

ABB machinery drives

Quick installation and start-up guide

ACS880-M04 drive



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Safety instructions

Read the full safety instructions in the *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).

- WARNING!** Follow these safety instructions. If you ignore them, injury or death, or damage to the equipment can occur.
- When you install the drive, make sure that dust does not go into the drive.
 - When the drive or connected equipment is energized, do not do work on the drive, motor cable, motor, control cables or control circuits.
 - After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
 - Disconnect any external power sources from the control circuit before you do work on the control cables.
 - 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 (PE) busbar is 0 V
 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) is close to 0 V.
 - If you have connected safety circuits to the drive (for example, emergency stop and Safe torque off), validate them at the start up.
 - 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 input power terminals.

WARNING! The installation, start-up and operation of the drive requires detailed installations. Refer to this quick guide and the hardware and firmware manuals intended for use with this product. Retain the guides with the drive at all times. You can download these manuals from the ABB website or order hard copies of drive manuals with the delivery.

1. Examine the installation site

- The drive has an ingress protection classification of IP20 for cabinet installation.
- Make sure that in the installation area:
- There is sufficient cooling and prevent hot air recirculation.
 - The ambient conditions obey the technical specifications. See *Ambient conditions*.
 - The mounting surface is non-flammable and can hold the weight of the drive. See *Dimensions and weights*.
 - Materials near the drive are non-flammable.
 - There is sufficient space above and below the drive for cooling and to do maintenance work. See *Free space requirements*.

For more details, see *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).

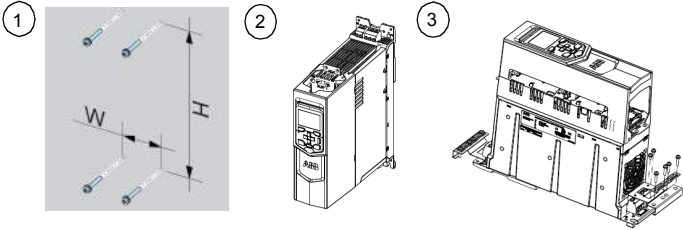
2. Install the drive

- You can install the drive with screws or to a DIN installation rail (with integrated lock).
- Installation requirements:
- Make sure the space around the drive obeys the *Free space requirements* at the top and bottom of the drive for cooling air.
 - You can install the drive vertically alone or several drives side by side.
 - You can install the drive horizontally alone or several drives side by side (front or back).

WARNING! Do not install the drive upside down or with the top of the drive above the bottom of the drive. Make sure that the cooling air exhaust (at the top) is always above the cooling air inlet (at the bottom).

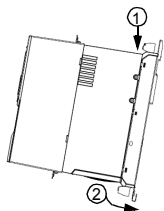
To install the drive with screws

- Mark the locations for the four holes and fix the screws or bolts to the marked locations. See the dimension drawings in *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).
- Install the drive onto the mounting screws.
Note: Lift the drive only by its chassis.
- Tighten the mounting screws.



To install the drive to a DIN installation rail with integrated lock – frames R1 and R2 only

- Position the drive to the rail. To detach the drive, press the release lever on top of the drive.
- Fasten the lower edge of the drive to the mounting base through the two fastening points.



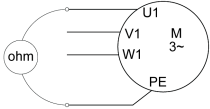
3. Measure the insulation resistance

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

Input power cable: Before you connect the input power cable, measure the insulation of the input cable. Obey the local regulations.

Motor and motor cable:

- Make sure the motor cable is connected to the motor and disconnected from the drive output terminals T1/U, T2/V and T3/W.
- Use a voltage of 1000 V DC to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of ABB motor must be more than 100 Mohm (at 25 °C/ 77 °F). For the insulation resistance of other motors, see the manufacturer's documentation.
Note: Moisture in the motor decreases the insulation resistance. If you think that there is moisture in the motor, dry the motor and do the measurement again.



4. Select the cables

Input power cable: For the best EMC performance, use a symmetrical shielded cable and two grounding conductors.

