>To adjust the value of a parameter, press  (Edit), adjust the value using , ,  and  keys and press  (Save). Note that the actual wiring must match the new value. Go back to the Main menu by pressing  (Back) repeatedly.</p>	 <p>Off  ACH580 0.0 Hz DI1: Actual value: 0 <input type="checkbox"/> Force input state Input state Off Used for: Start/stop Add use Back 15:21 Edit Off  ACH580 0.0 Hz Used for: Not used DI1 start/stop DI1 start/stop, DI2 direction DI1 forward, DI2 reverse DI1P start, DI2 stop Cancel 15:21 Save</p>

4. Check setup with the Diagnostics menu

<p>1</p>	<p>After making the additional adjustments and checking the I/O connections, use the Diagnostics menu to make sure that the setup is functioning correctly.</p> <p>In the Main menu, select Diagnostics and press  (Select) (or ).</p>	 <p>The screenshot shows the 'Main menu' with three options: 'Primary settings', 'I/O', and 'Diagnostics'. The 'Diagnostics' option is highlighted with a black bar. At the bottom, there is an 'Exit' button, the time '15:22', and a 'Select' button.</p>
<p>2</p>	<p>Select the diagnostics item you want to view and press  (Select).</p> <p>Return to the Diagnostics menu by pressing  (Back).</p>	 <p>The screenshot shows the 'Diagnostics' menu with five options: 'Start/stop/reference summary', 'Limit status', 'Active faults', 'Active warnings', and 'Active inhibits'. The 'Start/stop/reference summary' option is highlighted with a black bar. At the bottom, there is a 'Back' button, the time '15:22', and a 'Select' button.</p>

How to control the drive through the I/O interface

Instructions below are for operating the drive through the digital and analog inputs when:

- the motor start-up is performed, and
- the default parameter settings of the HVAC default configurations are in use.

Preliminary settings

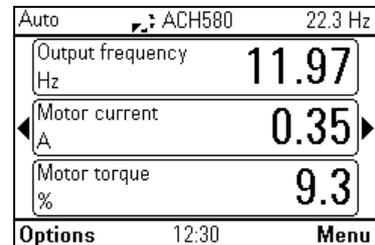
If you need to change the direction of rotation, check that limits allow reverse direction. Check parameter group *30 Limits* and make sure that the minimum limit has a negative value and the maximum limit has a positive value.

Note: Default settings only allow forward direction.

1. Make sure that the control connections are wired according to the connection diagram given for the HVAC default. See section [Default control connections for the HVAC default on page 41](#).
2. Make sure that the drive is in external control. To switch to external control, press key . In external control, the panel display shows text **Auto** at the top left.

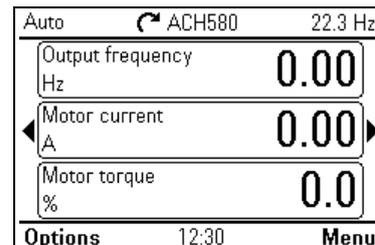
Starting and controlling the speed of the motor

1. Start by switching digital input DI1 on. The arrow starts rotating. It is dotted until the setpoint is reached.
2. Regulate the drive output frequency (motor speed) by adjusting voltage of analog input AI1.

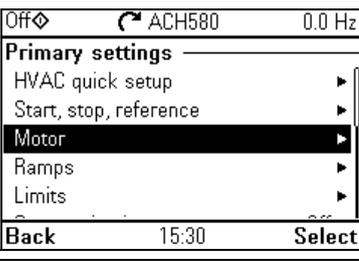
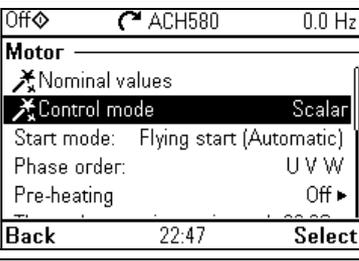
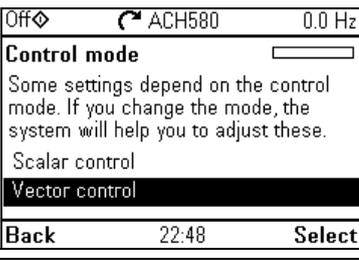
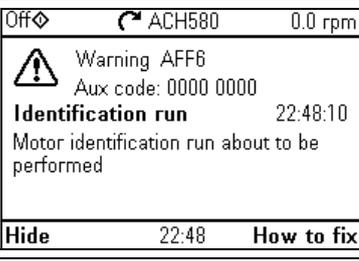
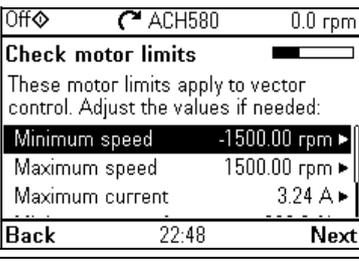
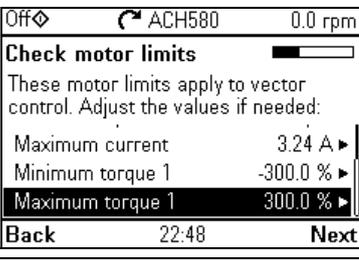


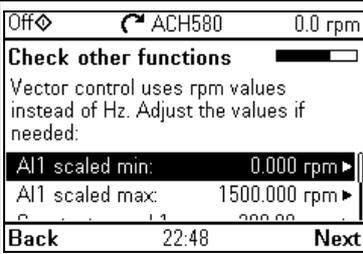
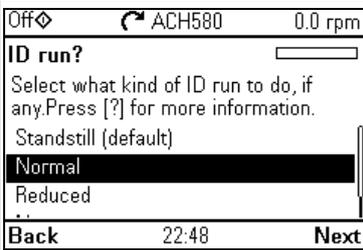
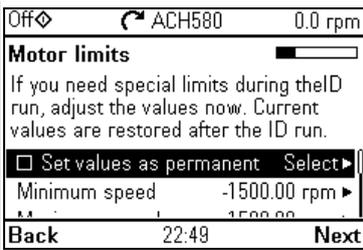
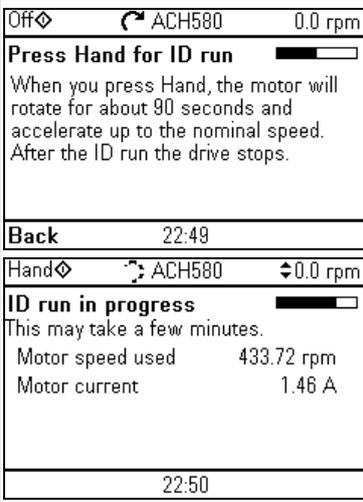
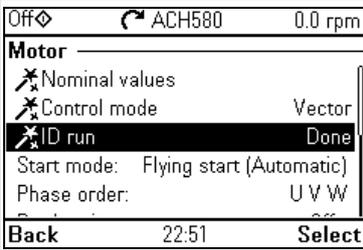
Stopping the motor

1. Switch digital input DI1 off. The arrow stops rotating.



1	<p>Go to the Main menu by pressing  (Menu) in the Home view.</p> <p>Select Primary settings and press  (Select) (or ).</p>	<table border="1"> <tr> <td>Off</td> <td>ACH580</td> <td>0.0 Hz</td> </tr> <tr> <td colspan="3">Main menu</td> </tr> <tr> <td></td> <td>Primary settings</td> <td>▶</td> </tr> <tr> <td></td> <td>I/O</td> <td>▶▶</td> </tr> <tr> <td></td> <td>Diagnostics</td> <td>▶</td> </tr> <tr> <td>Exit</td> <td>22:47</td> <td>Select</td> </tr> </table>	Off	ACH580	0.0 Hz	Main menu				Primary settings	▶		I/O	▶▶		Diagnostics	▶	Exit	22:47	Select
Off	ACH580	0.0 Hz																		
Main menu																				
	Primary settings	▶																		
	I/O	▶▶																		
	Diagnostics	▶																		
Exit	22:47	Select																		

<p>2</p>	<p>Select Motor and press  (Select) (or ).</p>	 <p>Off  ACH580 0.0 Hz</p> <p>Primary settings</p> <ul style="list-style-type: none"> HVAC quick setup Start, stop, reference Motor Ramps Limits <p>Back 15:30 Select</p>
<p>3</p>	<p>If the control modes is scalar, select Control mode and press  (Select) (or ) and continue to the next step.</p>	 <p>Off  ACH580 0.0 Hz</p> <p>Motor</p> <ul style="list-style-type: none"> Nominal values Control mode Scalar Start mode: Flying start (Automatic) Phase order: U V W Pre-heating Off <p>Back 22:47 Select</p>
<p>4</p>	<p>Select Vector control and press  (Select) (or )</p>	 <p>Off  ACH580 0.0 Hz</p> <p>Control mode</p> <p>Some settings depend on the control mode. If you change the mode, the system will help you to adjust these.</p> <ul style="list-style-type: none"> Scalar control Vector control <p>Back 22:48 Select</p>
<p>5</p>	<p>Warning message Identification run is shown for a moment.</p>	 <p>Off  ACH580 0.0 rpm</p> <p> Warning AFB6 Aux code: 0000 0000</p> <p>Identification run 22:48:10</p> <p>Motor identification run about to be performed</p> <p>Hide 22:48 How to fix</p>
<p>6</p>	<p>Check the motor speed limits. The following must be true: Minimum speed ≤ 0 rpm Maximum speed = motor rated speed.</p>	 <p>Off  ACH580 0.0 rpm</p> <p>Check motor limits</p> <p>These motor limits apply to vector control. Adjust the values if needed:</p> <ul style="list-style-type: none"> Minimum speed -1500.00 rpm Maximum speed 1500.00 rpm Maximum current 3.24 A <p>Back 22:48 Next</p>
<p>7</p>	<p>Check the motor current as well as torque limits. The following must be true: Maximum current $> I_{HD}$ Maximum torque $> 50\%$.</p>	 <p>Off  ACH580 0.0 rpm</p> <p>Check motor limits</p> <p>These motor limits apply to vector control. Adjust the values if needed:</p> <ul style="list-style-type: none"> Maximum current 3.24 A Minimum torque 1 -300.0 % Maximum torque 1 300.0 % <p>Back 22:48 Next</p>

