ABB DRIVES FOR WATER

ACQ80-01 (30 to 200 kW) drives

Quick installation and start-up guide

This guide is applicable to ACQ80-01 drives, frames R4 to R9.

Documentation in other languages	Ecodesign information (EU 2019/1781)	About this document
		3AXD50001017217 Rev B EN 2024-07-01

Original instructions.

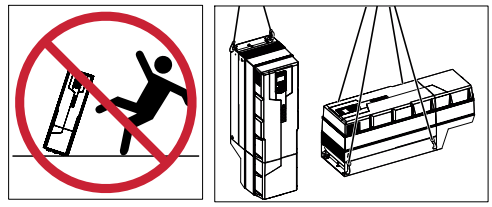
3AXD50001017217B

Safety instructions

WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation or maintenance work.

- Do not do work on the drive, motor cable, motor, or control cables when the drive is connected to the input power. Before you start the work, isolate the drive from all dangerous voltage sources and make sure that it is safe to start the work. Always wait for 5 minutes after disconnecting the input power to let the intermediate circuit capacitors discharge.
- Do not do work on the drive when a rotating permanent magnet motor is connected to it. A rotating permanent magnet motor energizes the drive, including its input and output terminals.
- Frames R5...R9: Do not tilt the drive. The drive is heavy and has a high center of gravity. It can topple accidentally.
- Frames R5...R9: Lift the drive with a lifting device. Use the lifting eyes of the drive.

Frames R5...R9



1. Unpack the delivery

Keep the drive in its package until you are ready to install it. After unpacking, protect the drive from dust, debris and moisture. Make sure that these items are included:

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

Make sure that there are no signs of damage to the items.

2. Reform the capacitors

If the drive has not been powered up for a year or more, you must reform the DC link capacitors. Refer to *Capacitor reforming instructions* (3BFE64059629 [English]) or contact ABB technical support.

3. Select the cables and fuses

- Select the power cables. Obey the local regulations.
  - **Input power cable:** ABB recommends to use symmetrical shielded cable (VFD cable) for the best EMC performance.
  - **Motor cable:** Use symmetrical shielded cable (VFD cable) for the best EMC performance. Symmetrical shielded cable also reduces bearing currents, wear, and stress on motor insulation.
  - **Power cable types:** In IEC installations, use copper or aluminum cables (if permitted). In UL installations, use only copper cables.
  - **Current rating:** max. load current.
  - **Voltage rating:** min. 380 V AC.
  - **Temperature rating:** In IEC installations, select a cable rated for at least 70 °C (158 °F) maximum permissible temperature of conductor in continuous use.
  - **Size:** Refer to *IEC ratings* for the typical cable sizes and to *Terminal data for the power cables* for the maximum cable sizes.
- Select the control cables. Use double-shielded twisted-pair cable for analog signals. Use double-shielded or single-shielded cable for the digital, relay and I/O signals. Do not run 24 V and 115/230 V signals in the same cable.
- Protect the drive and input power cable with the correct fuses. Refer to *IEC ratings*.

4. Examine the installation site

Examine the site where you will install the drive. Make sure that:

- The installation site is sufficiently ventilated or cooled to remove heat from the drive.
- The ambient conditions meet the requirements. Refer to *Ambient conditions*.
- The installation surface is as close to vertical as possible and strong enough to support the weight of the drive. For the weights, refer to *Weights and free space requirements*.
- The installation surface, floor and materials near the drive are not flammable.
- There is sufficient free space around the drive for cooling, maintenance, and operation. For the minimum free space requirements, refer to *Weights and free space requirements*.
- There are no sources of strong magnetic fields such as high-current single-core conductors or contactor coils near the drive. A strong magnetic field can cause interference or inaccuracy in the operation of the drive.

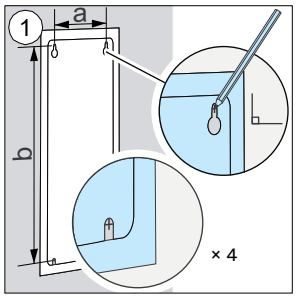
5. Install the drive on the wall

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

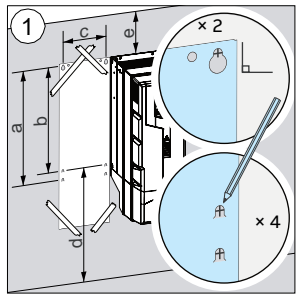
Prepare the installation site

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

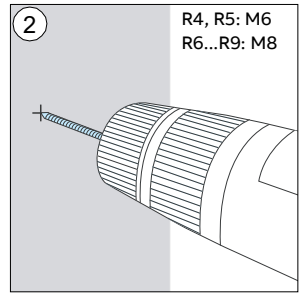
R4



R5...R9

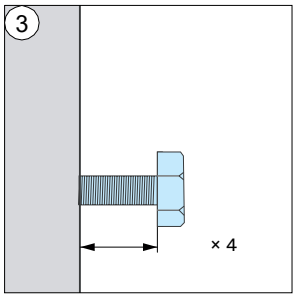


R4...R9

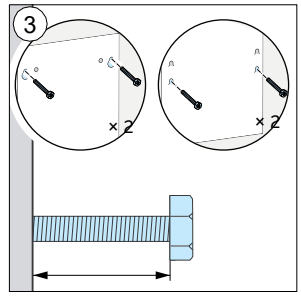


	R4		R5		R6		R7		R8		R9	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
a	160	6.30	612	24.09	571	22.5	623	24.5	701	27.6	718	28.3
b	619	24.37	581	22.87	531	20.9	583	23.0	658	25.9	658	25.9
c	-	-	160	6.30	213	8.4	245	9.7	263	10.3	345	13.6
d >	-	-	200	7.87	300	11.8	300	11.8	300	11.8	300	11.8
e >	-	-	100	3.94	155	6.1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

