8

Installation checklist

Contents of this chapter

This chapter contains an installation checklist which you must complete before you start up the drive.

Warnings

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. If you ignore them, injury or death, or damage to the equipment can occur.

Checklist

Do the steps in section *Electrical safety precautions* on page *19* before you start the work. Go through the checklist together with another person.

☑	**Make sure that …**
☐	The ambient operating conditions meet the specification in section *Ambient conditions* on page *312*.
☐	If the drive will be connected to another system than symmetrically grounded TN-S system: Examine if you must disconnect the EMC filter or ground-to-phase varistor. See section • IEC: *Examining the compatibility with IT (ungrounded), corner-grounded delta, midpoint-grounded delta and TT systems* on page *116*, or • North America: *Examining the compatibility with IT (ungrounded), corner-grounded delta, midpoint-grounded delta and TT systems* on page *168*.

☑	**Make sure that …**
☐	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. See section *Reforming the capacitors* on page *236*.
☐	There is an adequately sized protective earth (ground) conductor between the drive and the switchboard.
☐	There is an adequately sized protective earth (ground) conductor between the motor and the drive.
☐	All protective earth (ground) conductors have been connected to the appropriate terminals and the terminals have been tightened (pull conductors to check).
☐	The supply voltage matches the nominal input voltage of the drive. See the type designation label.
☐	The input power cable has been connected to appropriate terminals, the phase order is correct, and the terminals have been properly tightened. (Pull conductors to check.)
☐	Appropriate supply fuses and disconnector have been installed.
☐	The motor cable has been connected to appropriate terminals, the phase order is right, and the terminals have been tightened. (Pull conductors to check.)
☐	The brake resistor cable (if present) has been connected to appropriate terminals, and the terminals have been tightened. (Pull conductors to check.)
☐	The motor cable (and brake resistor cable, if present) has been routed away from other cables.
☐	The control cables (if any) have been connected to the control unit.
☐	If a drive bypass connection will be used: The direct-on-line contactor of the motor and the drive output contactor are either mechanically or electrically interlocked (cannot be closed simultaneously).
☐	There are no tools, foreign objects or dust from drilling inside the drive.
☐	Drive and motor connection box covers are in place.
☐	The motor and the driven equipment are ready for start-up.

9

Maintenance and hardware diagnostics

Contents of this chapter

This chapter contains preventive maintenance instructions and LED indicator descriptions.

Maintenance intervals

The table below shows the maintenance tasks which can be done by the end user. The complete maintenance schedule is available on the Internet (www.abb.com/drivesservices). For more information, consult your local ABB Service representative (www.abb.com/searchchannels).

Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.

Note: Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service representative for additional maintenance recommendations.

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	DC circuit capacitors reforming for spare modules and spare capacitors (page *236*)
I	Tightness of terminals
I	Dustiness, corrosion or temperature
P	Heat sink cleaning (page *225*)

Recommended maintenance actions by the user

Component	Years from start-up						
	3	6	9	12	15	18	21
Cooling							
Fans, IP21 (UL Type 1) frames R1 to R9							
Main cooling fan R1…R4: page *227*, R5: page *229*		R		R		R	
Main cooling fan LONGLIFE R6…R8: page *229*, R9: page *230*			R			R	
Auxiliary cooling fan (LONGLIFE) for circuit boards, R5…R9 only: page *231*			R			R	
Fans, IP55 (UL Type 12) frames R1 to R9							
Main cooling fan R1…R4: page *227*, R5: page *229*		R		R		R	
Main cooling fan LONGLIFE R6…R8: page *229*, R9: page *230*			R			R	
Auxiliary cooling fan for circuit boards R1…R2: page *232*	R	R	R	R	R	R	R
Auxiliary cooling fan (LONGLIFE) for circuit boards R3: page *233*, R4: page *234*, R5…R9: page *231*			R			R	
Second auxiliary cooling fan (LONGLIFE) R8 and R9: page *235*			R			R	
Aging							
Control panel battery: page *237*			R			R	
Functional safety							
Safety function test	I See the maintenance information of the safety function						
Safety component expiry (Mission time, T_M)	20 years						

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Heatsink

The drive heatsink fins pick up dust from the cooling air. The drive can run into overtemperature warnings and faults if the heatsink is not clean. When necessary, clean the heatsink as follows.

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

WARNING! Use a vacuum cleaner with antistatic hose and nozzle. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

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 *Electrical safety precautions* on page *19* before you start the work.
2. Remove the cooling fan(s). See section *Fans* on page *226*.
3. Blow clean, dry and oil free compressed air 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 dust entering adjoining equipment, do the cleaning in another room.
4. Reinstall the cooling fan(s).

Fans

See section *Maintenance intervals* on page *223* for the fan replacement interval in average operation conditions.

Parameter 05.04 Fan on-time counter indicates the running time of the cooling fan. Reset the counter after a fan replacement. See the firmware manual.

In a speed-controlled fan, the speed of the fan matches the cooling needs. This increases the life span of the fan.

Main fans are speed controlled. When the drive is stopped, the main fan runs at low speed until the drive cools down. IP21 (UL Type 1) frames R5…R9 and all IP55 (UL Type 12) frames have auxiliary fans that are not speed controlled and run all the time when the control unit is powered.

Replacement fans are available from the manufacturer. Do not use other than specified spare parts.

Replacing the main cooling fan, IP21 and IP55 (UL Type 1 and UL Type 12) frames R1…R4

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* before you start the work.

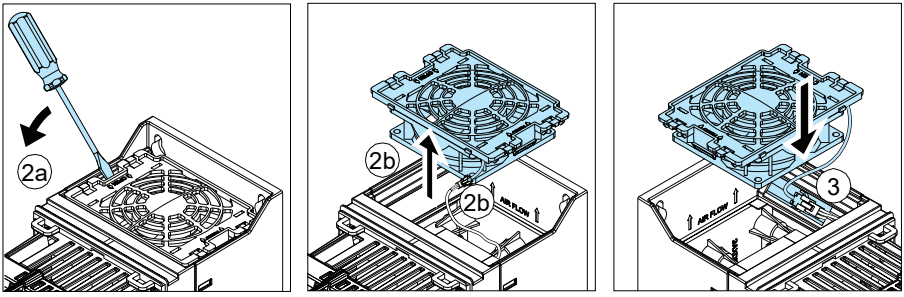
R1…R3

2. Lever the fan assembly off the drive frame with for example a screwdriver (2a) and pull out 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.

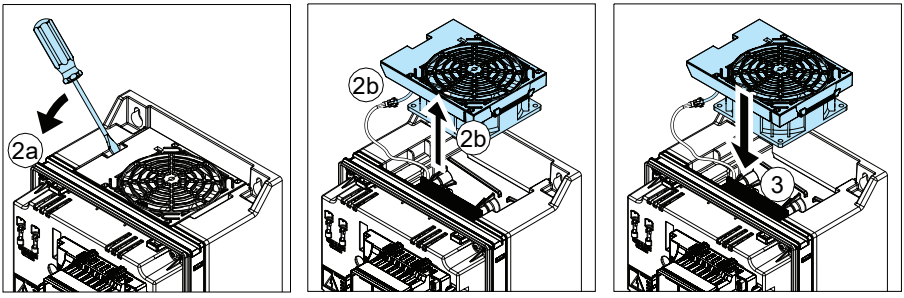
   R1…R2: Put the connector and extra length of wires in the groove so that the wires do not get caught in the revolving fan.

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

R1…R2



R3

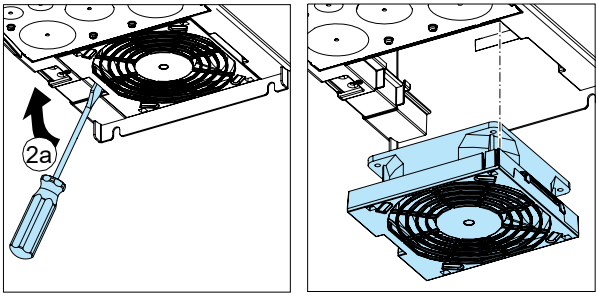


R4

2. Lever the fan assembly off the drive frame with for example a screwdriver (2a) and pull out the fan assembly (2b).

3. Install the fan assembly in reverse order.

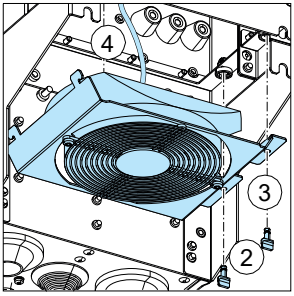
R4

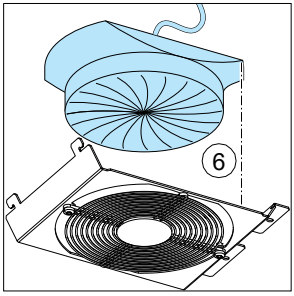


Replacing the main cooling fan, IP21 and IP55 (UL Type 1 and UL Type 12) frames R5…R8

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* before you start the work.
2. Remove the two mounting screws of the fan mounting plate at the bottom of the drive.
3. Pull the fan mounting plate down from the side edge.
4. Unplug the fan power supply wires from the drive.
5. Lift the fan mounting plate off.
6. Remove the fan from the mounting plate.
7. Install the new fan in reverse order.

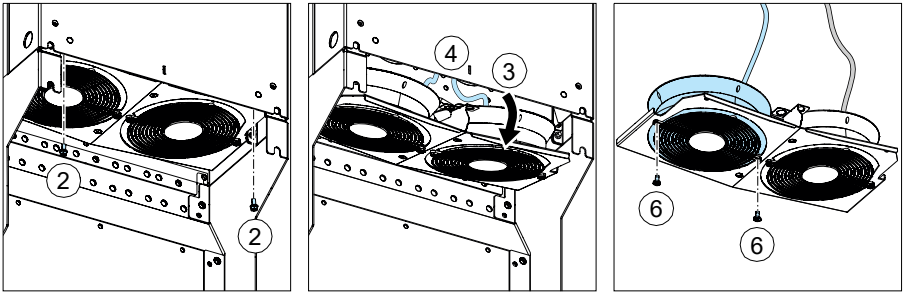




Replacing the main cooling fans, IP21 and IP55 (UL Type 1 and UL Type 12) frame R9

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

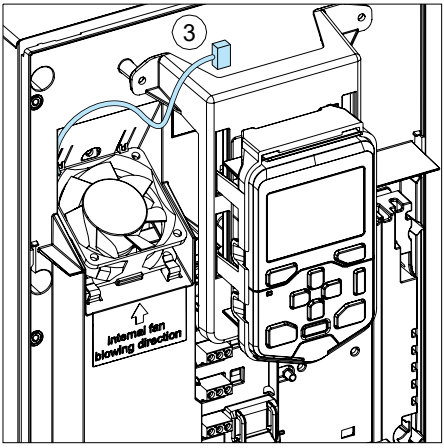
1. Stop the drive and disconnect it from the power line. Wait for 5 minutes and then make sure by measuring that there is no voltage. See section *Electrical safety precautions* on page *19* before you start the work.
2. Remove the two mounting screws of the fan mounting plate.
3. Turn the mounting plate downwards.
4. Unplug the fan power supply wires from the drive.
5. Remove the fan mounting plate.
6. Remove the fans by removing the two mounting screws.
7. Install the new fans in reverse order.

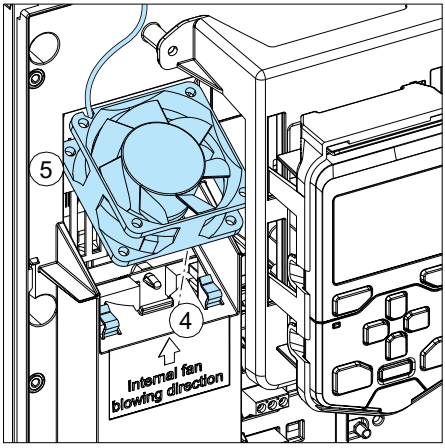


Replacing the auxiliary cooling fan, IP21 and IP55 (UL Type 1 and UL Type 12) frames R5…R9

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* before you start the work.
2. Remove the front cover (see page *79*).
3. Unplug fan power supply wires from the drive.
4. Release the retaining clips.
5. Lift the fan off.
6. Install the new fan in reverse order.
   Note: Make sure that the arrow on the fan points up.

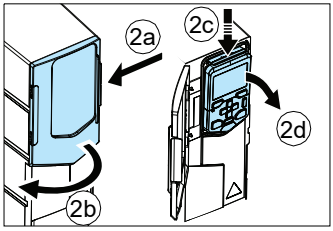


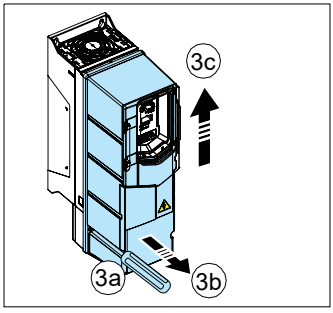


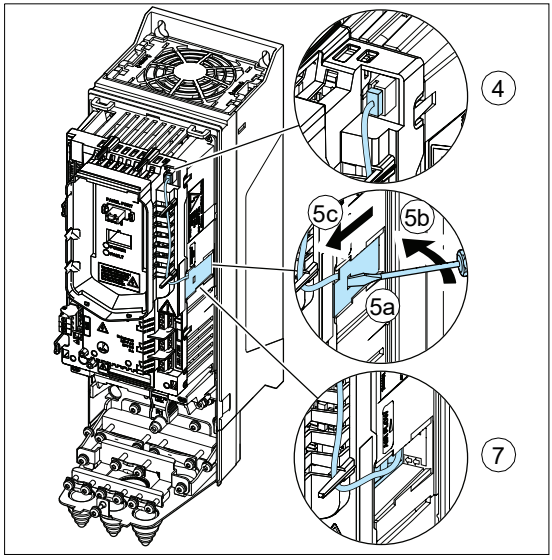
Replacing the auxiliary cooling fan, IP55 (UL Type 12) frames R1…R2

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* 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.



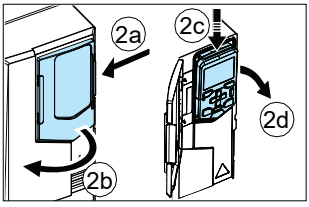


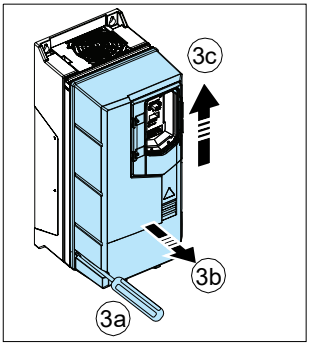


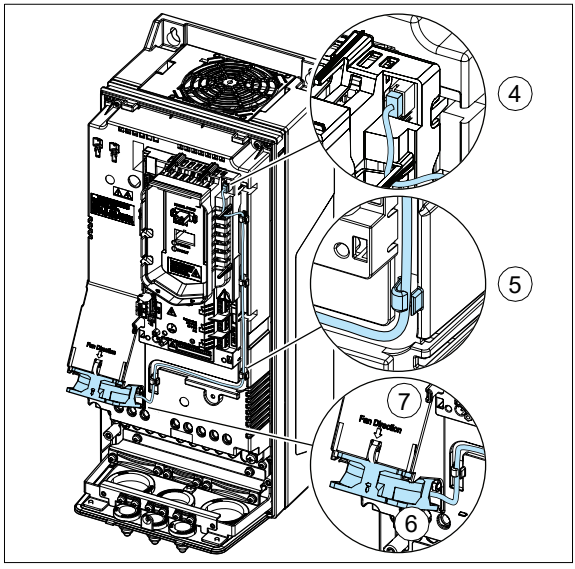
Replacing the auxiliary cooling fan, IP55 (UL Type 12) frame R3

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* 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 screw 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).



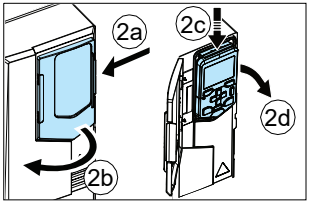


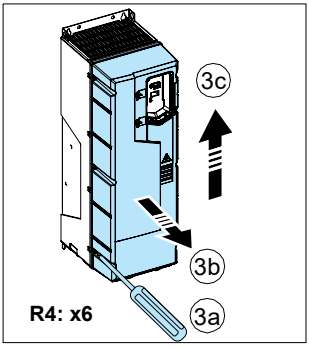


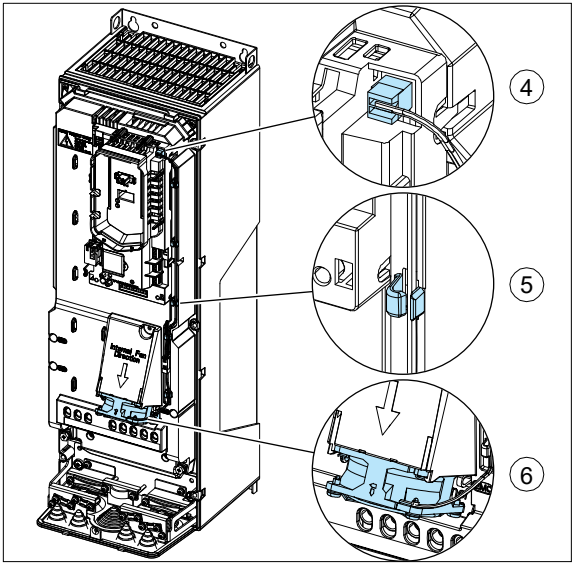
Replacing the auxiliary cooling fan, IP55 (UL Type 12) frame R4

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* 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 (6 pieces) 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 clips.
6. Pull the fan off.
7. Install the new fan in reverse order.
   Note: Make sure that the arrow on the fan points down.



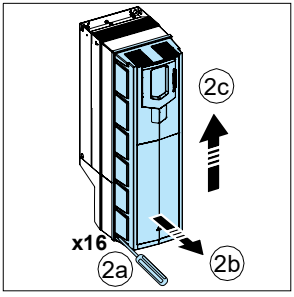


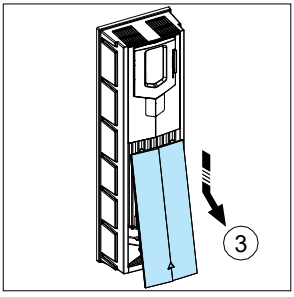


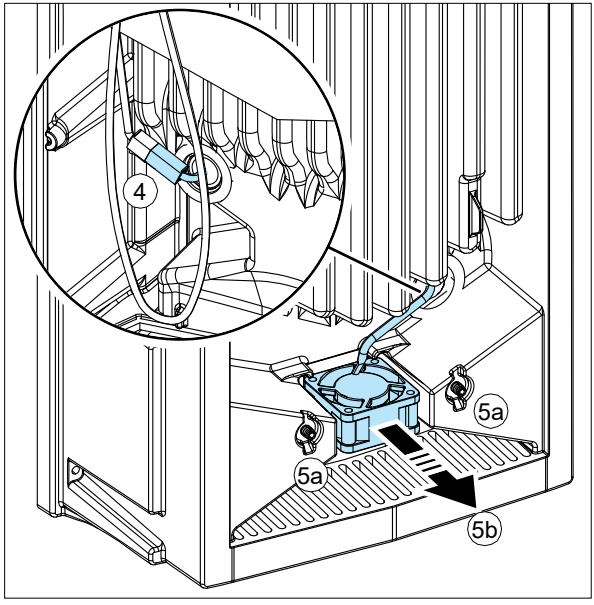
Replacing the second auxiliary cooling fan, IP55 (UL Type 12) frames R8…R9

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 *Electrical safety precautions* on page *19* before you start the work.
2. Remove the front cover: Loosen the retaining screws (14 pieces) with a screwdriver (2a) and lift the cover from the bottom outwards (2b) and then up (2c).
3. Remove the lower cover panel from the cover.
4. Unplug the fan power supply wires from the connector on the other side of the IP55 (UL Type 12) front cover.
5. Remove the retaining screws (5a) and pull off the fan (5b).
6. Install the new fan in reverse order.
   Note: Make sure that the arrow on the fan points up.







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 section *Type designation label* on page *47* 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 the control panel

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

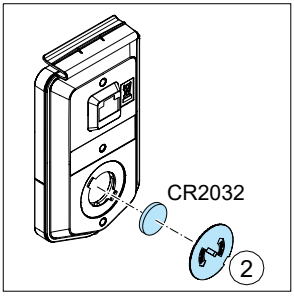
Replacing the battery in the control panel

A battery is used in all control panels, except the basic control panel that does not support the clock function, to keep the clock operating in memory during power interruptions.

The expected life for the battery is greater than ten years.

Note: The battery is NOT required for any control panel or drive functions, except the clock.

1. Remove the control panel from the drive. See section *Control panel* on page *46*.
2. To remove the battery, use a coin to rotate the battery cover on the back of the control panel.
3. Replace the battery with type CR2032. Dispose the old battery according to local disposal rules or applicable laws.



LEDs

Drive LEDs

There is a green POWER and a red FAULT LED on the front of the drive. They are visible through the panel cover but invisible if a control panel is attached to the drive. The table below describes the drive LED indications.

Drive LEDs POWER and FAULT, on the front of the drive, under the control panel / panel cover If a control panel is attached to the drive, switch to remote control (otherwise a fault will be generated), and then remove the panel to be able to see the LEDs				
LEDs off	**LED lit and steady**		**LED blinking**	
No power	Green (POWER)	Power supply on the board OK	Green (POWER)	Blinking: Drive in an alarm state Blinking for one second: Drive selected on the control panel when multiple drives are connected to the same panel bus.
	Red (FAULT)	Active fault in the drive. To reset the fault, press RESET from the control panel or switch off the drive power.	Red (FAULT)	Active fault in the drive. To reset the fault, switch off the drive power.

Control panel LEDs

The assistant control panel has one LED. The table below describes the control panel LED indications. For more information see A*Cx-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

Control panel LED, at the left edge of the control panel				
LED off	**LED lit and steady**		**LED blinking/flickering**	
Panel has no power	Green	Drive functioning normally. Connection between the drive and control panel may be faulty or lost, or the panel and drive may be incompatible. Check the control panel display.	Green	Blinking: Active warning in the drive Flickering: Data transferred between the PC tool and drive through the USB connection of the control panel
	Red	Check the display to see where the fault is. • Active fault in the drive. Reset the fault. • Active fault in another drive in the panel bus. Switch to the drive in question and check and reset the fault.	Red	Active fault in the drive. To reset the fault, cycle the drive power.
			Blue	Panels with a Bluetooth interface only. Blinking: Bluetooth interface is enabled. It is in discoverable mode and ready for pairing. Flickering: Data is transfered through the Bluetooth interface of the control panel.

Functional safety components

The mission time of functional safety components is 20 years which equals the time during which failure rates of electronic components remain constant. This applies to the components of the standard Safe torque off circuit as well as any modules, relays and, typically, any other components that are part of functional safety circuits.

The expiry of mission time terminates the certification and SIL/PL classification of the safety function. The following options exist:

- Renewal of the whole drive and all optional functional safety module(s) and components.
- Renewal of the components in the safety function circuit. In practice, this is economical only with larger drives that have replaceable circuit boards and other components such as relays.

Note that some of the components may already have been renewed earlier, restarting their mission time. The remaining mission time of the whole circuit is however determined by its oldest component.

Contact your local ABB service representative for more information.

10

Technical data

Contents of this chapter

This chapter contains the technical specifications of the drive, for example ratings, sizes and technical requirements as well as provisions for fulfilling the requirements for CE, UL and other approval marks.

Electrical ratings

IEC ratings at U_n = 230 V

Type ACS580 -01-	Input rating	Output ratings							Frame size
		Max. current	Nominal use		Light-duty use		Heavy-duty use		
	I_1	I_{max}	I_2	P_n	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	kW	A	kW	A	kW	
3-phase U_n = 230 V									
04A7-2	4.7	6.3	4.7	0.75	4.6	0.75	3.5	0.55	R1
06A7-2	6.7	8.9	6.7	1.1	6.6	1.1	4.6	0.75	R1
07A6-2	7.6	11.9	7.6	1.5	7.5	1.5	6.6	1.1	R1
012A-2	12.0	19.1	12.0	3.0	11.8	3.0	7.5	2.2	R1
018A-2	16.9	22.0	16.9	4.0	16.7	4.0	10.6	3.0	R1
025A-2	24.5	32.7	24.5	5.5	24.2	5.5	16.7	4.0	R2
032A-2	31.2	43.6	31.2	7.5	30.8	7.5	24.2	5.5	R2
047A-2	46.7	62.4	46.7	11	46.2	11	30.8	7.5	R3
060A-2	60	83.2	60	15	59.4	15	46.2	11	R3
089A-2	89	135	89	22	88	22	74.8	18.5	R5
115A-2	115	158	115	30	114	30	88.0	22.0	R5
144A-2	144	205	144	37	143	37	114	30	R6
171A-2	171	257	171	45	169	45	143	37	R7
213A-2	213	304	213	55	211	55	169	45	R7
276A-2	276	380	276	75	273	75	211	55	R8

Type ACS580-01-	Input ratings	Output ratings		Frame size
	I_1	I_2	P_n	
	A	A[1)]	kW	
1-phase U_n = 230 V				
04A7-2	3.3	2.2	0.37	R1
06A7-2	4.6	3.2	0.55	R1
07A6-2	6.3	4.2	0.75	R1
012A-2	8.9	6.0	1.1	R1
018A-2	11.8	6.8	1.5	R1
025A-2	17.3	9.6	2.2	R2
032A-2	30.4	15.2	4.0	R2
047A-2	42	22.0	5.5	R3
060A-2	55	28.0	7.5	R3
089A-2	81	42	11.0	R5
115A-2	111	54	15.0	R5
144A-2	137	68	18.5	R6
171A-2	153	80	22.0	R7
213A-2	209	104	30.0	R7
276A-2	258	130	37.0	R8

[1)] Continuous current, no overloadability

See definitions and notes on page *245*.

IEC ratings at U_n = 400 V

Type ACS580 -01-	Input rating	Output ratings							Frame size
		Max. current	Nominal use		Light-duty use		Heavy-duty use		
	I_1	I_{max}	I_2	P_n	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	kW	A	kW	A	kW	
3-phase U_n = 400 V									
02A7-4	2.6	3.2	2.6	0.75	2.5	0.75	1.8	0.6	R1
03A4-4	3.3	4.7	3.3	1.1	3.1	1.1	2.6	0.8	R1
04A1-4	4.0	5.9	4.0	1.5	3.8	1.5	3.3	1.1	R1
05A7-4	5.6	7.2	5.6	2.2	5.3	2.2	4.0	1.5	R1
07A3-4	7.2	10.1	7.2	3.0	6.8	3.0	5.6	2.2	R1
09A5-4	9.4	13.0	9.4	4.0	8.9	4.0	7.2	3.0	R1
12A7-4	12.6	15.3	12.6	5.5	12.0	5.5	9.4	4.0	R1
018A-4	17.0	22.7	17.0	7.5	16.2	7.5	12.6	5.5	R2
026A-4	25.0	30.6	25.0	11.0	23.8	11.0	17.0	7.5	R2
033A-4	32.0	44.3	32.0	15.0	30.4	15.0	24.6	11.0	R3
039A-4	38.0	56.9	38.0	18.5	36.1	18.5	31.6	15.0	R3
046A-4	45.0	67.9	45.0	22.0	42.8	22.0	37.7	18.5	R3
062A-4	62	81	62	30	58	30	45	22.0	R4
073A-4	73	109.8	73	37	68	37	61	30.0	R4
088A-4	88	129.6	88	45	83	45	72	37	R5
106A-4	106	156.6	106	55	100	55	87	45	R5
145A-4	145	178	145	75	138	75	105	55	R6
169A-4	169	247	169	90	161	90	145	75	R7
206A-4	206	287	206	110	196	110	169	90	R7
246A-4	246	350	246	132	234	132	206	110	R8
293A-4	293	418	293	160	278	160	246[1)]	132	R8
363A-4	363	498	363	200	345	200	293	160	R9
430A-4	430	545	430	250	400	200	363[2)]	200	R9
500A-4	500	600	500	250	500	250	373	200	R9

See definitions and notes on page 245.

IEC ratings at U_n = 480 V

Type ACS580 -01-	Input rating	Output ratings							Frame size
		Max. current	Nominal use			Heavy-duty use			
	I_1	I_{max}	I_{Ld}	P_{Ld}		I_{Hd}	P_{Hd}		
	A	A	A	kW	hp	A	kW	hp	
3-phase U_n = 480 V									
02A7-4	2.1	2.9	2.1	0.75	1.0	1.6	0.55	0.75	R1
03A4-4	3.0	3.8	3.0	1.1	1.5	2.1	0.75	1.0	R1
04A1-4	3.4	5.4	3.5	1.5	2.0	3.0	1.1	1.5	R1
05A7-4	4.8	6.1	4.8	2.2	3.0	3.4	1.5	2.0	R1
07A3-4	6.0	7.2	6.0	3.0	3.0	4.0	2.2	3.0	R1
09A5-4	7.6	8.6	7.6	4.0	5.0	4.8	3.0	3.0	R1
12A7-4	11.0	13.7	12.0	5.5	7.5	7.6	4.0	5.0	R1
018A-4	14.0	19.8	14.0	7.5	10.0	11.0	5.5	7.5	R2
026A-4	21.0	25.2	23.0	11.0	15.0	14.0	7.5	10.0	R2
033A-4	27.0	37.8	27.0	15.0	20.0	21.0	11.0	15.0	R3
039A-4	34.0	48.6	34.0	18.5	25.0	27.0	15.0	20.0	R3
046A-4	40.0	61.2	44.0	22.0	30.0	34.0	18.5	25.0	R3
062A-4	52	76	52	30	40	40	22	30	R4
073A-4	65	104	65	37	50	52	30	40	R4
088A-4	77	122	77	45	60	65	37	50	R5
106A-4	96	148	96	55	75	77	45	60	R5
145A-4	124	178	124	75	100	96	55	75	R6
169A-4	156	247	156	90	125	124	75	100	R7
206A-4	180	287	180	110	150	156	90	125	R7
246A-4	240	350	240	132	200	180	110	150	R8
293A-4	260	418	260	160	200	240[1)]	132	150	R8
363A-4	361	542	361	200	300	302	160	250	R9
430A-4	414	542	414	250	350	361[2)]	200	300	R9

Definitions

U_n Nominal output voltage of the drive. For input voltage range U_1, see section *Electrical power network specification* on page 301. 50 Hz for IEC ratings and 60 Hz for UL (NEC) ratings.

I_1 Nominal input current (rms) at 40 °C (104 °F)

I_{max} Maximum output current. Available for two seconds at start.

I_2 Nominal output current. Maximum continuous rms output current allowed (no overload).

P_n Nominal power of the drive. Typical motor power (no overload). The kilowatt ratings apply to most IEC 4-pole motors. The horsepower (hp) ratings apply to most NEMA 4-pole motors.

I_{Ld} Maximum current with 10% overload, allowed for one minute every ten minutes

P_{Ld} Typical motor power in light-duty use (10% overload). The horsepower (hp) ratings apply to most NEMA 4-pole motors.

I_{Hd}	Maximum current with 50% overload, allowed for one minute every ten minutes [1] Maximum current with 30% overload, allowed for one minute every ten minutes [2] Maximum current with 25% overload, allowed for one minute every ten minutes
P_{Hd}	Typical motor power in heavy-duty use (50% overload)

UL (NEC) ratings at U_n = 208/230 V

Type ACS580 -01-	Input rating	Output ratings					Frame size
		Max. current	Light-duty use		Heavy-duty use		
	I_1	I_{max}	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	hp	A	hp	
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz							
04A6-2	4.6	6.3	4.6	1.0	3.5	0.8	R1
06A6-2	6.6	8.9	6.6	1.5	4.6	1.0	R1
07A5-2	7.5	11.9	7.5	2.0	6.6	1.5	R1
10A6-2	10.6	14.3	10.6	3.0	7.5	2.0	R1
017A-2	16.7	22.6	16.7	5.0	10.6	3.0	R1
024A-2	24	32.7	24.2	7.5	16.7	5.0	R2
031A-2	31	43.6	30.8	10	24.2	7.5	R2
046A-2	46	62.4	46.2	15	30.8	10	R3
059A-2	59	83.2	59.4	20	46.2	15	R3
075A-2	75	107	74.8	25	59.4	20	R4
088A-2	88	135	88	30	74.8	25	R5
114A-2	114	158	114	40	88.0	30	R5
143A-2	143	205	143	50	114	40	R6
169A-2	169	257	169	60	143	50	R7
211A-2	211	304	211	75	169	60	R7
273A-2	273	380	273	100	211	75	R8

Type ACS580-01-	Input ratings	Output ratings		Frame size
	I_1	I_2	P_n	
	A	A[1)]	Hp	
1-phase U_n = 208 V				
04A6-2	3.3	2.2	0.5	R1
06A6-2	4.6	3.2	0.75	R1
07A5-2	6.3	4.2	1	R1
10A6-2	8.9	6.0	1.5	R1
017A-2	11.8	6.8	2	R1
024A-2	17.3	9.6	3	R2
031A-2	30.4	15.2	5	R2
046A-2	42	22	7.5	R3
059A-2	55	28	10	R3
075A-2	-	28	10	R4
088A-2	81	42	15	R5
114A-2	111	54	20	R5
143A-2	137	68	25	R6
169A-2	153	80	30	R7
211A-2	209	104	40	R7
273A-2	258	130	50	R8

[1)] Continuous current, no overloadability

See definitions and notes on page 249.

UL (NEC) ratings at U_n = 480 V

Type ACS580-01-	Input rating	Output ratings					Frame size
		Max. current	Light-duty use		Heavy-duty use		
	I_1	I_{max}	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	hp	A	hp	
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz							
02A1-4	2.1	2.9	2.1	1.0	1.6	0.75	R1
03A0-4	3.0	4.1	3.0	1.5	2.1	1.0	R1
03A5-4	3.5	5.4	3.5	2.0	3.0	1.5	R1
04A8-4	4.8	6.5	4.8	3.0	3.4	2.0	R1
06A0-4	6.0	8.6	6.0	3.0	4.0	3.0	R1
07A6-4	7.6	10.8	7.6	5.0	4.8	3.0	R1
012A-4	12.0	15.3	12.0	7.5	7.6	5.0	R1
014A-4	14.0	21.6	14.0	10.0	11.0	7.5	R2
023A-4	23.0	30.5	23.0	15.0	14.0	10.0	R2
027A-4	27.0	41.4	27.0	20.0	21.0	15.0	R3
034A-4	34.0	48.6	34.0	25.0	27.0	20.0	R3
044A-4	44.0	61.2	44.0	30.0	34.0	25.0	R3
052A-4	52	79	52	40	40	30	R4
065A-4	65	94	65	50	52	40	R4
077A-4	77	117	77	60	65	50	R4
078A-4	77	117	77	60	65	50	R5
096A-4	96	139	96	75	77	60	R5
124A-4	124	173	124	100	96	75	R6
156A-4	156	223	156	125	124	100	R7
180A-4	180	281	180	150	156	125	R7
240A-4	240	324	240	200	180	150	R8
260A-4	260	418	260	200	240	150	R8
302A-4	302	468	302	250	260	200	R9
361A-4	361	498	361	300	302	250	R9
414A-4	414	544	414	350	361	300	R9

See definitions and notes on page 249.

UL (NEC) ratings at U_n = 575 V

Type ACS580-01-	Input rating	Output ratings					Frame size
		Max. current	Nominal use		Heavy-duty use		
	I_1	I_{max}	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}	
	A	A	A	hp	A	hp	
3-phase U_1 = 525...600 V, P_n at U_n = 575 V, 60 Hz							
02A7-6	2.7	4.3	2.7	2.0	2.4	1.5	R2
03A9-6	3.9	5.3	3.9	3.0	2.7	2.0	R2
06A1-6	6.1	8.2	6.1	5.0	3.9	3.0	R2
09A0-6	9.0	12.2	9.0	7.5	6.1	5.0	R2
011A-6	11.0	16.2	11.0	10	9.0	7.5	R2
017A-6	17.0	23.0	17.0	15	11.0	10	R2
022A-6	22	30.6	22	20	17	15	R3
027A-6	27	39.6	27	25	22	20	R3
032A-6	32	48.6	32	30	27	25	R3
041A-6	41	58	41	40	32	30	R5
052A-6	52	74	52	50	41	40	R5
062A-6	62	94	62	60	52	50	R5
077A-6	77	112	77	75	62	60	R5
099A-6	99	139	99	100	77	75	R7
125A-6	125	178	125	125	99	100	R7
144A-6	144	225	144	150	125	125	R8
192A-6	192	259	192	200	144	150	R9
242A-6	242	346	242	250	192	200	R9
271A-6	271	411	271	250	242	250	R9

Definitions

U_n Nominal output voltage of the drive. For input voltage range U_1, see section *Electrical power network specification* on page 301. 50 Hz for IEC ratings and 60 Hz for UL (NEC) ratings.