<p>8</p>	<p>Check AI1 scaling, see parameters 12.19 AI1 scaled at AI1 min and 12.20 AI1 scaled at AI1 max.</p>	 <p>Off ACH580 0.0 rpm Check other functions Vector control uses rpm values instead of Hz. Adjust the values if needed: AI1 scaled min: 0.000 rpm AI1 scaled max: 1500.000 rpm Back 22:48 Next</p>
<p>9</p>	<p>Select the type of ID run you want to do and press (Select) (or )</p>	 <p>Off ACH580 0.0 rpm ID run? Select what kind of ID run to do, if any. Press [?] for more information. Standstill (default) Normal Reduced Back 22:48 Next</p>
<p>10</p>	<p>Check the motor limits shown on the panel. If you need other limits during the ID run you can enter them here. The originals limits will be restored after the ID run, unless you select Set values as permanent.</p>	 <p>Off ACH580 0.0 rpm Motor limits If you need special limits during the ID run, adjust the values now. Current values are restored after the ID run. <input type="checkbox"/> Set values as permanent Select Minimum speed -1500.00 rpm Back 22:48 Next</p>
<p>11</p>	<p>Press the Hand key () to start the ID run. In general, it is recommended not to press any control panel keys during the ID run. However, you can stop the ID run at any time by pressing the Off key () During the ID run a progress view is shown. After the ID run is completed, text ID run done is shown. The LED stops blinking. If the ID run fails, fault <i>FF61 ID run</i> is shown.</p>	 <p>Off ACH580 0.0 rpm Press Hand for ID run When you press Hand, the motor will rotate for about 90 seconds and accelerate up to the nominal speed. After the ID run the drive stops. Back 22:48 Hand ACH580 0.0 rpm ID run in progress This may take a few minutes. Motor speed used 433.72 rpm Motor current 1.46 A 22:50</p>
<p>12</p>	<p>After the ID run is completed, text Done is shown on row ID run.</p>	 <p>Off ACH580 0.0 rpm Motor Nominal values Control mode Vector ID run Done Start mode: Flying start (Automatic) Phase order: U V W Back 22:51 Select</p>

Diagnostics

Warning Messages

Note: The list also contains events that only appear in the Event log.

Code (hex)	Warning / Aux. code	Cause	What to do
64FF	Fault reset	A fault has been reset from the panel, Drive composer PC tool, fieldbus or I/O.	Event. Informative only.
A2B1	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this warning may also be caused by an earth fault or supply phase loss.	<p>Check motor load.</p> <p>Check acceleration times in parameter group <i>23 Speed reference ramp</i> (speed control) or <i>28 Frequency reference chain</i> (frequency control). Also check parameters <i>46.01 Speed scaling</i>, <i>46.02 Frequency scaling</i> and <i>46.03 Torque scaling</i>.</p> <p>Check motor and motor cable (including phasing and delta/star connection).</p> <p>Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See Checking the insulation of the assembly on page 16.</p> <p>Check there are no contactors opening and closing in motor cable.</p> <p>Check that the start-up data in parameter group <i>99 Motor data</i> corresponds to the motor rating plate.</p> <p>Check that there are no power factor correction capacitors or surge absorbers in motor cable.</p>
A2B3	Earth leakage	Drive has detected load unbalance typically due to earth fault in motor or motor cable.	<p>Check there are no power factor correction capacitors or surge absorbers in motor cable.</p> <p>Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See Checking the insulation of the assembly on page 16. If an earth fault is found, fix or change the motor cable and/or motor.</p> <p>If no earth fault can be detected, contact your local ABB representative.</p>

Code (hex)	Warning / Aux. code	Cause	What to do
A2B4	Short circuit	Short-circuit in motor cable(s) or motor.	<p>Check motor and motor cable for cabling errors.</p> <p>Check motor and motor cable (including phasing and delta/star connection).</p> <p>Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See Checking the insulation of the assembly on page 16.</p> <p>Check there are no power factor correction capacitors or surge absorbers in motor cable.</p>
A2BA	IGBT overload	Excessive IGBT junction to case temperature. This warning protects the IGBT(s) and can be activated by a short circuit in the motor cable.	<p>Check motor cable.</p> <p>Check ambient conditions.</p> <p>Check air flow and fan operation.</p> <p>Check heatsink fins for dust pick-up.</p> <p>Check motor power against drive power.</p>
A3A1	DC link overvoltage	Intermediate circuit DC voltage too high (when the drive is stopped).	<p>Check the supply voltage setting (parameter <i>95.01 Supply voltage</i>). Note that the wrong setting of the parameter may cause the motor to rush uncontrollably, or may overload the brake chopper or resistor.</p> <p>Check the supply voltage.</p> <p>If the problem persists, contact your local ABB representative.</p>
A3A2	DC link undervoltage	Intermediate circuit DC voltage too low (when the drive is stopped).	
A3AA	DC not charged	The voltage of the intermediate DC circuit has not yet risen to operating level.	
A490	Incorrect temperature sensor setup	Temperature cannot be supervised due to incorrect adapter setup.	Check the settings of temperature source parameters <i>35.11</i> and <i>35.21</i> .
A491	External temperature 1 (Editable message text)	Measured temperature 1 has exceeded warning limit.	<p>Check the value of parameter <i>35.02 Measured temperature 1</i>.</p> <p>Check the cooling of the motor (or other equipment whose temperature is being measured).</p> <p>Check the value of <i>35.13 Temperature 1 warning limit</i>.</p>
A492	External temperature 2 (Editable message text)	Measured temperature 2 has exceeded warning limit.	<p>Check the value of parameter <i>35.03 Measured temperature 2</i>.</p> <p>Check the cooling of the motor (or other equipment whose temperature is being measured).</p> <p>Check the value of <i>35.23 Temperature 2 warning limit</i>.</p>
A4A0	Control board temperature	Control board temperature is too high.	Check the auxiliary code. See actions for each code below.

Code (hex)	Warning / Aux. code	Cause	What to do
	(none)	Temperature above warning limit	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up.
	1	Thermistor broken	Contact an ABB service representative for control board replacement.
A4A1	IGBT overtemperature	Estimated drive IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
A4A9	Cooling	Drive module temperature is excessive.	Check ambient temperature. If it exceeds 40 °C/104 °F (IP21 frames R4...R9) or if it exceeds 50 °C /122 °F (IP21 frames R1...R9), ensure that load current does not exceed derated load capacity of drive. For all P55 frames, check the derating temperatures. See chapter <i>Technical data</i> , section <i>Derating</i> in the <i>Hardware manual</i> of the drive. Check drive module cooling air flow and fan operation. Check inside of cabinet and heatsink of drive module for dust pick-up. Clean whenever necessary.
A4B0	Excess temperature	Power unit module temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
A4B1	Excess temperature difference	High temperature difference between the IGBTs of different phases.	Check the motor cabling. Check cooling of drive module(s).
A4F6	IGBT temperature	Drive IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
A581	Fan	Cooling fan feedback missing.	Check the auxiliary code to identify the fan. Code 0 denotes main fan 1. Other codes (format XYZ): "X" specifies state code (1 : ID run, 2 : normal). "Y" = 0, "Z" specifies the index of the fan (1 : Main fan 1, 2 : Main fan 2, 3 : Main fan 3). Check fan operation and connection. Replace fan if faulty.