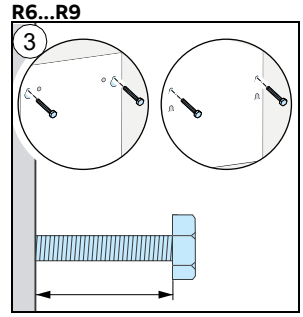
R4



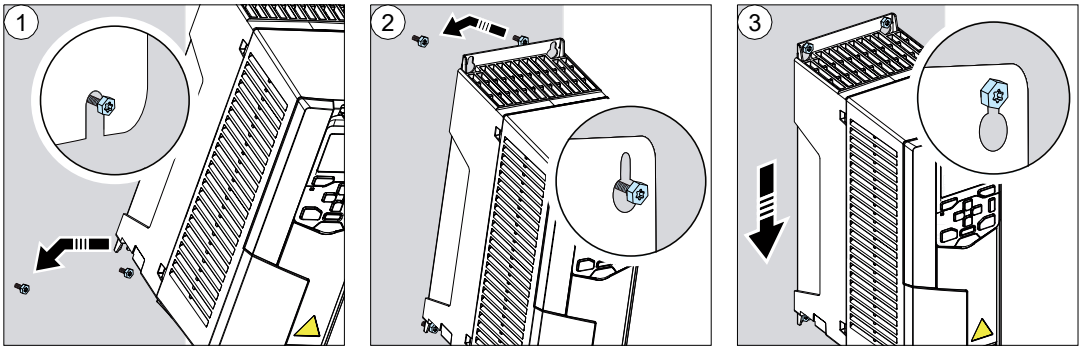
R5



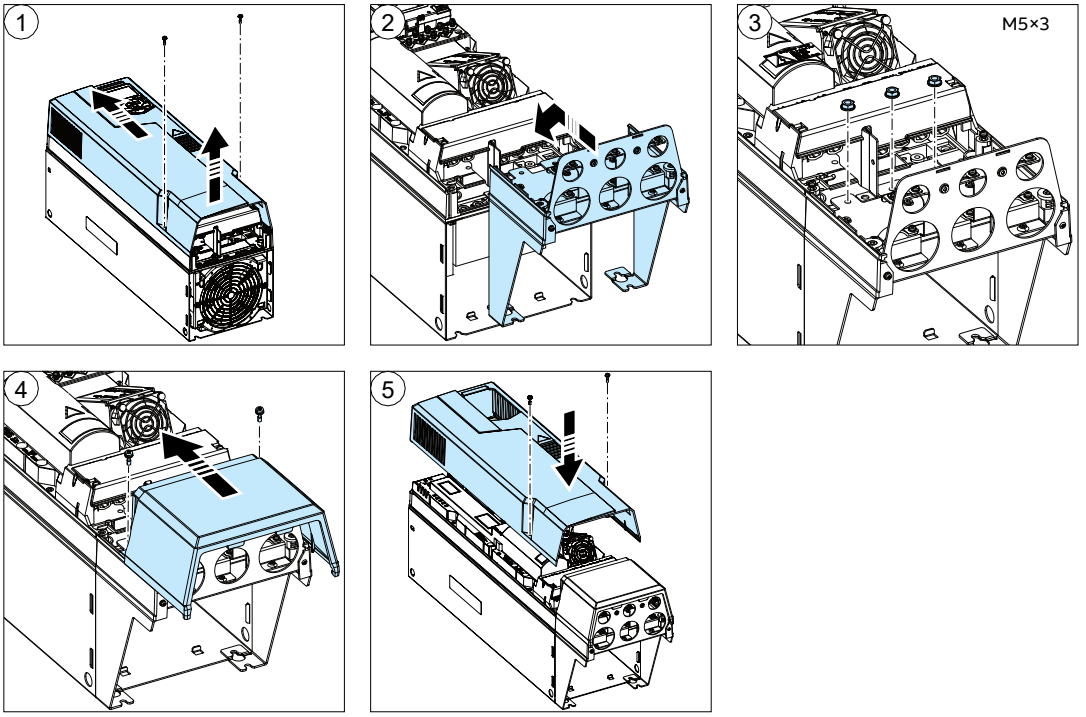
R6...R9



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

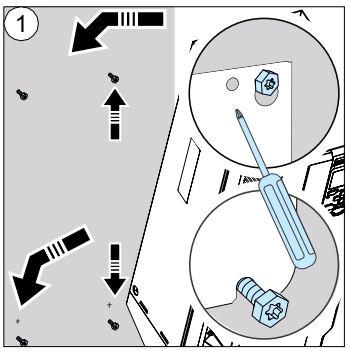


Frame R5, IP21 (UL Type 1): Install the cable box

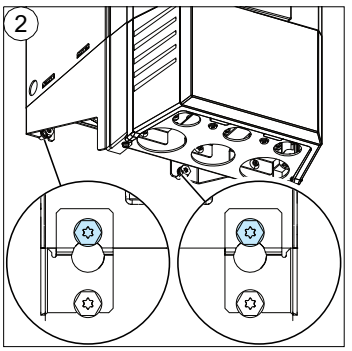


Frames R5...R6: Put the drive on the wall and tighten the screws

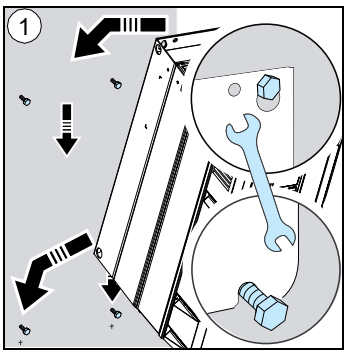
R5



R5

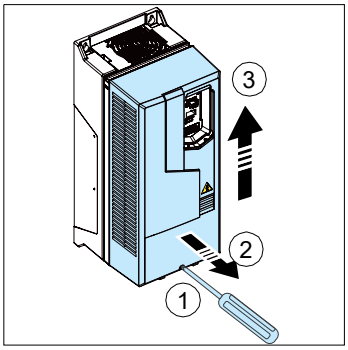


R6...R9

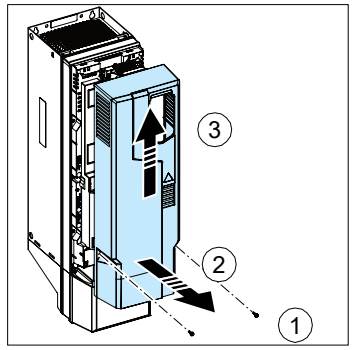


6. Remove the cover(s)

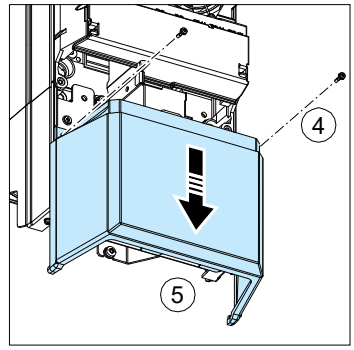
R4, IP21 (UL Type 1)



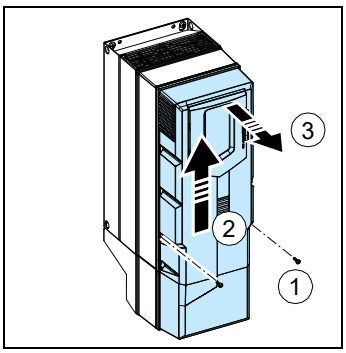
R5, IP21 (UL Type 1)



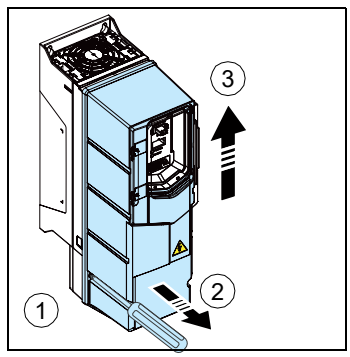
R5, IP21 (UL Type 1)



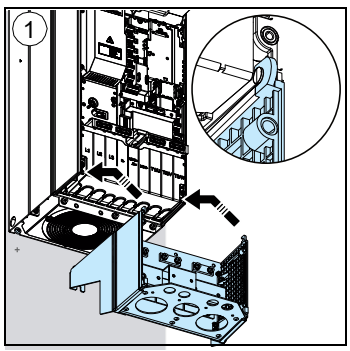
R6...R9, IP21 (UL Type 1)

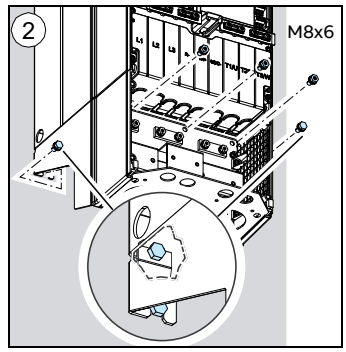


R4...R9, IP55 (UL Type 12)



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





8. Attach a residual voltage warning sticker to the drive