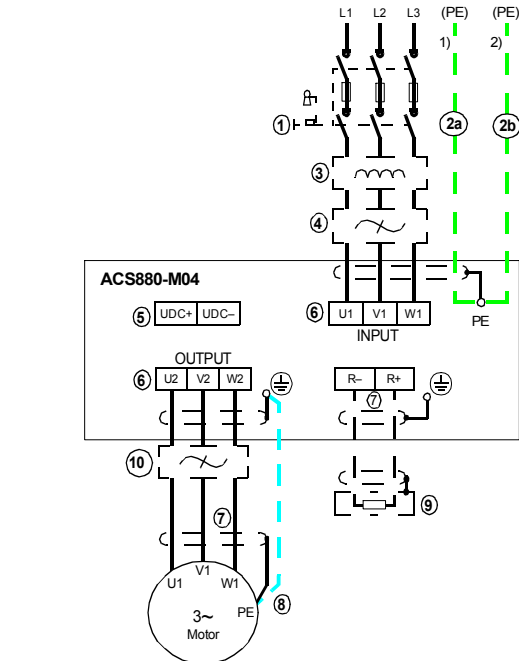
Motor cable: Use a symmetrical shielded cable.

Control cable: Use a double-shielded twisted-pair cable for analog signals. Use a single-shielded cable for digital, relay and I/O signals. Use separate cables for analog and relay signals.

Control panel cable: Use a CAT 5e unshielded or shielded twisted pair cable for connecting the control panel to the drive. Use a USB type a (PC) - type B (control panel) cable for connecting the Drive compose PC tool to the drive through the USB port of the control panel.

5. Connect the power cables

Connection diagram



- Hand-operated input disconnecting device.
- Two grounding conductors, PE cable (2a) and Cable with grounding conductor (2b).
- External mains choke (optional with frames R1 and R2). With frame R3 and R4, the drive has an internal mains choke.
- External EMC filter (optional with frames R1 and R2). With frames R3 and R4, the drive has an internal filter.
- Terminals for common DC configurations.
- Pane for input and output power cables.
- Cabinet entry with 360-degree grounding (recommended).
- Separate grounding cable. Use this cable if the conductivity of the cable shield is less than 50% of the conductivity of the phase conductor and there is no symmetrically constructed grounding conductor in the cable.
- Brake resistor (optional).
- du/dt filter (optional).

Connection procedure

WARNING! Follow the safety instructions in the *ACS880-M04 Hardware manual* (3AXD50000028613 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

- If you are using a drive of frame size R3 or R4, remove the plastic connector covers on top and bottom of the drive. Each cover is fastened with screws.
- On IT (ungrounded) systems and corner grounded TN systems, disconnect the internal varistors and EMC filters (option +E200) by removing the screws connected to the VAR, VAR1, VAR2 and EMC terminals. In frames R1 and R2, the VAR terminal is located close to the supply terminal. In frames R3 and R4, the EMC, VAR1 and VAR2 terminals are located on the front of the power unit.

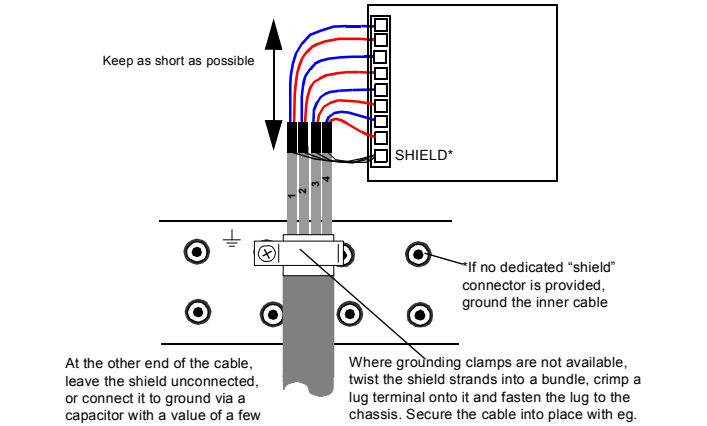
WARNING! If a drive whose varistors/filters are not disconnected is installed on an IT system (an ungrounded power system or a high resistance grounded [over 30 ohms] power system), the system connects to the ground potential through these varistors/filters of the drive. If a drive whose varistors/filters are not connected is installed on a corner grounded TN system, the drive will be damaged.