Code (hex)	Warning / Aux. code	Cause	What to do
A582	Auxiliary fan missing	An auxiliary cooling fan (IP55 internal fan) is stuck or disconnected.	Check the auxiliary code. Check the auxiliary fan and connection. Replace faulty fan. Make sure the front cover of the drive is in place and tightened. If the commissioning of the drive requires that the cover is off, this warning will be generated even if the corresponding fault is defeated. See fault 5081 Auxiliary fan broken on page 73 .
A5A0	Safe torque off Programmable warning: 31.22 STO indication run/ stop	Safe torque off function is active, ie safety circuit signal(s) connected to connector STO is lost.	Check safety circuit connections. For more information, chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and description of parameter 31.22 STO indication run/stop in the Firmware manual. Check the value of parameter 95.04 Control board supply.
A5EA	Measurement circuit temperature	Problem with internal temperature measurement of the drive.	Contact your local ABB representative.
A5EB	PU board powerfail	Power unit power supply failure.	Contact your local ABB representative.
A5ED	Measurement circuit ADC	Measurement circuit fault.	Contact your local ABB representative.
A5EE	Measurement circuit DFF	Measurement circuit fault.	Contact your local ABB representative.
A5EF	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
A5F0	Charging feedback	Charging feedback signal missing.	Check the feedback signal coming from the charging system.
A682	Flash erase speed exceeded	The flash memory (in the memory unit) has been erased too frequently, compromising the lifetime of the memory.	Avoid forcing unnecessary parameter saves by parameter 96.07 or cyclic parameter writes (such as user logger triggering through parameters). Check the auxiliary code (format XYYY YZZZ). "X" specifies the source of warning (1: generic flash erase supervision). "ZZZ" specifies the flash subsector number that generated the warning.
A6A4	Motor nominal value	The motor parameters are set incorrectly. The drive is not dimensioned correctly.	Check the auxiliary code. See actions for each code below.

Code (hex)	Warning / Aux. code	Cause	What to do
	0001	Slip frequency is too small.	Check the settings of the motor configuration parameters in groups 98 and 99. Check that the drive is sized correctly for the motor.
	0002	Synchronous and nominal speeds differ too much.	
	0003	Nominal speed is higher than synchronous speed with 1 pole pair.	
	0004	Nominal current is outside limits	
	0005	Nominal voltage is outside limits.	
	0006	Nominal power is higher than apparent power.	
	0007	Nominal power not consistent with nominal speed and torque.	
A6A5	No motor data	Parameters in group 99 have not been set.	Check that all the required parameters in group 99 have been set. Note: It is normal for this warning to appear during the start-up and continue until the motor data is entered.
A6A6	Voltage category unselected	The voltage category has not been defined.	Set voltage category in parameter <i>95.01 Supply voltage</i> .
A6A7	System time not set	System time is not set. Timed functions cannot be used and fault log dates are not correct.	Set the system time manually or connect the panel to the drive to synchronize the clock. If basic panel is used, synchronize the clock through the EFB or a fieldbus module. Set parameter <i>34.10 Timed functions enable</i> to <i>Not selected</i> to disable the timed functions if they are not used.
A6B0	User lock is open	The user lock is open, ie. user lock configuration parameters <i>96.100...96.102</i> are visible.	Close the user lock by entering an invalid pass code in parameter <i>96.02 Pass code</i> . See section <i>User lock</i> in the Firmware manual.
A6B1	User pass code not confirmed	A new user pass code has been entered in parameter <i>96.100</i> but not confirmed in <i>96.101</i> .	Confirm the new pass code by entering the same code in <i>96.101</i> . To cancel, close the user lock without confirming the new code. See section <i>User lock</i> in the Firmware manual
A6D1	FBA A parameter conflict	The drive does not have a functionality requested by a PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups <i>50 Fieldbus adapter (FBA)</i> .

Code (hex)	Warning / Aux. code	Cause	What to do
A6E5	AI parametrization	The current/voltage hardware setting of an analog input does not correspond to parameter settings.	Check the event log for an auxiliary code. The code identifies the analog input whose settings are in conflict. Adjust either the hardware setting (on the drive control unit) or parameter 12.15/12.25. Note: Control board reboot (either by cycling the power or through parameter 96.08 <i>Control board boot</i>) is required to validate any changes in the hardware settings.
A6E6	ULC configuration	User load curve configuration error.	Check the auxiliary code (format XXXX ZZZZ). "ZZZZ" indicates the problem (see actions for each code below).
	0000	Speed points inconsistent.	Check that each speed point (parameters 37.11...37.15) has a higher value than the previous point.
	0001	Frequency points inconsistent.	Check that each frequency point (37.20...37.16) has a higher value than the previous point.
	0002	Underload point above overload point.	Check that each overload point (37.31...37.35) has a higher value than the corresponding underload point (37.21...37.25).
	0003	Overload point below underload point.	
A780	Motor stall Programmable warning: 31.24 <i>Stall function</i>	Motor is operating in stall region because of e.g. excessive load or insufficient motor power.	Check motor load and drive ratings. Check fault function parameters.
A792	Brake resistor wiring	Brake resistor short circuit or brake chopper control fault. For drive frames R6 or larger.	Check brake chopper and brake resistor connection. Ensure brake resistor is not damaged.
A793	BR excess temperature	Brake resistor temperature has exceeded warning limit defined by parameter 43.12 <i>Brake resistor warning limit</i> .	Stop drive. Let resistor cool down. Check resistor overload protection function settings (parameter group 43 <i>Brake chopper</i>). Check warning limit setting, parameter 43.12 <i>Brake resistor warning limit</i> . Check that the resistor has been dimensioned correctly. Check that braking cycle meets allowed limits.
A794	BR data	Brake resistor data has not been given.	One or more of the resistor data settings (parameters 43.08...43.10) is incorrect. The parameter is specified by the auxiliary code.
	0000 0001	Resistance value too low.	Check value of 43.10.
	0000 0002	Thermal time constant not given.	Check value of 43.08.

Code (hex)	Warning / Aux. code	Cause	What to do
	0000 0003	Maximum continuous power not given.	Check value of 43.09.
A79C	BC IGBT excess temperature	Brake chopper IGBT temperature has exceeded internal warning limit.	Let chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet. Check resistor overload protection function settings (parameters 43.06...43.10). Check minimum allowed resistor value for the chopper being used. Check that braking cycle meets allowed limits. Check that drive supply AC voltage is not excessive.
A7AB	Extension I/O configuration failure	Installed CMOD module is not the same as configured.	Check that the installed module (shown by parameter 15.02 <i>Detected extension module</i>) is the same as selected by parameter 15.01 <i>Extension module type</i> .
A7C1	FBA A communication Programmable warning: 50.02 <i>FBA A comm loss func</i>	Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 50 <i>Fieldbus adapter (FBA)</i> , 51 <i>FBA A settings</i> , 52 <i>FBA A data in</i> and 53 <i>FBA A data out</i> . Check cable connections. Check if communication master is able to communicate.
A7CE	EFB comm loss Programmable warning: 58.14 <i>Communication loss action</i>	Communication break in embedded fieldbus (EFB) communication.	Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit.
A7EE	Panel loss Programmable warning: 49.05 <i>Communication loss action</i>	Control panel or PC tool selected as active control location for drive has ceased communicating.	Check PC tool or control panel connection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel.
A88F	Cooling fan	Maintenance timer limit exceeded.	Consider changing the cooling fan. Parameter 05.04 <i>Fan on-time counter</i> shows the running time of the cooling fan.

Code (hex)	Warning / Aux. code	Cause	What to do
A8A0	AI supervision Programmable warning: <i>12.03 AI supervision function</i>	An analog signal is outside the limits specified for the analog input.	Check signal level at the analog input. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group <i>12 Standard AI</i> .
A8A1	RO life warning	The relay has changed states more than the recommended number of times.	Change the control board or stop using the relay output.
	0001	Relay output 1	Change the control board or stop using relay output 1.
	0002	Relay output 2	Change the control board or stop using relay output 2.
	0003	Relay output 3	Change the control board or stop using relay output 3.
A8A2	RO toggle warning	The relay output is changing states faster than recommended, eg. if a fast changing frequency signal is connected to it. The relay lifetime will be exceeded shortly.	Replace the signal connected to the relay output source with a less frequently changing signal.
	0001	Relay output 1	Select a different signal with parameter <i>10.24 RO1 source</i> .
	0002	Relay output 2	Select a different signal with parameter <i>10.27 RO2 source</i> .
	0003	Relay output 3	Select a different signal with parameter <i>10.30 RO3 source</i> .
A8B0	ABB Signal supervision 1 (Editable message text) Programmable warning: <i>32.06 Supervision 1 action</i>	Warning generated by the signal supervision function 1.	Check the source of the warning (parameter <i>32.07 Supervision 1 signal</i>).
A8B1	ABB Signal supervision 2 (Editable message text) Programmable warning: <i>32.16 Supervision 2 action</i>	Warning generated by the signal supervision function 2.	Check the source of the warning (parameter <i>32.17 Supervision 2 signal</i>).
A8B2	ABB Signal supervision 3 (Editable message text) Programmable warning: <i>32.26 Supervision 3 action</i>	Warning generated by the signal supervision function 3.	Check the source of the warning (parameter <i>32.27 Supervision 3 signal</i>).
A8B3	ABB Signal supervision 4 (Editable message text) Programmable warning: <i>32.36 Supervision 4 action</i>	Warning generated by the signal supervision function 4.	Check the source of the warning (parameter <i>32.37 Supervision 4 signal</i>).
A8B4	ABB Signal supervision 5 (Editable message text) Programmable warning: <i>32.46 Supervision 5 action</i>	Warning generated by the signal supervision function 5.	Check the source of the warning (parameter <i>32.47 Supervision 5 signal</i>).