Frame R4: to the control panel mounting platform and Frames R5...R9: next to the control unit.

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

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

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

Frame size	Symmetrically grounded TN-S systems (center-grounded wye)	Corner-grounded delta and midpoint-grounded delta systems	IT systems (ungrounded or high-resistance grounded)	TT systems [1) 2)]
R6…R9	Do not disconnect EMC or VAR screw.	Do not disconnect EMC AC or VAR screws. Disconnect EMC DC screw	Disconnect EMC screws (2 pieces) and VAR screw.	Disconnect EMC screws (2 pieces) and VAR screw.

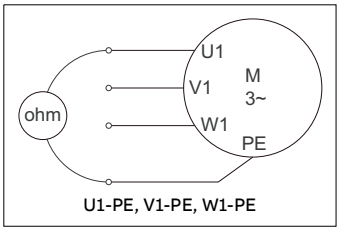
1) A residual current device must be installed in the supply system.

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

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

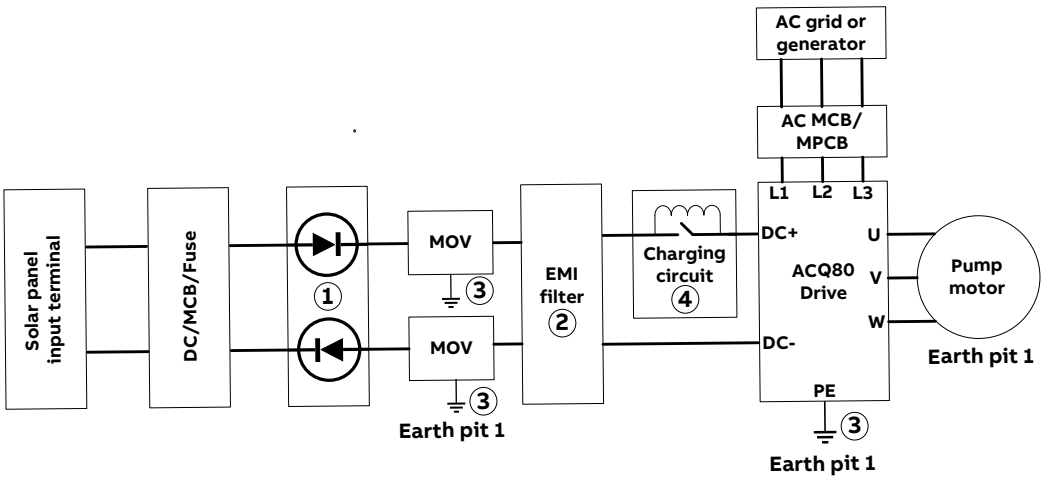
Measure the insulation of the input cable before you connect it to the drive. Obey the local regulations.