I_1 Nominal input current (rms) at 40 °C (104 °F)

I_{max} Maximum output current. Available for two seconds at start.

I_{Ld} Maximum current with 10% overload, allowed for one minute every ten minutes

P_{Ld} Typical motor power in light-duty use (10% overload). The horsepower (hp) ratings apply to most NEMA 4-pole motors.

I_{Hd} Maximum current with 50% overload, allowed for one minute every ten minutes

[1] Maximum current with 30% overload, allowed for one minute every ten minutes

[2] Maximum current with 25% overload, allowed for one minute every ten minutes

P_{Hd} Typical motor power in heavy-duty use (50% overload)

Conversion tables for IEC and North American type codes

IEC type ACS580-01-	North American type ACS580-01-	Frame size
3-phase U_n = 230 V		
04A7-2	04A6-2	R1
06A7-2	06A6-2	R1
07A6-2	07A5-2	R1
012A-2	10A6-2	R1
018A-2	017A-2	R1
025A-2	024A-2	R2
032A-2	031A-2	R2
047A-2	046A-2	R3
060A-2	059A-2	R3
-	075A-2	R4
089A-2	088A-2	R5
115A-2	114A-2	R5
144A-2	143A-2	R6
171A-2	169A-2	R7
213A-2	211A-2	R7
276A-2	273A-2	R8
346A-2	343A-2	R9
400A-2	396A-2	R9

IEC type ACS580-01-	North American type ACS580-01-	Frame size
3-phase U_n = 480 V		
02A7-4	02A1-4	R1
03A4-4	03A0-4	R1
04A1-4	03A5-4	R1
05A7-4	04A8-4	R1
07A3-4	06A0-4	R1
09A5-4	07A6-4	R1
12A7-4	012A-4	R1
018A-4	014A-4	R2
026A-4	023A-4	R2
033A-4	027A-4	R3
039A-4	034A-4	R3
046A-4	044A-4	R3
062A-4	052A-4	R4
073A-4	065A-4	R4
088A-4	078A-4	R5
106A-4	096A-4	R5
145A-4	124A-4	R6
169A-4	156A-4	R7
206A-4	180A-4	R7

IEC type ACS580-01-	North American type ACS580-01-	Frame size
246A-4	240A-4	R8
293A-4	260A-4	R8
293A-4	302A-4	R9
363A-4	361A-4	R9
430A-4	414A-4	R9

IEC type ACS580-01-	North American type ACS580-01-	Frame size
3-phase U_n = 600 V		
-	02A7-6	R2
-	03A9-6	R2
-	06A1-6	R2
-	09A0-6	R2
-	011A-6	R2
-	017A-6	R2
-	022A-6	R3
-	027A-6	R3
-	032A-6	R3
-	041A-6	R5
-	052A-6	R5
-	062A-6	R5
-	077A-6	R5
-	099A-6	R7
-	125A-6	R7
-	144A-6	R8
-	192A-6	R9
-	242A-6	R9
-	271A-6	R9

Note: IEC types not available

Sizing

Drive sizing is based on the rated motor current, and voltage and power. 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. Also the rated power of the drive must be higher than or equal to the rated motor power. The power ratings are the same regardless of the supply voltage within one voltage range.

Note: The ratings apply at ambient temperature of 40 °C (104 °F) for I_2 (I_{Ld} for UL (NEC)). Above these temperatures derating is required.

Note: The DriveSize dimensioning PC tool available from ABB (http://new.abb.com/drives/software-tools/drivesize) is recommended for selecting the drive, motor and gear combination.

Derating

The output load capacity (I_2, I_{Ld}, I_{Hd}; note that I_{max} is not derated) decreases in certain situations. In situations, where full motor power is required, oversize the drive so that the total derated output current provides sufficient capacity to supply the required nominal voltage to run the motor.

Note: The DriveSize dimensioning PC tool available from ABB (http://new.abb.com/drives/software-tools/drivesize) is also suitable for derating.

Note: If several situations are present at a time, the effects of derating are cumulative:

I_2 (derated) or I_{Ld} (derated) or I_{Hd} (derated) = (I_2 or I_{Ld} or I_{Hd}) x (switching frequency derating) x (altitude derating) x (ambient temperature derating), where no derating = 1.0.

Note: The motor may have a derating on it too.

Example 1, IEC: How to calculate the derated current

The IP21 / UL Type 1 drive type is ACS580-01-062A-4, which has drive output current of 62 A. Calculate the derated drive output current (I_2) at 4kHz switching frequency, at 1500 m altitude and at 50 °C ambient temperature as follows:

1. *Switching frequency derating by derating factor* (page *262*):
   No derating needed for 4 kHz.
2. *Altitude derating* (page *260*):
   The derating factor for 1500 m is 1 - 1/10 000 m · (1500 - 1000) m = 0.95.
   The derated drive output current becomes I_2 = 0.95 · 62 A = 58.9 A.
3. *Ambient temperature derating, IP21 (UL Type 1)* (page *254*):
   The derating factor for 50 °C ambient temperature = 0.90.
   The derated drive output current becomes then I_2 = 0.90 · 58.9 A = 53.01 A.

Example 1, UL (NEC): How to calculate the derated current

The IP21 / UL Type 1 drive type is ACS580-01-052A-4, which has drive output current of 52 A. Calculate the derated drive output current (I_{LD}) at 4kHz switching frequency, at 4921 ft (1500 m) altitude and at 50 °C ambient temperature as follows:

1. *Switching frequency derating by derating factor* (page *262*):
   No derating needed for 4 kHz.
2. *Altitude derating* (page *260*):
   The derating factor for 4921 ft (1500 m) is 1 - 1/10 000 m · (1500 - 1000) m = 0.95.
   The derated drive output current becomes I_{LD} = 0.95 · 52 A = 49.4 A.
3. *Ambient temperature derating, IP21 (UL Type 1)* (page *254*):
   The derating factor for 50 °C ambient temperature = 0.90.
   The derated drive output current becomes then I_{LD} = 0.90 · 49.4 A = 44.46 A.

Example 2, IEC: How to calculate the required drive

If your application requires continuous 12.0 A of motor current (I_2) at 8 kHz switching frequency, the supply voltage is 400 V and the drive is situated at 1500 m altitude and at 35 °C ambient temperature, calculate the appropriate IP21 / UL Type 1 drive size requirement as follows:

1. *Switching frequency derating by derating factor* (page *262*):
   The minimum size required is I_2 = 12.0 A / 0.65 = 18.46 A,
   where 0.65 is the derating for 8 kHz switching frequency (frames R2…R3).
2. *Altitude derating* (page *260*):
   The derating factor for 1500 m is 1 - 1/10 000 m · (1500 - 1000) m = 0.95.
   The minimum size required becomes then I_2 = 18.46 A / 0.95 = 19.43 A.
3. *Ambient temperature derating, IP21 (UL Type 1)* (page *254*):
   No derating needed for 35 °C ambient temperature.

Referring to I_2 in the ratings tables (starting from page *244*), drive type ACS580-01-026A-4 exceeds the I_2 requirement of 19.43 A.

Example 2, UL (NEC): How to calculate the required drive

If your application requires continuous maximum current with 10% overload 12.0 A of motor current (I_{LD}) at 8 kHz switching frequency, the supply voltage is 480 V and the drive is situated at 4921 ft (1500 m) altitude and at 35 °C ambient temperature, calculate the appropriate IP21 / UL Type 1 drive size requirement as follows:

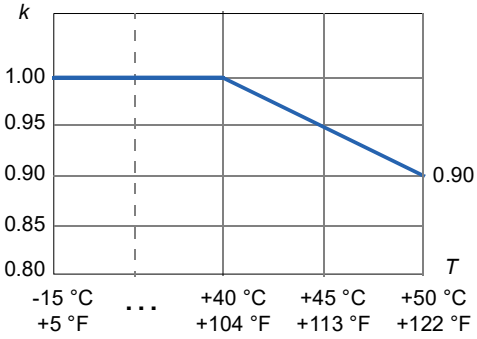
1. *Switching frequency derating by derating factor* (page *262*):
   The minimum size required is I_{LD} = 12.0 A / 0.65 = 18.46 A,
   where 0.65 is the derating for 8 kHz switching frequency (frames R2…R3).
2. *Altitude derating* (page *260*):
   The derating factor for 4921 ft (1500 m) is 1 - 1/10 000 m · (1500 - 1000) m = 0.95.
   The minimum size required becomes then I_{LD} = 18.46 A / 0.95 = 19.43 A.
3. *Ambient temperature derating, IP21 (UL Type 1)* (page *254*):
   No derating needed for 35 °C ambient temperature.

Referring to I_{LD} in the ratings tables (starting from page *248*), drive type ACS580-01-023A-4 exceeds the I_{LD} requirement of 19.43 A.

Ambient temperature derating, IP21 (UL Type 1)

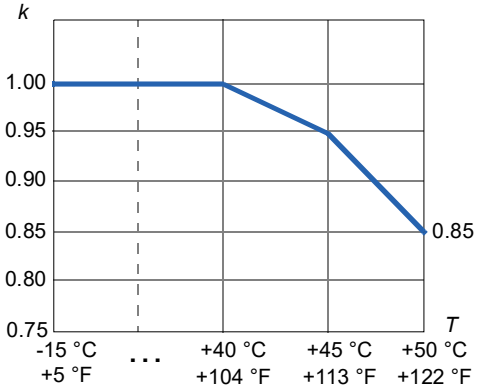
IP21 (UL Type 1) drive types, other than the exceptions below

In the temperature range +40…50 °C (+104…122 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k, in the diagram below).

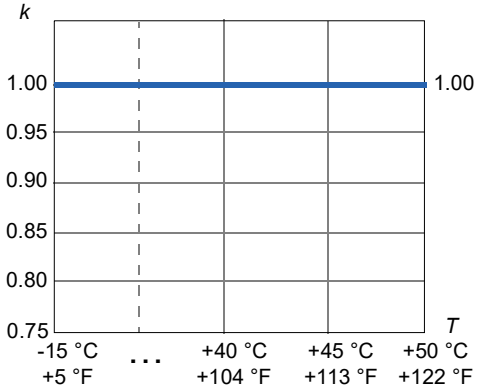


IP21 (UL Type 1) drive type -078A-4 and -302A-4; -099A-6, -125A-6, -144A-6

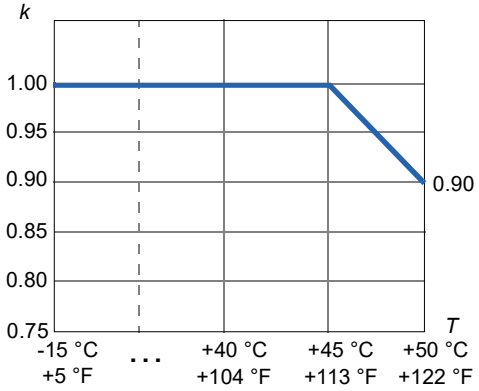
-078A-4: In the temperature range +40…45 °C (+104…113 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). In the temperature range +45…50 °C (+113…122 °F), the rated output current is derated by 2% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



-302A-4: In the temperature range +40…50 °C (+104…122 °F), the rated output current is not derated at all.



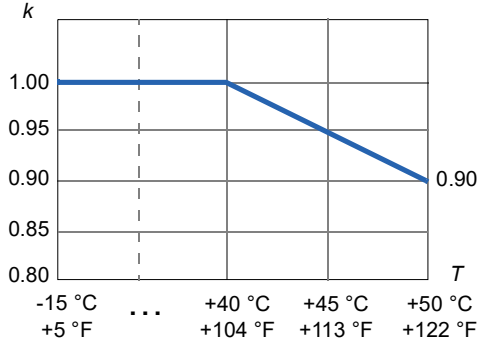
-099A-6, -125A-6, -144A-6: In the temperature range +40…45 °C (+104…113 °F), the rated output current is not derated at all. In the temperature range +45…50 °C (+113…122 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



Ambient temperature derating, IP55 (UL Type 12)

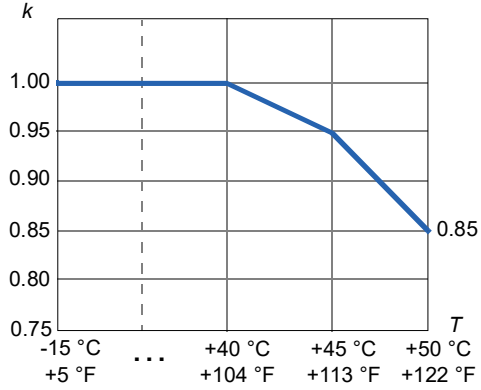
IP55 (UL Type 12) drive types, other than the exceptions below

In the temperature range +40…50 °C (+104…122 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



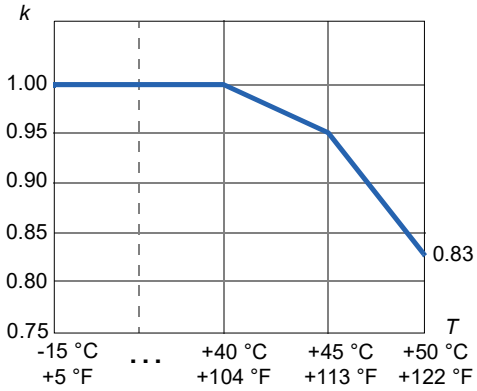
IP55 (UL Type 12) drive type -077A-4, -078A-4, -260A-4, -293A-4, -302A-4, -361A-4, -363A-4, -414A-4 and -430A-4; -075A-2, -273A-2, -276A-2; -099A-6, -125A-6, -144A-6,-192A-6, -242A-6, -271A-6

-077A-4 and -078A-4; -075A-2: In the temperature range +40…45 °C (+104…113 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). In the temperature range +45…50 °C (+113…122 °F), the rated output current is derated by 2% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):

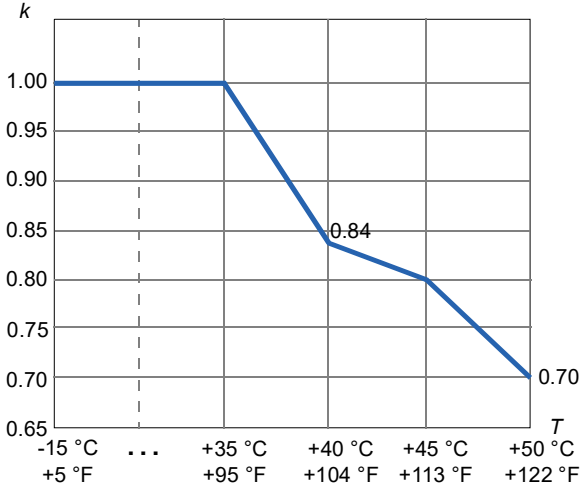


-260A-4, -293A-4, -361A-4 and -363A-4; -273A-2, -276A-2: In the temperature range +40…45 °C (+104…113 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). In the temperature range +45…50 °C (+113…122 °F), the rated

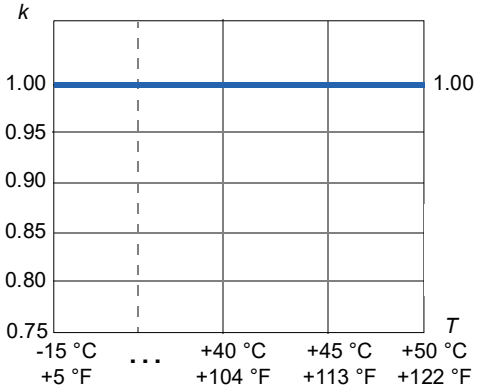
output current is derated by 2.5% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



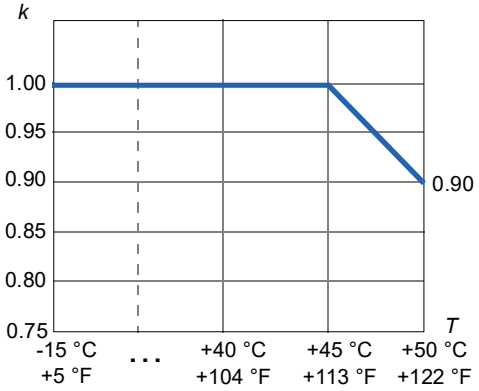
-414A-4 and -430A-4: In the temperature range +35…40 °C (+95…104 °F), the rated output current is derated by 3.2% for every added 1 °C (1.8 °F). In the temperature range +40…45°C (+104…113°F), the rated output current is derated by 0.85% for every added 1 °C (1.8 °F). In the temperature range +45…50 °C (+104…122 °F), the rated output current is derated by 2.2% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



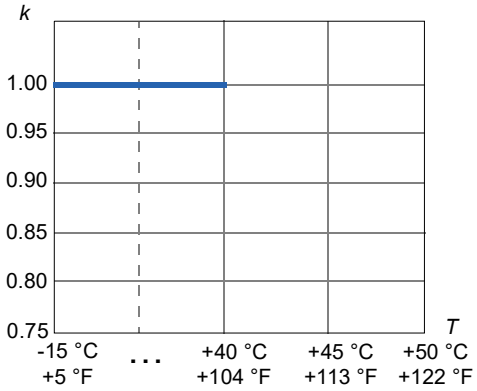
-302A-4: In the temperature range +40…50 °C (+104…122 °F), the rated output current is not derated at all.



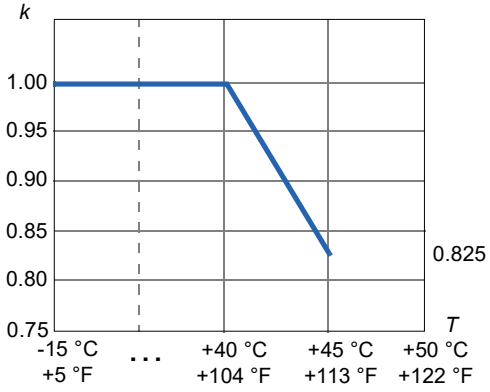
-099A-6, -125A-6, -144A-6: In the temperature range +40…45 °C (+104…113 °F), the rated output current is not derated at all. In the temperature range +45…50 °C (+113…122 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



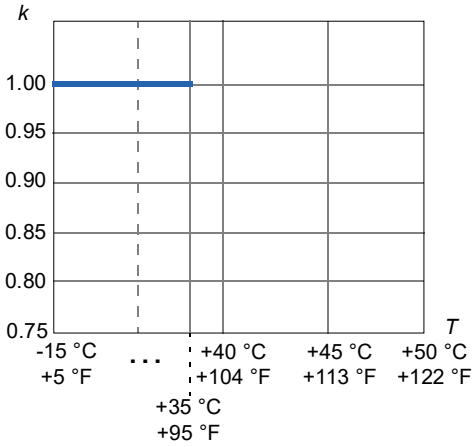
-192A-6: In the temperature range +40…50 °C (+104…122 °F), derating is to be defined. The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



-242A-6: In the temperature range +40…45 °C (+104…113 °F), the rated output current is derated by 1% for every added 3.5 °C (5.4 °F). The maximum temperature allowed is 45 °C (113 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



-271A-6: The maximum temperature allowed is 35 °C (95 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



Altitude derating

In altitudes 1000…4000 m (3300…13120 ft) above sea level, the derating is 1% for every 100 m (330 ft).

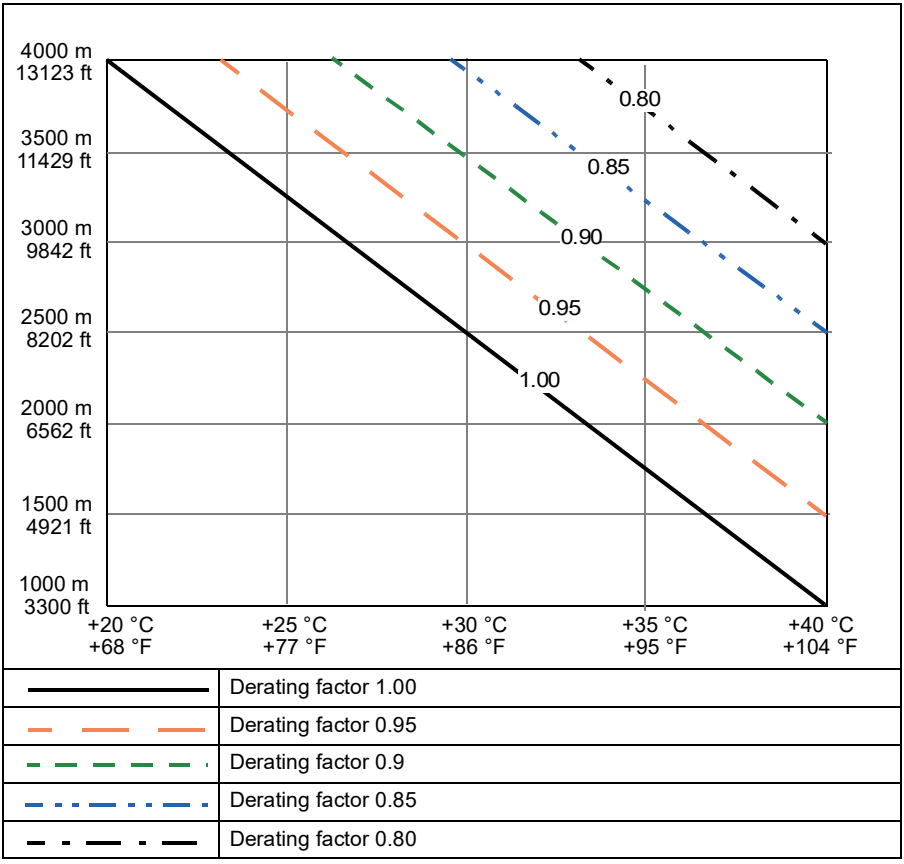
Note: There are special considerations in corner-grounded installations above 2000 m. Contact your local ABB representative for further information.

The output current is calculated by multiplying the current given in the rating table by the derating factor k, which for x meters (1000 m ≤ x ≤ 4000 m) is:

$$k = 1 - \frac{1}{10\,000\ m} \cdot (x - 1000)\ m$$

Altitude and ambient temperature

If ambient temperature is below 40 °C (+104 °F), the derating can be reduced by 1.5% for every 1 °C (1.8 °F) reduction in temperature. A few altitude derating curves are shown below. For a more accurate derating, use the DriveSize dimensioning PC tool.



The altitude derating can be reduced if the temperature is below +40 °C, for example, if the temperature is 30 °C, the derating factor is 1 - 1.5% · 10 = 0.85. You can reduce the output current by 35% instead of 40% at 4000 meter above the see level.

Note: Check the supply network compatibility restrictions above 2000 m (6562 ft), see *Installation site altitude* on page *312*. Check also PELV limitation on relay output terminals above 2000 m (6562 ft), see sections *Isolation areas, R1…R5* on page *308* and *Isolation areas, R6…R9* on page *309*.

Switching frequency derating by derating factor

The output current is calculated by multiplying the current given in the rating table by the derating factor given in the table below.

Note: If you change the minimum switching frequency with parameter 97.02 Minimum switching frequency, derate according to the table below. Changing parameter 97.01 Switching frequency reference does not require derating.

IEC

Frame size	IEC Type ACS580-01-	Derating factor (k) for the minimum switching frequencies at 40 °C (+104 °F)				
		1 kHz	2 kHz	4kHz	8 kHz	12 kHz
3-phase U_n = 230 V						
R1	04A7-2...018A-2	1	1	1	0.89	0.80
R2	025A-2...032A-2	1	1	1	0.86	0.74
R3	047A-2...060A-2	1	1	1	0.85	0.72
R5	089A-2...115A-2	1	1	1	0.89	0.79
R6	144A-2	1	1	1	0.90	0.80
R7	171A-2...213A-2	1	1	1	0.90	0.80
R8	276A-2	1	1	1	TBD	TBD
3-phase U_n = 400 V						
R1	02A7-4…12A7-4	1	1	1	0.67	0.50
R2	018A-4…026A-4	1	1	1	0.65	0.48
R3	033A-4…046A-4	1	1	1	0.65	0.48
R4	062A-4	1	1	1	0.82	0.64
R4	073A-4	1	1	1	0.73	0.55
R5	088A-4…106A-4	1	1	1	0.71	0.57
R6	145A-4	1	0.97	0.84	0.66	0.52
R7	169A-4…206A-4	1	0.98	0.89	0.71	0.53
R8	246A-4…293A-4	1	0.96	0.82	0.61	0.45
R9	363A-4…430A-4	1	0.95	0.79	0.58	0.43

UL (NEC)

Frame size	NEC Type ACS580-01-	Derating factor (k) for the minimum switching frequencies at 40 °C (+104 °F)				
		1 kHz	2 kHz	4kHz	8 kHz	12 kHz
3-phase U_1 = 200...240 V, P_n at U_n = 208/230 V, 60 Hz						
R1	04A6-2...017A-2	1	1	1	0.89	0.80
R2	024A-2...031A-2	1	1	1	0.86	0.74
R3	046A-2...059A-2	1	1	1	0.85	0.72
R4	075A-2	1	1	1	0.86	0.74
R5	088A-2...114A-2	1	1	1	0.89	0.79
R6	143A-2	1	1	1	0.90	0.80
R7	169A-2...211A-2	1	1	1	0.90	0.80
R8	273A-2	1	1	1	TBD	TBD
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz						
R1	02A1-4…012A-4	1	1	1	0.67	0.5
R2	014A-4…024A-4	1	1	1	0.65	0.48
R3	027A-4…044A-4	1	1	1	0.65	0.48
R4	052A-4…065A-4	1	1	1	0.82	0.64
R4	077A-4	1	1	1	0.73	0.55
R5	078A-4…096A-4	1	1	1	0.71	0.57
R6	124A-4	1	1	1	0.66	0.52
R7	156A-4…180A-4	1	1	1	0.71	0.53
R8	240A-4	1	1	1	0.61	0.45
R8	260A-4	1	1	1	0.61	0.45
R9	302A-4	1	1	1	0.58	0.43
R9	361A-4…414A-4	1	1	0.79	0.58	0.43
3-phase U_1 = 500...600 V, P_n at U_n = 575 V, 60 Hz						
R2	02A7-6…017A-6	1	1	1	0.72	0.54
R3	022A-6…032A-6	1	1	1	0.70	0.50
R5	041A-6…077A-6	1	1	1	0.70	0.51
R7	099A-6…125A-6	1	1	1	0.66	0.50
R8	144A-6	1	1	1	0.66	0.50
R9	192A-6	1	1	1	0.66	0.50
R9	242A-6	1	1	0.83	0.66	0.50
R9	271A-6	1	1	0.74	0.66	0.50

Switching frequency derating with actual output current values

These tables show the output current values with different switching frequencies. Note that other derating factors, for example ambient temperature and altitude, may also affect to the output current.

IEC

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 230 V								
04A7-2	4.7	4.7	4.7	4.7	4.2	3.8	3.4	R1
06A7-2	6.7	6.7	6.7	6.7	6.0	5.4	4.8	R1
07A6-2	7.6	7.6	7.6	7.6	6.8	6.1	5.5	R1
012A-2	12.0	12.0	12.0	12.0	10.7	9.6	8.6	R1
018A-2	16.9	16.9	16.9	16.9	15.0	13.5	12.1	R1
025A-2	24.5	24.5	24.5	24.5	21.1	18.1	15.9	R2
032A-2	31.2	31.2	31.2	31.2	26.8	23.1	20.3	R2
047A-2	46.7	46.7	46.7	46.7	39.7	33.6	29.4	R3
060A-2	60	60	60	60	51	43.2	37.8	R3
089A-2	89	89	89	89	79	70	62	R5
115A-2	115	115	115	115	103	91	81	R5
144A-2	144	144	144	144	130	116	101	R6
171A-2	171	171	171	171	154	137	120	R7
213A-2	213	213	213	213	192	171	149	R7
276A-2	276	276	276	276	N/A	N/A	N/A	R8

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 400 V								
02A7-4	2.6	2.6	2.6	2.6	1.7	1.3	N/A	R1
03A4-4	3.3	3.3	3.3	3.3	2.2	1.7	N/A	R1
04A1-4	4.0	4.0	4.0	4.0	2.7	2.0	N/A	R1
05A7-4	5.6	5.6	5.6	5.6	3.8	2.8	N/A	R1
07A3-4	7.2	7.2	7.2	7.2	4.8	3.6	N/A	R1
09A5-4	9.4	9.4	9.4	9.4	6.3	4.7	N/A	R1
12A7-4	12.6	12.6	12.6	12.6	8.4	6.3	N/A	R1
018A-4	17.0	17.0	17.0	17.0	11.1	8.2	N/A	R2
026A-4	25.0	25.0	25.0	25.0	16.3	12.0	N/A	R2
033A-4	32.0	32.0	32.0	32.0	20.8	15.4	N/A	R3
039A-4	38.0	38.0	38.0	38.0	24.7	18.2	N/A	R3
046A-4	45.0	45.0	45.0	45.0	29.3	21.6	N/A	R3
062A-4	62	62	62	62	51	39.7	N/A	R4

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
073A-4	73	73	73	73	53	40.2	N/A	R4
088A-4	88	88	88	88	62	50	N/A	R5
106A-4	106	106	106	106	75	60	N/A	R5
145A-4	145	145	141	122	96	75	N/A	R6
169A-4	169	169	166	150	120	90	N/A	R7
206A-4	206	206	202	183	146	109	N/A	R7
246A-4	246	246	236	202	150	111	N/A	R8
293A-4	293	293	281	240	179	132	N/A	R8
363A-4	363	363	345	287	211	156	N/A	R9
430A-4	430	430	409	340	249	185	N/A	R9

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 480 V								
02A7-6	2.7	2.7	2.7	2.7	1.9	1.5	1.1	R2
03A9-6	3.9	3.9	3.9	3.9	2.8	2.1	1.6	R2
06A1-6	6.1	6.1	6.1	6.1	4.4	3.3	2.4	R2
09A0-6	9.0	9.0	9.0	9.0	6.5	4.9	3.6	R2
011A-6	11.0	11.0	11.0	11.0	7.9	5.9	4.4	R2
017A-6	17.0	17.0	17.0	17.0	12.2	9.2	6.8	R2
022A-6	22.0	22.0	22.0	22.0	15.4	11.0	7.5	R3
027A-6	27.0	27.0	27.0	27.0	18.9	13.5	9.2	R3
032A-6	32.0	32.0	32.0	32.0	22.4	16.0	10.9	R3
041A-6	41.0	41.0	41.0	41.0	28.7	20.9	14.8	R5
052A-6	52	52	52	52	36.4	26.5	18.7	R5
062A-6	62	62	62	62	43.4	31.6	22.3	R5
077A-6	77	77	77	77	54	39.3	27.7	R5
099A-6	99	99	99	99	65	50	N/A	R7
125A-6	125	125	125	125	83	63	N/A	R7
144A-6	144	144	144	144	95	72	N/A	R8
192A-6	192	192	192	192	127	96	N/A	R9
242A-6	242	242	242	201	160	121	N/A	R9
271A-6	271	271	271	201	179	136	N/A	R9

UL (NEC)

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz								
04A6-2	4.7	4.7	4.7	4.7	4.2	3.8	3.4	R1
06A6-2	6.7	6.7	6.7	6.7	6.0	5.4	4.8	R1
07A5-2	7.6	7.6	7.6	7.6	6.8	6.1	5.5	R1
10A6-2	12.0	12.0	12.0	12.0	10.7	9.6	8.6	R1
017A-2	16.9	16.9	16.9	16.9	15.0	13.5	12.1	R1
024A-2	24.5	24.5	24.5	24.5	21.1	18.1	15.9	R2
031A-2	31.2	31.2	31.2	31.2	26.8	23.1	20.3	R2
046A-2	46.7	46.7	46.7	46.7	39.7	33.6	29.4	R3
059A-2	60	60	60	60	51	43.2	37.8	R3
088A-2	89	89	89	89	79	70	62	R5
114A-2	115	115	115	115	103	91	81	R5
143A-2	144	144	144	144	130	116	101	R6
169A-2	171	171	171	171	154	137	120	R7
211A-2	213	213	213	213	192	171	149	R7
273A-2	276	276	276	276	-	-	-	R8
346A-2	-	-	-	-	-	-	-	R9
400A-2	-	-	-	-	-	-	-	R9

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz								
02A1-4	2.6	2.6	2.6	2.6	1.7	1.3	N/A	R1
03A0-4	3.3	3.3	3.3	3.3	2.2	1.7	N/A	R1
03A5-4	4.0	4.0	4.0	4.0	2.7	2.0	N/A	R1
04A8-4	5.6	5.6	5.6	5.6	3.8	2.8	N/A	R1
06A0-4	7.2	7.2	7.2	7.2	4.8	3.6	N/A	R1
07A6-4	9.4	9.4	9.4	9.4	6.3	4.7	N/A	R1
012A-4	12.6	12.6	12.6	12.6	8.4	6.3	N/A	R1
014A-4	17.0	17.0	17.0	17.0	11.1	8.2	N/A	R2
023A-4	25.0	25.0	25.0	25.0	16.3	12.0	N/A	R2
027A-4	32.0	32.0	32.0	32.0	20.8	15.4	N/A	R3
034A-4	38.0	38.0	38.0	38.0	24.7	18.2	N/A	R3
044A-4	45.0	45.0	45.0	45.0	29.3	21.6	N/A	R3
052A-4	62	62	62	62	51	39.7	N/A	R4
065A-4	73	73	73	73	53	40.2	N/A	R4
078A-4	88	88	88	88	62	50	N/A	R5

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
096A-4	106	106	106	106	75	60	N/A	R5
124A-4	145	145	141	122	96	75	N/A	R6
156A-4	169	169	166	150	120	90	N/A	R7
180A-4	206	206	202	183	146	109	N/A	R7
240A-4	246	246	236	202	150	111	N/A	R8
260A-4	293	293	281	240	179	132	N/A	R8
302A-4	302	N/A	N/A	N/A	N/A	N/A	N/A	R9
361A-4	363	363	345	287	211	156	N/A	R9
414A-4	430	430	409	340	249	185	N/A	R9

Type ACS580-01-	Nominal output	Nominal output current (I_2) for the minimum switching frequencies at 40 °C (+104 °F)						Frame size
	I_2	1 kHz	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz	
	A	A	A	A	A	A	A	
3-phase U_1 = 500...600 V, P_n at U_n = 575 V, 60 Hz								
02A7-6	2.7	2.7	2.7	2.7	1.9	1.5	1.1	R2
03A9-6	3.9	3.9	3.9	3.9	2.8	2.1	1.6	R2
06A1-6	6.1	6.1	6.1	6.1	4.4	3.3	2.4	R2
09A0-6	9.0	9.0	9.0	9.0	6.5	4.9	3.6	R2
011A-6	11.0	11.0	11.0	11.0	7.9	5.9	4.4	R2
017A-6	17.0	17.0	17.0	17.0	12.2	9.2	6.8	R2
022A-6	22.0	22.0	22.0	22.0	15.4	11.0	7.5	R3
027A-6	27.0	27.0	27.0	27.0	18.9	13.5	9.2	R3
032A-6	32.0	32.0	32.0	32.0	22.4	16.0	10.9	R3
041A-6	41.0	41.0	41.0	41.0	28.7	20.9	14.8	R5
052A-6	52	52	52	52	36.4	26.5	18.7	R5
062A-6	62	62	62	62	43.4	31.6	22.3	R5
077A-6	77	77	77	77	54	39.3	27.7	R5
099A-6	99	99	99	99	65	50	N/A	R7
125A-6	125	125	125	125	83	63	N/A	R7
144A-6	144	144	144	144	95	72	N/A	R8
192A-6	192	192	192	192	127	96	N/A	R9
242A-6	242	242	242	201	160	121	N/A	R9
271A-6	271	271	271	201	179	136	N/A	R9

Output frequency derating

Output frequency derating applies for ratings up to ACS580-01-106A-4 (R5). Inverter output current is limited by the following factor k below 5 Hz absolute inverter output frequency f_abs.

$k = 2/3 + 1/3 \cdot (f\_abs / 5\ Hz)$

Fuses (IEC)

gG as well as uR or aR fuses for protection against short-circuit in the input power cable or drive are listed below. Either fuse type can be used for frames R1…R9 if it operates rapidly enough. The operating time depends on the supply network impedance and the cross-sectional area and length of the supply cable.

Note 1: See also *Implementing short-circuit and thermal overload protection* on page *104*.

Note 2: Fuses with higher current rating than the recommended ones must not be used.