Code (hex)	Warning / Aux. code	Cause	What to do
A8B5	ABB Signal supervision 6 (Editable message text) Programmable warning: <i>32.56 Supervision 6 action</i>	Warning generated by the signal supervision function 6.	Check the source of the warning (parameter <i>32.57 Supervision 6 signal</i>).
A8BE	ULC overload warning Programmable fault: <i>37.03 ULC overload actions</i>	Selected signal has exceeded the user overload curve.	Check for any operating conditions increasing the monitored signal (for example, the loading of the motor if the torque or current is being monitored). Check the definition of the load curve (parameter group <i>37 User load curve</i>).
A8BF	ULC underload warning Programmable fault: <i>37.04 ULC underload actions</i>	Selected signal has fallen below the user underload curve.	Check for any operating conditions decreasing the monitored signal (for example, loss of load if the torque or current is being monitored). Check the definition of the load curve (parameter group <i>37 User load curve</i>).
A981	External warning 1 (Editable message text) Programmable warning: <i>31.01 External event 1 source</i> <i>31.02 External event 1 type</i>	Fault in external device 1.	Check the external device. Check setting of parameter <i>31.01 External event 1 source</i> .
A982	External warning 2 (Editable message text) Programmable warning: <i>31.03 External event 2 source</i> <i>31.04 External event 2 type</i>	Fault in external device 2.	Check the external device. Check setting of parameter <i>31.03 External event 2 source</i> .
A983	External warning 3 (Editable message text) Programmable warning: <i>31.05 External event 3 source</i> <i>31.06 External event 3 type</i>	Fault in external device 3.	Check the external device. Check setting of parameter <i>31.05 External event 3 source</i> .
A984	External warning 4 (Editable message text) Programmable warning: <i>31.07 External event 4 source</i> <i>31.08 External event 4 type</i>	Fault in external device 4.	Check the external device. Check setting of parameter <i>31.07 External event 4 source</i> .

Code (hex)	Warning / Aux. code	Cause	What to do
A985	External warning 5 (Editable message text) Programmable warning: <i>31.09 External event 5 source</i> <i>31.10 External event 5 type</i>	Fault in external device 5.	Check the external device. Check setting of parameter <i>31.09 External event 5 source</i> .
AF80	INU-LSU comm loss Programmable warning: <i>60.79 INU-LSU comm loss function</i>	DDCS (fiber optic) communication between converters (for example, the inverter unit and the supply unit) is lost. Note that the inverter unit will continue operating based on the status information that was last received from the other converter.	Check status of other converter (parameters <i>06.36</i> and <i>06.39</i>). Check settings of parameter group <i>60 DDCS communication</i> . Check the corresponding settings in the control program of the other converter. Check cable connections. If necessary, replace cables.
AF85	Line side unit warning	The supply unit (or other converter) has generated a warning.	The auxiliary code specifies the original warning code in the supply unit control program. See chapter <i>Fault tracing</i> in the ACH580 HVAC control program firmware manual , publication number 3AXD5000027537 .
AF88	Season configuration warning	You have configured a season which starts before the previous season.	Configure the seasons with increasing start dates, see parameters <i>34.60 Season 1 start date...34.63 Season 4 start date</i> .
AF8C	Process PID sleep mode	The drive is entering sleep mode.	Informative warning. See section <i>Sleep and boost functions for process PID control</i> , and parameters <i>40.43...40.48</i> in the Firmware manual
AFAA	Autoreset	A fault is about to be autoreset.	Informative warning. See the settings in parameter group <i>31 Fault functions</i> .
AFE1	Emergency stop (off2)	Drive has received an emergency stop (mode selection off2) command.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive.
AFE2	Emergency stop (off1 or off3)	Drive has received an emergency stop (mode selection off1 or off3) command.	If the emergency stop was unintentional, check the source selected by parameter <i>21.05 Emergency stop source</i> .
AFE9	Start delay	The start delay is active and the drive will start the motor after a predefined delay.	Informative warning. See parameter <i>21.22 Start delay</i> .
AFED	Run permissive	Run permissive is keeping the drive from running the motor.	Check the setting of (and source selected by) parameter <i>20.40 Run permissive</i> .
AFEE	Start interlock 1	Start interlock 1 is keeping the drive from starting.	Check the signal source selected for parameter <i>20.41 Start interlock 1</i> .

Code (hex)	Warning / Aux. code	Cause	What to do
AFEF	Start interlock 2	Start interlock 2 is keeping the drive from starting.	Check the signal source selected for parameter 20.42 <i>Start interlock 2</i> .
AFF0	Start interlock 3	Start interlock 3 is keeping the drive from starting.	Check the signal source selected for parameter 20.43 <i>Start interlock 3</i> .
AFF1	Start interlock 4	Start interlock 4 is keeping the drive from starting.	Check the signal source selected for parameter 20.44 <i>Start interlock 4</i> .
AFF5	Override new start required	The Safe torque off function was active and has been reset while in Override.	A new start signal is required to start the drive again.
AFF6	Identification run	Motor ID run will occur at next start.	Informative warning.
AFF8	Motor heating active	Pre-heating is being performed	Informative warning. Motor pre-heating is active. Current specified by parameter 21.16 <i>Pre-heating current</i> is being passed through the motor.
AFFE	Override active	Drive is in override mode.	Informative warning.
B5A0	STO event Programmable event: 31.22 <i>STO indication run/stop</i>	Safe torque off function is active, ie. safety circuit signal(s) connected to connector STO is lost.	Informative warning. Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and parameter 31.22 <i>STO indication run/stop</i> .
D501	No more available PFC motors	No more PFC motors can be started because they can be interlocked or in the Hand mode.	Check that there are no interlocked PFC motors, see parameters: 76.81...76.84. If all motors are in use, the PFC system is not adequately dimensioned to handle the demand.
D502	All motors interlocked	All the motors in the PFC system are interlocked.	Check that there are no interlocked PFC motors, see parameters 76.81...76.84.
D503	VSD controlled PFC motor interlocked	The motor connected to the drive is interlocked (unavailable).	Motor connected to the drive is interlocked and thus cannot be started. Remove the corresponding interlock to start the drive controlled PFC motor. See parameters 76.81...76.84.

Fault messages

Code (hex)	Fault / Aux. code	Cause	What to do
1080	Backup/Restore timeout	Panel or PC tool has failed to communicate with the drive when backup was being made or restored.	Request backup or restore again.
1081	Rating ID fault	Drive software has not been able to read the rating ID of the drive.	Reset the fault to make the drive try to reread the rating ID. If the fault reappears, cycle the power to the drive. You may have to be repeat this. If the fault persists, contact your local ABB representative.
2310	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this fault may also be caused by an earth fault or supply phase loss.	Check motor load. Check acceleration times in parameter group 23 <i>Speed reference ramp</i> (speed control) or 28 <i>Frequency reference chain</i> (frequency control). Also check parameters 46.01 <i>Speed scaling</i> , 46.02 <i>Frequency scaling</i> and 46.03 <i>Torque scaling</i> . Check motor and motor cable (including phasing and delta/star connection). Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See Checking the insulation of the assembly on page 16 .
2330	Earth leakage Programmable fault: 31.20 <i>Earth fault</i>	Drive has detected load unbalance typically due to earth fault in motor or motor cable.	Check there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. Try running the motor in scalar control mode if allowed. (See parameter 99.04 <i>Motor control mode</i> .) If no earth fault can be detected, contact your local ABB representative.

Code (hex)	Fault / Aux. code	Cause	What to do
2340	Short circuit	Short-circuit in motor cable(s) or motor	Check motor and motor cable for cabling errors. Check there are no power factor correction capacitors or surge absorbers in motor cable. Cycle the power to the drive.
2381	IGBT overload	Excessive IGBT junction to case temperature. This fault protects the IGBT(s) and can be activated by a short circuit in the motor cable.	Check motor cable. Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
3130	Input phase loss Programmable fault: 31.21 <i>Supply phase loss</i>	Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse.	Check input power line fuses. Check for loose power cable connections. Check for input power supply imbalance.
3181	Wiring or earth fault Programmable fault: 31.23 <i>Wiring or earth fault</i>	Incorrect input power and motor cable connection (ie. input power cable is connected to drive motor connection).	Check input power connections.
3210	DC link overvoltage	Excessive intermediate circuit DC voltage.	Check that overvoltage control is on (parameter 30.30 <i>Overvoltage control</i>). Check that the supply voltage matches the nominal input voltage of the drive. Check the supply line for static or transient overvoltage. Check brake chopper and resistor (if present). Check deceleration time. Use coast-to-stop function (if applicable). Retrofit drive with brake chopper and brake resistor. Check that the brake resistor is dimensioned properly and the resistance is between acceptable range for the drive.
3220	DC link undervoltage	Intermediate circuit DC voltage is not sufficient because of a missing supply phase, blown fuse or fault in the rectifier bridge.	Check supply cabling, fuses and switchgear.
3381	Output phase loss Programmable fault: 31.19 <i>Motor phase loss</i>	Motor circuit fault due to missing motor connection (all three phases are not connected).	Connect motor cable.