- Fasten the cable clamp plates to the top and bottom of the drive. The clamp plates are identical.
- Strip the power cables so that the shields are bare at the cable clamps.
- Twist the ends of the cable shield wires into pigtails.
- Strip the ends of the phase conductors.
- Connect the phase conductors of supply cable to U1, V1 and W1 terminals of the drive.
- Connect the phase conductors of motor cable to U2, V2 and W2 terminals.
- Connect the resistor cable conductors (if present) to the R+ and R- terminals. In frame sizes R3 and R4, attach the screw terminal lugs included with the conductors. It is recommended to use crimp lugs instead of screw lugs.
- Tighten the cable clamps onto the bare cable shields.
- Crimp a cable lug onto each shield pigtail. Fasten the lugs to ground terminals.
Note: Try to work out a compromise between the length of the pigtail and the length of unshielded phase conductors as both should ideally be as short as possible.
- Cover the visible bare shield and pigtail with an insulating tape.
- If you are using a drive of frame size R3 or R4, cut suitable slots on the edges of the connector covers to accommodate the supply and motor cables. Install the covers again. Torque the terminals to 3 N.m [25 lbf.in].
- Mechanically secure the cables outside the unit.
- Ground the other end of the supply cable shield or PE conductor(s) at the distribution board.
- If a mains choke and/or an EMC filter is installed, make sure the PE conductor is continuous from the distribution board to the drive.

6. Connect the control cables

Connection procedure

- In the cabinet, remove shrouding wherever necessary to allow access to the cable entries and any trunking inside the cubicle.
 - Connect the control cables into the cubicle. If possible, arrange for a 360° grounding of the cable shield at the cable entry.
If the outer surface of the shield is non-conductive, turn the shield inside out as shown below and wrap a copper foil around the cable to keep the shielding continuous. Do not cut the grounding wire (if present).
-
- Connect the cables to the control unit of the drive (or other connection point) using cable trunking wherever possible.
 - When connecting the cable to drive, remove the outer sheathing of the cable of one of the clamps on the plate. Tighten the clamp onto the bare cable shield.
 - Cut the cables to suitable length.
 - Strip the cable ends and conductors. When connecting to the drive I/O, also remove the shield along with the outer sheathing, and use electrical tape or shrink tubing to contain the strands. Otherwise, twist the outer shield strands into a bundle, crimp a lug onto it and connect it to the nearest chassis grounding point.



- Connect the conductors to appropriate terminals.
- Refit any shrouds removed earlier.

Default I/O connection diagram

Descriptions	Terminals
Relay outputs	XRO1...XRO3
Ready 250 V AC / 30 V DC 2 A	NO 13 COM 12 NC 11
Running 250 V AC / 30 V DC 2 A	NO 23 COM 22 NC 21
Faulted(-1) 250 V AC / 30 V DC 2 A	NO 33 COM 32 NC 31
External power input	XP0W
24 V DC, 2 A min. (without optional modules)	GND 2 +24VI 1
Reference voltage and analog inputs	J1, J2, XAI
AI1/AI2 current/voltage selection	AI1: U AI2: U AI1: I AI2: I
By default not in use. 0(4)...20 mA, R _{in} = 100 ohm ¹⁾	AI2- 7 AI2+ 6
Speed reference 0(2)...10 V, R _{in} > 200 kohm ²⁾	AI1- 5 AI1+ 4
Ground	AGND 3
-10 V DC, R _L 1...10 kohm	-VREF 2
10 V DC, R _L 1...10 kohm	+VREF 1
Analog outputs	XAO
Motor current 0...20 mA, R _L < 500 ohm	AGND 4 AO2 3
Motor speed rpm 0...20 mA, R _L < 500 ohm	AGND 2 AO1 1
Drive-to-drive link	XD2D
	Shield 4 BGND 3 A 2 B 1
Drive-to-drive link ³⁾	
Drive-to-drive link termination ³⁾	J3
Safe torque off	XSTO
	IN2 4 IN1 3 SGND 2 OUT 1
Safe torque off. Both circuits must be closed for the drive to start. ⁴⁾	
Digital inputs	XDI
By default not in use.	DI6 6
Constant speed 1 select (1 = on) ⁵⁾	DI5 5
Acceleration & deceleration select ⁶⁾	DI4 4
Reset	DI3 3
Forward (0) / Reverse (1)	DI2 2
Stop (0) / Start (1)	DI1 1
Digital input/outputs	XDIO
Output: Running	DIO2 2
Output: Ready	DIO1 1
Ground selection ⁷⁾	J6
Auxiliary voltage output, digital interlock ⁸⁾	XD24
Digital input/output ground	DIOGND 5
+24 V DC 200 mA ⁹⁾	+24VD 4
Digital input ground	DICOM 3
+24 V DC 200 mA ⁹⁾	+24VD 2
Run enable ⁸⁾	DIIL 1
Safety functions module connection	X12
Control panel connection	X13
Memory unit connection	X205