Note 3: Fuses from other manufacturers can be used if they meet the ratings and the melting curve of the fuse does not exceed the melting curve of the fuse mentioned in the table.

gG fuses (IEC)

Check on the fuse time-current curve to ensure the operating time of the fuse is below 0.5 seconds. Obey the local regulations.

Type ACS580-01-	Min. short-circuit current[1)]	Input current	gG (IEC 60269)				
			Nominal current	I^2t	Voltage rating	ABB type	IEC 60269 size
	A	A	A	A^2s	V		
3-phase U_n = 230 V							
04A7-2	200	4.7	25	2500	500	OFAF000H25	000
06A7-2	200	6.7	25	2500	500	OFAF000H25	000
07A6-2	200	7.6	25	2500	500	OFAF000H25	000
012A-2	200	12.0	25	2500	500	OFAF000H25	000
018A-2	200	16.9	25	2500	500	OFAF000H25	000
025A-2	320	24.5	40	7700	500	OFAF000H40	000
032A-2	320	31.2	40	7700	500	OFAF000H40	000
047A-2	500	46.7	63	20100	500	OFAF000H63	000
060A-2	500	60	63	20100	500	OFAF000H63	000
089A-2	1300	89	125	103000	500	OFAF00H125	00
115A-2	1300	115	125	103000	500	OFAF00H125	00
144A-2	1700	144	200	300000	500	OFAF0H200	0
171A-2	2300	171	250	600000	500	OFAF0H250	0
213A-2	3300	213	315	710000	500	OFAF1H315	1
276A-2	5500	276	400	1100000	500	OFAF2H400	2
3-phase U_n = 400 or 480 V							
02A7-4	32	2.6	4	55	500	OFAF000H4	000
03A4-4	48	3.3	6	110	500	OFAF000H6	000
04A1-4	48	4.0	6	110	500	OFAF000H6	000
05A7-4	80	5.6	10	360	500	OFAF000H10	000
07A3-4	80	7.2	10	360	500	OFAF000H10	000
09A5-4	128	9.4	16	740	500	OFAF000H16	000

Type ACS580-01-	Min. short-circuit current[1)]	Input current	gG (IEC 60269)				
			Nominal current	I^2t	Voltage rating	ABB type	IEC 60269 size
	A	A	A	A^2s	V		
12A7-4	128	12.6	16	740	500	OFAF000H16	000
018A-4	200	17.0	25	2500	500	OFAF000H25	000
026A-4	256	25.0	32	4000	500	OFAF000H32	000
033A-4	320	32.0	40	7700	500	OFAF000H40	000
039A-4	400	38.0	50	16000	500	OFAF000H50	000
046A-4	500	45.0	63	20100	500	OFAF000H63	000
062A-4	800	62	80	37500	500	OFAF000H80	000
073A-4	1000	73	100	65000	500	OFAF000H100	000
088A-4	1000	88	100	65000	500	OFAF000H100	000
106A-4	1300	106	125	103000	500	OFAF00H125	00
145A-4	1700	145	160	185000	500	OFAF00H160	00
169A-4	3300	169	250	600000	500	OFAF0H250	0
206A-4	5500	206	315	710000	500	OFAF1H315	1
246A-4	6400	246	355	920000	500	OFAF1H355	1
293A-4	7800	293	425	1300000	500	OFAF2H425	2
363A-4	9400	363	500	2000000	500	OFAF2H500	2
430A-4	10200	430	630	2800000	500	OFAF3H630	3

[1)] Minimum short-circuit current of the installation

uR and aR fuses (IEC)

Type ACS580 -01-	Min. short-circuit current[1)]	Input current	uR or aR (DIN 43620 blade style)				
			Nominal current	I^2t	Voltage rating	Bussmann type	IEC 60269 size
	A	A	A	A^2s	V		
3-phase U_n = 230 V							
04A7-2	120.0	4.7	40.0	460	690	170M1563	000
06A7-2	120.0	6.7	40.0	460	690	170M1563	000
07A6-2	120.0	7.6	40.0	460	690	170M1563	000
012A-2	120.0	12.0	40.0	460	690	170M1563	000
018A-2	120.0	16.9	40.0	460	690	170M1563	000
025A-2	170.0	24.5	63.0	1450	690	170M1565	000
032A-2	170.0	31.2	63.0	1450	690	170M1565	000
047A-2	280.0	46.7	80.0	2550	690	170M1566	000
060A-2	280.0	60	80.0	2550	690	170M1566	000
089A-2	700.0	89	200	15000	690	170M3815	1
115A-2	700.0	115	200	15000	690	170M3815	1
144A-2	1000	144	315	46500	690	170M3817	1
171A-2	1280	171	450	105000	690	170M5809	2
213A-2	1450	213	500	155000	690	170M5810	2
276A-2	2050	276	630	220000	690	170M6810	3
3-phase U_n = 400 or 480 V							
02A7-4	65	2.6	25	130	690	170M1561	000
03A4-4	65	3.3	25	130	690	170M1561	000
04A1-4	65	4.0	25	130	690	170M1561	000
05A7-4	65	5.6	25	130	690	170M1561	000
07A3-4	65	7.2	25	130	690	170M1561	000
09A5-4	65	9.4	25	130	690	170M1561	000
12A7-4	65	12.6	25	130	690	170M1561	000
018A-4	120	17.0	40	460	690	170M1563	000
026A-4	120	25.0	40	460	690	170M1563	000
033A-4	170	32.0	63	1450	690	170M1565	000
039A-4	170	38.0	63	1450	690	170M1565	000
046A-4	280	45.0	80	2550	690	170M1566	000
062A-4	380	62	100	4650	690	170M1567	000
073A-4	480	73	125	8500	690	170M1568	000
088A-4	700	88	160	16000	690	170M1569	000
106A-4	1280	106	315	46500	690	170M3817	1
145A-4	1280	145	315	46500	690	170M3817	1
169A-4	1800	169	450	105000	690	170M5809	2
206A-4	2210	206	500	145000	690	170M5810	2
246A-4	3010	246	630	275000	690	170M5812	2
293A-4	4000	293	800	490000	690	170M6812D	3
363A-4	5550	363	1000	985000	690	170M6814D	3
430A-4	7800	430	1250	2150000	690	170M8554D	3

[1)] Minimum short-circuit current of the installation

Type ACS580 -01-	Min. short-circuit current[1)]	Input current	uR or aR (DIN 43653 bolted tags)				
			Nominal current	I^2t	Voltage rating	Bussmann type	IEC 60269 size
	A	A	A	A^2s	V		
3-phase U_n = 400 or 480 V							
02A7-4	65	2.6	25	130	690	170M1311	0
03A4-4	65	3.3	25	130	690	170M1311	0
04A1-4	65	4.0	25	130	690	170M1311	0
05A7-4	65	5.6	25	130	690	170M1311	0
07A3-4	65	7.2	25	130	690	170M1311	0
09A5-4	65	9.4	25	130	690	170M1311	0
12A7-4	65	12.6	25	130	690	170M1311	0
018A-4	120	17.0	40	460	690	170M1313	0
026A-4	120	25.0	40	460	690	170M1313	0
033A-4	170	32.0	63	1450	690	170M1315	0
039A-4	170	38.0	63	1450	690	170M1315	0
046A-4	280	45.0	80	2550	690	170M1316	0
062A-4	380	62	100	4650	690	170M1417	0
073A-4	480	73	125	8500	690	170M1318	0
088A-4	700	88	160	16000	690	170M1319	0
106A-4	700	106	200	15000	690	170M3015	1
145A-4	1000	145	250	28500	690	170M3016	1
169A-4	1280	169	315	46500	690	170M3017	1
206A-4	1520	206	350	68500	690	170M3018	1
246A-4	2050	246	450	105000	690	170M5009	2
293A-4	2200	293	500	145000	690	170M5010	2
363A-4	3100	363	630	275000	690	170M5012	2
430A-4	3600	430	700	405000	690	170M5013	2

[1)] Minimum short-circuit current of the installation

Circuit breakers (IEC)

This section does not apply to the North American market. See section *Circuit breakers (UL)* for branch circuit protection on page *278*.

The protective characteristics of circuit breakers depend on the type, construction and settings of the breakers. There are also limitations pertaining to the short-circuit capacity of the supply network.

WARNING! Due to the inherent operating principle and construction of circuit breakers, independent of the manufacturer, hot ionized gases can escape from the breaker enclosure in case of a short-circuit. To ensure safe use, pay special attention to the installation and placement of the breakers. Obey the manufacturer's instructions.

You can use the circuit breakers listed below. Other circuit breakers can be used with drive if they provide the same electrical characteristics. ABB does not assume any liability whatsoever for the correct function and protection with circuit breakers not listed below. Furthermore, if the recommendations given by ABB are not obeyed, the drive can experience problems that the warranty does not cover.

Type ACS580 -01-	MCBs and MCCBs					
	ABB type	Max. short-circuit I_{sc}	Tmax frame XT / T class	Tmax rating	Electronic release	SACE ordering code for breaker and release unit
		kA	A	A	A	
3-phase U_n = 400 or 480 V						
02A7-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
03A4-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
04A1-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
05A7-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
07A3-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
09A5-4	S 203P-B/C/Z 10	20	N/A	N/A	N/A	N/A
12A7-4	S 203P-B/C/Z 16	20	N/A	N/A	N/A	N/A
018A-4	S 203P-B/C/Z 20	20	N/A	N/A	N/A	N/A
026A-4	S 203P-B/C/Z 25	20	N/A	N/A	N/A	N/A
033A-4	S 203P-B/C/Z 32	12	N/A	N/A	N/A	N/A
039A-4	S 203P-B/C/Z 40	12	N/A	N/A	N/A	N/A
046A-4	S 203P-B/C/Z 50	12	N/A	N/A	N/A	N/A
062A-4	S 803S-B/C 80	50	N/A	N/A	N/A	N/A
073A-4	S 803S-B/C 80	50	N/A	N/A	N/A	N/A
088A-4	S 803S-B/C 100	50	N/A	N/A	N/A	N/A
106A-4	S 803S-B/C 125	50	N/A	N/A	N/A	N/A

Type ACS580 -01-	MCBs and MCCBs					
	ABB type	Max. short-circuit I_{sc}	Tmax frame XT / T class	Tmax rating	Electronic release	SACE ordering code for breaker and release unit
		kA	A	A	**A**	
145A-4	XT4 L 250 Ekip LS/I In=250 3p F F	65	XT4	250	250	1SDA068555R1
169A-4	XT4 L 250 Ekip LS/I In=250 3p F F	65	XT4	250	250	1SDA068555R1
206A-4	T4 L 320 PR221DS-LS/I In=320 3p F F	65	T4	320	320	1SDA054141R1
246A-4	T5 L 400 PR221DS-LS/I In=400 3p F F	65	T5	400	400	1SDA054365R1
293A-4	T5 L 630 PR221DS-LS/I In=630 3p F F	65	T5	630	630	1SDA054420R1
363A-4	T5 L 630 PR221DS-LS/I In=630 3p F F	65	T5	630	630	1SDA054420R1
430A-4	T5 L 630 PR221DS-LS/I In=630 3p F F	65	T5	630	630	1SDA054420R1

Fuses (UL)

Fuses for branch circuit protection per NEC are listed below. ABB recommends fast acting class T or faster fuses in the USA. Obey local regulations.

UL/NEC type ACS580-01-	Input current	UL			
		Maximum current	Voltage rating	Bussmann type	UL class[1)]
	A	A	V		
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz					
04A6-2	4.6	15	600	JJS-15	T
06A6-2	6.6	15	600	JJS-15	T
07A5-2	7.5	15	600	JJS-15	T
10A6-2	10.6	15	600	JJS-15	T
017A-2	16.7	30	600	JJS-30	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	88.0	150	600	JJS-150	T
114A-2	114	150	600	JJS-150	T
143A-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
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz					
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
06A0-4	6.0	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	80	600	JJS-80	T
065A-4	62	100	600	JJS-100	T
077A-4	77	100	600	JJS-100	T
078A-4	78	110	600	JJS-110	T
096A-4	106	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
260A-4	260	400	600	JJS-400	T

UL/NEC type ACS580-01-	Input current	UL			
		Maximum current	Voltage rating	Bussmann type	UL class [1]
	A	A	V		
302A-4	302	500	600	JJS-500	T
361A-4 [2]	361	500	600	JJS-500	T
414A-4 [2]	414	600	600	JJS-600	T
3-phase U_1 = 525...600 V, P_n at U_n = 575 V, 60 Hz					
02A7-6	2.7	15	600	JJS-15	T
03A9-6	3.9	15	600	JJS-15	T
06A1-6	6.1	15	600	JJS-15	T
09A0-6	9.0	15	600	JJS-15	T
011A-6	11.0	15	600	JJS-15	T
017A-6	17.0	30	600	JJS-30	T
022A-6	22.0	40	600	JJS-40	T
027A-6	27.0	40	600	JJS-40	T
032A-6	32.0	40	600	JJS-40	T
041A-6	41.0	100	600	JJS-100	T
052A-6	52.0	100	600	JJS-100	T
062A-6	62.0	100	600	JJS-100	T
077A-6	77.0	100	600	JJS-100	T
099A-6	99.0	150	600	JJS-150	T
125A-6	125	200	600	JJS-200	T
144A-6	144	250	600	JJS-250	T
192A-6	192	300	600	JJS-300	T
242A-6	242	400	600	JJS-400	T
271A-6	271	400	600	JJS-400	T

1) Class J, CC, and CF fuses are also allowed at the same nominal current and voltage ratings

2) See note 8 below

Notes:

1. See also section *Implementing short-circuit and thermal overload protection* on page *104*.
2. Fuses are required as part of the installation. Fuses are not included in the base drive configuration and must be provided by others.
3. The UL listed fuses in the hardware manual tables, or the tables in this document are the required branch circuit protection per NEC.
4. Recommended size or smaller UL 248 listed fast acting, time delay, or high speed fuses must be used to maintain the drive UL listing. Additional protection can be used. Refer to local codes and regulations.
5. UL 248 listed, fast acting, time delay, or high speed fuses from other manufacturers can be used if they meet the rating requirements specified in the rules above.
6. A fuse of a different class can be used at the high fault rating where the I_{peak} and I^2t of the new fuse is not greater than that of the specified fuse.
7. When installing a drive, always follow installation instructions and NEC requirements.
8. Only 480V R9 frame drives with serial numbers beginning 1204109256 when built in Finland and beginning 22106xxxxx when built in the U.S. may be protected with fuses listed in the tables above. Drives with earlier serial numbers can only be protected with Class T fuses.
9. Alternative fuses can be used if they meet certain characteristics. For acceptable fuses, see the manual supplement (*3AXD50000645015* [English]).

Circuit breakers (UL)

These drives are suitable for use on a circuit capable of delivering not more than 65 kA symmetrical amperes (RMS) at 240 / 480 / 600 V maximum, when protected by appropriate circuit breakers in the tables below. Additional fuse protection is not required by UL when using circuit breakers herein. Circuit breakers are not required to be in the same enclosure as the drive.

Notes below the tables must be followed when using these breakers.

ACS580-01-	Frame size	Input current	CB maximum current	CB voltage	Enclosure minimum volume	Drive volume	ABB circuit breaker
		A	A	V	in^3	in^3	65 kA @ 240 V
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz							
04A6-2	R1	4.6	25	240	6480	506	XT2Nαβ025#********
06A6-2	R1	6.6	25	240	6480	506	XT2Nαβ025#********
07A5-2	R1	7.5	25	240	6480	506	XT2Nαβ025#********
10A6-2	R1	10.6	25	240	6480	560	XT2Nαβ025#********
017A-2	R1	16.7	25	240	6480	506	XT2Nαβ025#********
024A-2	R2	24.2	40	240	6480	684	XT2Nαβ040#********
031A-2	R2	30.8	40	240	6480	684	XT2Nαβ040#********
046A-2	R3	46.2	100	240	6480	1011	XT2Nαβ100#********
059A-2	R3	59.4	100	240	6480	1011	XT2Nαβ100#********
075A-2	R4	74.8	100	240	6480	1669	XT2Nαβ100#********
088A-2	R5	88.0	150	240	8100	2030	XT4Nαβ150#********
114A-2	R5	114	150	240	8100	2030	XT4Nαβ150#********
143A-2	R6	143	200	240	¤	2880	XT4Nαβ200#********
169A-2	R7	169	300	240	¤	3369	XT5Nαβ30A#********
211A-2	R7	211	300	240	¤	3369	XT5Nαβ30A#********
273A-2	R8	273	400	240	¤	3858	XT5Nαβ40A#********

¤ Enclosure minimum volume is not applicable

See notes 1-11 below

ACS580-01-	Frame size	Input current	CB max. current	CB voltage	Enclosure minimum volume	Drive volume	ABB circuit breaker	Maximum I^2t	Maximum I_{peak}
		A	A	V	in^3	in^3	65 kA @ 480 V	A^{2}s	kA
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz									
02A1-4	R1	2.1	20	480	6480	506	XT2Hαβ020#********	0.512×10^6	23.2
03A0-4	R1	3.0	20	480	6480	506	XT2Hαβ020#********	0.512×10^6	23.2
03A5-4	R1	3.5	20	480	6480	506	XT2Hαβ020#********	0.512×10^6	23.2
04A8-4	R1	4.8	20	480	6480	560	XT2Hαβ020#********	0.512×10^6	23.2
07A6-4	R1	7.6	20	480	6480	506	XT2Hαβ020#********	0.512×10^6	23.2
012A-4	R1	12.0	20	480	6480	506	XT2Hαβ020#********	0.512×10^6	23.2
014A-4	R2	14.0	35	480	16200	684	XT2Hαβ035#********	0.512×10^6	23.2
023A-4	R2	23.0	35	480	16200	684	XT2Hαβ035#********	0.512×10^6	23.2
027A-4	R3	27.0	70	480	27720	1011	XT2Hαβ070#********	0.512×10^6	23.2
034A-4	R3	34.0	70	480	27720	1011	XT2Hαβ070#********	0.512×10^6	23.2

ACS580-01-	Frame size	Input current	CB max. current	CB voltage	Enclosure minimum volume	Drive volume	ABB circuit breaker	Maximum I^2t	Maximum I_{peak}
		A	A	V	in^3	in^3	65 kA @ 480 V	A^2s	kA
044A-4	R3	44.0	70	480	27720	1011	XT2Hαβ070#********	0.512×10^6	23.2
052A-4	R4	52	125	480	30240	1669	XT2Hαβ125#********	0.512×10^6	23.2
065A-4	R4	65	125	480	30240	1669	XT2Hαβ125#********	0.512×10^6	23.2
077A-4	R4	77	125	480	30240	1669	XT2Hαβ125#********	0.512×10^6	23.2
078A-4	R5	78	150	480	30240	2030	XT4Hαβ150#********	0.98×10^6	30
096A-4	R5	96	150	480	30240	2030	XT4Hαβ150#********	0.98×10^6	30
124A-4	R6	124	225	480	53705	2880	XT4Hαβ225#********	0.98×10^6	30
156A-4	R7	156	250	480	53703	3369	XT4Hαβ250#********	0.98×10^6	30
180A-4	R7	180	250	480	53703	3369	XT4Hαβ250#********	0.98×10^6	30
240A-4	R8	240	400	480	53703	3858	XT5Hαβ40A#********	4.2×10^6	47.9
260A-4	R8	240	400	480	53703	3858	XT5Hαβ40A#********	4.2×10^6	47.9
302A-4	R9	302	600	480	53703	5226	XT5Hαβ60B#********	4.2×10^6	47.9
361A-4	R9	361	600	480	53703	5226	XT5Hαβ60B#********	4.2×10^6	47.9
414A-4	R9	414	600	480	53703	5226	XT5Hαβ60B#********	4.2×10^6	47.9

See notes 1-9 and 12-16 below

ACS580-01-	Frame size	Input current	CB max. current	CB voltage	Enclosure minimum volume	Drive volume	ABB circuit breaker	Maximum I^2t	Maximum I_{peak}
		A	A	V	in^3	in^3	65 kA @ 600 V	A^2s	kA
3-phase U_1 = 525...600 V, P_n at U_n =W 575 V, 60 Hz									
02A7-6	R2	2.7	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
03A9-6	R2	3.9	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
06A1-6	R2	6.1	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
09A0-6	R2	9	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
011A-6	R2	11	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
017A-6	R2	17	25	600	16200	684	XT4Vαβ025#********	1.2×10^6	31.5
022A-6	R3	22	50	600	16200	684	XT4Vαβ050#********	1.2×10^6	31.5
027A-6	R3	27	50	600	16200	1011	XT4Vαβ050#********	1.2×10^6	31.5
032A-6	R3	32	50	600	16200	1011	XT4Vαβ050#********	1.2×10^6	31.5
041A-6	R5	41	125	600	16200	2030	XT4Vαβ125#********	1.2×10^6	31.5
052A-6	R5	52	125	600	16200	2030	XT4Vαβ125#********	1.2×10^6	31.5
062A-6	R5	62	125	600	16200	2030	XT4Vαβ125#********	1.2×10^6	31.5
077A-6	R5	77	125	600	16200	2030	XT4Vαβ125#********	1.2×10^6	31.5
099A-6	R7	99	200	600	18900	3369	XT4Vαβ200#********	1.2×10^6	31.5
125A-6	R7	125	200	600	18900	3369	XT4Vαβ200#********	1.2×10^6	31.5
144A-6	R7	144	250	600	32400	3858	XT4Vαβ200#********	1.2×10^6	31.5
192A-6	R9	192	400	600	32400	5226	XT5Lαβ40A#********	4.2×10^6	51.4
242A-6	R9	242	400	600	32400	5226	XT5Lαβ40A#********	4.2×10^6	51.4
271A-6	R9	271	400	600	32400	5226	XT5Lαβ40A#********	4.2×10^6	51.4

See notes 1-9, 12-13 and 17 below

Notes:

1. Drives that have an enclosure minimum volume listed must be mounted in an enclosure ≥ enclosure minimum volume specified in the tables above.
2. When multiple drives that have an enclosure minimum volume specified are installed in the same enclosure, minimum volume of the enclosure is determined by largest enclosure minimum volume of the drives to be placed in the enclosure, plus the volume(s) of each additional drive. i.e. for the 480V R6 and R3 drive select enclosure with the volume ≥ 53703+1011 = 54714 in^3.
3. For UL Type Open, Type 1 or UL Type 12 drives that have a minimum enclosure volume indicated with ¤, no minimum enclosure volume is required but the drive must be mounted inside an enclosure.
4. If combining a drive with an enclosure minimum volume specified and others with an enclosure minimum volume indicated with ¤, start with the largest specified enclosure minimum volume listed and add the drive volumes for the other drives.
5. If you are only mounting drives with no enclosure minimum volume specified, you have no restrictions on the enclosure size, but follow air clearances specified in the drive HW manuals for sufficient ventilation around each drive.
6. Open Type, Type 1 and Type 12 drives can be used inside of the enclosure. Use drive volume for all three types listed in the table when installing multiple drives in the enclosure.
7. The ABB circuit breaker part number listed in the table is a base part number.
   - Symbol α represents 80% or 100% allowable continuous current. Options allowed are U, Q, C and D.
   - Symbol β represents the number of poles for the breaker. Options allowed are 3, and 4.
   - Symbol # represents trip units. Trip units allowed include A thru C, E thru L, P thru Z. If using Ekip breakers, set the overload current of the circuit breaker equal to or less than the value shown in the “CB Maximum Current” column in the tables above.
   - The digits indicated with an “*” represent accessories for the breakers and have no impact on the drive UL listing or performance or rating of the breaker.
   - For the ABB circuit breaker configurator refer to: *https://lowvoltage-configurator.tnb.com/configurator/#/config/tmax_xt*
8. Ratings in the tables are maximum for the given circuit breaker frame size. Breakers of the same frame size and interrupting rating with lower current ratings are also allowed.
9. Using a circuit breaker with a lower KAIC rating is not allowed even if the available SC current is less than 65kA.

230V drives were tested with ABB inverse time circuit breakers rated at 65kA and 240V.

Notes 10 and 11 for 230V drives only:

10. Other manufacturers' inverse time circuit breakers can be used if they are UL 489 listed, they are 240V or higher, they have a 65kA or higher interrupting rating and they have the same or lower nominal current rating than the ABB specified circuit breaker.
11. Current limiting inverse time circuit breakers must not be used.

480V and 600V drives were tested with ABB current limiting inverse time circuit breakers rated at 65kA and 480V or 600V.

Notes 12 and 13 for 480V and 600V drives only:

12. When designing UL508A panels, Article SB 4.2.3 Exception No. 3 allows the use of other manufacturers' current limiting inverse time circuit breakers which have same voltage, current and interrupting rating, if I_{peak} and I^2t are the same or less than the ABB specified circuit breaker.
13. Non-current limiting inverse time circuit breakers must not be used.

Notes 14...16 for 480V drives only:

14. Enclosures for frames R1, R3, and R9 must have a solid bottom directly below the drive. i.e. fans, filters or louvers cannot be mounted directly below the drive but can be mounted in adjacent areas on the bottom of the enclosure.
15. Only 480V R8 frame drives with serial numbers after 1204301926 when built in Finland and after 2205002140 when built in the U.S. may be protected with circuit breakers listed in the tables above.
16. Only 480V R9 frame drives with serial numbers beginning 1204109256 when built in Finland and beginning 22106xxxxx when built in the U.S. may be protected with circuit breakers listed in the tables above.

Note 17 for 600V drives only:

17. Enclosures for frames R2, R3, R5 and R9 must have a solid bottom directly below the drive. i.e. fans, filters or louvers cannot be mounted directly below the drive but can be mounted in adjacent areas on the bottom of the enclosure.

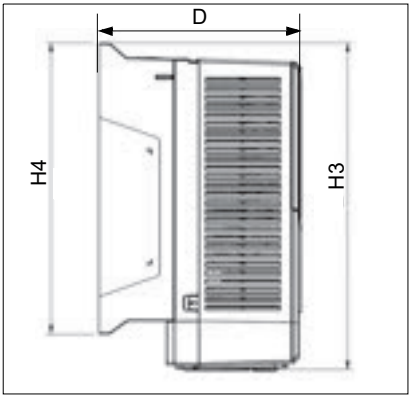
Alternative circuit breakers can be used if they meet certain characteristics. For acceptable breakers see the manual supplement (*3AXD50000645015* [English]).

Dimensions, weights and free space requirements

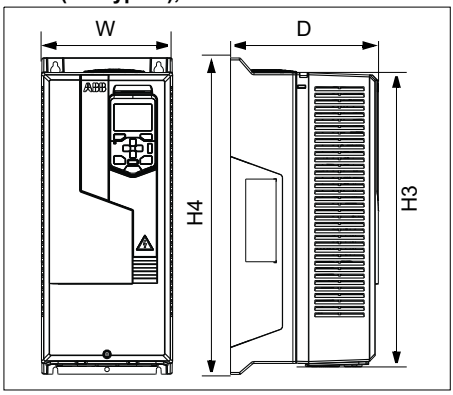
Frame size	Dimensions and weights													
	IP21							UL Type 1						
	H1	H2	H3	H4	W	D	Weight	H1	H2	H3	H4	W	D	Weight
	mm	mm	mm	mm	mm	mm	kg	in	in	in	in	in	in	lb
R1	N/A	N/A	373	331	125	223	4.6	N/A	N/A	14.69	13.03	4.92	8.78	10.1
R2	N/A	N/A	473	432	125	229	6.6	N/A	N/A	18.62	17.01	4.92	9.00	14.6
R3	N/A[1)]	N/A[1)]	454	490	203	229	11.8	N/A[1)]	N/A[1)]	17.87	19.29	7.99	9.02	26.0
R4	N/A[1)]	N/A[1)]	600	636	203	257	19.0	N/A[1)]	N/A[1)]	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	11.61	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	54.0	23.62	23.67	34.65	25.25	11.18	14.57	119.1
R8	680	677	965	721	300	393	69.0	26.77	26.66	37.99	28.39	11.81	15.47	152.1
R9	680	680	955	741	380	418	97.0	26.77	26.77	37.60	29.19	14.96	16.46	213.9

[1)] Frames with an integrated cable/conduit box

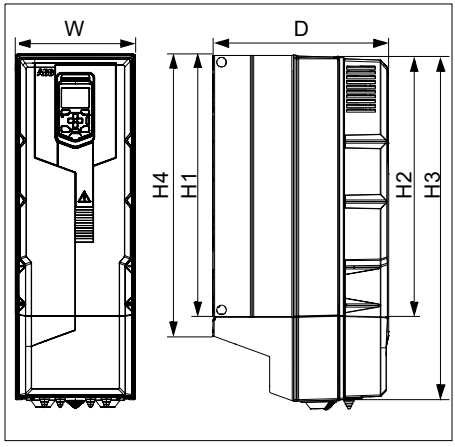
IP21 (UL Type 1) & IP55 (UL Type 12), R1…R2



IP21 (UL Type 1), R3…R4



IP21 (UL Type 1), R5…R9



Symbols

IP21 / UL Type 1

H1 R5.…R9: Height back without cable/conduit box

H2 R5.…R9: Height front without cable/conduit box

H3 R3.…R4: Height front, R1…R2, R5.…R9: Height front with cable/conduit box

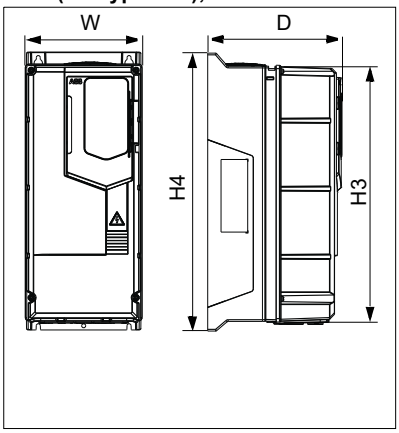
H4 R1.…R4: Height back, R5.…R9: Height back with cable/conduit box

W Width

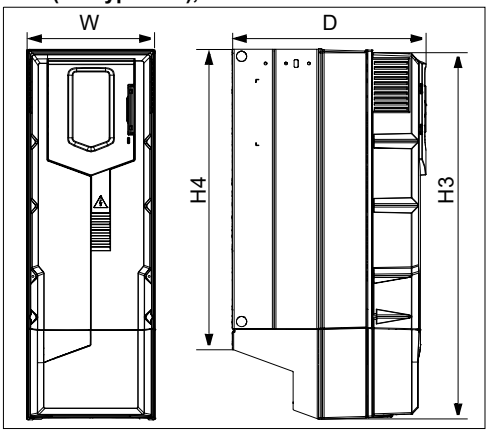
D Depth

Frame size	Dimensions and weights												
	IP55					UL Type 12							
	H3	H4	W	D	Weight	H3	H4	H5	W	D	Weight	HH	HW
	mm	mm	mm	mm	kg	in	in	in	in	in	lb	in	in
R1	403	331	128	233	4.8	15.87	13.03	17.78	5.04	9.17	10.6	2.56	5.09
R2	503	432	128	239	6.8	19.80	17.01	21.49	5.04	9.41	15.0	2.56	5.10
R3	456	490	206	237	13.0	17.95	19.29	20.93	8.11	9.33	28.7	2.52	8.16
R4	600	636	203	265	20.0	23.62	25.04	27.03	7.99	10.43	44.1	2.83	8.59
R5	732	633	203	320	29.0	28.82	24.90	32.01	7.99	12.60	64.0	3.15	8.58
R6	727	589	252	380	43.0	28.62	23.20	34.81	9.92	14.96	94.8	6.10	11.46
R7	880	641	284	381	56.0	34.65	25.25	40.86	11.18	15.00	123.5	6.10	13.00
R8	965	721	300	452	77.0	37.99	28.39	44.23	11.81	17.80	169.8	6.10	13.80
R9	955	741	380	477	103.0	37.60	29.19	46.75	14.96	18.78	227.1	9.06	16.95

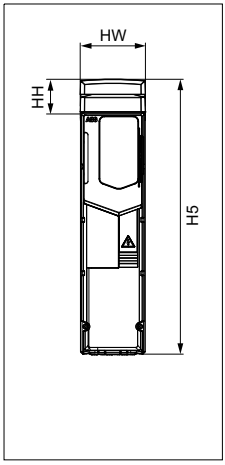
IP55 (UL Type 12[1)]), R3…R4



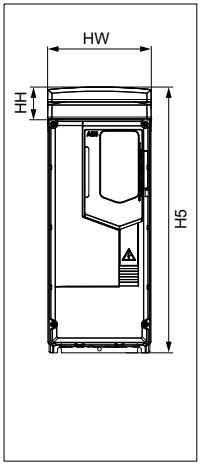
IP55 (UL Type 12[1)]), R5…R9



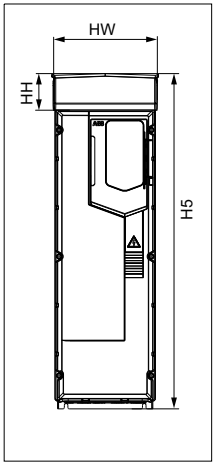
UL Type 12, R1…R2



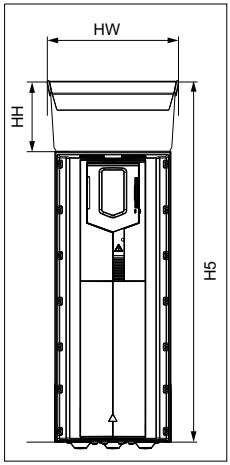
UL Type 12, R3



UL Type 12, R4…R5



UL Type 12, R6…R9



Symbols

IP55 / UL Type 12 [1)] without hood

H3 R3.…R4: Height front, R1…R2 [2)] and R5.…R9: Height front with cable/conduit box

H4 R3.…R4: Height back, R1…R2 [2)] and R5.…R9: Height back with cable/conduit box

H5 Height with hood (UL Type 12 only)

W Width

D Depth

HH Hood height

HW Hood width

[2)] See H3 and H4 location for R1…R2 in the figure on *282*

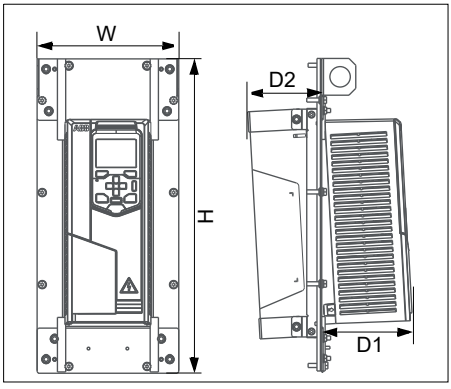
Frame size	Dimensions and weights with main switch and EMC C1 filter options (+F278, +F316, +E223), IP55									
	H3		H4		W		D		Weight	
	mm	in	mm	in	mm	in	mm	in	kg	lb
R1	403	15.87	331	13.03	128	5.04	255	10.03	5.4	11.8
R2	503	19.80	432	17.01	128	5.04	257	10.12	7.4	16.4
R3	733	28.86	519	20.43	207	8.15	258	10.16	15.0	33.1
R4	879	34.61	665	26.18	206	8.11	286	11.26	23.3	51.5
R5	1023	40.28	626	24.65	203	7.99	342	13.46	33.0	72.8

For the symbols see page *284*.

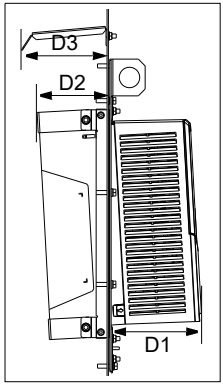
Frame size	Dimensions with flange option kit (+C135), IP21 (UL Type 1) & IP55 (UL Type 12)								UL Type 12 hood	
	H		W		D1		D2		D3	
	mm	in	mm	in	mm	in	mm	in	mm	in
R1	461	18.15	206	8.12	133	5.22	109	4.28	126	4.95
R2	551	21.69	206	8.12	130	5.13	114	4.51	126	4.95
R3	613	24.13	290	11.42	118	4.65	116	4.58	191	7.53
R4	776	30.55	290	11.42	120	4.74	137	5.41	191	7.53
R5	776	30.55	290	11.42	124	4.89	173	6.81	191	7.53
R6	672	26.46	374	14.72	194	7.63	170	6.67	191	7.53
R7	722	28.43	406	15,98	195	7.67	169	6.65	211	8.32
R8	814	32.01	433	17.46	202	7.95	184	7.22	209	8.22
R9	804	31.65	502	19.76	204	8.03	209	8.21	226	8.91

H Height with flange
W Width with flange
D1 Depth of the drive outwards from the outer surface of the flange plate
D2 Depth of the drive inwards from the outer surface of the flange plate
D3 Depth of the hood inwards from the outer surface of the flange plate (UL Type 12 only)

R1…R3 IP21 (UL Type 1)[1,2)]

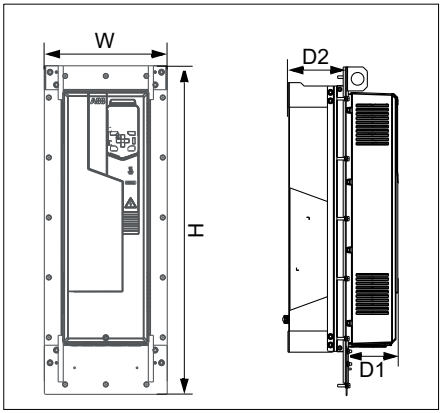


R1…R3 IP55 (UL Type 12)[1,2)]

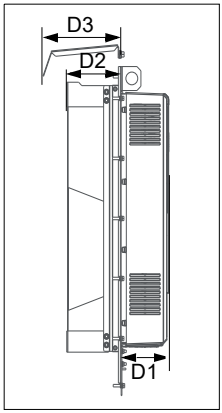


[1)] For the actual degree of protection that can be achieved with flange for each frame size (on the back and front sides of the drive), see *Flange mounting kit installation supplement* (3AXD50000019100 [English]).