Code (hex)	Fault / Aux. code	Cause	What to do
4110	Control board temperature	Control board temperature is too high.	Check proper cooling of the drive. Check the auxiliary cooling fan.
4210	IGBT overtemperature	Estimated drive IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
4290	Cooling	Drive module temperature is excessive.	Check ambient temperature. If it exceeds 40 °C/104 °F (IP21 frames R4...R9) or if it exceeds 50 °C /122 °F (IP21 frames R1...R9), ensure that load current does not exceed derated load capacity of drive. For all P55 frames, check the derating temperatures. See chapter <i>Technical data</i> , section <i>Derating</i> in the <i>Hardware manual</i> of the drive. Check drive module cooling air flow and fan operation. Check inside of cabinet and heatsink of drive module for dust pick-up. Clean whenever necessary.
42F1	IGBT temperature	Drive IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
4310	Excess temperature	Power unit module temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power.
4380	Excess temperature difference	High temperature difference between the IGBTs of different phases.	Check the motor cabling. Check cooling of drive module(s).
4981	External temperature 1 (Editable message text)	Measured temperature 1 has exceeded fault limit.	Check the value of parameter 35.02 <i>Measured temperature 1</i> . Check the cooling of the motor (or other equipment whose temperature is being measured).
4982	External temperature 2 (Editable message text)	Measured temperature 2 has exceeded fault limit.	Check the value of parameter 35.03 <i>Measured temperature 2</i> . Check the cooling of the motor (or other equipment whose temperature is being measured).
5080	Fan	Cooling fan feedback missing.	See A581 Fan (page 61).

Code (hex)	Fault / Aux. code	Cause	What to do
5081	Auxiliary fan broken	An auxiliary cooling fan (connected to the fan connectors on the control unit) is stuck or disconnected.	Check the auxiliary code. Check auxiliary fan(s) and connection(s). Replace fan if faulty. Make sure the front cover of the drive is in place and tightened. If the commissioning of the drive requires th the cover is off, activate parameter 31.36 <i>Aux fan fault bypass</i> within 2 min from control unit reboot to temporarily suppress the fault. Reboot the control unit (using parameter 96.08 <i>Control board boot</i>) or by cycling power.
	0001	Auxiliary fan 1 broken.	
	0002	Auxiliary fan 2 broken.	
5090	STO hardware failure	STO hardware diagnostics has detected hardware failure.	Contact your local ABB representative for hardware replacement.
5091	Safe torque off Programmable fault: 31.22 <i>STO indication run/stop</i>	Safe torque off function is active, ie. safety circuit signal(s) connected to connector STO is broken during start or run.	Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and parameter 31.22 <i>STO indication run/stop</i> . Check the value of parameter 95.04 <i>Control board supply</i> .
5092	PU logic error	Power unit memory has cleared.	Contact your local ABB representative.
5093	Rating ID mismatch	The hardware of the drive does not match the information stored in the memory. This may occur eg. after a firmware update.	Cycle the power to the drive. You may have to be repeat this.
5094	Measurement circuit temperature	Problem with internal temperature measurement of the drive.	Contact your local ABB representative.
5098	I/O communication loss	Internal standard I/O communication failure.	Try resetting the fault or reboot the drive.
50A0	Fan	Cooling fan stuck or disconnected.	Check fan operation and connection. Replace fan if faulty.
5682	Power unit lost	Connection between the drive control unit and the power unit is lost.	Check the connection between the control unit and the power unit.
5691	Measurement circuit ADC	Measurement circuit fault.	Contact your local ABB representative.
5692	PU board powerfail	Power unit power supply failure.	Contact your local ABB representative.

Code (hex)	Fault / Aux. code	Cause	What to do
5693	Measurement circuit DFF	Measurement circuit fault.	Contact your local ABB representative.
5696	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
5697	Charging feedback	Charging feedback signal missing.	Check the feedback signal coming from the charging system
5698	Unknown PU fault	The power unit logic has generated a fault which is not known by the software.	Check the logic and software compatibility.
6181	FPGA version incompatible	Firmware and FPGA versions are incompatible.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative.
6306	FBA A mapping file	Fieldbus adapter A mapping file read error.	Contact your local ABB representative.
6481	Task overload	Internal fault.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative.
6487	Stack overflow	Internal fault.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative.
64A1	Internal file load	File read error.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative
64A4	Rating ID fault	Rating ID load error.	Contact your local ABB representative.
64A6	Adaptive program	Error running the adaptive program.	Check the auxiliary code (format <i>XXYY ZZZZ</i>). "XX" specifies the number of the state (00=base program) and "YY" specifies the number of the function block (0000=generic error). "ZZZZ" indicates the problem.
	000A	Program corrupted or block non-existent	Restore the template program or download the program to the drive.
	000C	Required block input missing	Check the inputs of the block.
	000E	Program corrupted or block non-existent	Restore the template program or download the program to the drive.
	0011	Program too large.	Remove blocks until the error stops.
	0012	Program is empty.	Correct the program and download it to the drive.

Code (hex)	Fault / Aux. code	Cause	What to do
	001C	A non-existing parameter or block is used in the program.	Edit the program to correct the parameter reference, or to use an existing block.
	001D	Parameter type invalid for selected pin.	Edit the program to correct the parameter reference.
	001E	Output to parameter failed because the parameter was write-protected.	Check the parameter reference in the program. Check for other sources affecting the target parameter.
	0023	Program file incompatible with current firmware version.	Adapt the program to current block library and firmware version.
	0024		
	Other	–	Contact your local ABB representative, quoting the auxiliary code.
64B1	Internal SSW fault	Internal fault.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative.
64B2	User set fault	Loading of user parameter set failed because <ul style="list-style-type: none"> • requested set does not exist • set is not compatible with control program • drive was switched off during loading. 	Ensure that a valid user parameter set exists. Reload if uncertain.
64E1	Kernel overload	Operating system error.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power. If the problem persists, contact your local ABB representative.
64B1	Fault reset	A fault has been reset. The cause of the fault no longer exists and the fault reset has been requested and completed.	Informative fault.
6581	Parameter system	Parameter load or save failed.	Try forcing a save using parameter <i>96.07 Parameter save manually</i> . Retry.
6591	Backup/Restore timeout	During backup creating or restoring operation a panel or PC-tool has failed to communicate with the drive as part this operation.	Check panel or PC-tool communication and if it is still in backup or restore state.

Code (hex)	Fault / Aux. code	Cause	What to do
65A1	FBA A parameter conflict	The drive does not have a functionality requested by PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups <i>50 Fieldbus adapter (FBA)</i> and <i>51 FBA A settings</i> .
6681	EFB comm loss Programmable fault: <i>58.14 Communication loss action</i>	Communication break in embedded fieldbus (EFB) communication.	Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit.
6682	EFB config file	Embedded fieldbus (EFB) configuration file could not be read.	Contact your local ABB representative.
6683	EFB invalid parameterization	Embedded fieldbus (EFB) parameter settings inconsistent or not compatible with selected protocol.	Check the settings in parameter group <i>58 Embedded fieldbus</i> .
6684	EFB load fault	Embedded fieldbus (EFB) protocol firmware could not be loaded.	Contact your local ABB representative.
		Version mismatch between EFB protocol firmware and drive firmware.	
6685	EFB fault 2	Fault reserved for the EFB protocol application.	Check the documentation of the protocol.
6686	EFB fault 3	Fault reserved for the EFB protocol application.	Check the documentation of the protocol.
6882	Text 32-bit table overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
6885	Text file overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
7081	Control panel loss Programmable fault: <i>49.05 Communication loss action</i>	Control panel or PC tool selected as active control location for drive has ceased communicating.	Check PC tool or control panel connection. Check control panel connector. Disconnect and reconnect the control panel.
7085	Incompatible option module	Fieldbus option module not supported.	Replace the module with a supported type.
7100	Excitation current	Excitation current feedback low or missing	
7121	Motor stall Programmable fault: <i>31.24 Stall function</i>	Motor is operating in stall region because of e.g. excessive load or insufficient motor power.	Check motor load and drive ratings. Check fault function parameters.

Code (hex)	Fault / Aux. code	Cause	What to do
7181	Brake resistor	Brake resistor broken or not connected.	Check that a brake resistor has been connected. Check the condition of the brake resistor. Check the dimensioning of the brake resistor.
7183	BR excess temperature	Brake resistor temperature has exceeded fault limit defined by parameter <i>43.11 Brake resistor fault limit</i> .	Stop drive. Let resistor cool down. Check resistor overload protection function settings (parameter group <i>43 Brake chopper</i>). Check fault limit setting, parameter <i>43.11 Brake resistor fault limit</i> . Check that braking cycle meets allowed limits.
7184	Brake resistor wiring	Brake resistor short circuit or brake chopper control fault.	Check brake chopper and brake resistor connection. Ensure brake resistor is not damaged.
7191	BC short circuit	Short circuit in brake chopper IGBT.	Ensure brake resistor is connected and not damaged. Check the electrical specifications of the brake resistor against chapter <i>Resistor braking in the Hardware manual</i> of the drive. Replace brake chopper (if replaceable).
7192	BC IGBT excess temperature	Brake chopper IGBT temperature has exceeded internal fault limit.	Let chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check resistor overload protection function settings (parameter group <i>43 Brake chopper</i>). Check that braking cycle meets allowed limits. Check that drive supply AC voltage is not excessive.
7310	Overspeed	Motor is turning faster than highest allowed speed due to incorrectly set minimum/maximum speed, insufficient braking torque or changes in load when using torque reference.	Check minimum/maximum speed settings, parameters <i>30.11 Minimum speed</i> and <i>30.12 Maximum speed</i> . Check adequacy of motor braking torque. Check applicability of torque control. Check need for brake chopper and resistor(s).
73F0	Overfrequency	Maximum allowed output frequency exceeded.	Contact your local ABB representative.