Note: The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 ... 2.5 mm² (24...12 AWG). The torque is 0.5 N·m (5 lbf·in).

- Current [0(4)...20 mA, R_{in} = 100 ohm] or voltage [0(2)...10 V, R_{in} > 200 kohm] input selected by jumper J2. Change of setting requires reboot of control unit
- Current [0(4)...20 mA, R_{in} = 100 ohm] or voltage [0(2)...10 V, R_{in} > 200 kohm] input selected by jumper J1. Change of setting requires reboot of control unit.
- Settings: Termination enabled • • • Termination disabled
- See Safe torque off function in ACS880-M04 drive HW manual.
- Constant speed 1 is defined by parameter 22.26.
- 0 = Acceleration/deceleration ramps defined by parameters 23.12/23.13 in use.
1 = Acceleration/deceleration ramps defined by parameters 23.14/23.15 in use.
- Jumper/switch J6. Determines whether DICOM is separated from DIOGND (ie. common reference for digital inputs floats; in practice, selects whether the digital inputs are used in current sinking or sourcing mode). See the Ground isolation diagram (ZCU) in *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).
- DIII input used for connecting safety circuits. By default, the input is parameterized to stop the unit when the input signal is lost.
- Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.

7. Start up the drive

WARNING! Follow all safety instructions of the drive. Only qualified electricians are allowed to start up the drive.
Never work on the drive, the brake chopper circuit, the motor cable or the motor when power is applied to the drive. Always make sure by measuring that no voltage is actually present.

WARNING! Make sure that the machinery into which the drive with brake control function is integrated fulfills the personnel safety regulations.
Note that the frequency converter (a Complete Drive Module or a Basic Drive Module, as defined in IEC 61800-2), is not considered as a safety device mentioned in the European Machinery Directive and related harmonized standards. Thus, the personnel safety of the complete machinery must not be based on a specific frequency converter feature (such as the brake control function), but it has to be implemented as defined in the application specific regulations.

- Check the mechanical and electrical installations of the drive before start-up. See the installation checklist in *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).
- Make sure the motor and drive equipment are ready to start.
- Perform the start-up tasks as instructed by the cabinet installer of the drive module.
- Switch On the power.
- Configure the drive parameters. See start-up instructions in *ACS880-M04 drive Firmware manual* (3AXD50000030629 [English]).
- Validate the Safe torque off function. See the STO function acceptance test procedure in *ACS880-M04 drive Hardware manual* (3AXD50000028613 [English]).

Fault messages generated by the drive

Code	Warning/fault
A2A1/2281	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 result from 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.
3181	Wiring or earth fault. The input power and motor cable connections are incorrect or there is a load unbalance due to earth fault in motor or motor cable.
A3A1/3210	DC link overvoltage. There is an overvoltage in the intermediate DC circuit.
A3A2/3220	DC link undervoltage. There is an undervoltage in the intermediate DC circuit.
3381	Output phase loss. All three phases are not connected to the motor.
A5A0/5091	Safe torque off. The Safe torque off (STO) function is on.
FA81	Safe torque off 1 loss. The Safe torque off circuit 1 is broken.
FA82	Safe torque off 2 loss. The Safe torque off circuit 2 is broken.

For more details, see *ACS880-M04 drive Firmware manual* (3AXD50000030629 [English]).

Ratings

See symbol definitions at the end of the ratings tables.