R4…R9 IP21 (UL Type 1)[1,2)]



R4…R9 IP55 (UL Type 12)[1,2)]



1) For the actual degree of protection that can be achieved with flange for each frame size (on the back and front sides of the drive), see *Flange mounting kit installation supplement* (3AXD50000019100 [English]).

2) Regarding flange mounting:

- The outside of the cabinet sets the limit for vertical positioning, since that is where the cooling is required
- There are no limitations inside the cabinet; practically the outside positioning defines the distance between drives
- The space inside the cabinet can be used as long as the following requirements are still met:
  - Heat loss dissipation inside the cabinet per the hardware manual
  - Sufficient space for the maintenance operations
  - Wire bending radius rules according to UL when planning routing for mains and motor cables.

Frame size	Free space, IP21 (UL Type 1)											
	Vertical mounting stand alone						Vertical mounting side by side					
	Above		Below[1]		Beside		Above		Below[1]		Between	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
R1	150	5.91	86	3.39	150	5.91	200	7.87	200	7.87	0	0
R2	150	5.91	86	3.39	150	5.91	200	7.87	200	7.87	0	0
R3	200	7.87	53	2.09	150	5.91	200	7.87	200	7.87	0	0
R4	53	2.09	200	7.87	150	5.91	200	7.87	200	7.87	0	0
R5	100	3.94	200	7.87	150	5.91	200	7.87	200	7.87	0	0
R6	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R7	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R8	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R9	200	7.87	300	11.81	150	5.91	200	7.87	300	11.81	0	0

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

Frame size	Free space, IP21 (UL Type 1)[1]					
	Horizontal mounting					
	Above[2]		Below[2,3]		Between[2]	
	mm	in	mm	in	mm	in
R1	150	5.91	86	3.39	30/200	1.18/7.87
R2	150	5.91	86	3.39	30/200	1.18/7.87
R3	200	7.87	53	2.09	30/200	1.18/7.87
R4	30	1.18	200	7.87	30/200	1.18/7.87
R5	30	1.18	200	7.87	30/200	1.18/7.87

1) **Note:** Horizontal installation meets IP20 requirements only.
2) For definition, see the figure on page *55*.
3) Free space below is always measured from the drive frame, not from the cable box.

Frame size	Free space, IP55 (UL Type 12)											
	Vertical mounting stand alone						Vertical mounting side by side					
	Above		Below[1]		Beside		Above		Below[1]		Between	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
R1	137	5.39	116	4.57	150	5.91	200	7.87	200	7.87	0	0
R2	137	5.39	116	4.57	150	5.91	200	7.87	200	7.87	0	0
R3	200	7.87	53	2.09	150	5.91	200	7.87	200	7.87	0	0
R4	53	2.0	200	7.87	150	5.91	200	7.87	200	7.87	0	0
R5	100	3.94	200	7.87	150	5.91	200	7.87	200	7.87	0	0
R6	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R7	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R8	155	6.10	300	11.81	150	5.91	200	7.87	300	11.81	0	0
R9	200	7.87	300	11.81	150	5.91	200	7.87	300	11.81	0	0

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

Frame size	Free space, IP55 (UL Type 12)[1]					
	Horizontal mounting					
	Above[3]		Below[2,3]		Between[3]	
	mm	in	mm	in	mm	in
R1	137	5.39	116	4.57	30/200	1.18/7.87
R2	137	5.39	116	4.57	30/200	1.18/7.87
R3	200	7.87	53	2.09	30/200	1.18/7.87
R4	30	1.18	200	7.87	30/200	1.18/7.87
R5	30	1.18	200	7.87	30/200	1.18/7.87

1) **Note:** IP55/Type 12 drive mounted horizontally meet IP21/Type 1 ratings.
2) For definition, see the figure on page *55*.
3) Free space below is always measured from the drive frame, not from the cable box.

See the figures in section *Examining the installation site* on page *52*.

Note: IP55 (UL Type 12) does not imply that the drive can be installed outside/outdoors. To install outside, contact your local ABB representative directly for specific instructions (3AXD10000425906). The warranty will be void if installed outdoors without using these special instructions.

Losses, cooling data and noise

The air flow direction is from bottom to top.

Cooling air flow, heat dissipation and noise for stand-alone drives

IEC

Type ACS580-01-	Typical heat dissipation[1]		Air flow		Noise	Frame size
	W	BTU/h	m^3/h	CFM	dB(A)	
3-phase U_n = 230 V						
04A7-2	51	-	43	25	59	R1
06A7-2	70	-	43	25	59	R1
07A6-2	80	-	43	25	59	R1
012A-2	142	-	43	25	59	R1
018A-2	228	-	43	25	59	R1
025A-2	253	-	101	59	64	R2
032A-2	358	-	101	59	64	R2
047A-2	527	-	179	105	76	R3
060A-2	775	-	179	105	76	R3
089A-2	876	-	139	82	63	R5
115A-2	1285	-	139	82	63	R5
144A-2	1932	-	435	256	67	R6
171A-2	2000	-	450	265	67	R7
213A-2	2854	-	450	265	67	R7
276A-2	3567	-	550	324	65	R8
3-phase U_n = 400 or 480 V						
02A7-4	42	-	43	25	59	R1
03A4-4	50	-	43	25	59	R1
04A1-4	59	-	43	25	59	R1
05A7-4	83	-	43	25	59	R1
07A3-4	97	-	43	25	59	R1
09A5-4	135	-	43	25	59	R1
12A7-4	211	-	43	25	59	R1
018A-4	238	-	101	59	64	R2
026A-4	382	-	101	59	64	R2
033A-4	486	-	179	105	76	R3
039A-4	517	-	179	105	76	R3
046A-4	667	-	179	105	76	R3
062A-4	867	-	134	79	69	R4
073A-4	1114	-	134	79	69	R4
088A-4	1139	-	139	82	63	R5
106A-4	1290	-	139	82	63	R5
145A-4	1960	-	435	256	67	R6
169A-4	2021	-	450	265	67	R7
206A-4	2785	-	450	265	67	R7
246A-4	3126	-	550	324	65	R8
293A-4	4066	-	550	324	65	R8
363A-4	4834	-	1150	677	68	R9

Type ACS580-01-	Typical heat dissipation[1]		Air flow		Noise	Frame size
	W	BTU/h	m^3/h	CFM	dB(A)	
430A-4	6067	-	1150	677	68	R9

[1] Typical drive losses when it operates at 90% of the motor nominal frequency and 100% of the drive nominal output current.

UL (NEC)

Type ACS580-01-	Typical heat dissipation		Air flow		Noise	Frame size
	W	BTU/h	m^3/h	CFM	dB(A)	
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz						
04A6-2	50	-	43	25	59	R1
06A6-2	69	-	43	25	59	R1
07A5-2	79	-	43	25	59	R1
10A6-2	120	-	43	25	59	R1
017A-2	203	-	43	25	59	R1
024A-2	247	-	101	59	64	R2
031A-2	348	-	101	59	64	R2
046A-2	518	-	179	105	76	R3
059A-2	762	-	179	105	76	R3
075A-2	809	-	288	170	69	R4
088A-2	861	-	139	82	63	R5
114A-2	1268	-	139	82	63	R5
143A-2	1916	-	435	256	67	R6
169A-2	1965	-	450	265	67	R7
211A-2	2089	-	450	265	67	R7
273A-2	3518	-	550	324	65	R8
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz						
02A1-4	37	-	43	25	59	R1
03A0-4	47	-	43	25	59	R1
03A5-4	52	-	43	25	59	R1
04A8-4	71	-	43	25	59	R1
06A0-4	79	-	43	25	59	R1
07A6-4	103	-	43	25	59	R1
012A-4	200	-	43	25	59	R1
014A-4	186	-	101	59	64	R2
023A-4	342	-	101	59	64	R2
027A-4	386	-	179	105	76	R3
034A-4	446	-	179	105	76	R3
044A-4	656	-	179	105	76	R3
052A-4	671	-	134	79	69	R4
065A-4	719	-	134	79	69	R4
077A-4	1047	-	288	170	63	R4
078A-4	941	-	139	82	63	R5
096A-4	1127	-	139	82	63	R5
124A-4	1563	-	435	256	67	R6
156A-4	1815	-	450	265	67	R7
180A-4	2285	-	450	265	67	R7
240A-4	3039	-	550	324	65	R8
260A-4	3398	-	550	324	65	R8
302A-4	3253	-	550	324	68	R9
361A-4	4836	-	1150	677	68	R9
414A-4	5691	-	1150	677	68	R9

Type ACS580-01-	Typical heat dissipation		Air flow		Noise	Frame size
	W	BTU/h	m^3/h	CFM	dB(A)	
3-phase U_1 = 525...600 V, P_n at U_n =W 575 V, 60 Hz						
02A7-6	66	224	101	59	64	R2
03A9-6	84	288	101	59	64	R2
06A1-6	133	454	101	59	64	R2
09A0-6	174	593	101	59	64	R2
011A-6	228	777	101	59	64	R2
017A-6	322	1100	101	59	64	R2
022A-6	430	1469	179	105	75	R3
027A-6	525	1791	179	105	75	R3
032A-6	619	2114	179	105	75	R3
041A-6	835	2852	139	82	63	R5
052A-6	1024	3497	139	82	63	R5
062A-6	1240	4235	139	82	63	R5
077A-6	1510	5157	139	82	63	R5
099A-6	2061	7039	450	265	67	R7
125A-6	2466	8422	450	265	67	R7
144A-6	3006	10266	550	324	65	R8
192A-6	4086	13954	1150	677	68	R9
242A-6	4896	16271	1150	677	68	R9
271A-6	4896	16271	1150	677	68	R9

Cooling air flow and heat dissipation for flange mounting (option +C135)

Flange mounting kit is ordered separately in North America, not with a plus code.

IEC

Type ACS580 -01-	Heat dissipation (+C135)		Air flow (+C135)				Frame size
	Heatsink	Front	Heatsink		Front		
	W	W	m^3/h	CFM	m^3/h	CFM	
3-phase U_n = 400 or 480 V							
02A7-4	20	23	TBA	TBA	TBA	TBA	R1
03A4-4	28	23	TBA	TBA	TBA	TBA	R1
04A1-4	36	23	TBA	TBA	TBA	TBA	R1
05A7-4	60	23	TBA	TBA	TBA	TBA	R1
07A3-4	72	24	TBA	TBA	TBA	TBA	R1
09A5-4	109	25	TBA	TBA	TBA	TBA	R1
12A7-4	181	28	TBA	TBA	TBA	TBA	R1
018A-4	192	43	TBA	TBA	TBA	TBA	R2
026A-4	322	54	TBA	TBA	TBA	TBA	R2
033A-4	418	71	TBA	TBA	TBA	TBA	R3
039A-4	439	82	TBA	TBA	TBA	TBA	R3
046A-4	578	92	TBA	TBA	TBA	TBA	R3
062A-4	729	127	TBA	TBA	TBA	TBA	R4
073A-4	947	151	TBA	TBA	TBA	TBA	R4
088A-4	977	141	TBA	TBA	TBA	TBA	R5
106A-4	1099	165	TBA	TBA	TBA	TBA	R5
145A-4	1733	188	435	256	52	31	R6
169A-4	1758	223	450	265	75	44	R7
206A-4	2464	266	450	265	75	44	R7
246A-4	2743	326	550	324	120	71	R8
293A-4	3601	391	550	324	120	71	R8
363A-4	4220	524	1150	677	170	100	R9
430A-4	5330	623	1150	677	170	100	R9

UL (NEC)

Type ACS580 -01-	Heat dissipation (with flange kit)		Air flow (with flange kit)				Frame size
	Heatsink	Front	Heatsink		Front		
	W	W	m^3/h	CFM	m^3/h	CFM	
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz							
02A1-4	20	23	TBA	TBA	TBA	TBA	R1
03A0-4	28	23	TBA	TBA	TBA	TBA	R1
03A5-4	36	23	TBA	TBA	TBA	TBA	R1
04A8-4	60	23	TBA	TBA	TBA	TBA	R1
06A0-4	72	24	TBA	TBA	TBA	TBA	R1
07A6-4	109	25	TBA	TBA	TBA	TBA	R1

Type ACS580 -01-	Heat dissipation (with flange kit)		Air flow (with flange kit)				Frame size
	Heatsink	Front	Heatsink		Front		
	W	W	m^3/h	CFM	m^3/h	CFM	
012A-4	181	28	TBA	TBA	TBA	TBA	R1
014A-4	192	43	TBA	TBA	TBA	TBA	R2
023A-4	322	54	TBA	TBA	TBA	TBA	R2
027A-4	418	71	TBA	TBA	TBA	TBA	R3
034A-4	439	82	TBA	TBA	TBA	TBA	R3
044A-4	578	92	TBA	TBA	TBA	TBA	R3
052A-4	729	127	TBA	TBA	TBA	TBA	R4
065A-4	947	151	TBA	TBA	TBA	TBA	R4
078A-4	977	141	TBA	TBA	TBA	TBA	R5
096A-4	1099	165	TBA	TBA	TBA	TBA	R5
124A-4	1733	188	435	256	52	31	R6
156A-4	1758	223	450	265	75	44	R7
180A-4	2464	266	450	265	75	44	R7
240A-4	2743	326	550	324	120	71	R8
260A-4	3601	391	550	324	120	71	R8
302A-4	2849	340	TBA	TBA	TBA	TBA	R9
361A-4	4220	524	1150	677	170	100	R9
414A-4	5330	623	1150	677	170	100	R9

Terminal and lead-through data for the power cables

IEC

Input, motor, resistor and DC cable lead-throughs, maximum wire sizes (per phase) and terminal screw sizes and tightening torques (*T*) are given below.

Frame size	Cable lead-through		L1, L2, L3, T1/U, T2/V, T3/W terminals			Grounding terminals	
	Per cable type	Ø[1]	Min wire size (solid/ stranded)[3]	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 = 230 V							
R1	1	30	0.2/0.2	6/4	1.0	16/16	1.5
R2	1	30	0.5/0.5	16/16	1.5	16/16	1.5
R3	1	30	0.5/0.5	35/35	3.5	35/35	1.5
R5	1	45	6	70	5.6	-	2.2
R6	1	45	25	150	30	180	9.8
R7	1	54	95	240	40	180	9.8
R8	2	45	2×50	2×150	40	2×180	9.8
3-phase U_n = 400 or 480 V							
R1	1	30	0.20/0.25	6/4	1.0	16/16	1.5
R2	1	30	0.5/0.5	16/16	1.5	16/16	1.5
R3	1	30	0.5/0.5	35/25	3.5	35/35	1.5
R4	1	45	0.5/0.5	50	4.0	35/35	1.5
R5	1	45	6	70	5.6	35/35[2]	2.9
R6	1	45	25	150	30	185[2]	2.2
R7	1	54	95	240	40	185[2]	9.8
R8	2	45	2×50	2×150	40	2×185[2]	9.8
R9	2	54	2×95	2×240	70	2×185[2]	9.8

[1] Maximum cable diameter accepted. For the lead-through plate hole diameters, see chapter *Dimension drawings* on page *323*.

[2] Either cable lug (R5, see page *135*) or clamp (R6…R9, see page *139*) is used for grounding.

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

Note: For the tightening torques of the grounding terminals, see sections *Connection procedure, frames R1…R4* on page *124*, *Connection procedure, frame R5* on page *131* and *Connection procedure, frames R6…R9* on page *137*.

Frame size	Cable lead-through		R+, R-, UDC+ and UDC- terminals			
	Per cable type	Ø[1]	Min wire size (solid/ stranded)[3]	Max wire size (solid/ stranded)	*T*	
					Screw/ Bolt	
	pcs	mm	mm^2	mm^2		N·m
3-phase U_n = 230 V						
R1	1	23	0.2/0.2	6/4	[2]	1.0
R2	1	23	0.5/0.5	16/16	[2]	1.5
R3	1	30	0.5/0.5	35/35	[2]	3.5
R5	1	39	6	70	M5	5.6
R6	1	45	25	150	M8	30
R7	1	54	95	240	M10	30
R8	2	45	2×50	2×150	M10	40
3-phase U_n = 400 or 480 V						
R1	1	23	0.20/0.25	6/4	[2]	1.0
R2	1	23	0.5/0.5	16/16	[2]	1.5
R3	1	23	0.5/0.5	35/25	[2]	3.5
R4	1	39	0.5/0.5	50	[2]	4.0
R5	1	39	6	70	M5	5.6
R6	1	45	25	150	M8	30
R7	1	54	95	240	M10	30
R8	2	45	2×50	2×150	M10	40
R9	2	54	2×95	2×240	M12	70

[1] Maximum cable diameter accepted. For the lead-through plate hole diameters, see chapter *Dimension drawings* on page *323*.
[2] See the table below.
[3] **Note:** Minimum wire size does not necessarily have enough current capability for full load. Make sure the installation complies with local laws and regulations.

Frame size	Screwdrivers for the terminals of the main circuit
R1	Combo: Slot 4 mm and PH1
R2	Combo: Slot 4.5 mm and PH2
R3, R4	PH2

UL (NEC)

Input, motor, resistor and DC cable lead-throughs, maximum wire sizes (per phase) and terminal screw sizes and tightening torques (*T*) are given below.

Frame size	Cable lead-through		L1, L2, L3, T1/U, T2/V, T3/W terminals			Grounding terminals		
	Per cable type	Ø[1]	Wire range stranded/solid[3]		*T*	Wire range stranded/solid[3]		*T*
			Min	Max		Min	Max	
	pcs	in	AWG	AWG	lbf·ft	AWG	AWG	lbf·ft
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz								
R1	1	1.18	24	10	0.7	18	6	1.1
R2	1	1.18	20	6	1.1	18	6	1.1
R3	1	1.18	20	2	2.6	18	2	1.1
R5	1	1.77	10	2/0	4.1	2)	2)	1.6
R6	1	1.77	4	300 MCM	22.1	2)	350 MCM	7.2
R7	1	2.13	3/0	500MCM	29.5	2)	350 MCM	7.2
R8	2	1.77	2×1/0	2×300MCM	29.5	2)	2×350 MCM	7.2
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz								
R1	1	1.18	24	10	0.7	18	6	1.1
R2	1	1.18	20	6	1.1	18	6	1.1
R3	1	1.18	20	2	2.6	24	2	1.1
R4	1	1.77	20	1	3.0	12	2	2.1
R5	1	1.77	10	2/0	4.1	2)	2	1.6
R6	1	1.77	4	300 MCM	22.1	2)	350 MCM	7.2
R7	1	2.13	3/0	500 MCM	29.5	2)	350 MCM	7.2
R8	2	1.77	2×1/0	2×300 MCM	29.5	2)	2×350 MCM	7.2
R9	2	2.13	2×3/0	2×500 MCM	51.6	2)	2×350 MCM	7.2
3-phase U_1 = 525...600 V, P_n at U_n = 575 V, 60 Hz								
R2	1	1.18	20	6	1.1	18	6	1.1
R3	1	1.18	20	2	2.6	18	6	1.1
R5	1	1.77	10	2/0	4.1	2)	2)	1.6
R7	1	2.13	3/0	500 MCM	29.5	2)	350 MCM	7.2
R8	2	1.77	2×1/0	2×300MCM	29.5	2)	2×350 MCM	7.2
R9	2	2.13	2×3/0	2×500 MCM	51.6	2)	2×350 MCM	7.2

1) Maximum cable diameter accepted. For the lead-through plate hole diameters, see chapter *Dimension drawings* on page *323*.

2) Either cable lug, not provided (R5, see page *185*) or cable clamp (R6…R9, see page *190*) is used for grounding.

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

Note: For the tightening torques of the grounding terminals, see sections *Connection procedure, frames R1…R4* on page *178*, *Connection procedure, frame R5* on page *183* and *Connection procedure, frames R6…R9* on page *188*.

Frame size	Cable lead-through		R+, R-, UDC+ and UDC- terminals			
	Per cable type	Ø[1]	Wire range stranded/solid[3]		*T*	
			Min	Max	Screw/ Bolt	
	pcs	in	AWG	AWG		lbf·ft
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz						
R1	1	0.91	24	10	2)	0.7
R2	1	0.91	20	6	2)	1.1
R3	1	1.18	20	2	2)	2.6
R4	1	1.54	50	1	2)	3.0
R5	1	1.54	10	2/0	M5	4.1
R6	1	1.77	4	300 MCM	M8	22.1
R7	1	2.13	3/0	500 MCM	M10	29.5
R8	2	1.77	2×1/0	2×300 MCM	M10	29.5
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz						
R1	1	0.91	24	10	2)	0.7
R2	1	0.91	20	6	2)	1.1
R3	1	0.91	20	2	2)	2.6
R4	1	1.54	50	1	2)	3.0
R5	1	1.54	10	2/0	M5	4.1
R6	1	1.77	4	300 MCM	M8	22.1
R7	1	2.13	3/0	500 MCM	M10	29.5
R8	2	1.77	2×1/0	2×300 MCM	M10	29.5
R9	2	2.13	2×3/0	2×500 MCM	M12	51.6
3-phase U_1 = 525...600 V, P_n at U_n = 575 V, 60 Hz						
R2	1	0.91	20	6	2)	1.1
R3	1	1.18	20	2	2)	2.6
R5	1	1.54	10	2/0	M5	4.1
R7	1	2.13	3/0	500 MCM	M10	29.5
R8	2	1.77	2×1/0	2×300 MCM	M10	29.5
R9	2	2.13	2×3/0	2×500 MCM	-	51.6

1) Maximum cable diameter accepted. For the lead-through plate hole diameters, see chapter *Dimension drawings* on page *323*.
2) See the table below.
3) **Note:** Minimum wire size does not necessarily have enough current capability for full load. Make sure the installation complies with local laws and regulations.

Frame size	Screwdrivers for the terminals of the main circuit
R1	Combo: Slot 4 mm and PH1
R2	Combo: Slot 4.5 mm and PH2
R3, R4	PH2

Terminal and lead-through data for the control cables

IEC

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

Frame size	Cable lead-through		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
3-phase U_n = 230 V						
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
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…1.5	0.5…0.6
R7	4	17	0.14…2.5	0.5…0.6	0.14…1.5	0.5…0.6
R8	4	17	0.14…2.5	0.5…0.6	0.14…1.5	0.5…0.6
3-phase U_n = 400 or 480 V						
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)

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

Frame size	Cable lead-through		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	lbf·ft	AWG	lbf·ft
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V, 60 Hz						
R1	3	0.67	24…14	0.4	26…16	0.4
R2	3	0.67	24…14	0.4	26…16	0.4
R3	3	0.67	24…14	0.4	26…16	0.4
R4	4	0.67	24…14	0.4	26…16	0.4
R5	3	0.67	24…14	0.4	26…16	0.4
R6	4	0.67	26…14	0.4	26…16	0.4
R7	4	0.67	26…14	0.4	26…16	0.4
R8	4	0.67	26…14	0.4	26…16	0.4
3-phase U_1 = 440...480 V, P_n at U_n = 480 V, 60 Hz						
R1	3	0.67	24…14	0.4	26…16	0.4
R2	3	0.67	24…14	0.4	26…16	0.4
R3	3	0.67	24…14	0.4	26…16	0.4
R4	4	0.67	24…14	0.4	26…16	0.4
R5	3	0.67	24…14	0.4	26…16	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
3-phase U_1 = 525...600 V, P_n at U_n = 575 V, 60 Hz						
R2	3	0.67	24…14	0.4	26…16	0.4
R3	3	0.67	24…14	0.4	26…16	0.4
R5	3	0.67	24…14	0.4	26…16	0.4
R7	4	0.67	26…14	0.4	26…16	0.4
R8	4	0.67	24…14	0.4	26…16	0.4
R9	4	0.67	26…14	0.4	26…16	0.4

Electrical power network specification

Voltage (U_1)	• ACS580-01-xxxx-2 drives: Input voltage range 3~ 208…240 V AC +10%…. -15%. IEC: This is indicated in the type designation label as typical input voltage levels 3~ 230 V AC. North America: This is indicated in the type designation label as typical input voltage levels 1~ 208/230 V AC and 3~ 208/230 V AC. • ACS580-01-xxxx-4 drives: Input voltage range 3~ 380…480 V AC +10%…. -15%. This is indicated in the type designation label as typical input voltage levels 3~ 400/480 V AC. • ACS580-01-xxxx-6 drives: Input voltage range 3~ 525…600 V AC +10%…. -15%. This is indicated in the type designation label as typical input voltage level 3~ 600 V AC.
Network type	Public low voltage networks. Symmetrically grounded TN-S system, IT (ungrounded), corner-grounded delta, midpoint-grounded delta and TT systems. See section: IEC: *When to disconnect EMC filter or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *117*, and *Guidelines for installing the drive to a TT system* on page *118*. North America: *When to connect EMC filter or disconnect ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *169*, and *Guidelines for installing the drive to a TT system* on page *170*. **Note:** IEC: Frames R4 and R5 cannot be used in corner-grounded or midpoint-grounded delta systems.
Rated conditional short-circuit current (IEC 61800-5-1)	65 kA when protected by fuses given in the tables in section *Fuses (IEC)* on page *269*.
Short-circuit current protection (UL 61800-5-1)	US and Canada: The drive is suitable for use on a circuit capable of delivering not more than 100 kA symmetrical amperes (rms) at 480 V maximum when protected by fuses given in the table in section *Fuses (UL)* on page *275*. US and Canada: The drive is suitable for use on a circuit capable of delivering not more than 65 kA symmetrical amperes (RMS) maximum when protected by circuit breakers given in the table in section *Circuit breakers (UL)* on page *278*.
Frequency (f_1)	48…63 Hz. This is indicated in the type designation label as typical input frequency level f1 (50/60 Hz).
Imbalance	Max. ± 3% of nominal phase to phase input voltage
Fundamental power factor (cos phi$_1$)	0.98 (at nominal load)

Minimum short-circuit power (IEC/EN 61000-3-12)

The minimum short-circuit power Sce given for each drive type for the Rsce (transformer short circuit ratio) value of 350.

Type ACS580 -01-	Input rating	Min. short circuit power		Frame size
		400 V	480 V	
	I_1	Ssc	Ssc	
	A	MVA	MVA	
3-phase U_n = 400 V and 480 V, IEC ratings				
02A7-4	2.6	0.63	0.61	R1
03A4-4	3.3	0.80	0.87	R1
04A1-4	4.0	0.97	1.02	R1
05A7-4	5.6	1.36	1.40	R1
07A3-4	7.2	1.75	1.75	R1
09A5-4	9.4	2.28	2.21	R1
12A7-4	12.6	3.06	3.49	R1
018A-4	17.0	4.12	4.07	R2
026A-4	25.0	6.06	6.69	R2
033A-4	32.0	7.76	7.86	R3
039A-4	38.0	9.21	9.89	R3
046A-4	45.0	10.91	12.80	R3
062A-4	62	15.03	15.13	R4
073A-4	73	17.70	18,91	R4
088A-4	88	21.34	22.41	R5
106A-4	106	25.70	27.93	R5
145A-4	145	35.16	36.08	R6
169A-4	169	40.98	45.39	R7
206A-4	206	49.95	52.38	R7
246A-4	246	59.65	69.84	R8
293A-4	293	71.05	75.66	R8
363A-4	363	88.02	105.05	R9
430A-4	430	104.27	120.47	R9

Motor connection data

Motor types

Asynchronous AC induction motors, permanent magnet motors and synchronous reluctance motors (SynRM)

Short-circuit current protection (IEC/EN 61800-5-1)

The drive provides solid state short circuit protection for the motor connection per IEC/EN 61800-5-1 and UL 61800-5-1.

Frequency (f_2)

0….500 Hz. This is indicated in the type designation label as output frequency level f1 (0....500 Hz).

Frequency resolution

0.01 Hz

Current

See section *Electrical ratings* on page 242.

Switching frequency

2 kHz, 4 kHz (default), 8 kHz, 12 kHz

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			
	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

*For 600 V drives the maximum motor cable length is 100 m (330 ft) for frame R2 and 200 m (660 ft) for frame R3.

Note 1: In multimotor systems, the calculated sum of all motor cable lengths must not exceed the maximum motor cable length given in the table.

Note 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 your local ABB representative for more information.

Note 3: When using longer motor cables than 50 m (165 ft), 8 and 12 kHz switching frequencies are not allowed. With motor cable length over 100 m, disconnect EMC DC screw if applicable.

Note 4: Acceptable motor cable length for motor manufactures may be different. Check with specific motor manufacturer for maximum allowable distance.

EMC compatibility and motor cable length

To comply with the European EMC Directive (standard IEC 61800-3), use the following maximum motor cable lengths at 4 kHz switching frequency. See the table below.

Frame size	Maximum motor cable length, 4 kHz	
	m	ft
EMC limits for Category C2 [1] Standard drive with an internal EMC filter. See notes 1, 2 and 3.		
R1	100	330
R2	100	330
R3	100	330
R4	100	330
R5	100	330
R6	150	492
R7	150	492
R8	150	492
R9	150	492
EMC limits for Category C3 [1] Standard drive with an internal EMC filter. See notes 3 and 4.		
R1	150	492
R2	150	492
R3	150	492
R4	150	492
R5	150	492
R6	150	492
R7	150	492
R8	150	492
R9	150	492

[1] See the terms in section *Definitions* on page *317*.

Note 1: Radiated and conducted emissions are according to category C2 with a internal EMC filter. The internal EMC filter must be connected.

Note 2: Categories C1 and C2 meet requirements for connecting equipment to the public low-voltage networks.

Note 3: Not applicable to 600 V ratings.

Note 4: Radiated and conducted emissions are according to category C3 with an internal EMC filter. The internal EMC filter must be connected.

Brake resistor connection data for frames R1…R3

Short-circuit protection (IEC/EN 61800-5-1, IEC 61439-1)

The brake resistor output is conditionally short-circuit proof by IEC/EN 61800-5-1. Rated conditional short-circuit current as defined in IEC 61439-1.

Control connection data

External power supply

Maximum power:
Frames R1…R5: 25 W, 1.04 A at 24 V AC/DC ±10% with an option module
Frames R6…R9: 36 W, 1.50 A at 24 V AC/DC ±10% as standard

Supplied from an external power supply through option module CMOD-01 or CMOD-02 with frames R1…R5. With frames R6…R9 no options are needed.

Terminal size:
Frames R1…R5: 0.2…2.5 mm^2 (24...14 AWG)
Frames R6…R9: 0.14…2.5 mm^2 (26...14 AWG)

+24 V DC output (Term. 10)

Total load capacity of this outputs is 6.0 W (250 mA / 24 V) minus the power taken by the option modules installed on the board.
Terminal size:
Frames R1…R5: 0.2…2.5 mm^2 (24...14 AWG)
Frames R6…R9: 0.14…2.5 mm^2 (26...14 AWG)

Digital inputs DI1…DI6 (Term. 13…18)

Input type: NPN/PNP
Terminal size:
Frames R1…R5: 0.14…1.5 mm^2 (26...16 AWG)
Frames R6…R9: 0.14…2.5 mm^2 (26...14 AWG)

DI1…DI4 (Term.13…16)
12/24 V DC logic levels: “0” < 4 V, “1” > 8 V,
10…24 V AC
R_{in}: 3 kohm
Hardware filtering: 0.04 ms, digital filtering: 2 ms sampling

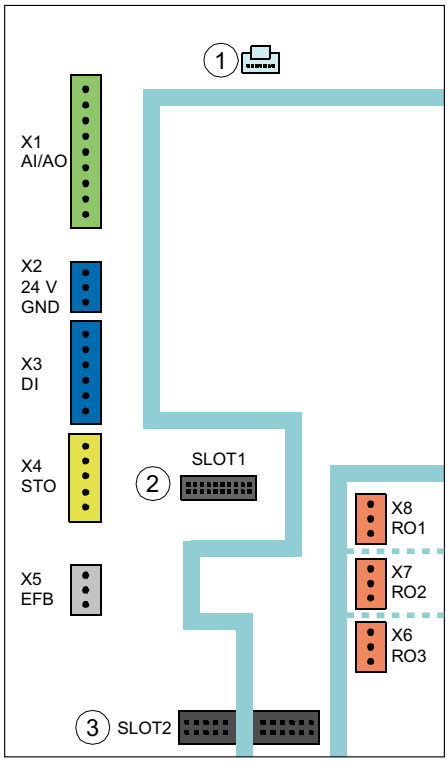
DI5 (Term.17)
Can be used as a digital or frequency input.
12/24 V DC logic levels: “0” < 4 V, “1” > 8 V,
10…24 V AC
R_{in}: 3 kohm
Max. frequency 16 kHz
Symmetrical signal (duty cycle D = 0.50)

DI6 (Term. 18)
Can be used as a digital or PTC input.
Digital input mode
12/24 V DC logic levels: “0” < 3 V, “1” > 8 V
R_{in}: 3 kohm
Hardware filtering: 0.04 ms, digital filtering: 2 ms sampling

	Note: DI6 is not supported in the NPN configuration. PTC mode – PTC thermistor can be connected between DI6 and +24 V DC: < 1.5 kohm = '1' (low temperature), > 4 kohm = '0' (high temperature), open circuit = '0' (high temperature). DI6 is not a reinforced/double insulated input. Connecting the motor PTC sensor to this input requires usage of a reinforced/double insulated PTC sensor inside the motor.
Relay outputs RO1…RO3 (Term. 19…27)	250 V AC / 30 V DC, 2 A Terminal size: Frames R1…R5: 0.14…1.5 mm^2 Frames R6…R9: 0.14…2.5 mm^2 See sections *Isolation areas, R1…R5* on page *308* and *Isolation areas, R6…R9* on page *309*.
Analog inputs AI1 and AI2 (Term. 2 and 5)	Current/voltage input mode selected with a parameter. Current input: 0(4)…20 mA, R_{in}: 100 ohm Voltage input: 0(2)…10 V, R_{in}: > 200 kohm Terminal size: Frames R1…R5: 0.14…1.5 mm^2 Frames R6…R9: 0.14…2.5 mm^2 Inaccuracy: typical ±1%, max. ±1.5% of full scale
Analog outputs AO1 and AO2 (Term. 7 and 8)	Current/voltage input mode selected with a parameter. Current output: 0…20 mA, R_{load}: < 500 ohm Voltage output: 0…10 V, R_{load}: > 100 kohm (AO1 only) Terminal size: Frames R1…R5: 0.14…1.5 mm^2 Frames R6…R9: 0.14…2.5 mm^2 Inaccuracy: ±1% of full scale (in voltage and current modes)
Reference voltage output for analog inputs +10V DC (Term. 4)	Max. 20 mA output Inaccuracy: ±1%
Embedded fieldbus (Term. 29…31)	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: EIA-485 Cable type: Shielded twisted pair cable with twisted pair for data and a wire or pair for signal ground, nominal impedance 100…165 ohms, for example Belden 9842 Baud rate: 4.8…115.2 kbit/s Termination by switch
Safe torque off (STO) inputs IN1 and IN2 (Term. 37 and 38)	24 V DC logic levels: "0" < 5 V, "1" > 13 V R_{in}: 2.47 kohm Terminal size: Frames R1…R5: 0.14…1.5 mm^2 Frames R6…R9: 0.14…2.5 mm^2
STO cable	Maximum cable length 300 m (984 ft) between activation switch (K) and drive control unit, see sections *An example of a Safe torque off wiring is shown below.* on page *367* and *Safety data* on page *377*.