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



11. Connect the power cables

Connection diagram

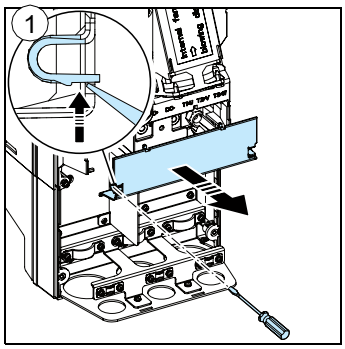


1	Reverse polarity diodes.
2	EMI filter is optional but is mandatory for EN62920 standard compliance which is required in Europe.
3	Ground connection should be common for MOV, drive, and pump.
4	Frames R6…R9 only: Initially the charging happens through the resistance and once predefine voltage charging is completed then the contactor will be closed.
Note: ACQ80 is intended to be used for speed control of 3-phase AC pump motors and is powered from either AC grid or DC solar array. ABB recommends not to use it as an island grid forming inverter or to supply generic single phase or 3-phase loads, other than 3-phase AC pump motors.	

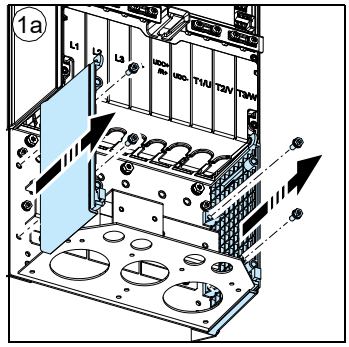
Connection procedure

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

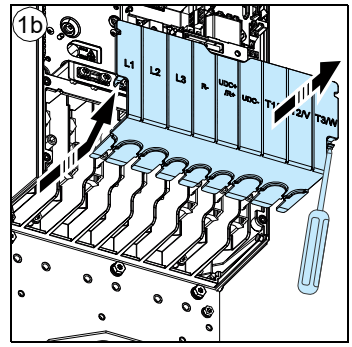
R5



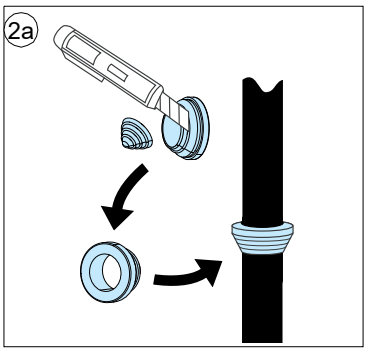
R6…R9

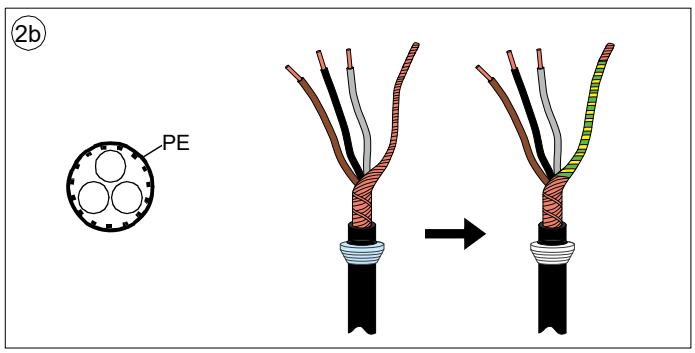


R6…R9



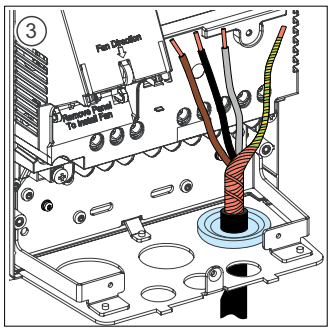
2. Prepare the motor cables:
   - Remove the rubber grommets from the cable entry.
   - Cut a sufficient hole in the rubber grommet. Slide the grommet onto the cable (2a).
   - Prepare the ends of the input power cable and motor cable as illustrated in the figure (2b).
   - If you use aluminum cables,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



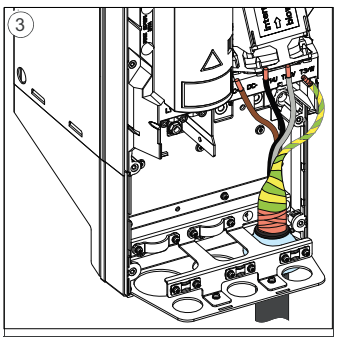


3. Slide the cable through the hole in the cable entry and attach the grommet to the hole.

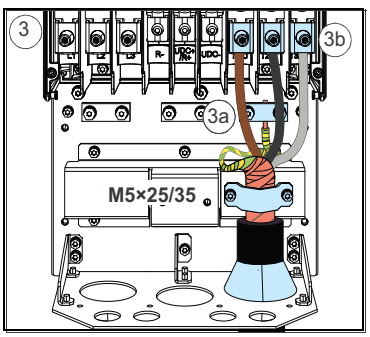
R4



R5

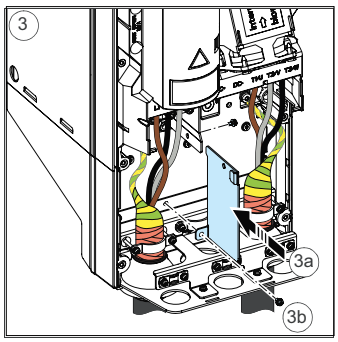


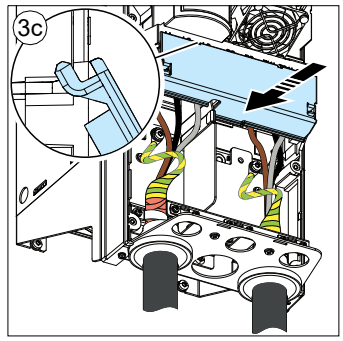
R6…R9



Frame R5, IP55 (UL Type 12): Install the cable box plate (3) and shroud (3c). Position the plate (3 a) and tighten the screw (3b).