Code (hex)	Fault / Aux. code	Cause	What to do
73B0	Emergency ramp failed	Emergency stop did not finish within expected time.	Check the settings of parameters <i>31.32 Emergency ramp supervision</i> and <i>31.33 Emergency ramp supervision delay</i> . Check the predefined ramp times (<i>23.11...23.15</i> for mode Off1, <i>23.23</i> for mode Off3).
7510	FBA A communication Programmable fault: <i>50.02 FBA A comm loss func</i>	Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups <i>50 Fieldbus adapter (FBA)</i> , <i>51 FBA A settings</i> , <i>52 FBA A data in</i> and <i>53 FBA A data out</i> . Check cable connections. Check if communication master is able to communicate.
7580	INU-LSU comm loss Programmable fault: <i>60.79 INU-LSU comm loss function</i>	DDCS communication between the inverter unit and the supply unit is lost.	Check status of the supply unit (parameter group <i>06 Control and status words</i>). Check settings of parameter group <i>60 DDCS communication</i> . Check the corresponding settings in the control program of the supply unit. Check cable connections. If necessary, replace cables.
7583	Line side unit faulted	The supply unit connected to the inverter unit has generated a fault.	The auxiliary code specifies the original fault code in the supply unit control program. See chapter <i>Fault tracing</i> in the <i>ACH580 HVAC control program firmware manual</i> , publication number <i>3AXD50000027537</i> .
7584	LSU charge failed	The supply unit was not ready (ie. the main contactor/breaker could not be closed) within expected time.	Check settings of parameter <i>94.10 LSU max charging time</i> . Check that parameter <i>60.71 INU-LSU communication port</i> is set to <i>DDCS via BC</i> . Check that the supply unit is enabled, allowed to start, and can be controlled by the inverter unit (eg. not in local control mode).
8001	ULC underload fault	User load curve: Signal has been too long under the underload curve.	See parameter <i>37.04 ULC underload actions</i> .
8002	ULC overload fault	User load curve: Signal has been too long over the overload curve.	See parameter <i>37.03 ULC overload actions</i> .

Code (hex)	Fault / Aux. code	Cause	What to do
80A0	AI supervision Programmable fault: <i>12.03 AI supervision function</i>	An analog signal is outside the limits specified for the analog input.	Check signal level at the analog input. Check the auxiliary code. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group <i>12 Standard AI</i> .
	0001	AI1LessMIN	
	0002	AI1GreaterMAX	
	0003	AI2LessMIN.	
	0004	AI2GreaterMAX	
80B0	Signal supervision 1 (Editable message text) Programmable fault: <i>32.06 Supervision 1 action</i>	Fault generated by the signal supervision function 1.	Check the source of the fault (parameter <i>32.07 Supervision 1 signal</i>).
80B1	Signal supervision 2 (Editable message text) Programmable fault: <i>32.16 Supervision 2 action</i>	Fault generated by the signal supervision function 2.	Check the source of the fault (parameter <i>32.17 Supervision 2 signal</i>).
80B2	Signal supervision 3 (Editable message text) Programmable fault: <i>32.26 Supervision 3 action</i>	Fault generated by the signal supervision function 3.	Check the source of the fault (parameter <i>32.27 Supervision 3 signal</i>).
80B3	Signal supervision 4 (Editable message text) Programmable fault: <i>32.36 Supervision 4 action</i>	Fault generated by the signal supervision function 4.	Check the source of the fault (parameter <i>32.37 Supervision 4 signal</i>).
80B4	Signal supervision 5 (Editable message text) Programmable fault: <i>32.46 Supervision 5 action</i>	Fault generated by the signal supervision function 5.	Check the source of the fault (parameter <i>32.47 Supervision 5 signal</i>).
80B5	Signal supervision 6 (Editable message text) Programmable fault: <i>32.56 Supervision 6 action</i>	Fault generated by the signal supervision function 6.	Check the source of the fault (parameter <i>32.57 Supervision 6 signal</i>).
9081	External fault 1 (Editable message text) Programmable fault: <i>31.01 External event 1 source</i> <i>31.02 External event 1 type</i>	Fault in external device 1.	Check the external device. Check setting of parameter <i>31.01 External event 1 source</i> .
9082	External fault 2 (Editable message text) Programmable fault: <i>31.03 External event 2 source</i> <i>31.04 External event 2 type</i>	Fault in external device 2.	Check the external device. Check setting of parameter <i>31.03 External event 2 source</i> .

Code (hex)	Fault / Aux. code	Cause	What to do
9083	External fault 3 (Editable message text) Programmable fault: 31.05 External event 3 source 31.06 External event 3 type	Fault in external device 3.	Check the external device. Check setting of parameter 31.05 External event 3 source.
9084	External fault 4 (Editable message text) Programmable fault: 31.07 External event 4 source 31.08 External event 4 type	Fault in external device 4.	Check the external device. Check setting of parameter 31.07 External event 4 source.
9085	External fault 5 (Editable message text) Programmable fault: 31.09 External event 5 source 31.10 External event 5 type	Fault in external device 5.	Check the external device. Check setting of parameter 31.09 External event 5 source.
FA81	Safe torque off 1	Safe torque off function is active, ie. STO circuit 1 is broken.	Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and parameter 31.22 <i>STO indication run/stop</i> . Check the value of parameter 95.04 <i>Control board supply</i> .
FA82	Safe torque off 2	Safe torque off function is active, ie. STO circuit 2 is broken.	
FF61	ID run	Motor ID run was not completed successfully.	Check the nominal motor values in parameter group 99 <i>Motor data</i> . Check that no external control system is connected to the drive. Cycle the power to the drive (and its control unit, if powered separately). Check that no operation limits prevent the completion of the ID run. Restore parameters to default settings and try again. Check that the motor shaft is not locked. Check the auxiliary code. The second number of the code indicates the problem (see actions for each code below).
	0001	Maximum current limit too low.	Check settings of parameters 99.06 <i>Motor nominal current</i> and 30.17 <i>Maximum current</i> . Make sure that 30.17 > 99.06. Check that the drive is dimensioned correctly according to the motor.

Code (hex)	Fault / Aux. code	Cause	What to do
	0002	Maximum speed limit or calculated field weakening point too low.	Check settings of parameters <i>30.11 Minimum speed</i> <i>30.12 Maximum speed</i> <i>99.07 Motor nominal voltage</i> <i>99.08 Motor nominal frequency</i> <i>99.09 Motor nominal speed.</i> Make sure that $30.12 > (0.55 \times 99.09) >$ $(0.50 \times \text{synchronous speed})$ $30.11 \leq 0$, and supply voltage $\geq (0.66 \times 99.07)$.
	0003	Maximum torque limit too low.	Check settings of parameter <i>99.12 Motor nominal torque</i> , and the torque limits in group <i>30 Limits</i> . Make sure that the maximum torque limit in force is greater than 100%.
	0004	Current measurement calibration did not finish within reasonable time	Contact your local ABB representative.
	0005...0008	Internal error.	Contact your local ABB representative.
	0009	(Asynchronous motors only) Acceleration did not finish within reasonable time.	Contact your local ABB representative.
	000A	(Asynchronous motors only) Deceleration did not finish within reasonable time.	Contact your local ABB representative.
	000B	(Asynchronous motors only) Speed dropped to zero during ID run.	Contact your local ABB representative.
	000C	(Permanent magnet motors only) First acceleration did not finish within reasonable time.	Contact your local ABB representative.
	000D	(Permanent magnet motors only) Second acceleration did not finish within reasonable time.	Contact your local ABB representative.
	000E...0010	Internal error.	Contact your local ABB representative.
	0011	(Synchronous reluctance motors only) Pulse test error.	Contact your local ABB representative.

Code (hex)	Fault / Aux. code	Cause	What to do
	0012	Motor too large for advanced standstill ID run.	Check that the motor and drive sizes are compatible. Contact your local ABB representative.
	0013	(Asynchronous motors only) Motor data error.	Check that the motor nominal value settings in the drive are the same as in the motor nameplate. Contact your local ABB representative.
FF63	STO diagnostics failure.	SW internal malfunction.	Reboot the control unit (using parameter <i>96.08 Control board boot</i>) or by cycling power.
FF81	FB A force trip	A fault trip command has been received through fieldbus adapter A.	Check the fault information provided by the PLC.
FF8E	EFB force trip	A fault trip command has been received through the embedded fieldbus interface.	Check the fault information provided by the PLC.

Maintenance



WARNING! Read [Safety instructions](#) on page 2 before performing any maintenance on the equipment. Ignoring the safety instructions can cause injury or death.