Control panel - drive and drive - drive connection (panel bus)	EIA-485, male RJ-45 connector, unshielded or shielded twisted pair cable, type CAT 5e or better, max. total cable length of the panel bus 100 m (in single or multiple cables)
Control panel - PC connection	USB Type Mini-B, max. cable length 3 m

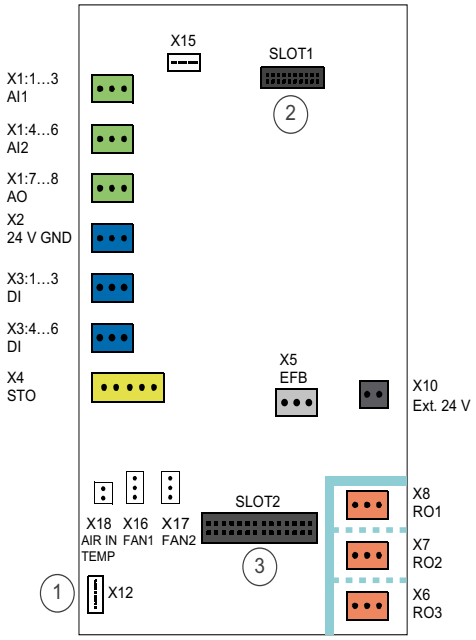
Isolation areas, R1…R5



Symbol	Description
1	Panel port
2	Power unit connection
3	I/O extension
	Reinforced insulation (IEC/EN 61800-5-1:2007)
	Functional insulation (IEC/EN 61800-5-1:2007)

Below altitudes 4000 m (13123 ft): The terminals on the control unit fulfill the Protective Extra Low Voltage (PELV) requirements (EN 50178): There is adequate insulation between the user terminals which only accept ELV voltages and terminals that accept higher voltages (relay outputs).

Isolation areas, R6…R9



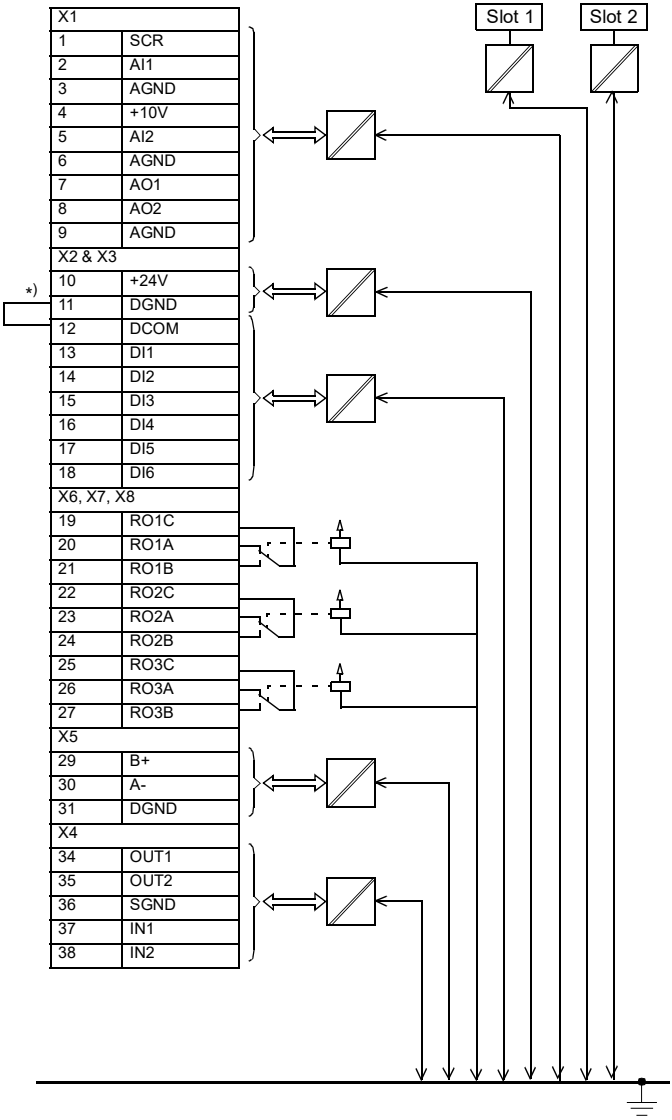
Symbol	Description
1	Power unit connection
2	I/O extension
	Reinforced insulation (IEC/EN 61800-5-1:2007)
	Functional insulation (IEC/EN 61800-5-1:2007)

The terminals on the control unit fulfill the Protective Extra Low Voltage (PELV) requirements (EN 50178): There is reinforced insulation between the user terminals which only accept ELV voltages and terminals that accept higher voltages (relay outputs).

Note: There is functional insulation between the individual relay outputs.

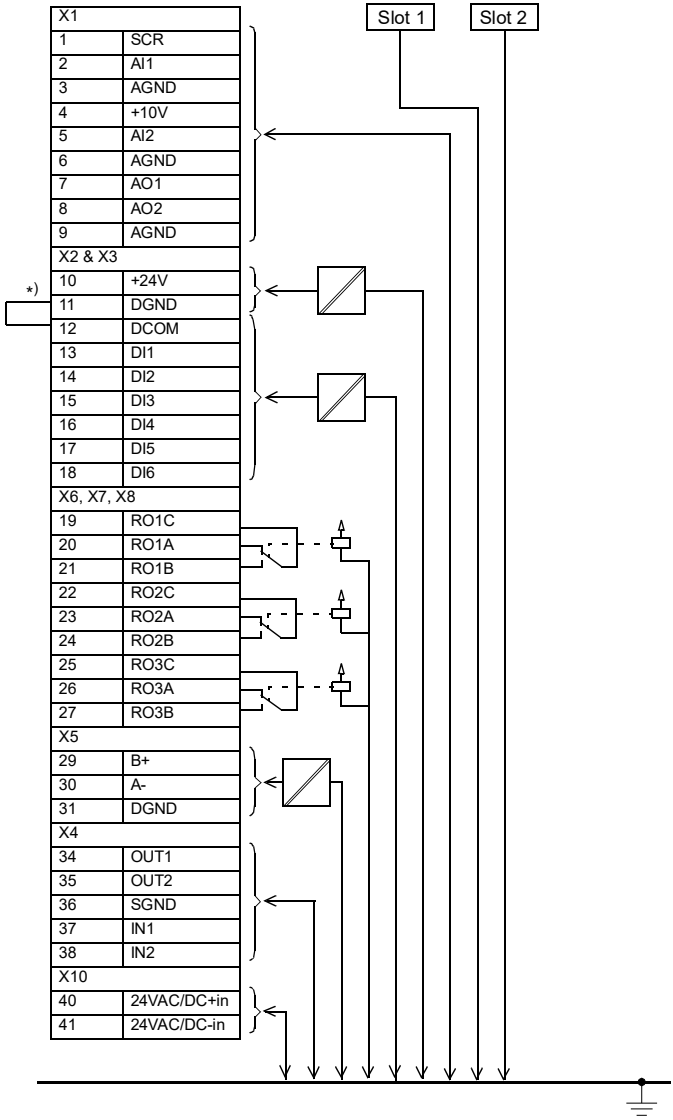
Note: There is reinforced insulation on the power unit.

Grounding of frames R1…R5



*) Jumper installed at the factory

Grounding of frames R6…R9



*) Jumper installed at the factory

Auxiliary circuit power consumption

Maximum external power supply:
Frames R1…R5: 25 W, 1.04 A at 24 V AC/DC (with option modules CMOD-01, CMOD-02)
Frames R6…R9: 36 W, 1.50 A at 24 V AC/DC (as standard, terminals 40…41)

Efficiency

Approximately 98% at nominal power level. The efficiency is not calculated according to IEC 61800-9-2.

Energy efficiency data (EU ecodesign)

Energy efficiency data according to IEC-61800-9-2 is available from the ecodesign tool (*https://ecodesign.drivesmotors.abb.com*).

Degree of protection

Degree of protection (IEC/EN 60529)	IP21, IP55
Enclosure types (UL 50/50E)	UL Type 1, UL Type 12
Overvoltage category (IEC 60664-1)	III
Protective classes (IEC/EN 61800-5-1)	I

Ambient conditions

Environmental limits for the drive are given below. The drive is to be used in a heated, indoor, controlled environment. All printed circuit boards are conformal coated.

	Operation installed for stationary use	**Storage** in the package	**Transportation** in the package
Installation site altitude	• 0…4000 m (13123 ft) above sea level [1)] • 0…2000 m (6561 ft) above sea level [2)] Output derated above 1000 m (3281 ft), see page *260*.	-	-

Air temperature	-15…+50 °C (5…122 °F). 0…-15 °C (32…5 °F): No frost allowed. Output derated above +40 °C (104 °F), see page *252*.	-40…+70 °C (-40…+158 °F)	-40…+70 °C (-40…+158 °F)
Relative humidity	5…95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination levels (IEC 60721-3-x)	IEC 60721-3-3: 2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations	IEC 60721-3-1: 1997	IEC 60721-3-2: 1997
Chemical gases	Class 3C2	Class 1C2	Class 2C2
Solid particles	Class 3S2. No conductive dust allowed.	Class 1S3 (packing must support this, otherwise 1S2)	Class 2S2
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2	-	-
Atmospheric pressure	70…106 kPa 0.7…1.05 atmospheres	70…106 kPa 0.7…1.05 atmospheres	60…106 kPa 0.6…1.05 atmospheres
Vibration (IEC 60068-2)	Max. 1 mm (0.04 in) (5…13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2…100 Hz) sinusoidal	-	-
Vibration (ISTA)	-	R1…R4 (ISTA 1A): Displacement, 25 mm peak to peak, 14200 vibratory impacts R5…R9 (ISTA 3E): Random, overall Grms level of 0.52	

<table>
<tr>
<td>Shock/Drop (ISTA)</td>
<td>Not allowed</td>
<td>R1…R4 (ISTA 1A): Drop, 6 faces, 3 edges and 1 corner
<table>
<tr><th>Weight range</th><th>mm</th><th>in</th></tr>
<tr><td>0…10 kg (0…22 lb)</td><td>760</td><td>29.9</td></tr>
<tr><td>10…19 kg (22…42 lb)</td><td>610</td><td>24.0</td></tr>
<tr><td>19…28 kg (42…62 lb)</td><td>460</td><td>18.1</td></tr>
<tr><td>28…41 kg (62…90 lb)</td><td>340</td><td>13.4</td></tr>
</table>
R5…R9 (ISTA 3E): Shock, incline impact: 1.1 m/s (3.61 ft/s)
Shock, rotational edge drop: 200 mm (7.9 in)</td>
</tr>
</table>

[1] For symmetrically grounded TN-S systems, TT systems, and ungrounded or symmetrically high-resistance grounded IT systems.
See also section *Limiting relay output maximum voltages at high installation altitudes* on page *110*.

[2] For corner-grounded delta systems, midpoint-grounded delta systems and corner-grounded (via high resistance) IT systems. **Note:** There are special considerations in corner-grounded installations above 2000 m. Contact your local ABB representative for further information.

Materials

Drive enclosure

- PC/ABS 3 mm, PC+GF10 3mm, color NCS 1502-Y (RAL 9002 / PMS 1C Cool Grey), RAL 9002 and PMS 425 C
- hot-dip zinc coated steel sheet 1.5…2.5 mm, thickness of coating 100 micrometers, color NCS 1502-Y

Package

Plywood, cardboard and molded pulp. Foam cushions PE, PP-E, bands PP.

Disposal

The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated.

Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code.

Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

Applicable standards

The drive complies with the following standards. The compliance with the European Low Voltage Directive is verified according to standard EN 61800-5-1.

EN 60204-1:2018, EN 60204-1:2006 + AC:2010	*Safety of machinery. Electrical equipment of machines. Part 1: General requirements. Provisions for compliance:* The final assembler of the machine is responsible for installing - emergency-stop device - supply disconnecting device.
IEC 60146-1-1:2009 **EN 60146-1-1:2010**	*Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements*
IEC 60529:1989 + AMD1:1999 + AMD2:2013, EN 60529:1991 + A1:2000 + A2: 2013	*Degrees of protection provided by enclosures (IP code)*
IEC 61000-3-2:2018, EN 61000-3-2:2014	*Electromagnetic compatibility (EMC) – Limits for harmonic current emissions (input current ≤ 16 A per phase)*
IEC/EN 61000-3-12:2011	*Electromagnetic compatibility (EMC) – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current input current > 16 A and < 75 A per phase* This drive complies with the standard provided that the short-circuit power Ssc is greater than or equal to the minimum short-circuit power given for the drive (listed for each drive type on page 302) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the drive to ensure, by consultation with the distribution network operator if necessary, that the drive is connected only to a supply with a short-circuit power Ssc greater than or equal to the minimum short-circuit power given for the drive.
IEC/EN 61800-3:2017	*Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods*
IEC/EN 61800-5-1:2007	*Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy*
IEC 61800-9-2: 2017	*Adjustable speed electrical power drive systems – Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – Energy efficiency indicators for power drive systems and motor starters*
IEC 60664-1:2007	*Insulation coordination for equipment within low-voltage systems. Part 1: Principles, requirements and tests.*
UL 61800-5-1: 1st edition	*Standard for Safety, Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy*
CSA C22.2 No. 274-17	*Adjustable speed drives*

CE marking

A CE mark is attached to the drive to verify that the drive follows the provisions of the European Low Voltage, EMC and RoHS Directives.The CE marking also verifies that the drive, in regard to its safety functions (such as Safe torque off), conforms with the Machinery Directive as a safety component.

Compliance with the European Low Voltage Directive

The compliance with the European Low Voltage Directive has been verified according to standard EN 61800-5-1:2007. The declaration of conformity (3AXD10000302784) is available on the Internet. See section *Document library on the Internet* on the inside of the back cover.

Compliance with the European EMC Directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (IEC 61800-3:2017) covers requirements stated for drives. See section *Compliance with the IEC 61800-3:2017* below. The declaration of conformity (3AXD10000302784) is available on the Internet. See section *Document library on the Internet* on the inside of the back cover.

Compliance with the European ROHS II Directive 2011/65/EU

The RoHS II Directive defines the restriction of the use of certain hazardous substances in electrical and electronic equipment. The declaration of conformity (3AXD10000302785) is available on the Internet. See section *Document library on the Internet* on the inside of the back cover.

Compliance with the European WEEE Directive

The WEEE Directive defines the regulated disposal and recycling of electric and electrical equipment.

Compliance with the European Machinery Directive 2006/42/EC 2nd Edition – June 2010

The drive is a machinery component that can be integrated into a wide range of machinery categories as specified in European Commission's *Guide to application of the Machinery Directive 2006/42/EC 2nd Edition – June 2010*. See section *Declarations of conformity* on page *380*.

Validating the operation of the Safe torque off function

See chapter *Safe torque off function* on page *363*.

Compliance with the IEC 61800-3:2017

Definitions

EMC stands for **E**lectro**m**agnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

First environment includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes.

Second environment includes establishments connected to a network not directly supplying domestic premises.

Drive of category C1: drive of rated voltage less than 1000 V and intended for use in the first environment.

Drive of category C2: drive of rated voltage less than 1000 V and intended to be installed and started up only by a professional when used in the first environment.

Note: A professional is a person or organization having necessary skills in installing and/or starting up power drive systems, including their EMC aspects.

Drive of category C3: drive of rated voltage less than 1000 V, intended for use in the second environment and not intended for use in the first environment.

Category C1

The conducted emission limits are complied with the following provisions:

1. The optional EMC C1 filter is selected according to the documentation and installed as specified in the EMC C1 filter manual. See *Main switch and EMC C1 filter options (+F278, +F316, +E223) installation supplement for ACS580-01, ACH580-01 and ACQ580-01 frames R1 to R5* (3AXD50000155132 [Multilingual]). Only available for IP55 (+B056) frames R1…R5, up to 55 kW.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.
4. The maximum motor cable length with 2 kHz switching frequency is 10 m.

WARNING! In a domestic environment, this product may cause radio inference, in which case supplementary mitigation measures may be required.

Category C2

The emission limits are complied with the following provisions:

18. The motor and control cables are selected as specified in this manual.
19. The drive is installed according to the instructions given in this manual.
20. For the maximum motor cable length with 4 kHz switching frequency, see page *303*.

WARNING! The drive may cause radio interference if used in residential or domestic environment. The user is required to take measures to prevent interference, in association to the requirements for the CE compliance listed above, if necessary.

Note: Do not install a drive with the EMC filter connected to a system that the filter is not suitable for. This can cause danger, or damage the drive.

Note: Do not install a drive with the ground-to-phase varistor connected to a system that the varistor is not suitable for. If you do, the varistor circuit can be damaged.

If you install the drive to any other system than symmetrically grounded TN-S system, you may need to disconnect the EMC filter or the ground-to-phase varistor. See sections:

IEC: *Examining the compatibility with IT (ungrounded), corner-grounded delta, midpoint-grounded delta and TT systems* on page *116*

North America: *Examining the compatibility with IT (ungrounded), corner-grounded delta, midpoint-grounded delta and TT systems* on page *168*

Category C3

The drive complies with the standard with the following provisions:

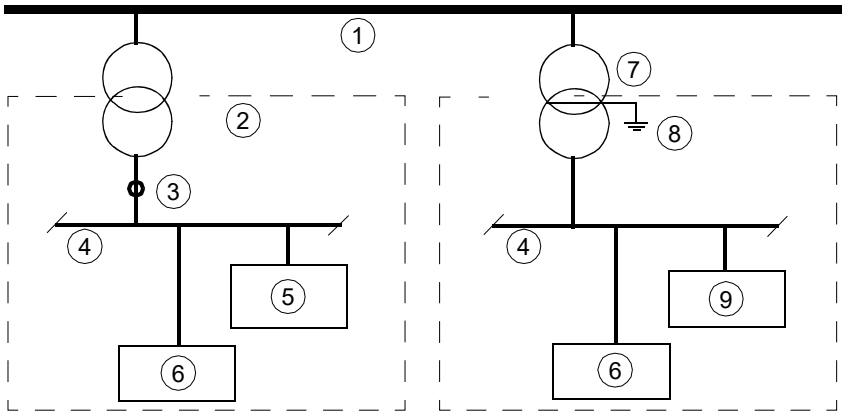
1. The motor and control cables are selected as specified in this manual.
2. The drive is installed according to the instructions given in this manual.
3. For the maximum motor cable length with 4 kHz switching frequency, see page *303*

WARNING! A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

Category C4

If the provisions under *Category C3* cannot be met, the requirements of the standard can be met as follows:

1. It is ensured that no excessive emission is propagated to neighboring low-voltage networks. In some cases, the inherent suppression in transformers and cables is sufficient. If in doubt, the supply transformer with static screening between the primary and secondary windings can be used.



1	Medium voltage network
2	Neighboring network
3	Point of measurement
4	Low voltage
5	Equipment (victim)
6	Equipment
7	Supply transformer
8	Static screen
9	Drive

2. An EMC plan for preventing disturbances is drawn up for the installation. A template is available from the local ABB representative.
3. The motor and control cables are selected as specified in this manual.
4. The drive is installed according to the instructions given in this manual.

WARNING! A drive of category C4 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

UL marking

The drive is cULus Listed.

UL checklist

WARNING! Operation of this drive requires detailed installation and operation instructions provided in the hardware and firmware manuals. The manuals can be found on the Internet. Depending on the product series, the drive package may contain the manuals in electric format or as hard copies (as standard or ordered with option codes with the drive). Hard copies of the manuals can also be ordered through the manufacturer separately. Retain the hard copies of the manuals with the drive.

- Make sure that the drive type designation label includes the cULus Listed marking.
- **CAUTION - Risk of electric shock**. After disconnecting the input power, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you start working on the drive, motor or motor cable.
- The drive is to be used in a heated, indoor controlled environment. The drive must be installed in clean air according to the enclosure classification. Cooling air must be clean, free from corrosive materials and electrically conductive dust.
- The maximum surrounding air temperature is 40 °C (104 °F) at rated current for all UL Type 1 and UL Type 12 frames. The current is derated for 40…50 °C (104…122 °F).
- The drive is suitable for use in a circuit capable of delivering not more than 100,000 rms symmetrical amperes, 600 V maximum when protected by the UL fuses given in the table on page *275*. The drive is suitable for use in a circuit capable of delivering not more than 65 kA rms symmetrical amperes, 480 V maximum when protected by the UL circuit breakers given in table on page *278*.
- The cables located within the motor circuit must be rated for at least 75 °C (167 °F) in UL-compliant installations.
- The input cable must be protected with fuses or circuit breakers. Suitable UL fuses and circuit breakers are listed on pages *275* and *278*, respectively. These protective devices provide branch circuit protection in accordance with the National Electrical Code (NEC) and Canadian Electrical Code. For installation in the United States, obey any other applicable local codes. For installation in Canada, obey any applicable provincial codes.

  WARNING! The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire

or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged.

- The drive provides motor overload protection. For the adjustments, see the firmware manual.
- For drive overvoltage category, see page 312. For pollution degree, see page 313.
- To maintain the environmental integrity of the enclosure, replace the cable grommets with field-installed industrial conduit hubs or closure plates required by the enclosure type (or better).

Product has been tested and evaluated against the relevant North American standards by the CSA Group. Valid with rated voltages up to 600 V.

China RoHS marking

The *People's Republic of China Electronic Industry Standard* (SJ/T 11364-2014) specifies the marking requirements for hazardous substances in electronic and electrical products. The green mark is attached to the drive to verify that it does not contain toxic and hazardous substances or elements above the maximum concentration values, and that it is an environmentally-friendly product which can be recycled and reused.

KC marking

The KC (Korea Certification) certification mark signifies compliance with Korea's product safety requirements for electrical and electronic equipment and components that utilize power from 50…1000 V AC.

RCM marking

See the type designation label for the valid markings of your drive. Regulatory Compliance (RCM) Mark is required in Australia and New Zealand. A RCM mark is attached to the drive to verify compliance with the relevant standard (IEC/EN 61800-3:2017 – *Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods*), mandated by the Trans-Tasman Electromagnetic Compatibility Scheme. For fulfilling the requirements of the standard, see section *Compliance with the IEC 61800-3:2017* on page 317. The declaration of conformity (3AXD10000493117) is available on the Internet. See section *Document library on the Internet* on the inside of the back cover.

WEEE marking

The drive is marked with the wheelie bin symbol. It indicates that at the end of life the drive should enter the recycling system at an appropriate collection point and not placed in the normal waste stream. See section *Disposal* on page *314*.

EAC marking

EAC marking is required in Russia, Belarus and Kazakhstan. The EAC certificate of conformity (3AXD10000312900) is available on the Internet. See section *Document library on the Internet* on the inside of the back cover.

UKCA (UK Conformity Assessed) marking

Product complies with the applicable United Kingdom’s legislation (Statutory Instruments). Marking is required for products being placed on the market in Great Britain (England, Wales and Scotland).

Disclaimer

The manufacturer shall have no obligation with respect to any product which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to the manufacturer's instructions; or (iv) has failed as a result of ordinary wear and tear.

Cyber security 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.

11

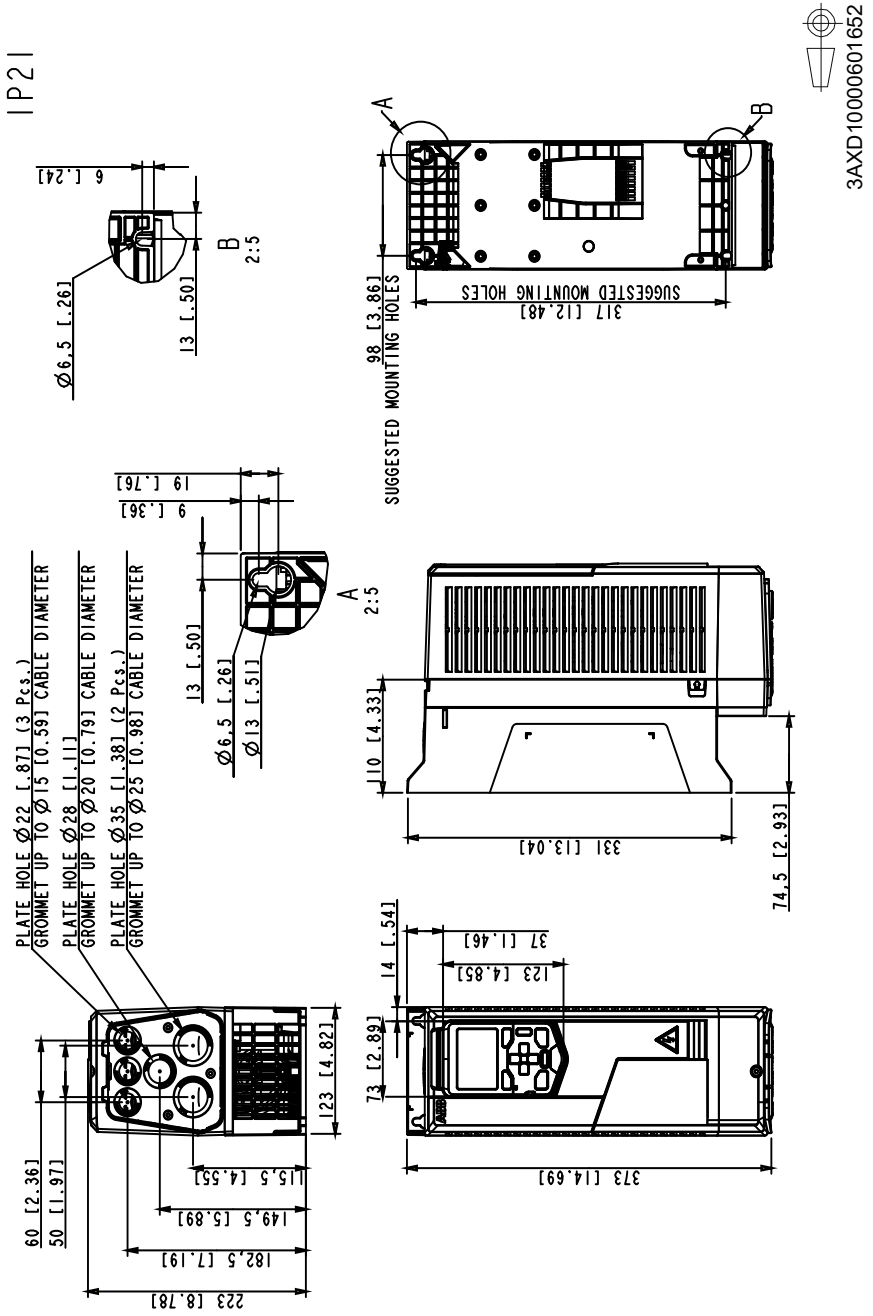
Dimension drawings

Contents of this chapter

This chapter shows the dimension drawings of the ACS580-01.

Note: The dimensions are given in millimeters and [inches].

Frame R1, IP21 (UL Type 1)



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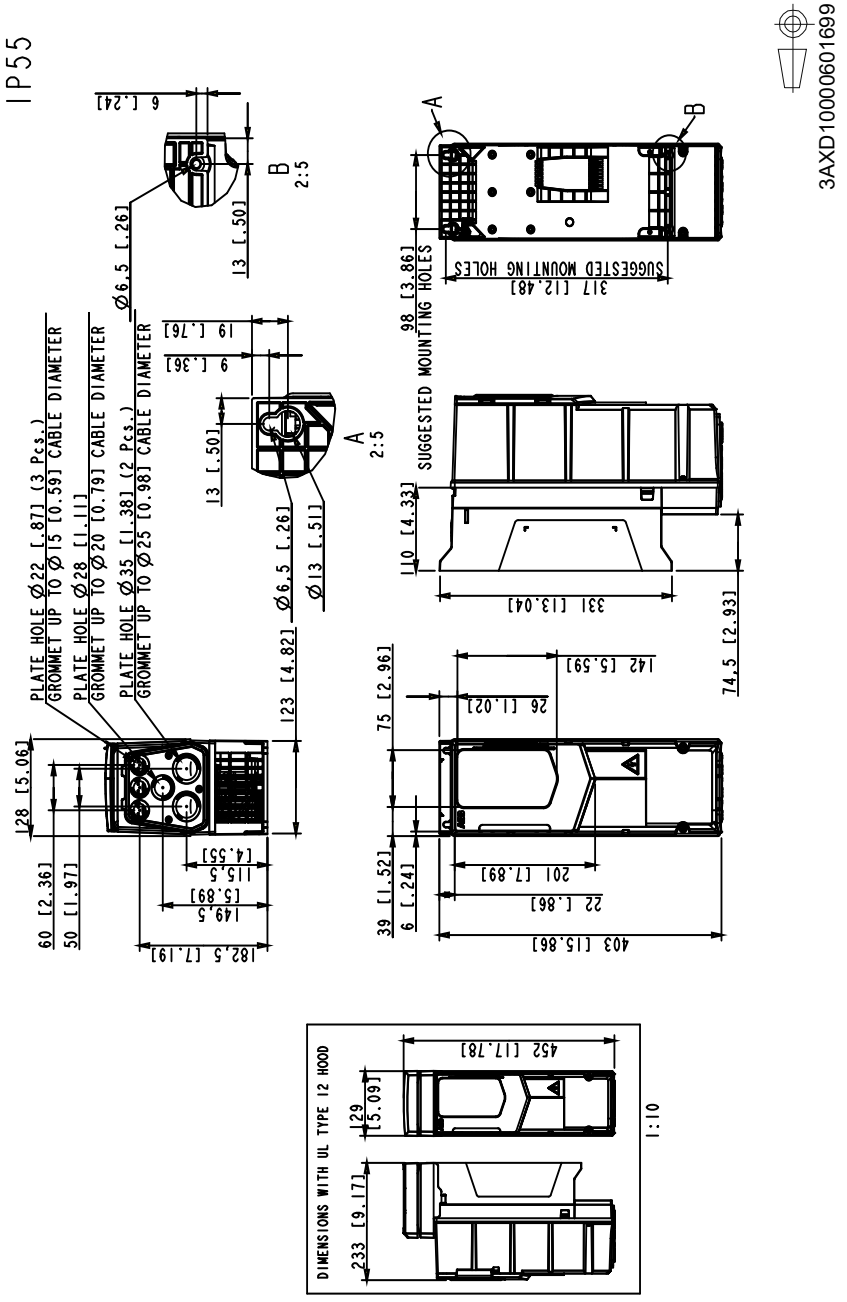

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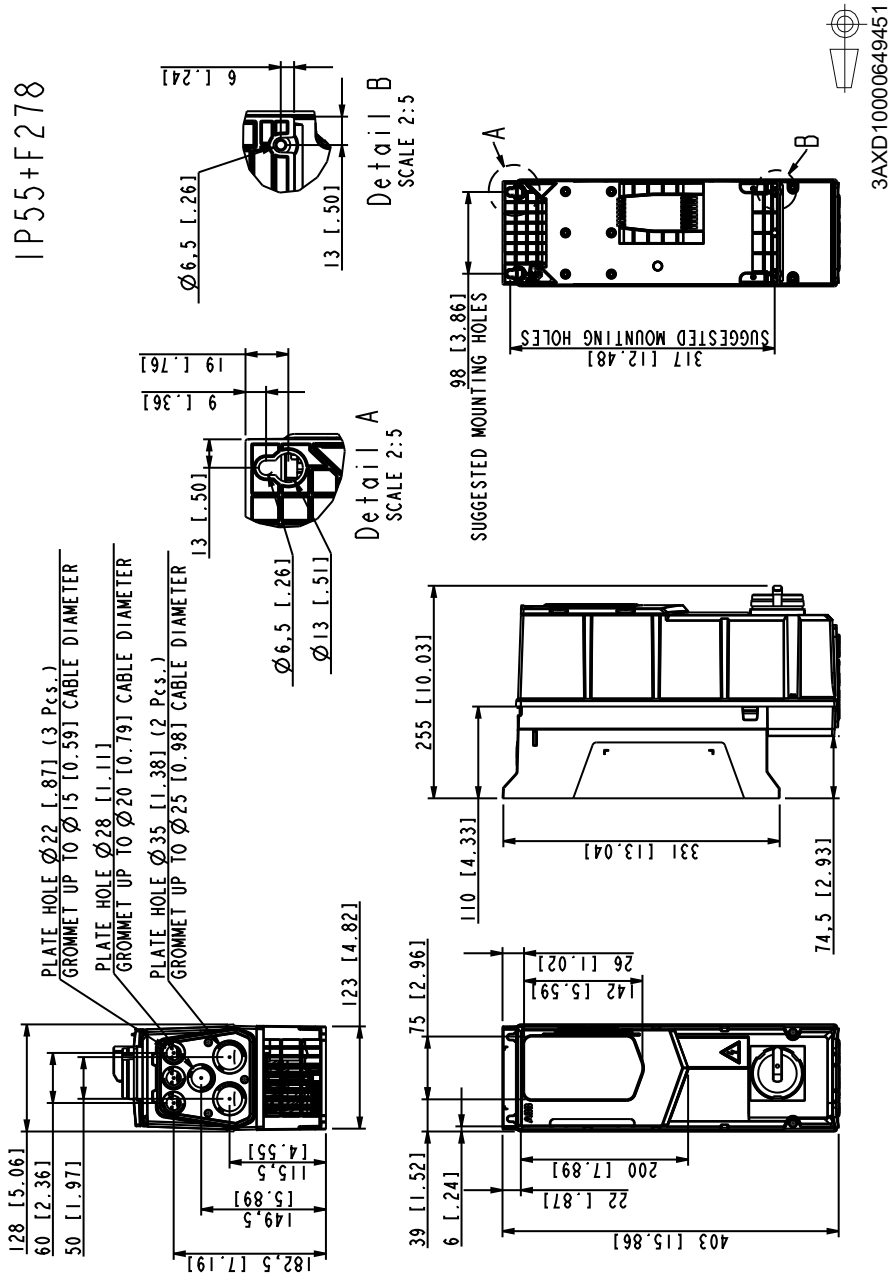

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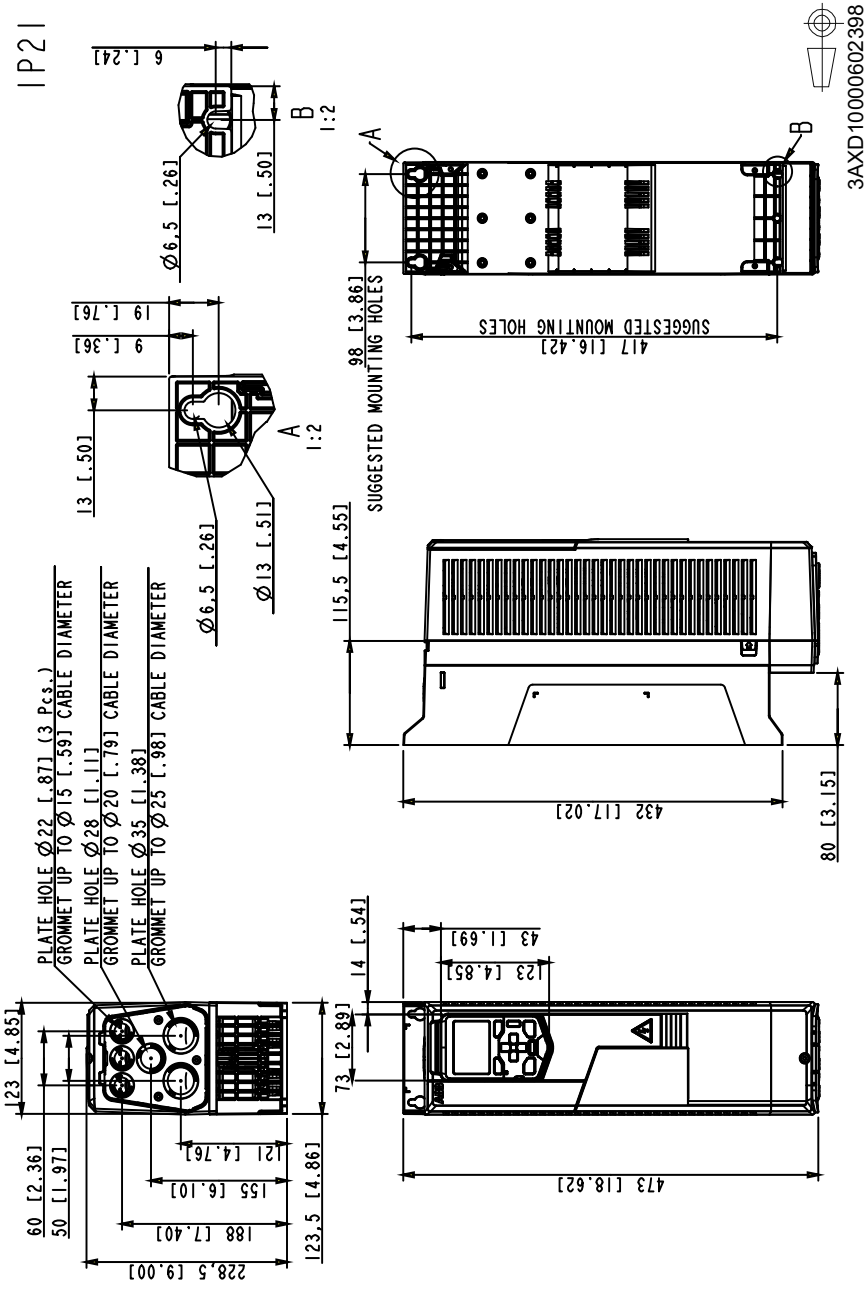