■ Nominal ratings with 230 V AC supply

ACS880-M04	Frame size	Input ratings		Output ratings									
				Nominal		No-overload use		Light-overload use		Heavy-duty use			
		<i>I</i> _{1N} A	<i>I</i> _{1N} A	<i>I</i> _{2N} A	<i>I</i> _{Max} A	<i>P</i> _N kW	hp	<i>I</i> _{Ld} A	<i>P</i> _{Ld} kW	<i>P</i> _{Ld} hp	<i>I</i> _{Hd} A	<i>P</i> _{Hd} kW	<i>P</i> _{Hd} hp
-03A0-2	R1	2.1	3.5	3.0	4.4	0.37	0.5	2.8	0.37	0.5	2.5	0.37	0.5
-03A6-2	R1	2.9	5.2	3.6	5.3	0.55	0.75	3.4	0.55	0.75	3.0	0.37	0.5
-04A8-2	R1	3.7	6.3	4.8	7.0	0.75	1	4.5	0.75	1	4.0	0.55	0.75
-06A0-2	R1	5.2	8.9	6.0	8.8	1.1	1.5	5.5	1.1	1.5	5.0	0.75	1
-08A0-2	R1	6.3	10.7	8.0	10.5	1.5	2	7.6	1.5	2	6.0	1.1	1.5
-010A-2	R2	8.3	13	10.5	13.5	2.2	3	9.7	2.2	3	9.0	1.5	2
-014A-2	R2	11	17	14	16.5	3	3	13.0	3	3	11.0	2.2	3
-018A-2	R2	15	21	18	21	4	5	16.8	4	5	14.0	3	3
-025A-2	R3	19	—	25	33	5.5	7.5	23	5.5	7.5	19.0	4	5
-030A-2	R3	26	—	30	36	7.5	10	28	7.5	10	24	5.5	7.5
-035A-2	R3	30	—	35	44	7.5	10	32	7.5	10	29	7.5	10
-044A-2	R3	35	—	44	53	11	15	41	11	15	35	7.5	10
-050A-2	R3	42	—	50	66	11	15	46	11	15	44	11	15
-061A-2	R4	54	—	61	78	15	20	57	15	20	52	11	15
-078A-2	R4	64	—	78	100	18.5	25	74	18.5	25	69	15	20
-094A-2	R4	81	—	94	124	22	30	90	22	30	75	18.5	25

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■ Nominal ratings with 400 V AC supply

ACS880-M04	Frame size	Input ratings		Output ratings									
				Nominal		No-overload use		Light-overload use		Heavy-duty use			
		<i>I</i> _{1N} A	<i>I</i> _{1N} A	<i>I</i> _{2N} A	<i>I</i> _{Max} A	<i>P</i> _N kW		<i>I</i> _{Ld} A	<i>P</i> _{Ld} kW	<i>I</i> _{Hd} A	<i>P</i> _{Hd} kW		
-03A0-5	R1	2.3	3.8	3.0	4.4	1.1		2.8	1.1	2.5	0.75		
-03A6-5	R1	3.1	5.6	3.6	5.3	1.5		3.4	1.5	3.0	1.1		
-04A8-5	R1	4.0	6.8	4.8	7.0	2.2		4.5	1.5	4.0	1.5		
-06A0-5	R1	5.5	9.4	6.0	8.8	2.2		5.5	2.2	5.0	2.2		
-08A0-5	R1	6.6	11.2	8.0	10.5	3.0		7.6	3.0	6.0	2.2		
-010A-5	R2	8.7	13	10.5	13.5	4.0		9.7	4.0	9.0	4.0		
-014A-5	R2	12	18	14	16.5	5.5		13.0	5.5	11.0	5.5		
-018A-5	R2	16	23	18	21	7.5		16.8	7.5	14.0	7.5		
-025A-5	R3	20	—	25	33	11.0		23	11	19.0	7.5		
-030A-5	R3	26	—	30	36	15.0		28	15	24	11.0		
-035A-5	R3	30	—	35	44	18.5		32	15	29	15.0		
-044A-5	R3	36	—	44	53	22		41	22	35	18.5		
-050A-5	R3	42	—	50	66	22		46	22	44	22		
-061A-5	R4	55	—	61	78	30		57	30	52	22		
-078A-5	R4	65	—	78	104	37		74	37	66	37		
-094A-5	R4	82	—	94	124	45		90	45	75	37		