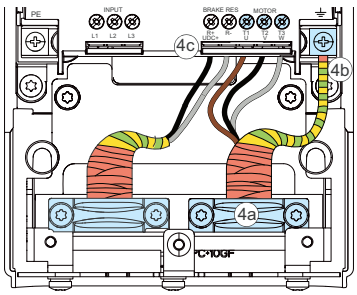
R5, IP55 (UL Type 12)



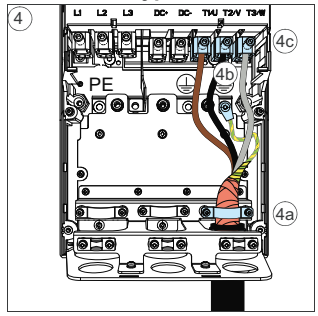


4. Connect the motor cable:
   - Ground the shield 360 degrees under the grounding clamps (4a).
   - Connect the twisted shield of the cable to the grounding terminal (4b).
   - Connect the phase conductors of the cable to terminals T1/U, T2/V and T3/W (4c). Tighten the screws to the torque given in the below table.

R4

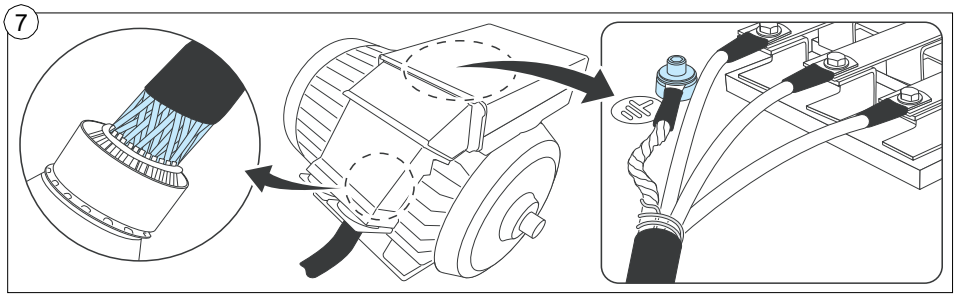


R5, IP21 (UL Type 1)



Frame size	R4		R5		R6		R7		R8		R9	
	N·m	lbf·ft	N·m	lbf·ft	N·m	lbf·ft	N·m	lbf·ft	N·m	lbf·ft	N·m	lbf·ft
T1/U, T2/V, T3/W	4.0	3.0	5.6	4.1	30	22	40	30	40	30	70	52
PE,	2.9	2.1	2.2	1.6	9.8	7.2	9.8	7.2	9.8	7.2	9.8	7.2
	1.2	0.9	1.2	0.9	1.2	0.9	1.2	0.9	1.2	0.9	1.2	0.9

5. Connect the input power cable. For wiring, obey solar panel manufacturer's wiring instructions.
6. Attach the cables outside the drive mechanically.
7. Ground the motor cable shield at the motor end. For minimum radio frequency interference, ground the motor cable shield 360 degrees at the cable entry of the motor terminal box.



12. DC connection

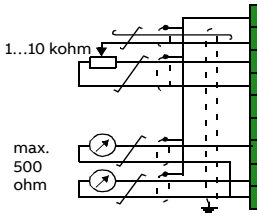
The UDC+ and UDC- terminals are used for DC power connection from the solar array. The UDC+ and UDC- terminals (as standard in frames R4 and R5) are for using external brake chopper units.

13. Connect the control cables

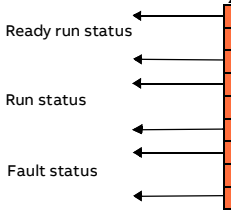
Make the connections according to the application. Keep the signal wire pairs twisted as near to the terminals as possible to prevent inductive coupling.

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

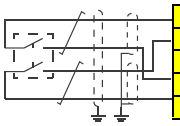
Default I/O connections (ABB standard macro)



X1			Reference voltage and analog inputs and outputs
	1	SCR	Signal cable shield (screen)
	2	AI1	Ext. frequency reference 1: 0 … 10 V
	3	AGND	Analog input circuit common
	4	+10V	Reference voltage 10 V DC
	5	AI2	Not configured
	6	AGND	Analog input circuit common
	7	AO1	Output frequency: 0 … 20 mA
	8	AO2	Output current: 0 … 20 mA
	9	AGND	Analog output circuit common
X2 & X3			Aux. voltage output and programmable digital inputs
	10	+24V	Aux. voltage output +24 V DC, max. 250 mA
	11	DGND	Aux. voltage output common
	12	DCOM	Digital input common for all
	13	DI1	Stop (0) / Start (1)
	14	DI2	Forward (0) / Reverse (1)
	15	DI3	Constant frequency/speed selection
	16	DI4	Constant frequency/speed selection
	17	DI5	Ramp set 1 (0) / Ramp set 2 (1)
	18	DI6	Not configured



X6, X7, X8			Relay outputs
	19	RO1C	Ready run 250 V AC / 30 V DC 2 A
	20	RO1A	
	21	RO1B	
	22	RO2C	Running 250 V AC / 30 V DC 2 A
	23	RO2A	
	24	RO2B	
	25	RO3C	Fault (-1) 250 V AC / 30 V DC 2 A
	26	RO3A	
	27	RO3B	
X5			Embedded fieldbus
	29	B+	Embedded Modbus RTU (EIA-485)
	30	A-	
	31	DGND	
	S4	TERM	Serial data link termination switch
	S5	BIAS	Serial data link bias resistors switch