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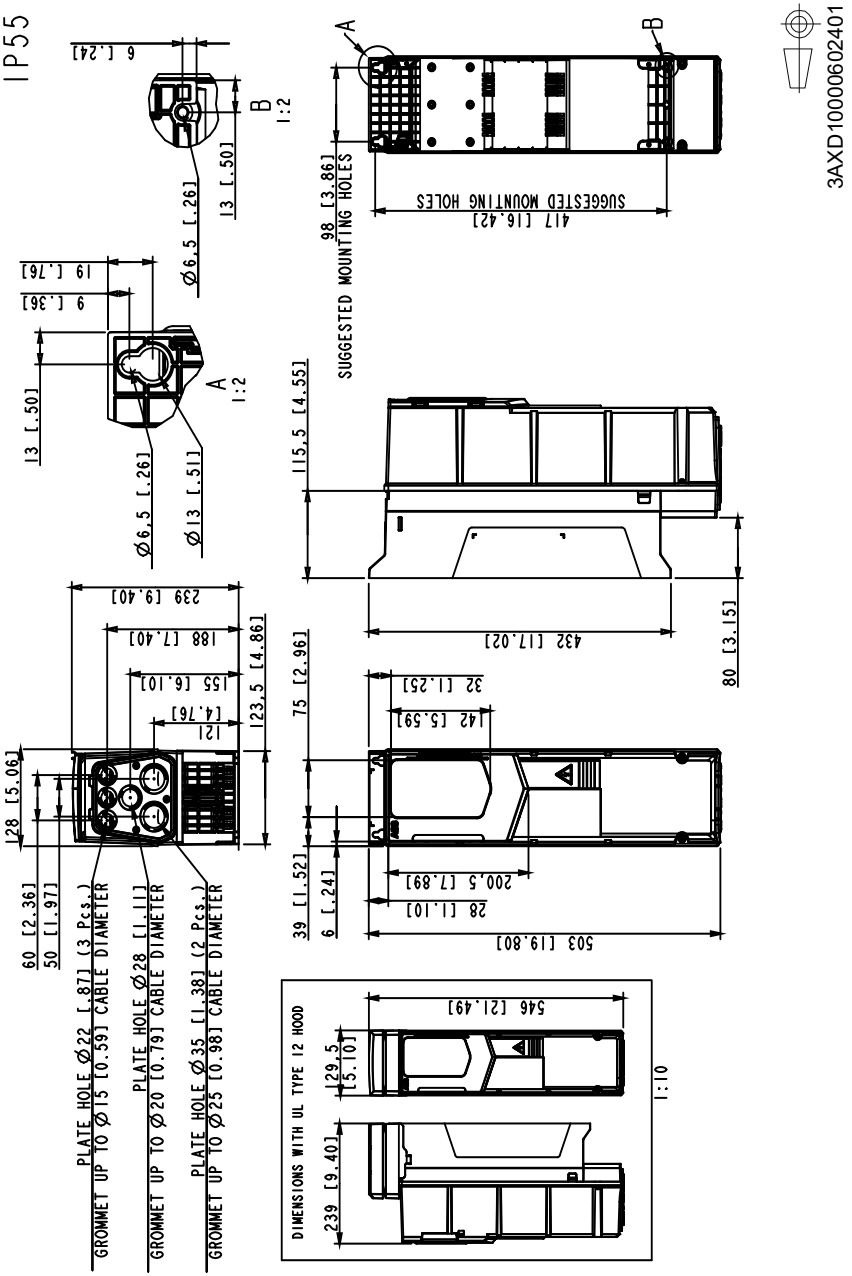

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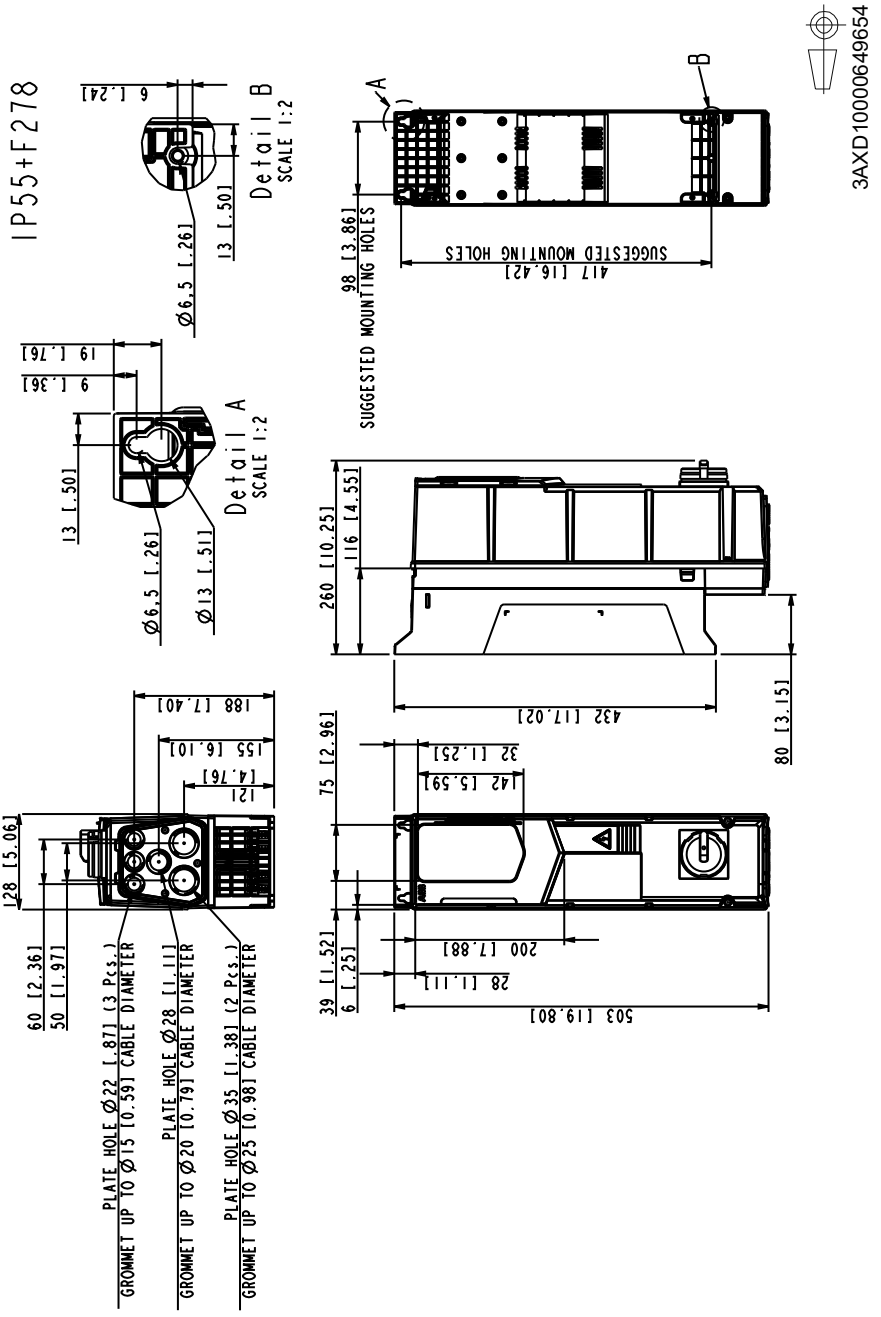

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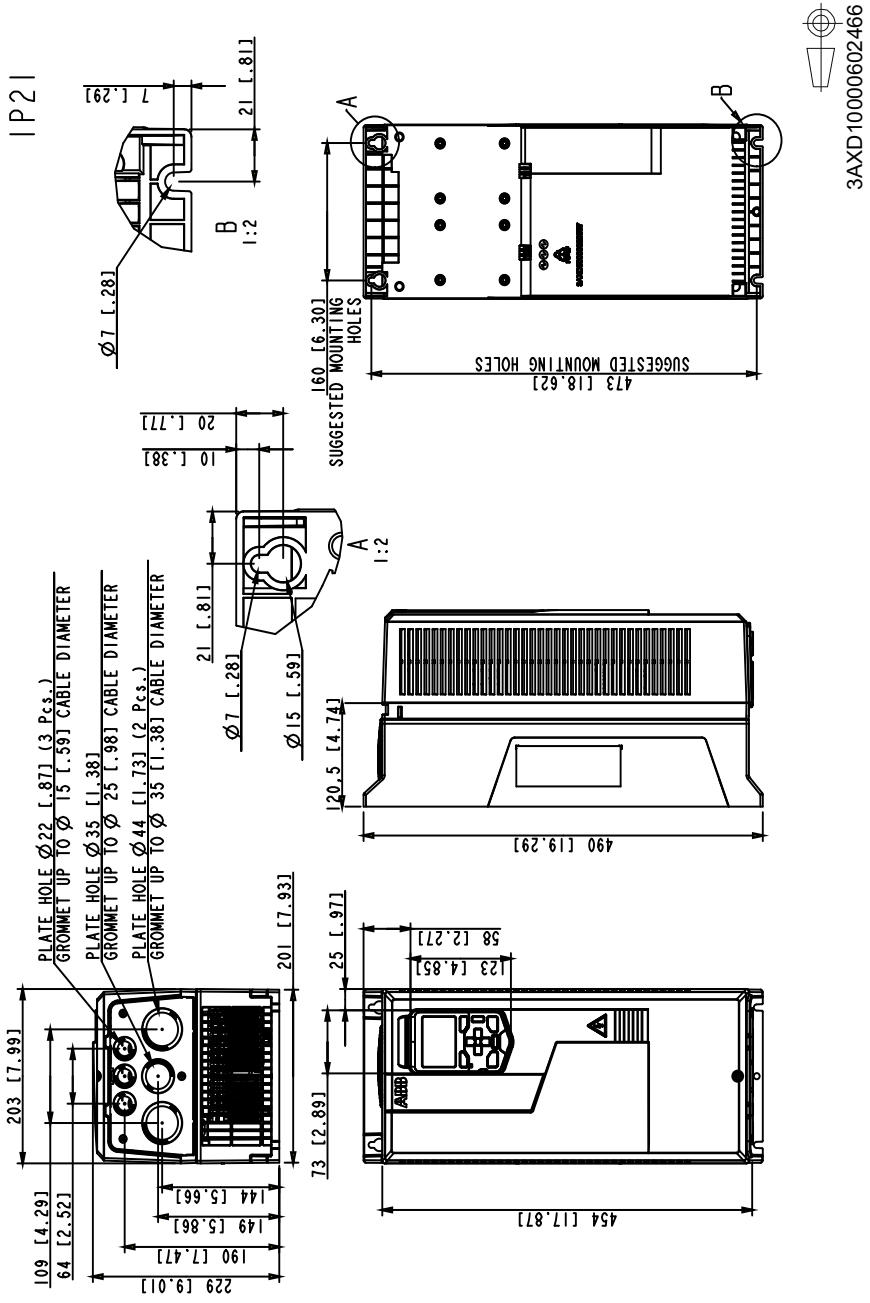

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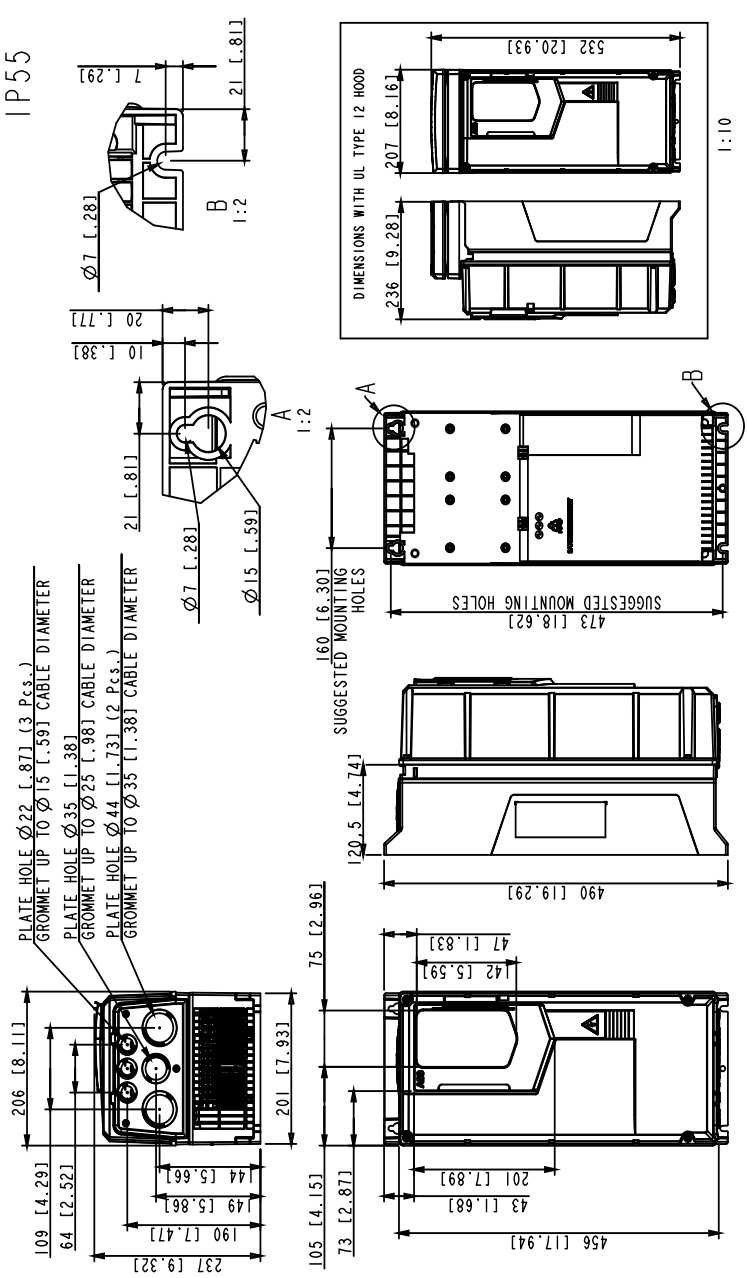

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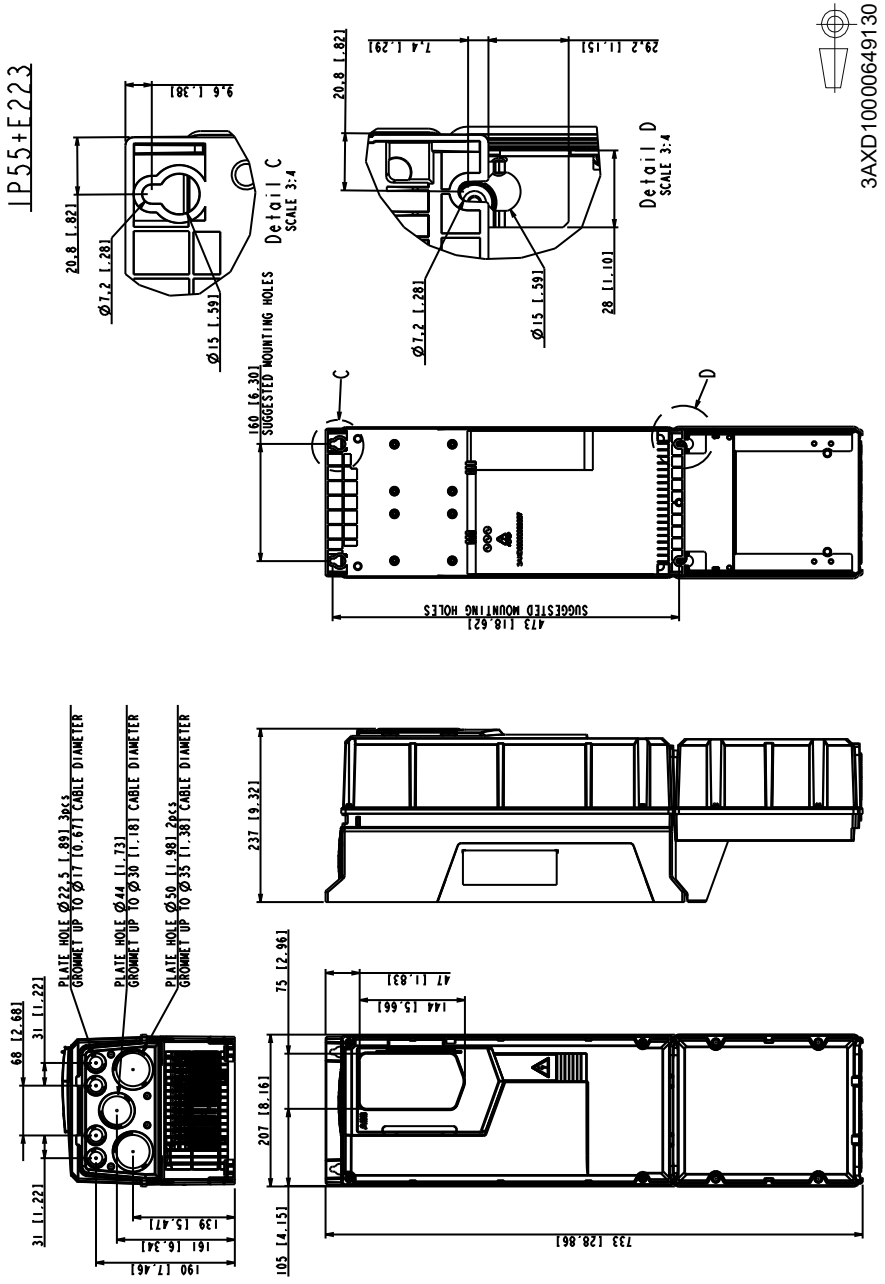

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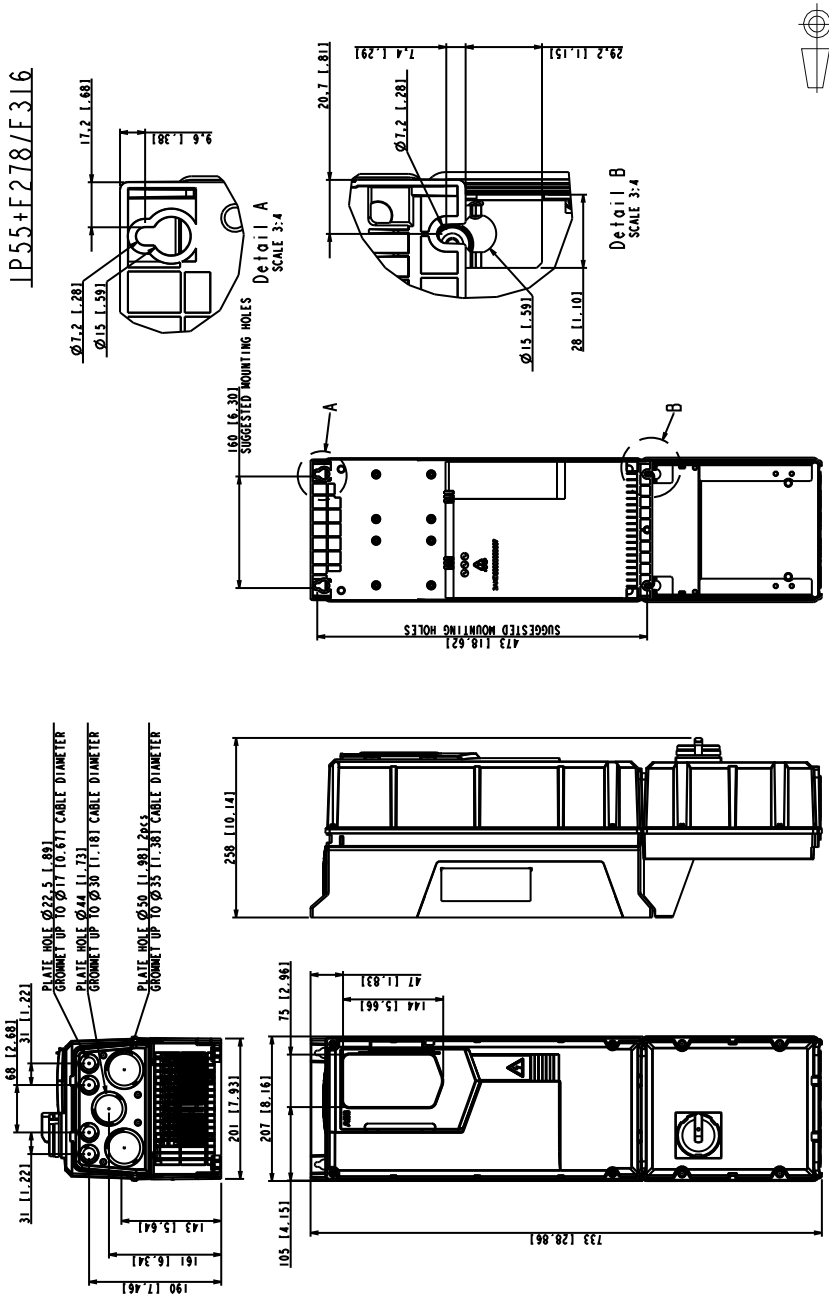

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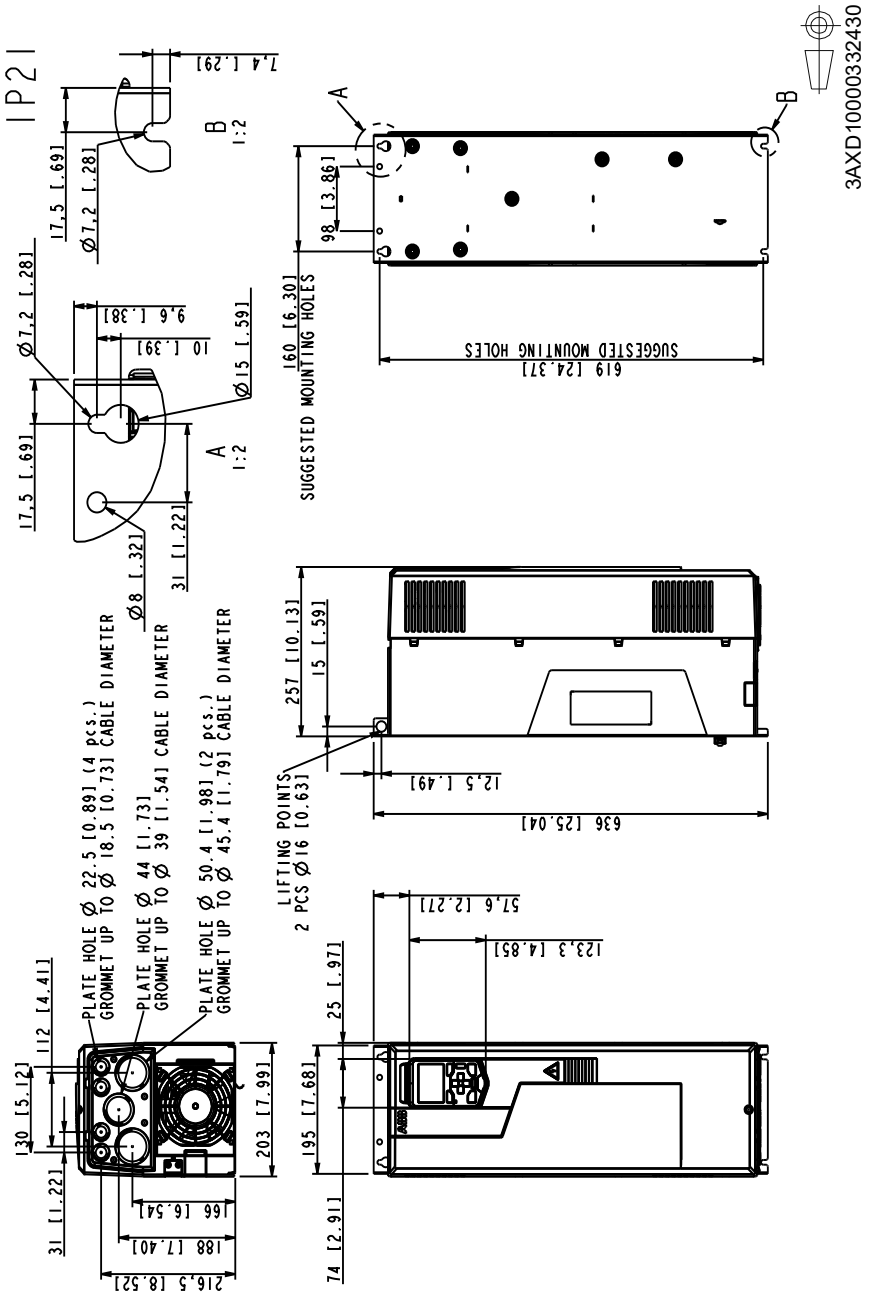

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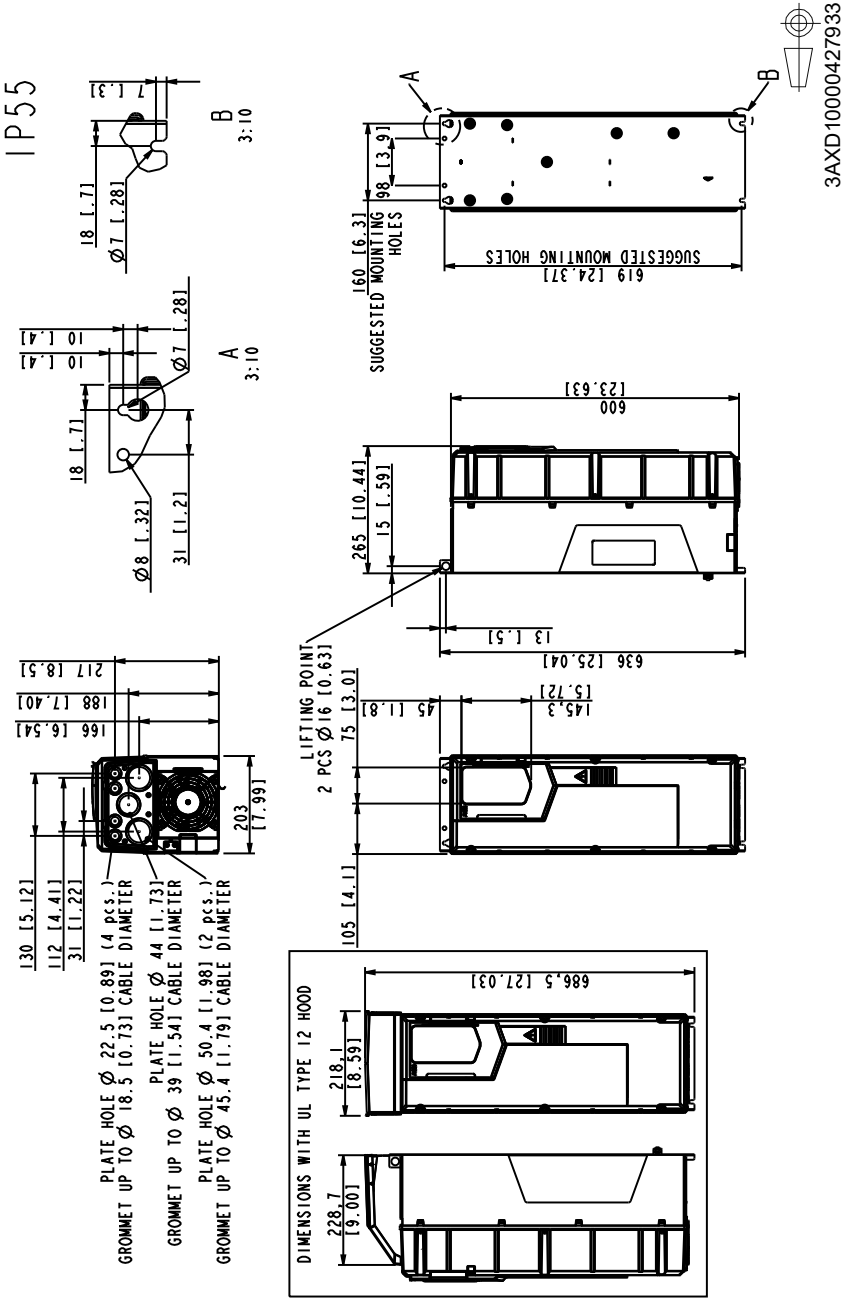
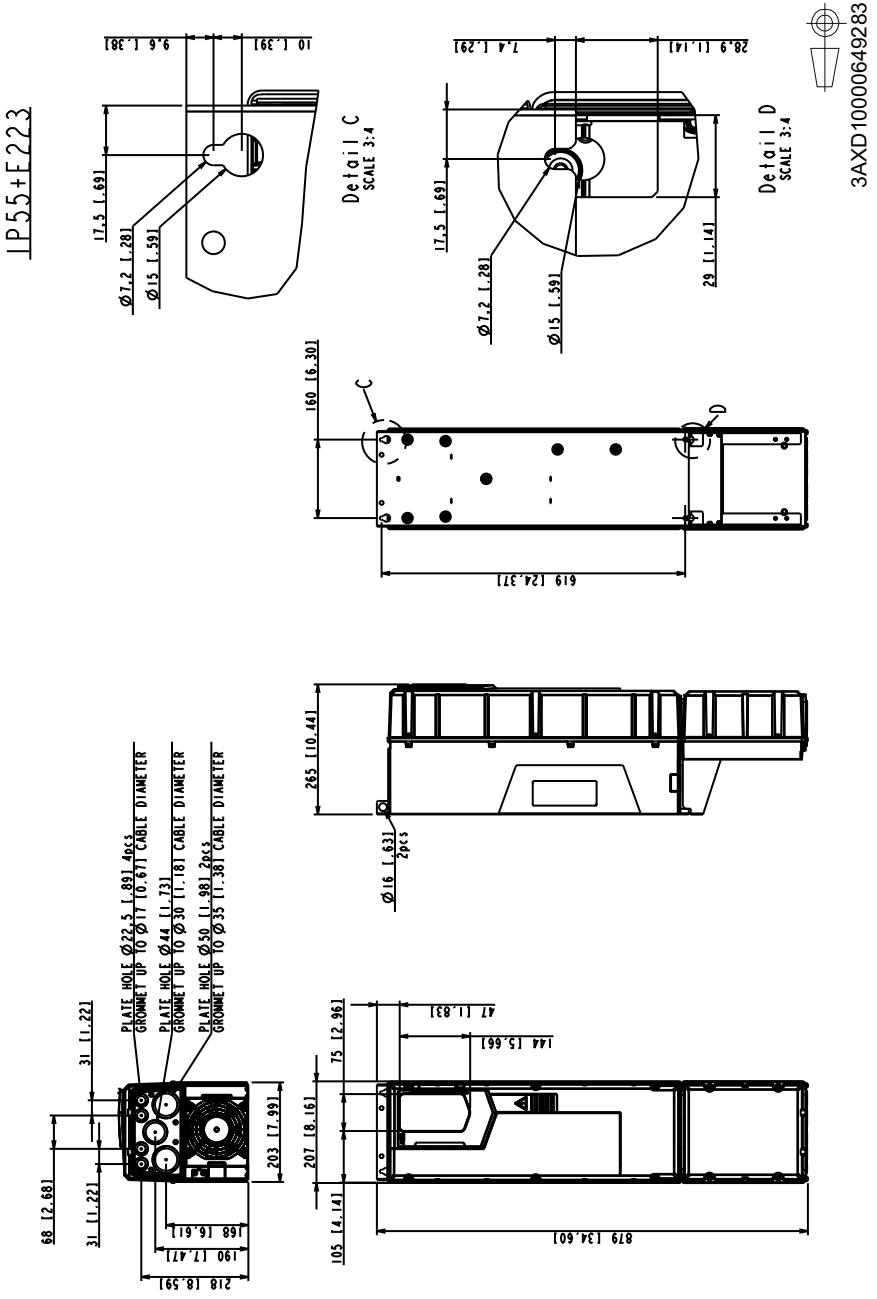
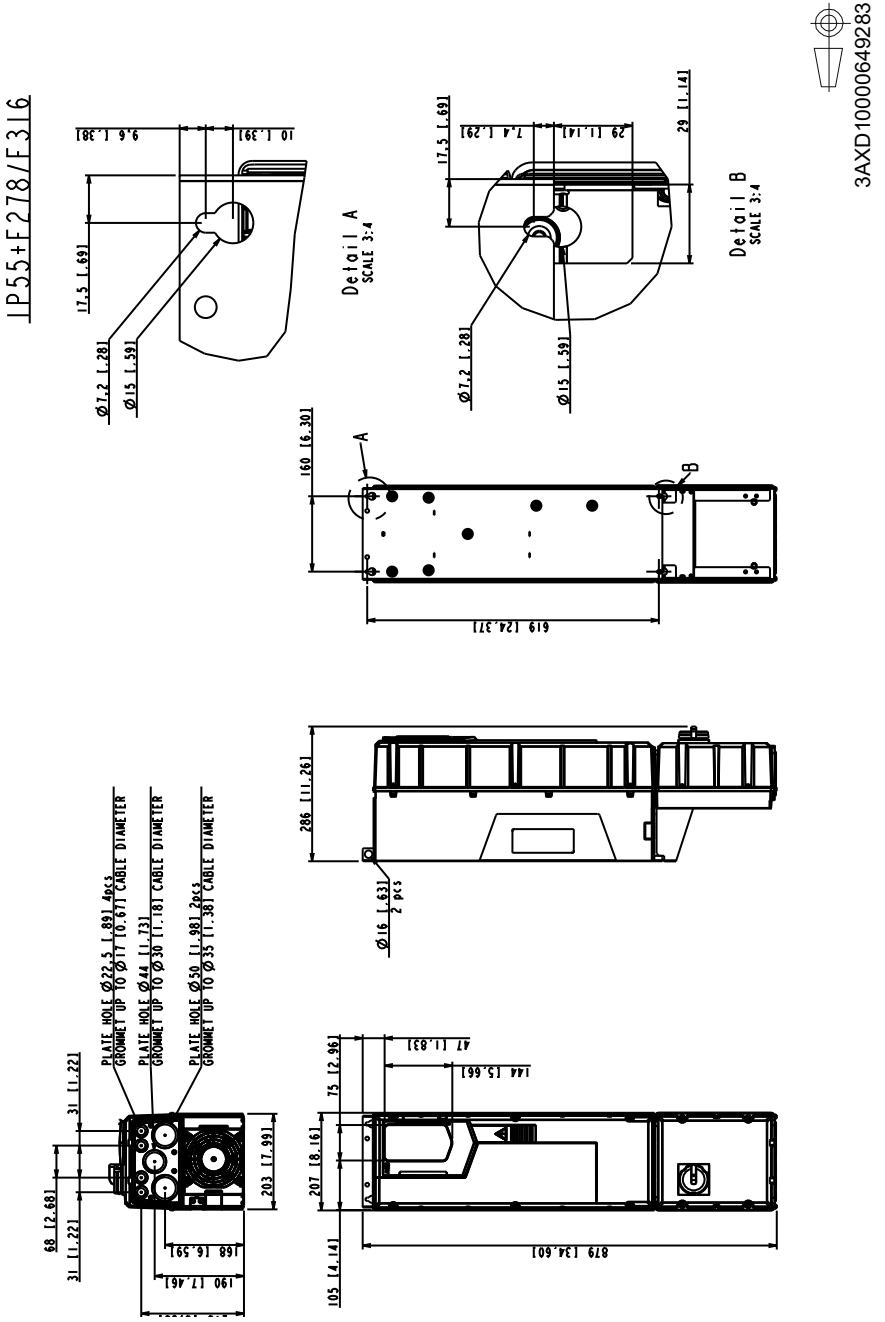


Frame R4, IP55+E223 (UL Type 12)



Frame R4, IP55+F278/F316 (UL Type 12)