Maintenance schedule

Recommended maintenance intervals and component replacements are based on specified operational and environmental conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.

Note: Long term operation near the maximum specified ratings or environmental conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service for maintenance recommendations at: www.abb.com/searchchannels

Description of symbols

Action	Description
I	Inspection (visual inspection and maintenance action if needed)
P	Performance of on/off-site work (commissioning, tests, measurements or other work)
R	Replacement

Recommended annual actions by the user

Action	Description
P	Quality of supply voltage
I	Spare parts
P	Capacitor reformatting for spare drives and spare capacitors (page 90)
I	Tightness of terminals
I	Dustiness, corrosion or temperature
P	Heat sink cleaning (page 84)

Recommended maintenance actions by the user

Component Replacement	Years from start-up							Instruction
	3	6	9	12	15	18	21	
Cooling								
Fans, IP21 (UL (NEMA) Type 1) frames R1 to R9								
Main cooling fans R1...R5		R		R				R1...R4: page 85, R5...R8: page 85, R9: page 86
Main cooling fans R6...R9			R			R		R5...R9: page 86
Auxiliary cooling fan for circuit boards			R			R		R5...R9: page 86
Fans, IP55 (UL (NEMA) Type 12) frames R1 to R9								
Main cooling fans R1...R5		R		R		R		R1...R4: page 85, R5...R8: page 85, R9: page 86
Main cooling fans R6...R9			R			R		R5...R9: page 86
Auxiliary cooling fan for circuit boards R1...R2		R		R		R		R1...R2: page 87, R3: page 88, R4: page 89, R5...R9: page 86
Auxiliary cooling fan for circuit boards R3...R9			R			R		R3...R9: page 86
Second auxiliary cooling fan			R			R		R8 and R9: page 89
Aging								
Control panel battery			R			R		page 90

Heatsink

The heatsink fins accumulate dust from the cooling air. Since a dusty heatsink is less efficient at cooling the drive, overtemperature faults become more likely. In a “normal” environment (not dusty, not clean) check the heatsink annually, in a dusty environment check more often.

Clean the heatsink as follows (when necessary):

1. Remove power from drive. Wait 5 minutes and measure to confirm.
2. Remove the cooling fan(s) (see section [Main cooling fan replacement](#) below).
3. Blow clean, dry, oil-free condensed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust.

Note: If there is a risk of the dust entering adjoining equipment, perform the cleaning in another room.

4. Replace the cooling fan(s).
5. Restore power.

Main cooling fan replacement

Main cooling fans are speed-controlled, and the speed of the fan matches the cooling needs. When the drive is stopped, the main fan is kept running at a low speed to cool the control board. Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

Frame Size R1...R3

To replace the fan:



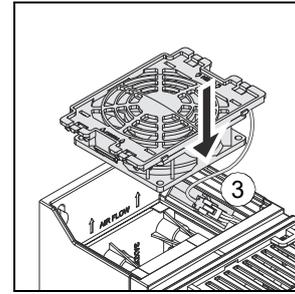
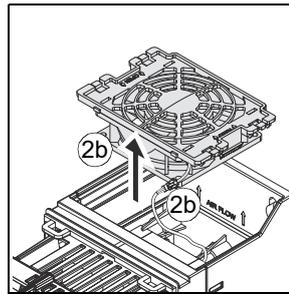
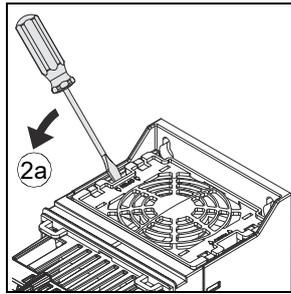
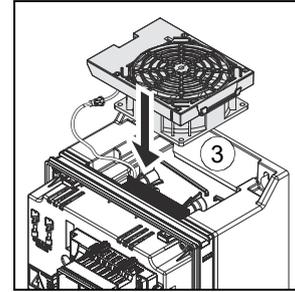
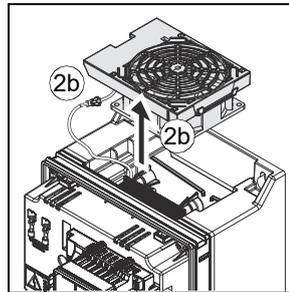
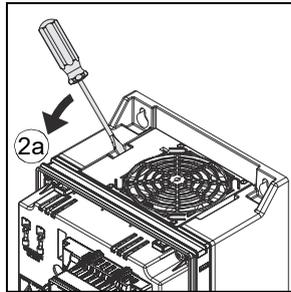
WARNING! Obey the [Safety instructions](#) on page 2. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for 5 minutes and then make sure by measuring that there is no voltage. See section [Precautions before electrical work](#) on page 3 before you start the work.
2. Pry the fan assembly off the drive frame with a screwdriver (2a) and pull out of the fan assembly (2b) until you can unplug the fan power supply wires from the fan assembly (2c).
3. Install the fan assembly in reverse order.

R1...R2: Put the connector and extra length of wires in the groove so that the wires do not get caught in the revolving fan.

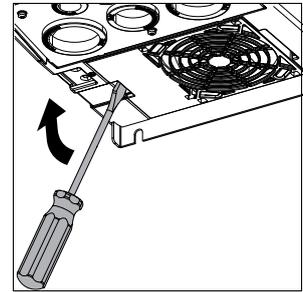
R3: Put the extra length of wires under the fan assembly so that the wires do not get caught in the revolving fan.

4. Restore power.

R1...R2**R3****Frame Size R4**

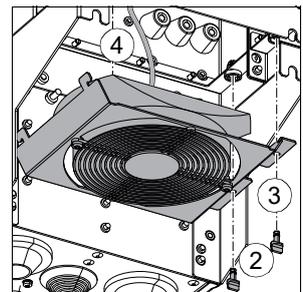
To replace the fan:

1. Remove power from drive.
2. Pry the fan assembly off the drive frame with a screwdriver and pull it out.
3. Disconnect the fan cable.
4. Install the fan in reverse order.
5. Restore power.

**Frame Sizes R5...R8**

To replace the fan:

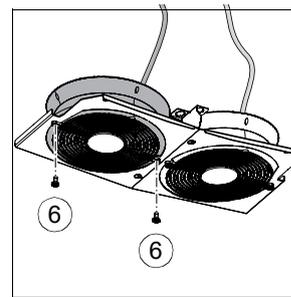
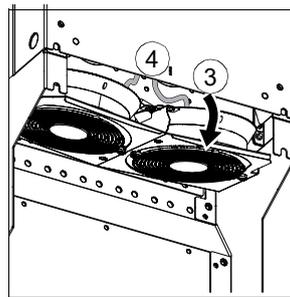
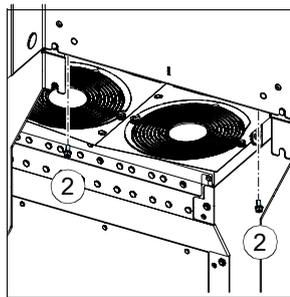
1. Remove power from drive.
2. Remove the 2 screws attaching the fan mounting plate at the bottom of the drive.
3. Pull the mounting plate down from the side edge.
4. Disconnect the fan cable.
5. Lift the mounting plate off.
6. Remove the fan from the mounting plate.
7. Install the fan in reverse order.
8. Restore power.



Frame Size R9

To replace the fans:

1. Remove power from drive.
2. Remove the 2 screws attaching the fan mounting plate.
3. Turn the mounting plate downwards.
4. Disconnect the fan cables
5. Remove the mounting plate.
6. Remove the fans by removing the 2 mounting screws.
7. Install the fan in reverse order.
8. Restore power.

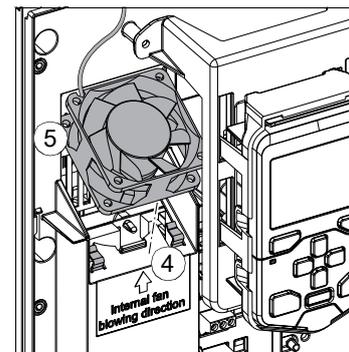
**Auxiliary cooling fan replacement**

Auxiliary cooling fans are not speed-controlled and run all the time that the control board is powered. Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

IP21/UL (NEMA) Type 1 and IP55/UL (NEMA) Type 12 Frame Sizes R5...R9

To replace the fan:

1. Remove power from drive.
2. Remove the front cover.
3. Disconnect the fan cable.
4. Release the retaining clips.
5. Lift the fan off.
6. Install the fan in reverse order.



Note: Make sure that the arrow on the fan points up.