X4			Safe torque off
	34	OUT1	Safe torque off (STO). Both circuits must be closed for the drive to start. The drawing shows the simplified connection of a safety circuit through safety contacts. If STO is not used, leave the factory-installed jumpers in place. See also section *Safe torque off (STO)*.
	35	OUT2	
	36	SGND	
	37	IN1	
	38	IN2	

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

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

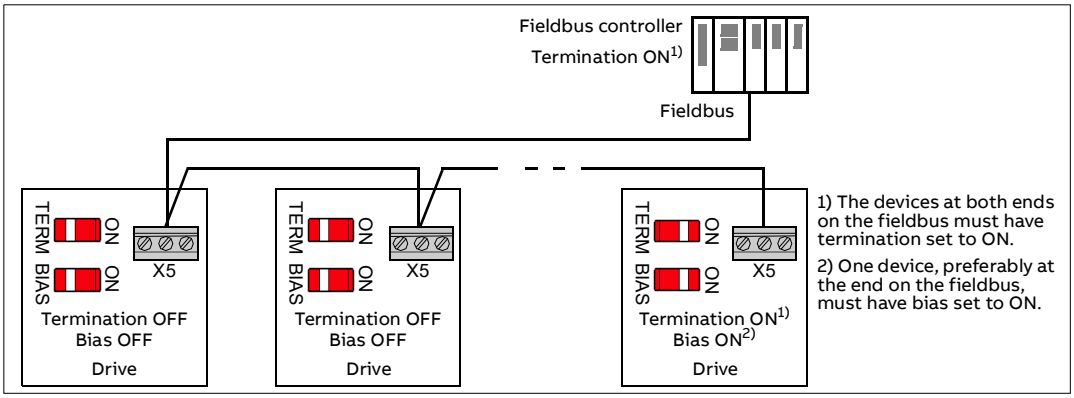
EIA-485 embedded fieldbus connection

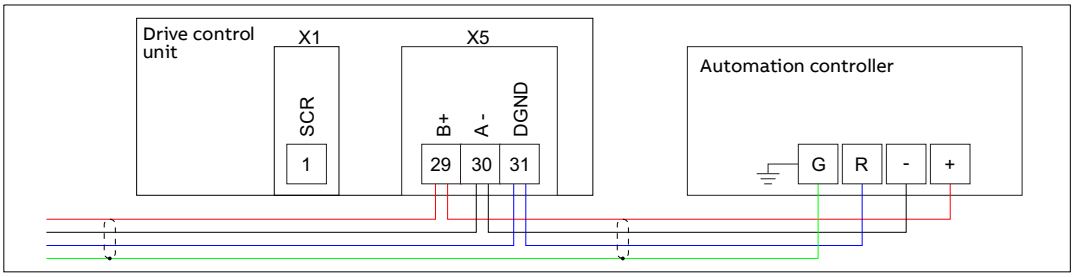
You can connect the drive to a serial communication link with a fieldbus adapter module or the embedded fieldbus interface. The embedded fieldbus interface supports the Modbus RTU protocol.

To configure Modbus RTU communication with the embedded fieldbus:

1. Connect the fieldbus cable and the required I/O signals.
2. If the drive is at the end of the fieldbus, set the termination switch to ON.
3. Power up the drive and set the required parameters. Refer to *Fieldbus communication*.

Overview and connection diagrams for connecting the drive to the fieldbus are shown below.





- Tie shield conductors together at the drive. Do not terminate at SCR.
- Terminate the shield only at terminal “G” (ground) in the automation controller.
- Terminate DGND conductor at terminal “R” (reference) in the automation controller.

14. Install optional modules, if included in the delivery

15. Install the cover(s)

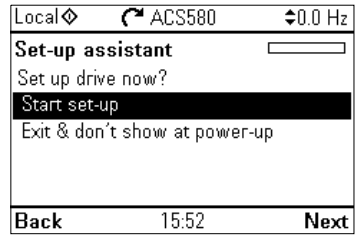
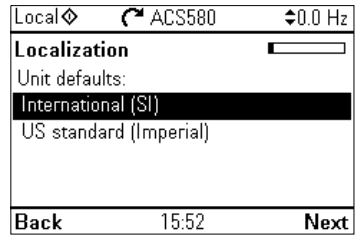
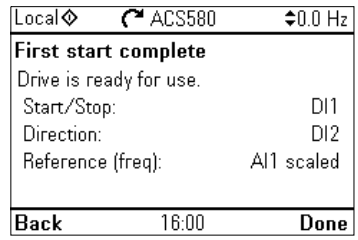
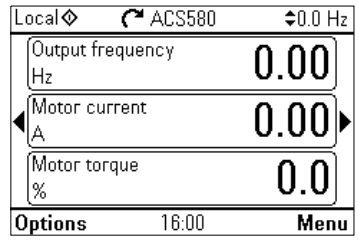
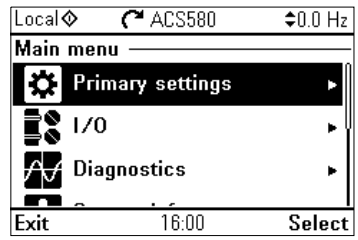
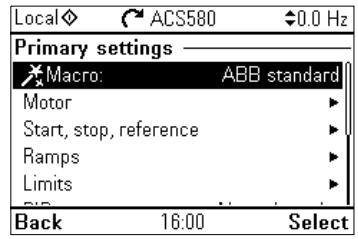
The cover installation procedure is the opposite of the removal procedure. Refer to *Remove the cover(s)*.