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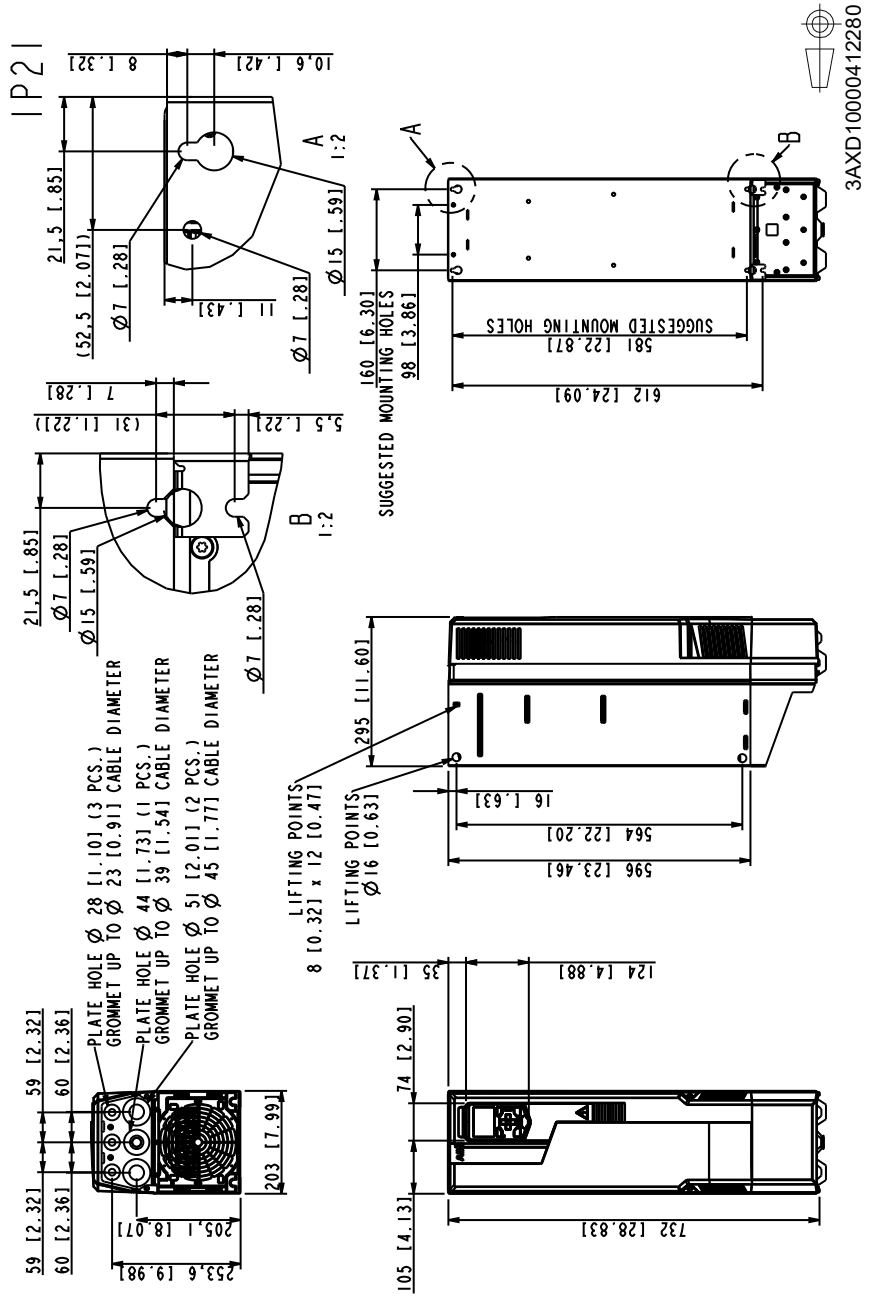
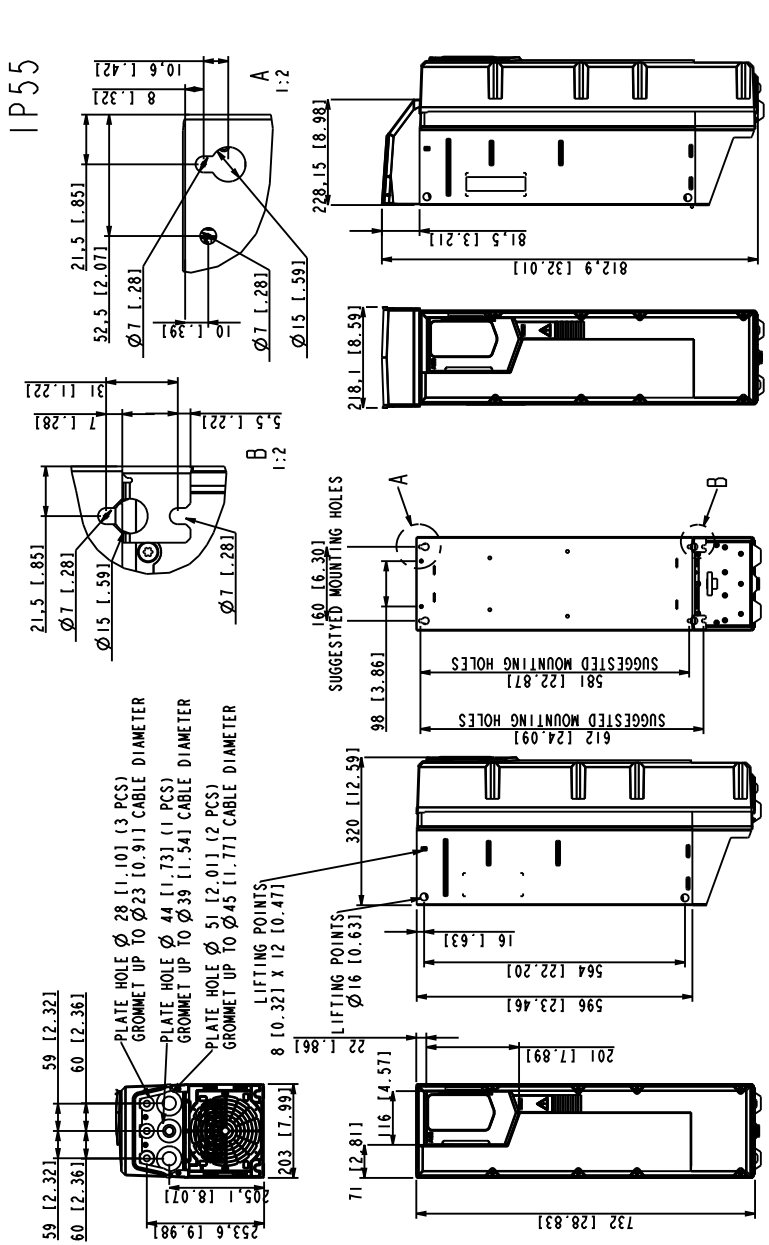


Frame R5, IP55 (UL Type 12)



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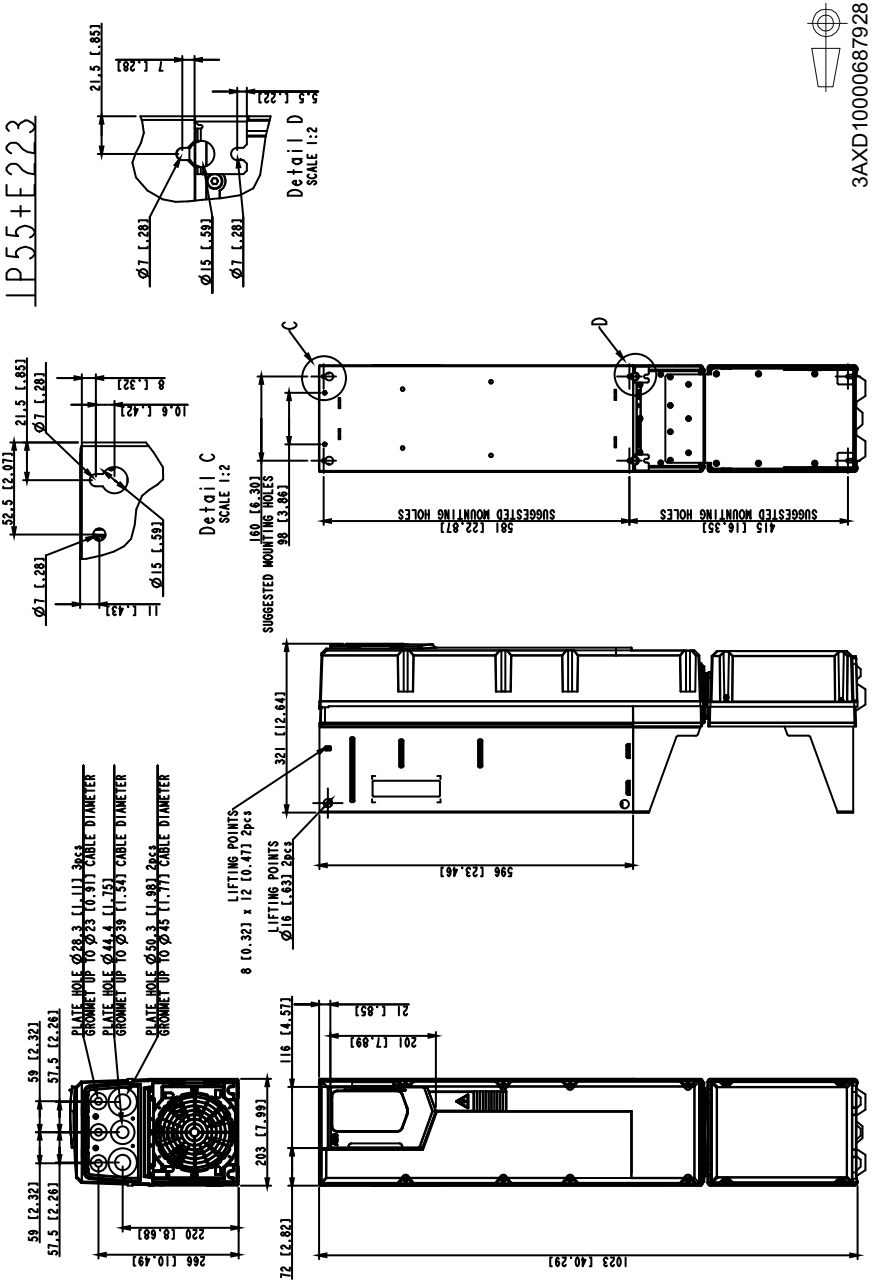
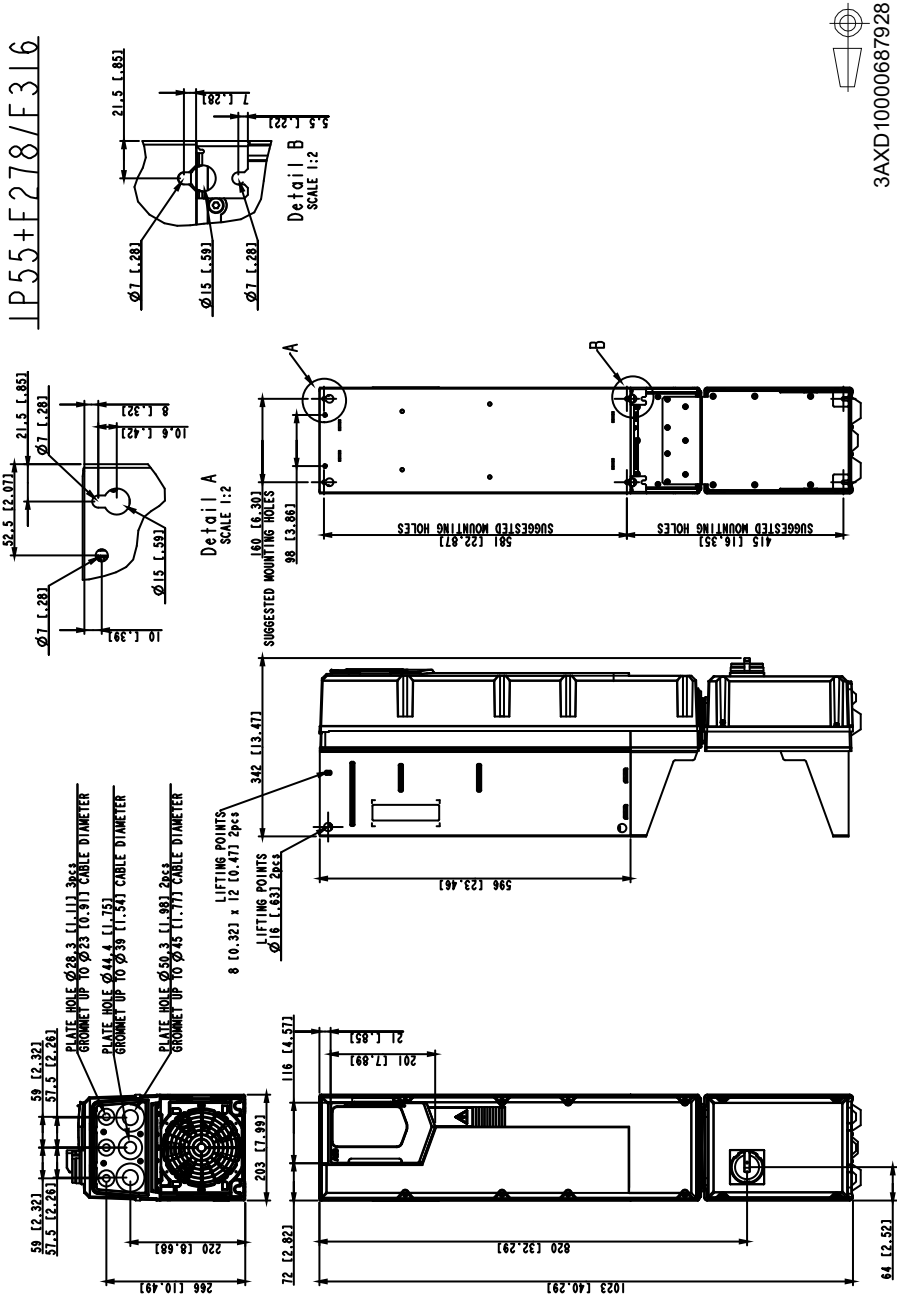


Frame R5, IP55+F278/F316 (UL Type 12)



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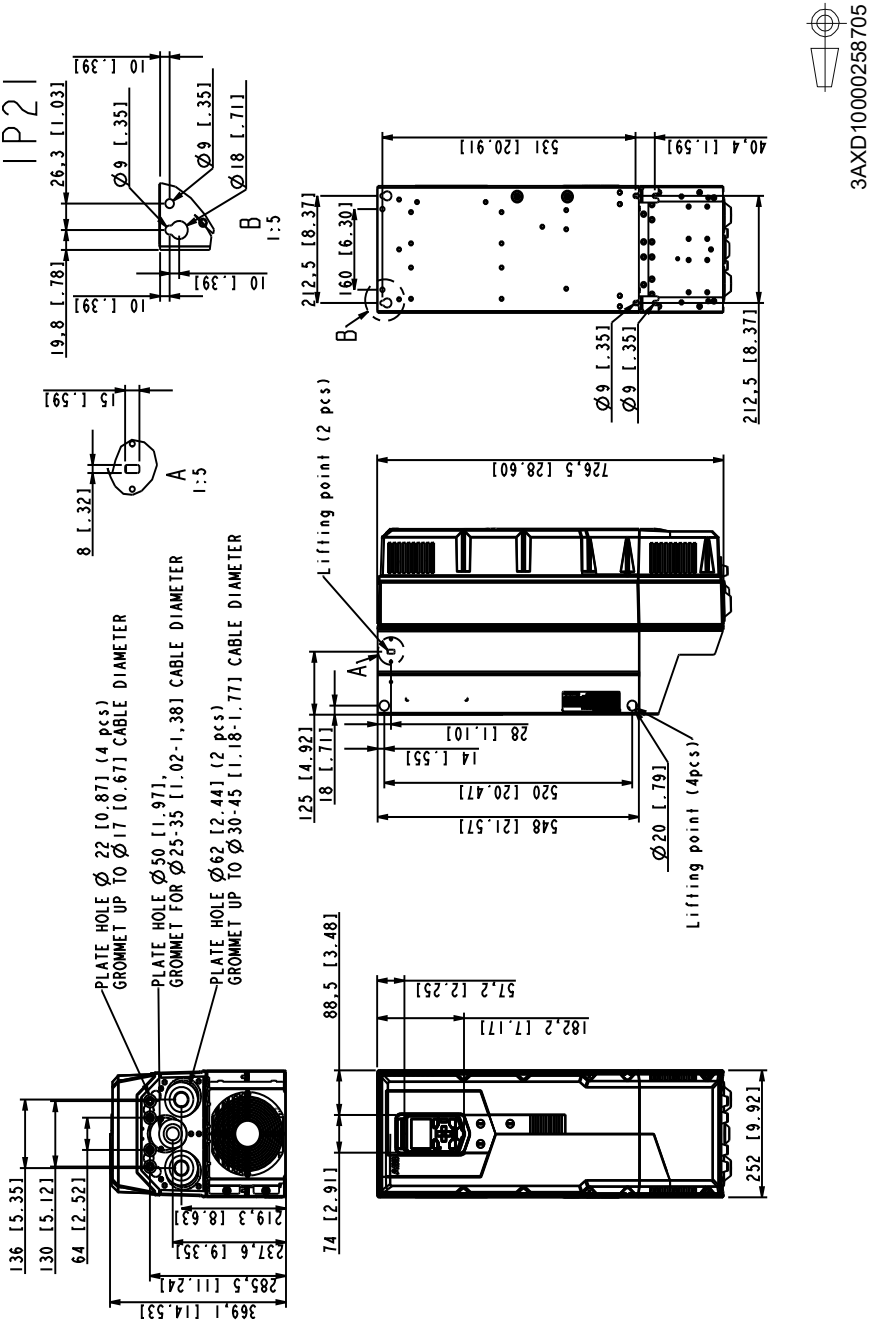

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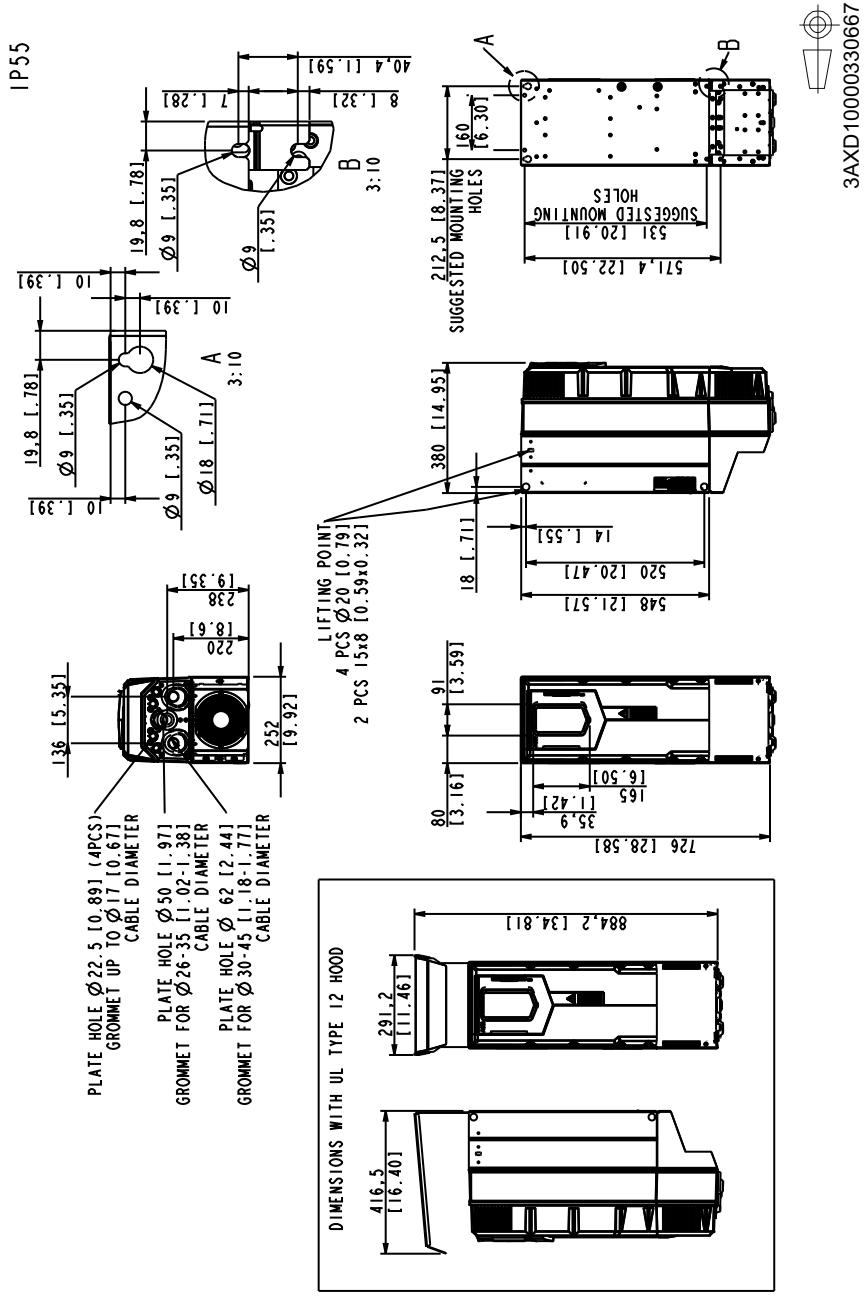
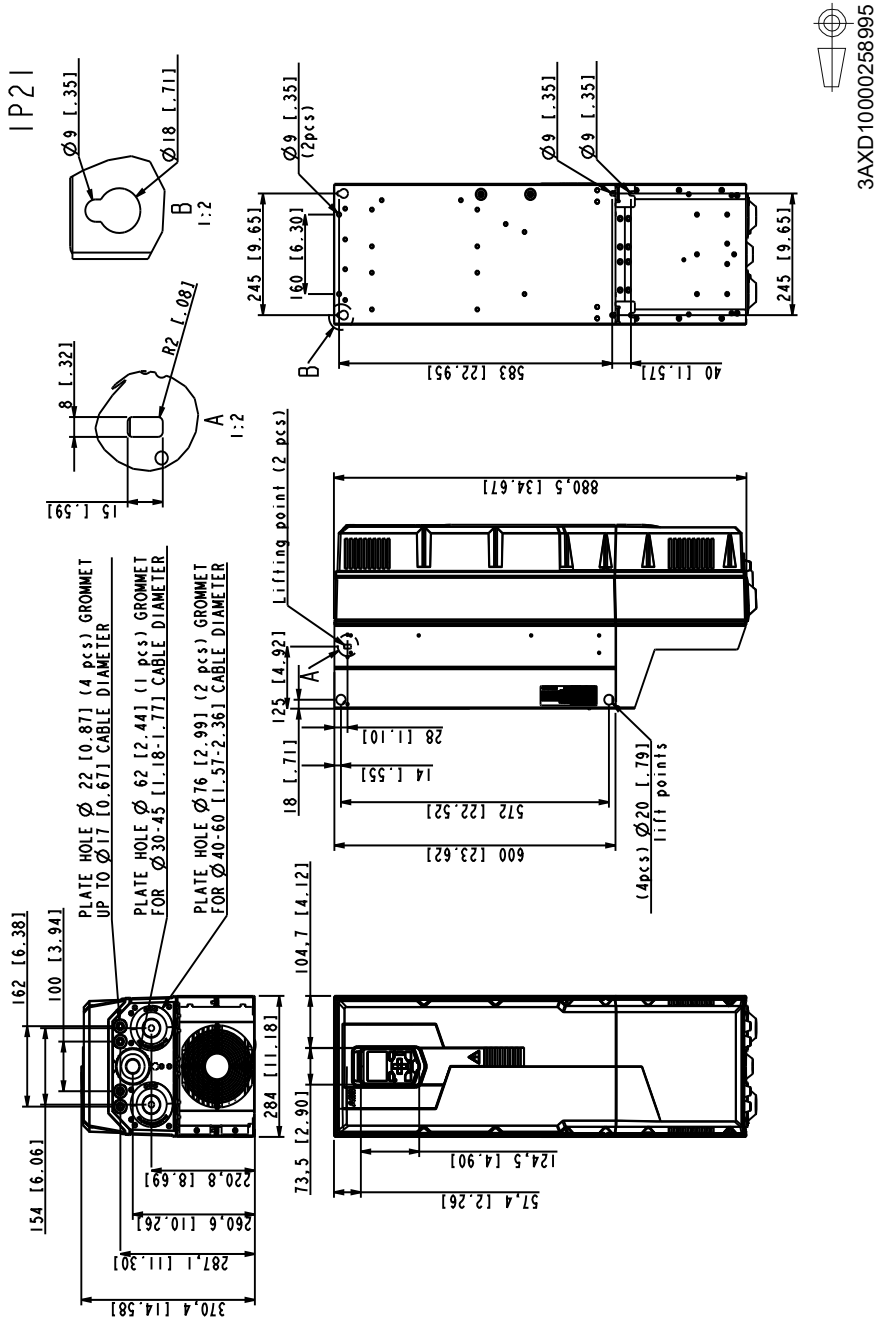


Frame R7, IP21 (UL Type 1)



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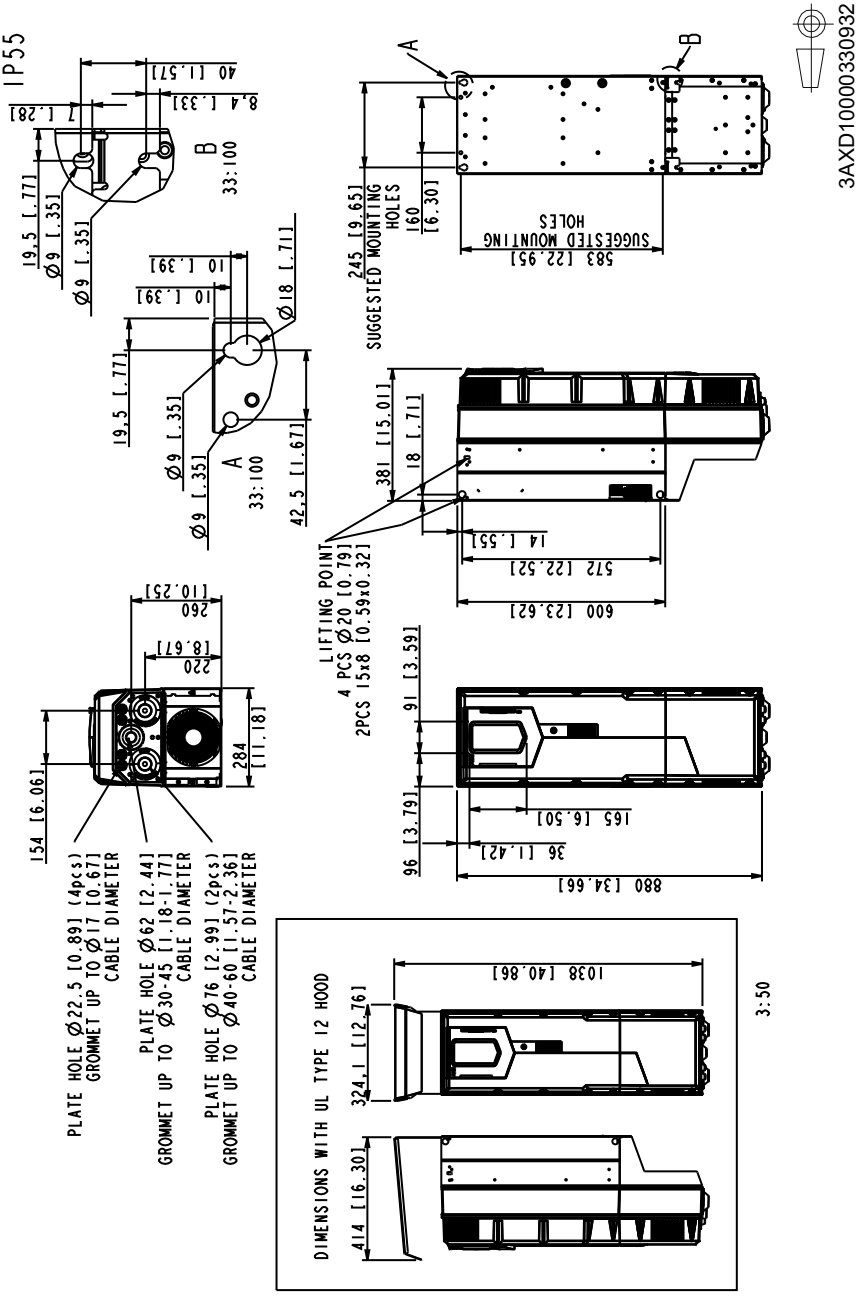
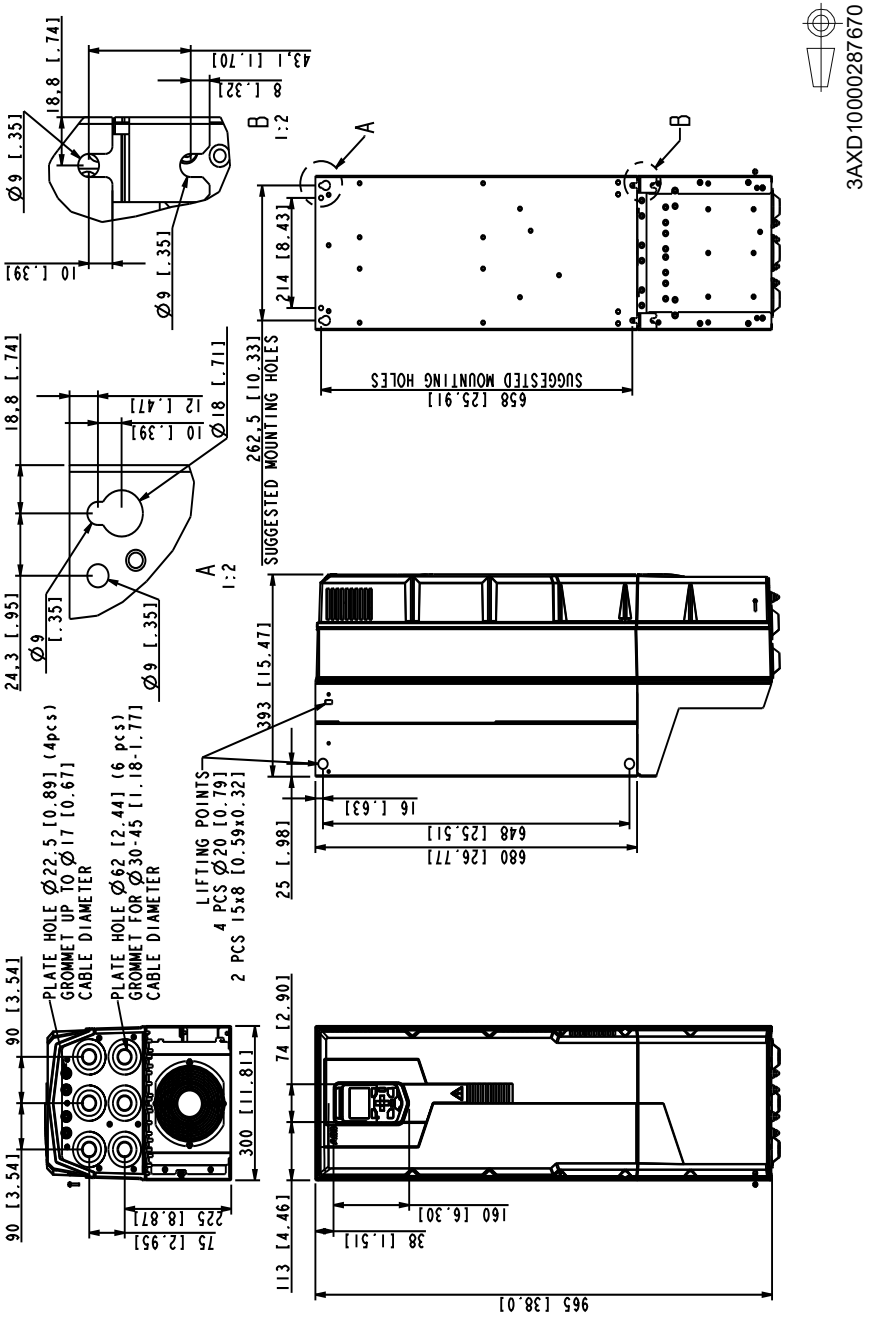


Frame R8, IP21 (UL Type 1)



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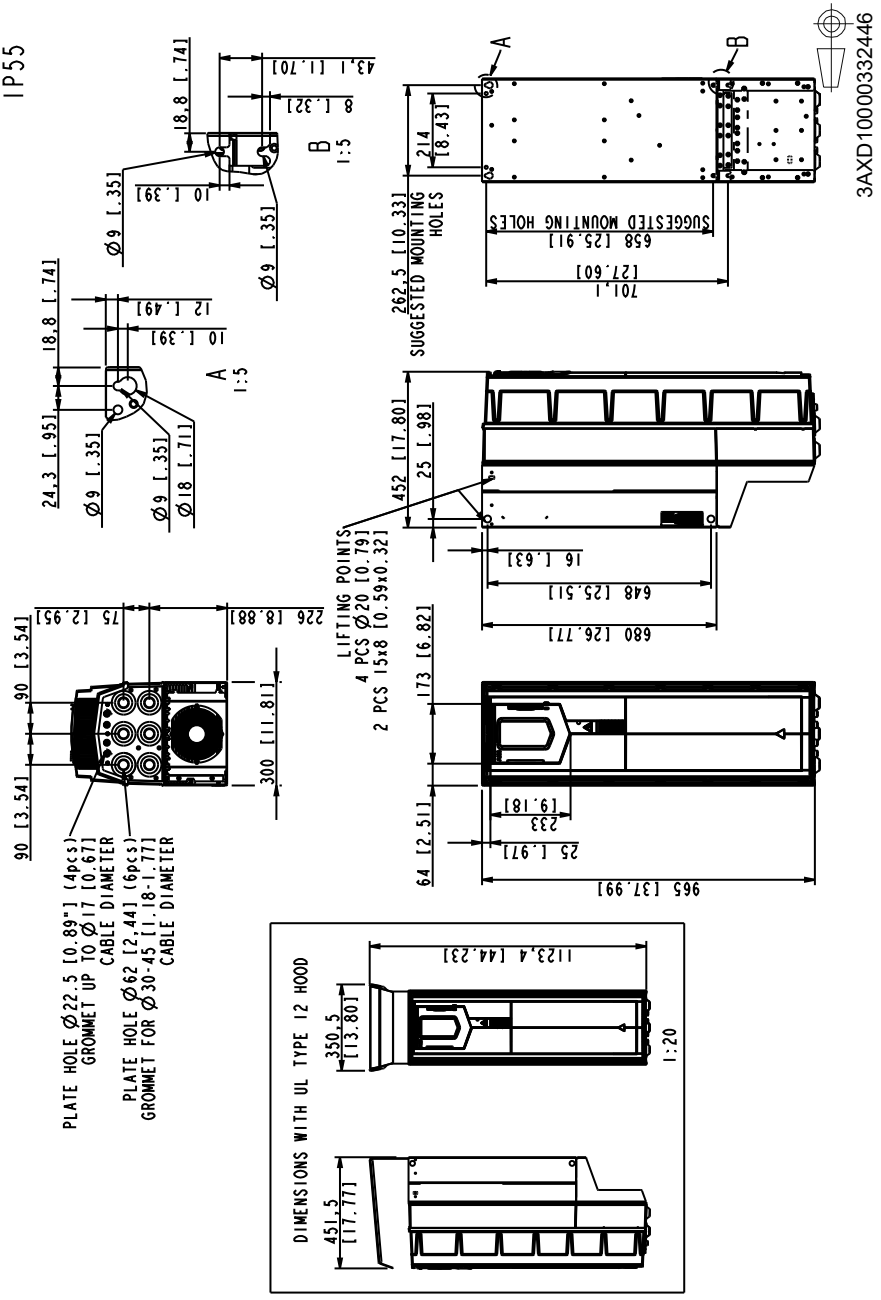