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■ Nominal ratings with 460 V AC supply

ACS880-M04	Frame size	Input ratings		Output ratings									
				Nominal		No-overload use		Light-overload use		Heavy-duty use			
		<i>I</i> _{1N} A	<i>I</i> _{1N} A	<i>I</i> _{2N} A	<i>I</i> _{Max} A	<i>P</i> _N hp		<i>I</i> _{Ld} A	<i>P</i> _{Ld} hp	<i>I</i> _{Hd} A	<i>P</i> _{Hd} hp		
-03A0-5	R1	2.3	3.8	3.0	4.4	1.5		2.8	1.0	2.5	1.0		
-03A6-5	R1	3.1	5.6	3.6	5.3	2.0		3.4	2.0	3.0	1.5		
-04A8-5	R1	4.0	6.8	4.8	7.0	3.0		4.5	2.0	4.0	2.0		
-06A0-5	R1	5.5	9.4	6.0	8.8	3.0		5.5	3.0	5.0	3.0		
-08A0-5	R1	6.6	11.2	8.0	10.5	5.0		7.6	5.0	6.0	3.0		
-010A-5	R2	8.7	13	10.5	13.5	5.0		9.7	5.0	9.0	5.0		
-014A-5	R2	12	18	14	16.5	7.5		13.0	7.5	11.0	7.5		
-018A-5	R2	16	23	18	21	10		16.8	10	14.0	10		
-025A-5	R3	20	—	25	33	15		23	15	19.0	10		
-030A-5	R3	26	—	30	36	20		28	20	24	15		
-035A-5	R3	30	—	35	44	25		32	20	29	20		
-044A-5	R3	36	—	44	53	30		41	30	35	25		
-050A-5	R3	42	—	50	66	30		46	30	44	30		
-061A-5	R4	55	—	61	78	40		57	40	52	40		
-078A-5	R4	65	—	78	104	50		74	50	66	50		
-094A-5	R4	82	—	94	124	60		90	60	75	50		

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■ Nominal ratings with 500 V AC supply

ACS880-M04	Frame size	Input ratings		Output ratings									
				Nominal		No-overload use		Light-overload use		Heavy-duty use			
		<i>I</i> _{1N} A	<i>I</i> _{1N} A	<i>I</i> _{2N} A	<i>I</i> _{Max} A	<i>P</i> _N kW		<i>I</i> _{Ld} A	<i>P</i> _{Ld} kW	<i>I</i> _{Hd} A	<i>P</i> _{Hd} kW		
-03A0-5	R1	2.3	3.8	3.0	4.4	1.5		2.8	1.1	2.5	1.1		
-03A6-5	R1	3.1	5.6	3.6	5.3	1.5		3.4	1.5	3.0	1.5		
-04A8-5	R1	4.0	6.8	4.8	7.0	2.2		4.5	2.2	4.0	2.2		
-06A0-5	R1	5.5	9.4	6.0	8.8	3.0		5.5	3.0	5.0	2.2		
-08A0-5	R1	6.6	11.2	8.0	10.5	4.0		7.6	4.0	6.0	3.0		
-010A-5	R2	8.7	13	10.5	13.5	5.5		9.7	5.5	9.0	4.0		
-014A-5	R2	12	18	14	16.5	7.5		13.0	7.5	11.0	5.5		
-018A-5	R2	16	23	18	21	11.0		16.8	7.5	14.0	7.5		
-025A-5	R3	20	—	25	33	15.0		23	11.0	19.0	11.0		
-030A-5	R3	26	—	30	36	18.5		28	15.0	24	15.0		
-035A-5	R3	30	—	35	44	22		32	18.5	29	18.5		
-044A-5	R3	36	—	44	53	30		41	22	35	22		
-050A-5	R3	42	—	50	66	30		46	30	44	30		
-061A-5	R4	55	—	61	78	37		57	37	52	30		
-078A-5	R4	65	—	78	104	45		74	45	66	45		
-094A-5	R4	82	—	94	124	55		90	55	75	45		