16. Start up the drive

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

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

1.	Power up the drive. Make sure that you have the motor name plate data available.	
2.	The First start assistant guides you through the first start-up. The assistant begins automatically. Wait until the control panel shows the language selection screen. Select the language you want to use and press **(OK).** **Note:** After you select the language, it takes a few minutes for the control panel to wake up.	

3.	Select **Start set-up** and press (**Next**).	
4.	Select the localization you want to use and press (**Next**).	
5.	To complete the first start assistant, select the values and settings when prompted by the assistant. Continue until the panel shows that the first start is complete. When the panel shows that the first start is complete, the drive is ready for use. Press (**Done**) to enter the Home view.	
6.	The Home view shows the values of the selected signals.	
7.	Make additional adjustments, for example macro, ramps and limits, starting from the Main menu. Press (**Menu**) in the Home view to enter the Main menu. Select **Primary settings** and press (**Select**) (or ▶). With the Primary settings menu, you can adjust settings related to the motor, PID, fieldbus, advanced functions and clock, region and display. You can also reset logs, parameters, and the control panel Home view. ABB recommends that you make at least these additional settings: • Choose a macro or set start, stop and reference values separately • Ramps • Limits. To get more information on the Primary settings menu items, press ? to open the help page.	 

Fieldbus communication

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

Parameter	Setting	Description
20.01 Ext1 commands	Embedded fieldbus	Selects fieldbus as the source for the start and stop commands when EXT1 is selected as the active control location.

Parameter	Setting	Description
22.11 Ext1 speed ref1	EFB ref1	Selects a reference received through the embedded fieldbus interface as speed reference 1. Use this parameter with the vector motor control mode.
26.11 Torque ref1 source	EFB ref1	Selects a reference received through the embedded fieldbus interface as torque reference 1. Use this parameter with the vector motor control mode.
28.11 Ext1 frequency ref1	EFB ref1	Selects a reference received through the embedded fieldbus interface as frequency reference 1. Use this parameter with the frequency motor control mode.
58.01 Protocol enable	Modbus RTU	Initializes embedded fieldbus communication.
58.03 Node address	1 (default)	Node address. There must be no two nodes with the same node address online.
58.04 Baud rate	19.2 kbps (default)	Defines the communication speed of the link. Use the same setting as in the master station.
58.05 Parity	8 EVEN 1 (default)	Selects the parity and stop bit setting. Use the same setting as in the master station.

Other parameters related to the fieldbus configuration:

58.14 Communication loss action	58.17 Transmit delay	58.28 EFB act1 type	58.34 Word order
58.15 Communication loss mode	58.25 Control profile	58.31 EFB act1 transparent source	58.101 Data I/O 1 … 58.114 Data I/O 14
58.16 Communication loss time	58.26 EFB ref1 type	58.33 Addressing mode	

Basic Parameter list

Parameter	Value
30.17 Maximum current	Maximum allowed drive current
99.03 Motor type	Asynchronous/Permanent magnet motor
99.04 Motor control mode	Scalar for Asynchronous motor and Vector for Permanent magnet motor
Motor data parameters 99.06...99.10	As per motor name plate
79.10 Operating mode	Manual IN1 Start; stop
79.11 Manual input source 1	Source 1 for start stop command: DI1
79.12 Manual input source 2	Source 2 for start stop command: DI2
79.41 Start DC voltage	Minimum DC voltage for drive to start running the pump motor
79.42 PV cell min voltage/79.43 PV cell max voltage	As per solar cell rating
79.51 Pump minimum speed	ABB recommends to keep this value 20% of motor nominal rpm or more.
79.52 Pump maximum speed	Pump maximum speed in RPM

Warnings and faults

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

IEC ratings

ACQ80-01-...	Frame size	Nominal input	Nominal DC input	Max. current	Output ratings		
					Nominal use		
		I_{1N}	I_{DC}	I_{max}	I_N	P_n	
		A	A	A	A	kW	hp
3-phase U_N = 400 V (380...480V)							
030kW-4	R4	62	75.88	76	62	30	40
037kW-4	R4	73	89.35	104	73	37	50
045kW-4	R5	88	108.93	122	88	45	60
055kW-4	R5	106	129.74	148	106	55	75
075kW-4	R6	145	177.47	178	145	75	100
090kW-4	R7	169	206.85	247	169	90	125
110kW-4	R7	206	252.14	287	206	110	150
132kW-4	R8	246	301.1	350	246	132	200
160kW-4	R8	293	358.62	415	293	160	200
200kW-4	R9	363	444.3	498	363	200	300

Terminal data for the power cables

Frame size	Cable entries		L1, L2, L3,T1/U, T2/V, T3/W terminals			Grounding terminals	
	Per cable type	Ø [1]	Min. wire size (solid/stranded) [2]	Max. wire size (solid/stranded)	*T*	Max wire size	*T*
	pcs	mm	mm^2	mm^2	N·m	mm^2	N.m
3-phase U_N = 400 V (380...480V)							
R4	1	45	0.5/0.5	50	4.0	35/35	2.9
R5	1	45	6	70	5.6	35/35	2.2
R6	1	45	25	150	30	185	9.8
R7	1	54	95	240	40	185	9.8
R8	2	45	2×50	2×150	40	2×185	9.8
R9	2	54	2×95	2×240	70	2×185	9.8

1) Maximum cable diameter accepted.

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

Weights and free space requirements

The below tables show the requirements for the ambient conditions when the drive is in operation (installed for stationary use).