7. Restore power.

IP55/UL (NEMA) Type 12 Frame Sizes R1...R2

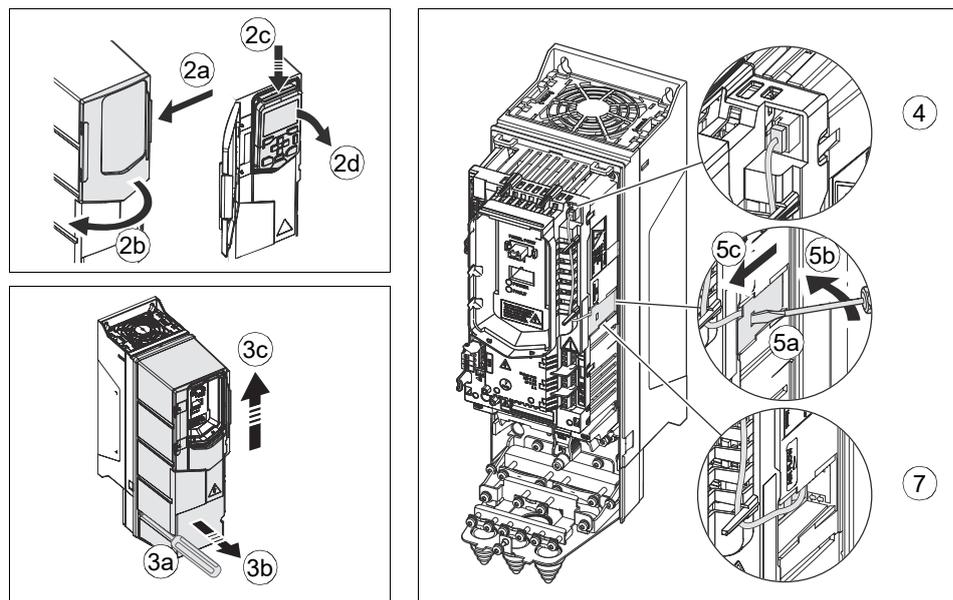
To replace the fan:



WARNING! Obey the [Safety instructions](#) on page 2. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for 5 minutes and then make sure by measuring that there is no voltage. See section [Precautions before electrical work](#) on page 3 before you start the work.
2. Remove the control panel: Press the retaining clip of the IP55 panel cover (2a) and open the cover (2b). Press the retaining clip of the control panel at the top (2c) and pull it forward from the top edge (2d).
3. Remove the front cover: Loosen the retaining screws with a screwdriver (3a) and lift the cover from the bottom outwards (3b) and then up (3c).
4. Unplug the fan power supply wires from the drive.
5. Remove the fingerguard: Insert a screwdriver into the hole of the fingerguard (5a), bend the front edge of the fingerguard a little away from the drive frame with the screwdriver (5b) and pull the fingerguard out of the groove (5c).
6. Pull off the fan.
7. Install the new fan assembly in reverse order. Route the wires round the pins.

Note: Make sure that the arrow on the fan points to the same direction as the arrow on the drive frame.



8. Restore power.

IP55/UL (NEMA) Type 12 Frame Size R3

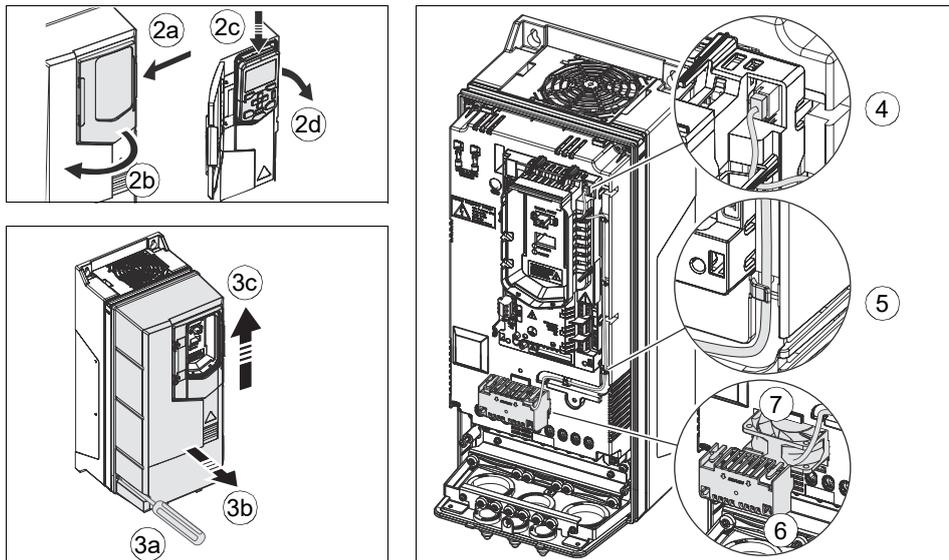
To replace the fan:



WARNING! Obey the [Safety instructions](#) on page 2. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for 5 minutes and then make sure by measuring that there is no voltage. See section [Precautions before electrical work](#) on page 3 before you start the work.
2. Remove the control panel: Press the retaining clip of the IP55 panel cover (2a) and open the cover (2b). Press the retaining clip of the control panel at the top (2c) and pull it forward from the top edge (2d).
3. Remove the front cover: Loosen the retaining screws with a screwdriver (3a) and lift the cover from the bottom outwards (3b) and then up (3c).
4. Unplug the fan power supply wires from the drive.
5. Detach the fan cable from the holders.
6. Pull off the plastic housing.
7. Pull off the fan.
8. Install the new fan and housing in reverse order.

Note: Make sure that the arrow on the fan points to the same direction as the arrow on the plastic housing (down).

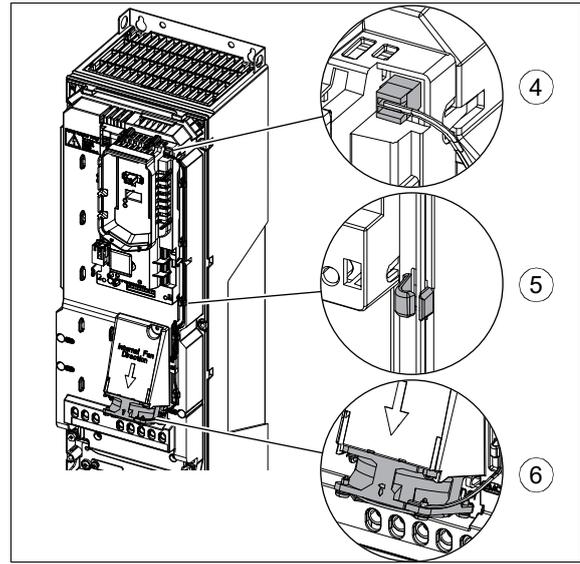


9. Restore power.

IP55/UL (NEMA) Type 12 Frame Size R4

To replace the fan:

1. Remove power from drive.
2. Remove the control panel: Press the retaining clip at the top and pull it forward.
3. Remove the front cover: Loosen the retaining screws at the bottom left and pull the cover outwards from the bottom and then up.
4. Unplug the fan cable from the drive.
5. Detach the fan cable from the clips.
6. Pull off the fan.
7. Install the fan in reverse order.



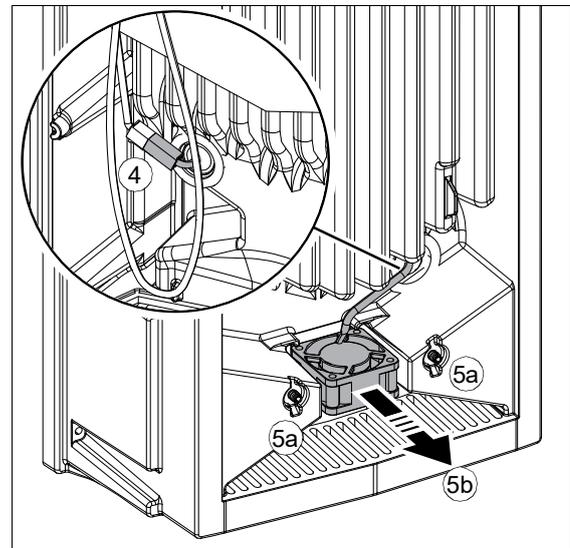
Note: Make sure that the arrow on the fan points up.

8. Restore power.

Second auxiliary cooling fan replacement*IP55/UL (NEMA) Type 12 Frame Sizes R8...R9*

To replace the fan:

1. Remove power from drive.
2. Remove the front cover: Loosen the 14 retaining screws and pull the cover outwards from the bottom and then up.
3. Remove the lower cover panel from the cover.
4. Unplug the fan cable from the connector on the other side.
5. Remove the retaining screws (5a) and pull off the fan (5b).
6. Install the fan in reverse order.



Note: Make sure that the arrow on the fan points up.

7. Restore power.

Capacitors

The drive intermediate DC circuit employs several electrolytic capacitors. Their lifespan depends on the operating time of the drive, loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature.

Capacitor failure is usually followed by damage to the drive and an input cable fuse failure, or a fault trip. Contact the manufacturer if capacitor failure is suspected. Replacements are available from the manufacturer. Do not use other than specified spare parts.

Reforming the capacitors

The capacitors must be reformed if the drive has not been powered (either in storage or unused) for a year or more. See label on page 7 for how to find out the manufacturing date from the serial number.

For information on reforming the capacitors, see [Converter module capacitor reforming instructions \(3BFE64059629 \[English\]\)](#), available on the Internet (go to <http://www.abb.com> and enter the document code in the Search field).

Control panel

Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery

A battery is used in all control panels to keep the clock operating in memory during power interruptions.

The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Note: The battery is NOT required for any control panel or drive function, except the real-time clock.