3AXD10000434191

■ Definitions

- I*_{1N} Nominal input current (rms) at 40 °C (104 °F).
*Without mains choke.
- **I*_{1N} Nominal input current (rms) at 40 °C (104 °F), without mains choke.
- I*_{2N} Nominal output current.
- I*_{Max} Maximum output current. Available for at least 10 seconds at start, otherwise as long as allowed by drive temperature.
- P*_N Typical motor power for no-overload use.
- I*_{Ld} Continuous rms output current. 10% overload is allowed for 1 minute every 5 minutes.
- P*_{Ld} Typical motor power for light-overload use.
- I*_{Hd} Continuous rms output current. 50% overload is allowed for 1 minute every 5 minutes.
- P*_{Hd} Typical motor power for heavy-duty use.
- Note:**
- To achieve the rated motor power given in the table, the rated current of the drive must be higher than or equal to the rated motor current.
 - The DriveSize dimensioning tool available from ABB is recommended for selecting the drive, motor and gear combination.
 - The maximum allowed motor shaft power is limited to 1.5 · *P*_{Hd}, 1.1 · *P*_N or *P*_{Cont,max} (whichever value is the greatest). If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.

Fuses

■ gG and gR fuses

ACS880-M04	gG fuses				gR fuses			
	Voltage rating: 500 V Manufacturer: ABB				Voltage rating: 690 V Manufacturer: Bussmann			
	Input current (A)	A ² s (@500 V)	ABB type	Fuse size DIN	Input current (A)	A ² s (@600 V)	ABB type	Fuse size DIN
1-phase U _N = 230 V								
03A0-2	6	110	OFAF000H6	000	20	70	170M2693	00
03A6-2	6	110	OFAF000H6	000	20	70	170M2693	00
04A8-2	10	360	OFAF000H10	000	20	70	170M2693	00
06A0-2	10	360	OFAF000H10	000	20	70	170M2693	00
08A0-2	16	750	OFAF000H16	000	20	70	170M2693	00
010A-2	16	750	OFAF000H16	000	20	70	170M2693	00
014A-2	20	1500	OFAF000H20	000	25	125	170M2694	00
018A-2	25	2550	OFAF000H25	000	32	275	170M2695	00
025A-2	25	2550	OFAF000H25	000	32	275	170M2695	00
030A-2	32	4500	OFAF000H35	000	32	275	170M2695	00
035A-2	40	7800	OFAF000H40	000	50	1000	170M2697	00
044A-2	50	16000	OFAF000H50	000	50	1000	170M2697	00
050A-2	50	16000	OFAF000H50	000	63	1800	170M2698	00
061A-2	63	20000	OFAF000H63	000	80	3600	170M2699	00
078A-2	80	37000	OFAF000H80	000	100	6650	170M2700	00
094A-2	100	65000	OFAF000H100	000	125	12000	170M2701	00
3-phase U _N = 400 V								
03A0-5	6	110	OFAF000H6	000	25	125	170M2694	00
03A6-5	6	110	OFAF000H6	000	25	125	170M2694	00
04A8-5	10	360	OFAF000H10	000	25	125	170M2694	00
06A0-5	10	360	OFAF000H10	000	25	125	170M2694	00
08A0-5	16	750	OFAF000H16	000	25	125	170M2694	00
010A-5	16	750	OFAF000H16	000	25	125	170M2694	00
014A-5	20	1500	OFAF000H20	000	40	490	170M2696	00
018A-5	25	2550	OFAF000H25	000	40	490	170M2696	00
025A-5	25	2550	OFAF000H25	000	40	490	170M2696	00
030A-5	32	4500	OFAF000H35	000	40	490	170M2696	00
035A-5	40	7800	OFAF000H40	000	63	1800	170M2698	00
044A-5	50	16000	OFAF000H50	000	63	1800	170M2698	00
050A-5	50	16000	OFAF000H50	000	63	1800	170M2698	00
061A-5	63	20000	OFAF000H63	000	80	3600	170M2699	00
078A-5	80	37000	OFAF000H80	000	100	6650	170M2700	00
094A-5	100	65000	OFAF000H100	000	125	12000	170M2701	00