Frame size	Dimensions and weights													
	IP21							UL Type 1						
	H1	H2	H3	H4	W	D	Weight	H1	H2	H3	H4	W	D	Weight
	mm	mm	mm	mm	mm	mm	kg	in	in	in	in	in	in	lb
R4	_ [1]	_	600	636	203	257	19.0	-	-	23.62	25.04	7.99	10.12	41.9
R5	596	596	732	633	203	295	28.3	23.46	23.46	28.82	24.90	7.99	1161	62.4
R6	548	549	727	589	252	369	42.4	21.57	21.63	28.62	23.20	9.92	14.53	93.5
R7	600	601	880	641	284	370	54	23.62	23.67	34.65	25.25	11.18	14.57	119.1
R8	680	677	965	721	300	393	69	26.77	26.66	37.99	28.39	11.81	15.47	152.1
R9	680	680	955	741	380	418	97	26.77	26.77	37.60	29.19	14.96	16.46	213.9

1) Frames with an integrated cable/conduit box

Frame size	Dimensions and weights										
	IP55					UL Type 1					
	H3	H4	W	D	Weight	H3	H4	H5	W	D	Weight
	mm	mm	mm	mm	kg	in	in	in	in	in	lb
R4	600	636	203	265	20.0	23.62	25.04	27.03	7.99	10.43	44.1
R5	732	633	203	320	29.0	28.82	24.90	32.01	7.99	12.60	64.0
R6	726	589	252	380	43.0	28.58	23.20	34.81	9.92	14.96	94.8
R7	880	641	284	381	56.0	34.65	25.25	40.86	11.18	15.00	123.5
R8	965	721	300	452	77	37.99	28.39	44.23	11.81	17.80	169.8
R9	955	741	380	477	103	37.60	29.19	46.75	14.96	18.78	227.1

Ambient conditions

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

Safe torque off (STO)

The drive has a Safe torque off function (STO) in accordance with IEC/EN 61800-5-2. It can be used, for example, as the final actuator device of safety circuits that stop the drive in case of danger (such as an emergency stop circuit).

When activated, the STO function disables the control voltage of the power semiconductors of the drive output stage, thus preventing the drive from generating the torque required to rotate the motor. The control program generates an indication as defined by parameter *31.22*. If the motor is running when Safe torque off is activated, it coasts to a stop. Closing the activation switch deactivates the STO. Any faults generated must be reset before restarting.

The STO function has a redundant architecture, that is, both channels must be used in the safety function implementation. The safety data given is calculated for redundant use, and does not apply if both channels are not used.

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

Notes:

- If stopping by coasting is not acceptable, stop the drive and machinery using the appropriate stop mode before activating the STO.
- The STO function overrides all other functions of the drive.

Wiring

The safety contacts must open/close within 200 ms of each other.

Double-shielded twisted-pair cable is recommended for the connection. The maximum length of the cabling between the switch and the drive control unit is 300 m (1000 ft). Ground the shield of the cable at the control unit only.

Validation

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

Technical data

- Minimum voltage at IN1 and IN2 to be interpreted as “1”: 13 V DC
- STO reaction time (shortest detectable break): 1 ms
- STO response time: 2 ms (typical), 5 ms (maximum)
- Fault detection time: Channels in different states for longer than 200 ms
- Fault reaction time: Fault detection time + 10 ms
- STO fault indication (parameter *31.22*) delay: < 500 ms
- STO warning indication (parameter *31.22*) delay: < 1000 ms
- Safety integrity level (EN 62061): SIL 3
- Performance level (EN ISO 13849-1): PL e

The drive STO is a type A safety component as defined in IEC 61508-2.

For the full safety data, exact failure rates and failure modes of the STO function, refer to the drive hardware manual.

Markings

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

CE ROHS RCM WEEE TÜV Nord Solar impulse

Related documents

Document	Code (English)
ACQ80-01 (30 kW to 200 kW) Drive HW manual	3AXD50001017101
ACQ80 standard control program firmware manual	3AXD50000170654
ACx-AP-x assistant control panels user's manual	3AUA0000085685
Drive Composer PC tool user's manual	3AUA0000094606

Declaration of Conformity

Power and productivity for a better world™ ABB

EU Declaration of Conformity

Machinery Directive 2006/42/EC

We
Manufacturer: ABB India Limited.
Address: Plot No 5 & 6,2nd Phase,
Peenya Industrial Area
Bangalore, 560058, India.
Phone: +91 80 22949359

declare under our sole responsibility that the following product:

Frequency converter

ACQ80

ACQ80-04 (frame sizes R0-R3), ACQ80-01 (frame sizes R4-R5, frame sizes R6-R9) & ACQ80-07 (frame sizes R6-R9)

With regard to the safety function

Safe torque-off

is in conformity with all the relevant safety component requirements of the EU Machinery Directive 2006/42/EC, when the listed safety function is used for safety component functionality.

The following harmonized standards have been applied:

EN 61800-5-2:2007	Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional
EN 62061:2021	Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN ISO 13849-1:2015	Safety of machinery – Safety-related parts of control systems. Part 1: General principles for design
EN ISO 13849-2:2012	Safety of machinery – Safety-related parts of the control systems. Part 2: Validation
EN 60204-1:2018	Safety of machinery – Electrical equipment of machines – Part 1: General requirements

3AXD10000715412

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EU Declaration of Conformity

Machinery Directive 2006/42/EC

The following other standard has been applied:

IEC 61508:2010, parts 1-2	Functional safety of electrical / electronic / programmable electronic safety-related systems
IEC 61800-5-2:2016	Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional

The product referred in this declaration of conformity fulfils the relevant provisions of other European union directives which are notified in a single EU declaration of conformity 3AXD10000715392.

Person authorized to compile the technical file 3AXD10000715648:
Name and address: Jussi Vesti, Hiomotie 13, 00380 Helsinki, Finland

Bangalore, 3rd June 2024

Signed for and on behalf of:

Madhusudhan A R
Vice President
ABB India Limited.

Laxmikantha Shenoy
Manager, Product engineering
ABB India Limited.

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