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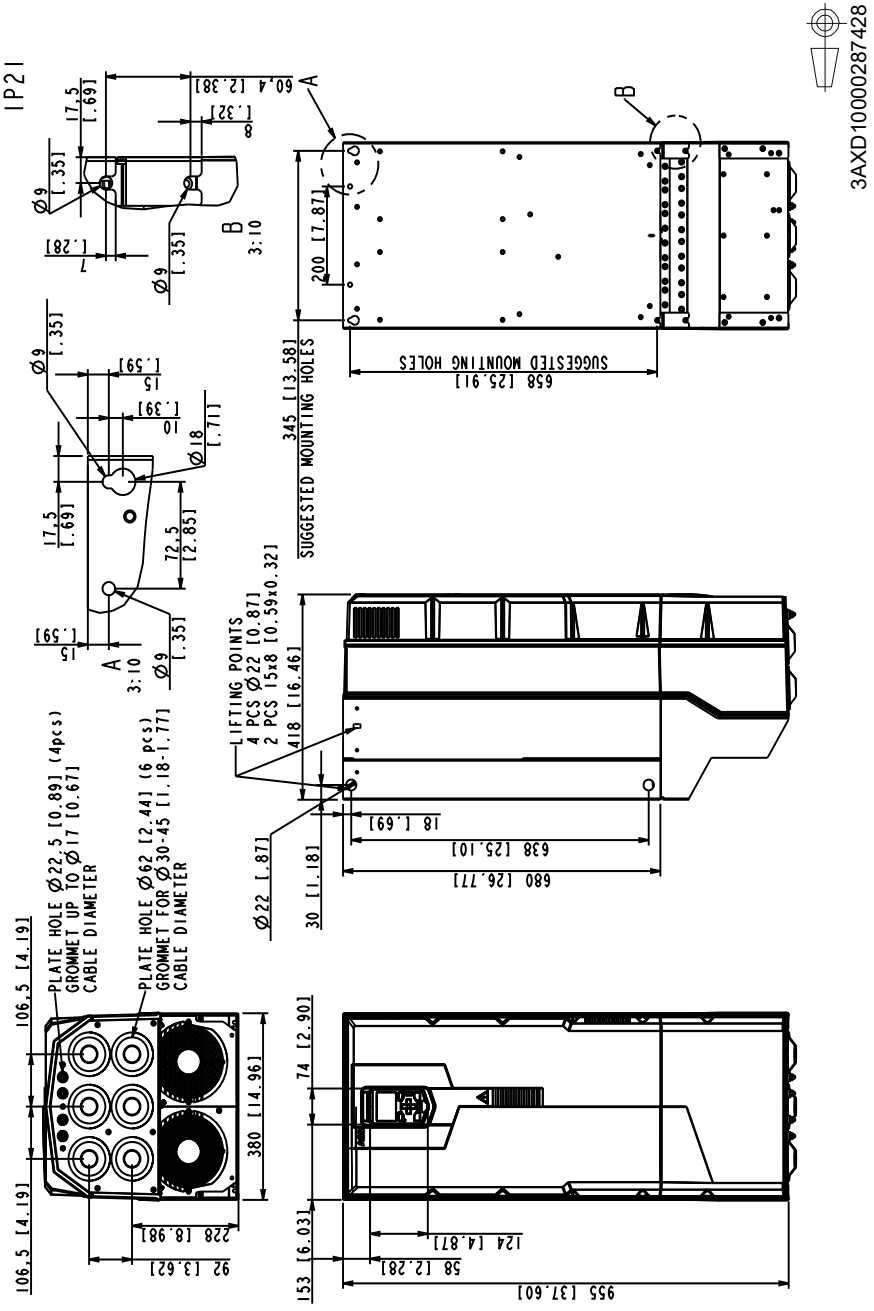

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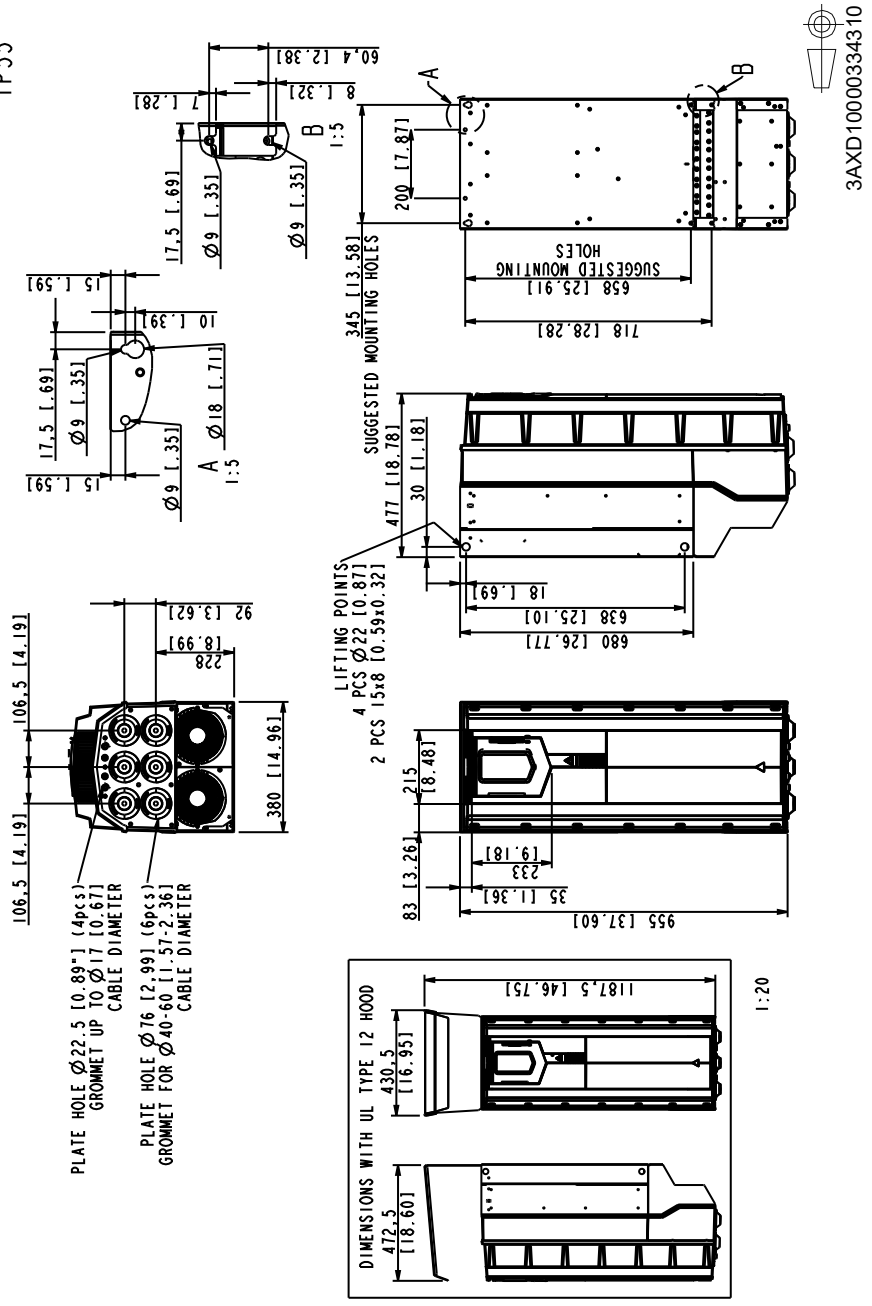


12

Resistor braking

Contents of this chapter

This chapter describes how to select the brake resistor and cables, protect the system, connect the brake resistor and enable resistor braking.

Operation principle and hardware description

The brake chopper handles the energy generated by a decelerating motor. The chopper connects the brake resistor to the intermediate DC circuit whenever the voltage in the circuit exceeds the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistor can be disconnected.

For frame R1…R3 internal brake choppers and resistors, see below. For R4…R9 external brake choppers and resistors, see *Resistor braking, frames R4…R9* on page *359*.

Resistor braking, frames R1…R3

Planning the braking system

Selecting the brake resistor

Frames R1…R3 have an built-in brake chopper as standard equipment. The brake resistor is selected using the table and equations presented in this section.

1. Determine the required maximum braking power P_{Rmax} for the application. P_{Rmax} must be smaller than P_{BRmax} given in the table on page *353* for the used drive type.
2. Calculate resistance R with Equation 1.
3. Calculate energy E_{Rpulse} with Equation 2.
4. Select the resistor so that the following conditions are met:
   - The rated power of the resistor must be greater than or equal to P_{Rmax}.
   - Resistance R must be between R_{min} and R_{max} given in the table for the used drive type.
   - The resistor must be able to dissipate energy E_{Rpulse} during the braking cycle T.

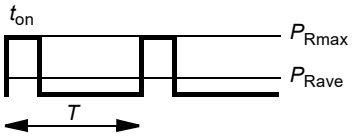
Equations for selecting the resistor:

Eq. 1. U_n = 400 V: $R = \frac{450000}{P_{Rmax}}$

U_n = 480 V: $R = \frac{615000}{P_{Rmax}}$

Eq. 2. $E_{Rpulse} = P_{Rmax} \cdot t_{on}$

Eq. 3. $P_{Rave} = P_{Rmax} \cdot \frac{t_{on}}{T}$



For conversion, use 1 hp = 746 W.

where

R = calculated brake resistor value (ohm). Make sure that: $R_{min} < R < R_{max}$.
P_{Rmax} = maximum power during the braking cycle (W)
P_{Rave} = average power during the braking cycle (W)
E_{Rpulse} = energy conducted into the resistor during a single braking pulse (J)
t_{on} = length of the braking pulse (s)
T = length of the braking cycle (s).

IEC

The table shows reference resistor types for the maximum braking power.

Type ACS580 -01-	R_{min}	R_{max}	P_{BRmax}	Reference resistor types
	ohm	ohm	kW	
3-phase U_n = 230 V				
04A7-2	25	205	0.7	Danotherm CBR-V 330 D T 406 78R UL
06A7-2	25	130	1.1	Danotherm CBR-V 330 D T 406 78R UL
07A6-2	25	95	1.5	Danotherm CBR-V 560 D HT 406 39R UL
012A-2	25	48	3.0	Danotherm CBR-V 560 D HT 406 39R UL
018A-2	25	35	4.1	-
025A-2	14	26	5.4	Danotherm CBT-H 560 D HT 406 19R
032A-2	14	19	7.4	Danotherm CBT-H 760 D HT 406 16R
047A-2	6.0	13	11	SAFUR90F575
060A-2	6.0	9.0	16	SAFUR90F575
3-phase U_n = 400 or 480 V				
02A7-4	52	864	0.6	Danotherm CBH 360 C T 406 210R
03A4-4	52	582	0.9	Danotherm CBH 360 C T 406 210R
04A1-4	52	392	1.4	Danotherm CBH 360 C T 406 210R
05A7-4	52	279	2.0	Danotherm CBH 360 C T 406 210R
07A3-4	52	191	2.9	Danotherm CBR-V 330 D T 406 78R UL
09A5-4	52	140	3.9	Danotherm CBR-V 330 D T 406 78R UL
12A7-4	52	104	5.3	Danotherm CBR-V 330 D T 406 78R UL
018A-4	31	75	7.3	Danotherm CBR-V 560 D HT 406 39R UL
026A-4	22	52	10	Danotherm CBR-V 560 D HT 406 39R UL
033A-4	16	37	15	Danotherm CBT-H 560 D HT 406 19R
039A-4	10	27	20	Danotherm CBT-H 760 D HT 406 16R
046A-4	10	22	25	Danotherm CBT-H 760 D HT 406 16R

UL (NEC)

The table shows reference resistor types for the maximum braking power.

Type ACS580 -01-	R_{min}	R_{max}	P_{BRmax}		Reference resistor types
	ohm	ohm	kW	hp	
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V					
04A6-2	25	205	0.7	0.9	Danotherm CBR-V 330 D T 406 78R UL
06A6-2	25	130	1.1	1.5	Danotherm CBR-V 330 D T 406 78R UL
07A5-2	25	95	1.5	2.0	Danotherm CBR-V 560 D HT 406 39R U
10A6-2	25	65	2.2	2.9	Danotherm CBR-V 560 D HT 406 39R UL
017A-2	25	35	4.0	5.4	TBD
024A-2	14	26	5.4	7.2	Danotherm CBT-H 560 D HT 406 19R

Type ACS580 -01-	R_{min}	R_{max}	P_{BRmax}		Reference resistor types
	ohm	ohm	kW	hp	
031A-2	14	19	7.4	9.9	Danotherm CBT-H 760 D HT 406 16R
046A-2	6.0	13	11	14.7	SAFUR90F575
059A-2	6.0	9.0	16	21.4	SAFUR90F575
3-phase U_1 = 440...480 V, P_n at U_n = 480 V					
02A1-4	52	864	0.6	0.8	Danotherm CBH 360 C T 406 210R
03A0-4	52	582	0.9	1.2	Danotherm CBH 360 C T 406 210R
03A5-4	52	392	1.4	1.9	Danotherm CBH 360 C T 406 210R
04A8-4	52	279	2.0	2.7	Danotherm CBH 360 C T 406 210R
06A0-4	52	191	2.9	3.9	Danotherm CBR-V 330 D T 406 78R UL
07A6-4	52	140	3.9	5.2	Danotherm CBR-V 330 D T 406 78R UL
012A-4	52	104	5.3	7.1	Danotherm CBR-V 330 D T 406 78R UL
014A-4	31	75	7.3	9.8	Danotherm CBR-V 560 D HT 406 39R UL
023A-4	22	52	10	13.6	Danotherm CBR-V 560 D HT 406 39R UL
027A-4	16	37	15	20.1	Danotherm CBT-H 560 D HT 406 19R
034A-4	10	27	20	26.8	Danotherm CBT-H 760 D HT 406 16R
044A-4	10	22	25	33.5	Danotherm CBT-H 760 D HT 406 16R
3-phase U_1 = 525...600 V, P_n at U_n = 575 V					
02A7-6	60	600	1.5	2.0	Danotherm CBR-V 330 D T 406 78R UL
03A9-6	60	450	2.2	2.7	Danotherm CBR-V 330 D T 406 78R UL
06A1-6	60	225	4.0	5.4	Danotherm CBR-V 330 D T 406 78R UL
09A0-6	60	165	5.4	7.2	Danotherm CBR-V 330 D T 406 78R UL
011A-6	60	120	7.4	9.9	Danotherm CBR-V 330 D T 406 78R UL
017A-6	60	82	11	14.7	Danotherm CBR-V 330 D T 406 78R UL
022A-6	25	56	16	21.4	Danotherm CBR-V 560 D HT 406 39R UL
027A-6	25	43	21	28.2	Danotherm CBR-V 560 D HT 406 39R UL
032A-6	25	35	26	34.9	TBD

Symbols

R_{min} = minimum allowed brake resistor that can be connected to the brake chopper
R_{max} = maximum allowed brake resistor that allows P_{BRmax}
P_{BRmax} = maximum braking capacity of the drive, must exceed the desired braking power.

WARNING! Do not use a brake resistor with a resistance below the minimum value specified for the particular drive. The drive and the internal chopper are not able to handle the overcurrent caused by the low resistance.

Selecting and routing the brake resistor cables

Use a shielded cable with the conductor size specified in section *Terminal and lead-through data for the power cables* on page *295*.

Minimizing electromagnetic interference

Follow these rules in order to minimize electromagnetic interference caused by the rapid current changes in the resistor cables:

- Install the cables away from other cable routes.
- Avoid long parallel runs with other cables. The minimum parallel cabling separation distance should be 0.3 meters.
- Cross the other cables at right angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on chopper IGBTs. The longer the cable the higher the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Maximum cable length

The maximum length of the resistor cable(s) is 10 m (33 ft).

EMC compliance of the complete installation

Note: ABB has not verified that the EMC requirements are fulfilled with external user-defined brake resistors and cabling. The EMC compliance of the complete installation must be considered by the customer.

Placing the brake resistor

Install the resistors outside the drive in a place where they will cool.

Arrange the cooling of the resistor in a way that:

- no danger of overheating is caused to the resistor or nearby materials
- the temperature of the room the resistor is located in does not exceed the allowed maximum.

Supply the resistor with cooling air/water according to the resistor manufacturer's instructions.

WARNING! The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. If the exhaust vents are connected to a ventilation system, make sure that the material withstands high temperatures. Protect the resistor against physical contact.

Protecting the system in brake circuit fault situations

Protecting the system in cable and brake resistor short-circuit situations

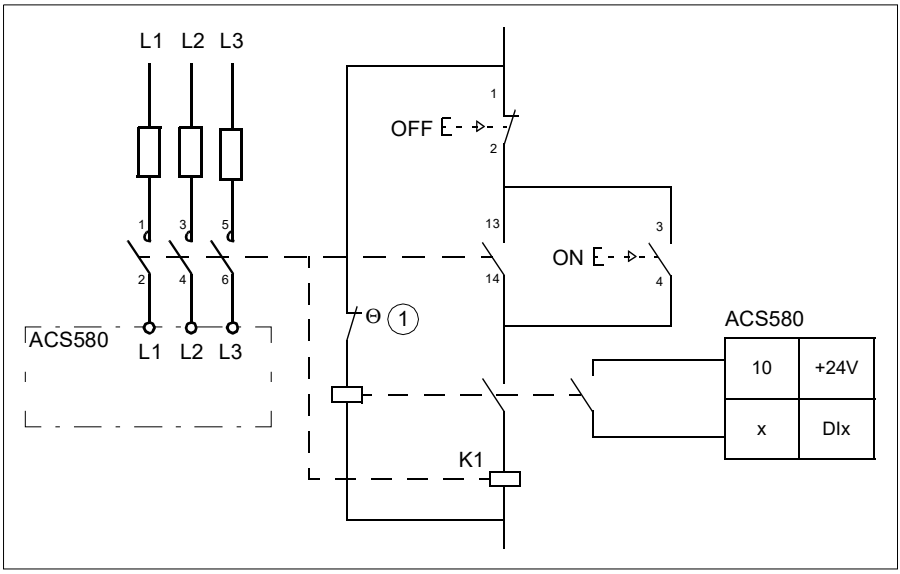
The drive input fuses will also protect the resistor cable when it is identical with the input cable.

Protecting the system against thermal overload

The drive has a brake thermal model which protects the brake resistor against overload. ABB recommends to enable the thermal model at start up.

ABB recommends to equip the drive with a main contactor for safety reasons even when you have enabled the resistor thermal model. Wire the contactor so that it opens in case the resistor overheats. This is essential for safety since the drive will not otherwise be able to interrupt the main supply if the chopper remains conductive in a fault situation. An example wiring diagram is shown below. ABB recommends that you use resistors equipped with a thermal switch (1) inside the resistor assembly. The switch indicates overtemperature.

ABB recommends that you also wire the thermal switch to a digital input of the drive, and configure the input to cause a fault trip at resistor overtemperature indication.



Mechanical installation

All brake resistors must be installed outside the drive. Follow the resistor manufacturer's instructions.

Electrical installation

Examining the insulation of the assembly

Follow the instructions given in section *Brake resistor assembly for R1…R3* on page *115* (IEC) or *Brake resistor assembly for R1…R3* on page *167* (North America).

Connection diagram

See section *Connection diagram* page *123* (IEC) or *Connection diagram* on page *176* (North America).

Connection procedure

See section *Grounding shelf* on page *129* (IEC).

Connect the thermal switch of the brake resistor as described in section *Protecting the system against thermal overload* on page *356*.

Start-up

Note: Protective oil on the brake resistors will burn off when the brake resistor is used for the first time. Make sure that the airflow is sufficient.

Set the following parameters:

1. Disable the overvoltage control of the drive with parameter 30.30 Overvoltage control.
2. Set the source of parameter 31.01 External event 1 source to point to the digital input where the thermal switch of the brake resistor is wired.
3. Set parameter 31.02 External event 1 type to Fault.
4. Enable the brake chopper by parameter 43.06 Brake chopper enable. If Enabled with thermal model is selected, set also the brake resistor overload protection parameters 43.08 and 43.09 according to the application.
5. Check the resistance value of parameter 43.10 Brake resistance.

With these parameter settings, the drive generates a fault and coasts to a stop on brake resistor overtemperature.

WARNING! If the drive is equipped with a brake chopper but the chopper is not enabled by the parameter setting, the internal thermal protection of the drive against resistor overheating is not in use. In this case, the brake resistor must be disconnected.

Resistor braking, frames R4…R9

Planning the braking system

Frames R4…R9 need external brake choppers and resistors. The tables below list suitable choppers and resistors.

For more information, see *NBRA-6xx Braking Choppers Installation and start-up guide* (3AFY58920541 [English]) and *ACS-BRK Brake Units Installation and start-up guide* (3AFY61514309 [English]).

IEC

Type ACS580-01	Brake chopper	R_{min} ohm	R_{max} ohm	P_{BRmax} kW	Reference resistor types[1)]
3-phase U_n = 230 V					
076A-2	NBRA-658	-	-	-	-
089A-2	NBRA-658	2.0	5.6	26	SAFUR125F500
115A-2	NBRA-658	2.0	4.7	31	SAFUR125F500
144A-2	NBRA-658	2.0	3.4	43	SAFUR200F500
171A-2	NBRA-658	1.3	2.8	53	SAFUR200F500
213A-2	NBRA-658	1.3	2.3	64	2xSAFUR210F575
276A-2	NBRA-658	0.9	1.9	78	2xSAFUR210F575
3-phase U_n = 400 or 480 V (380…415 V, 440…480 V)					
062A-4	ACS-BRK-D	7.8	18.1	30	Built in with the brake chopper
073A-4	ACS-BRK-D	7.8	13.1	42	Built in with the brake chopper
088A-4	ACS-BRK-D	7.8	10.7	51	Built in with the brake chopper
106A-4	NBRA-658	1.3	8.7	63	SAFUR125F500
145A-4	NBRA-658	1.3	7.1	77	SAFUR125F500
169A-4	NBRA-658	1.3	5.2	105	SAFUR200F500
206A-4	NBRA-658	1.3	4.3	126	SAFUR200F500
246A-4	NBRA-658	1.3	3.5	156	2xSAFUR125F500
293A-4	NBRA-658	1.3	2.9	187	2xSAFUR210F575
363A-4	NBRA-659	0.7	2.4	227	2xSAFUR200F500
430A-4	NBRA-659	0.7	1.9	284	2xSAFUR200F500

[1)] Other resistors can be used if they meet the minimum resistance value and required power values.

Symbols

R_{min} = minimum allowed brake resistor that can be connected to the brake chopper
R_{max} = maximum allowed brake resistor that allows P_{BRmax}
P_{BRmax} = maximum braking capacity of the drive, must exceed the desired braking power.

UL (NEC)

Type ACS580 -01-	R_{min}	R_{max}	P_{BRmax}	Reference resistor types
	ohm	ohm	kW	
3-phase U_1 = 208...240 V, P_n at U_n = 208/230 V				
075A-2	2.6	7	21	SAFUR125F500
088A-2	2	5.6	26	SAFUR125F500
114A-2	2	4.7	31	SAFUR125F500
143A-2	2	3.4	43	SAFUR200F500
169A-2	1.3	2.8	53	SAFUR200F500
211A-2	1.3	2.3	64	2xSAFUR210F575
273A-2	0.9	1.9	78	2xSAFUR210F575
3-phase U_1 = 440...480 V, P_n at U_n = 480 V				
052A-4	7.8	18.1	30	Built in with the brake chopper
065A-4	7.8	13.1	42	Built in with the brake chopper
077A-4	-	-	-	-
078A-4	7.8	10.7	51	Built in with the brake chopper
096A-4	1.3	8.7	63	SAFUR125F500
124A-4	1.3	7.1	77	SAFUR125F500
156A-4	1.3	5.2	105	SAFUR200F500
180A-4	1.3	4.3	126	SAFUR200F500
240A-4	1.3	3.5	156	2xSAFUR125F500
260A-4	1.3	2.9	187	2xSAFUR210F575
302A-4	-	-	-	-
361A-4	0.7	2.4	227	2xSAFUR200F500
414A-4	0.7	1.9	284	2xSAFUR200F500
3-phase U_1 = 525...600 V, P_n at U_n = 575 V				
041A-6	6.5	30	31	SAFUR90F575
052A-6	6.5	21	43	SAFUR90F575
062A-6	6.5	17	53	SAFUR90F575
077A-6	6.5	14	64	SAFUR90F575
099A-6	4.3	11.5	78	SAFUR80F500
125A-6	4.3	8.5	107	SAFUR80F500
144A-6	3.2	7	128	SAFUR80F500
192A-6	2.2	5.8	157	SAFUR125F500
242A-6	2.2	4.8	188	SAFUR200F500
271A-6	2.2	4	228	SAFUR200F500

Symbols

R_{min} = minimum allowed brake resistor that can be connected to the brake chopper
R_{max} = maximum allowed brake resistor that allows P_{BRmax}
P_{BRmax} = maximum braking capacity of the drive, must exceed the desired braking power.

WARNING! Do not use a brake resistor with a resistance below the minimum value specified for the particular drive. The drive and the internal chopper are not able to handle the overcurrent caused by the low resistance.

Parameter settings for external braking chopper and resistor

Disable the overvoltage control of the drive with parameter 30.30 Overvoltage control.

Disable parameter 43.06 Braking chopper function as parameter group 43 Brake chopper is used for internal braking chopper and resistor only.

13

Safe torque off function

Contents of this chapter

This chapter describes the Safe torque off (STO) function of the drive and gives instructions for its use.

Description

The Safe torque off function 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). Another typical application is a prevention of unexpected start-up function that enables short-time maintenance operations like cleaning or work on non-electrical parts of the machinery without switching off the power supply to the drive.

When activated, the Safe torque off function disables the control voltage of the power semiconductors of the drive output stage (A, see diagram on page *364*), thus preventing the drive from generating the torque required to rotate the motor. If the motor is running when Safe torque off is activated, it coasts to a stop.

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

The Safe torque off function of the drive complies with these standards:

Standard	Name
IEC 60204-1:2016 EN 60204-1:2018	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
IEC 61000-6-7:2014	*Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*
IEC 61326-3-1:2017	*Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications*
IEC 61508-1:2010	*Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*
IEC 61508-2:2010	*Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*
IEC 61511-1:2017	*Functional safety – Safety instrumented systems for the process industry sector*
IEC 61800-5-2:2016 EN 61800-5-2:2007	*Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional*
IEC 62061:2005 + A1:2012 + A2:2015 EN 62061:2005 + AC:2010 + A1:2013 +A2:2015	*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 requirements*
EN ISO 13849-2:2012	*Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

The function also corresponds to Prevention of unexpected start-up as specified by EN ISO 14118:2018 (ISO 14118:2017), and Uncontrolled stop (stop category 0) as specified in EN/IEC 60204-1.

Compliance with the European Machinery Directive

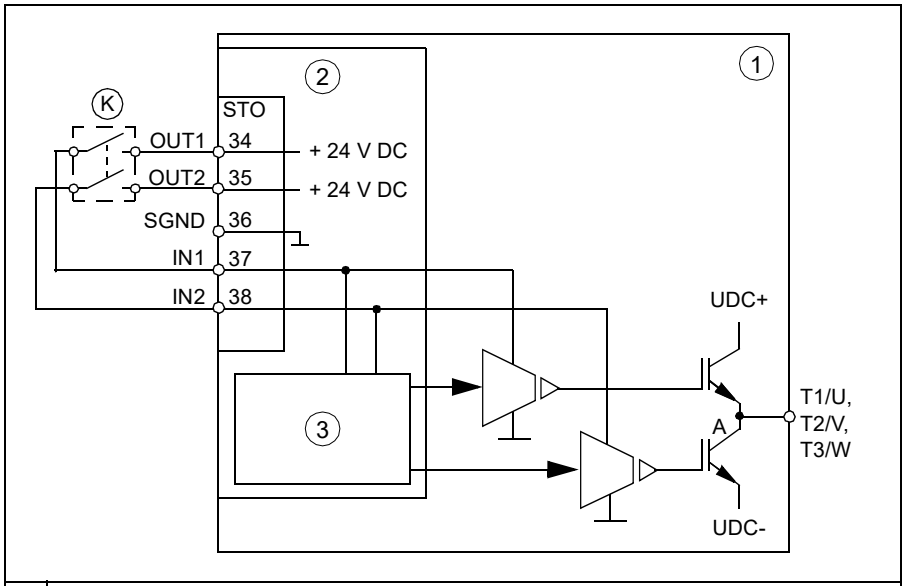
See section *Compliance with the European Machinery Directive 2006/42/EC 2nd Edition – June 2010* on page 316.

Connection principle

For information on the specifications of the STO input, see chapter *Control connection data* (page 305).

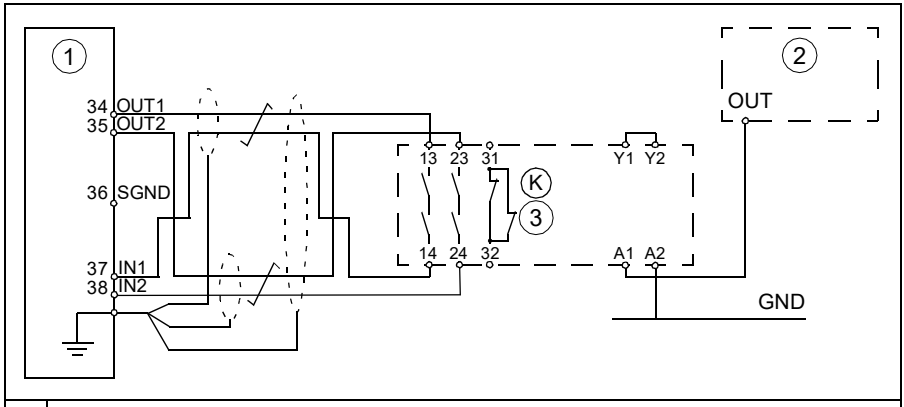
Single drive, internal +24 V DC power supply

Dual-channel connection



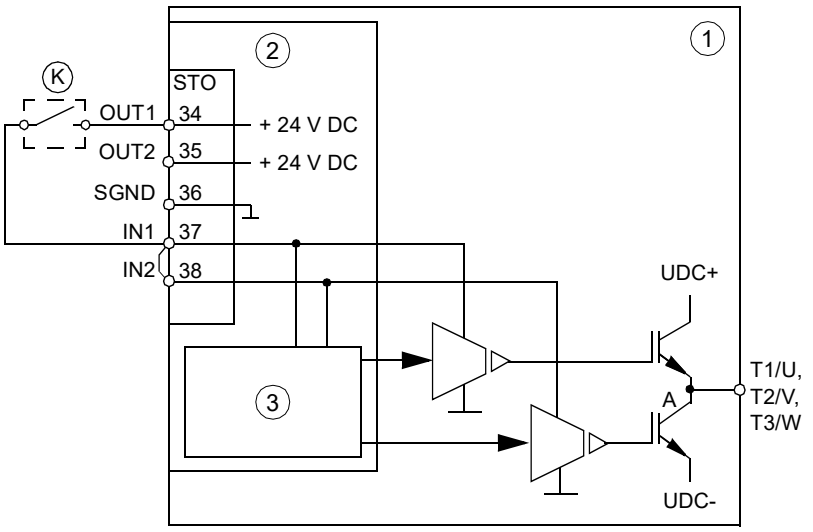
1	Drive
2	Control unit
3	Control logic

An example of a Safe torque off wiring is shown below.



1	Drive
2	Safety PLC
3	Safety relay

Single-channel connection

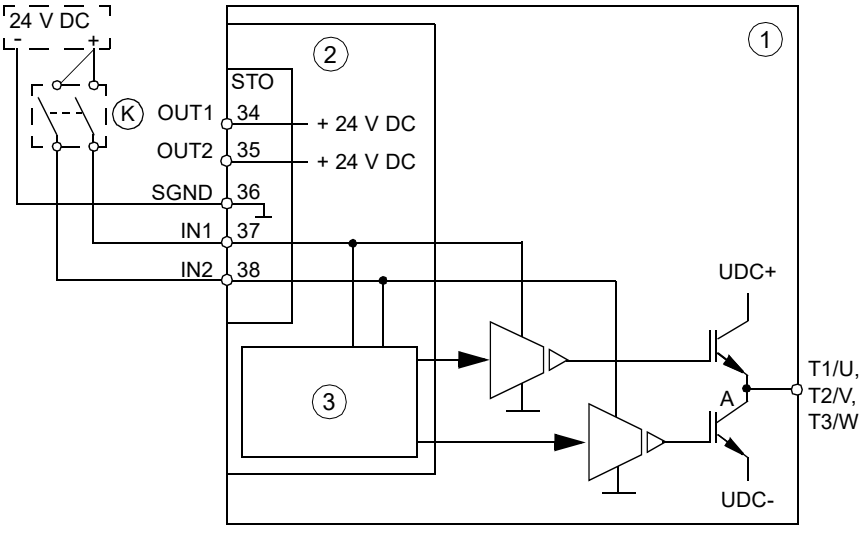


1	Drive
2	Control unit
3	Control logic

Notes:

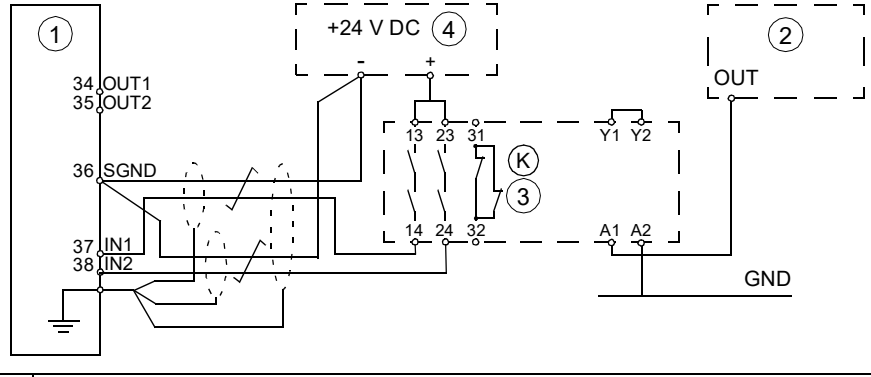
- Both STO inputs (IN1, IN2) must be connected to the activation switch. Otherwise, no SIL/PL classification is given.
- Pay special attention to avoiding any potential failure modes for the wiring. For example, use shielded cable. For measures for fault exclusion of wiring, see eg. EN ISO 13849-2:2012, table D.4.

Single drive, external +24 V DC power supply



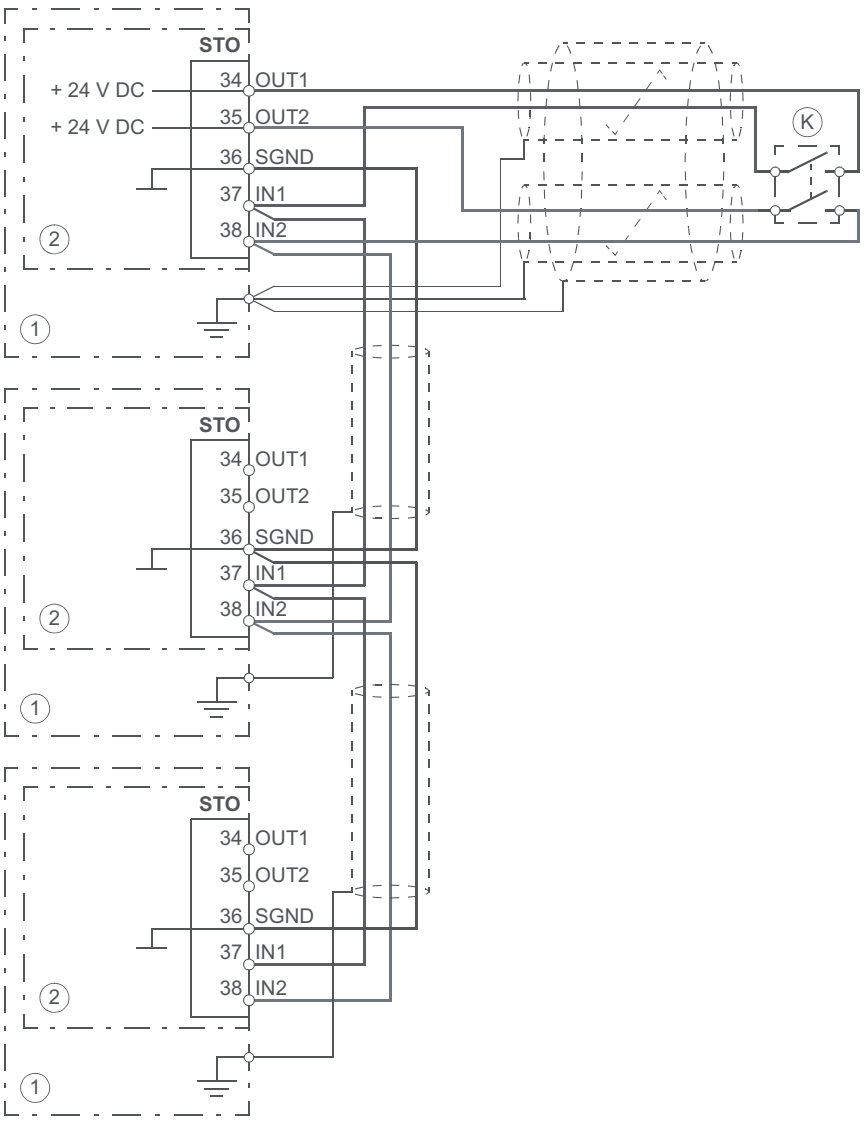
1	Drive
2	Control unit
3	Control logic

An example of a Safe torque off wiring is shown below.



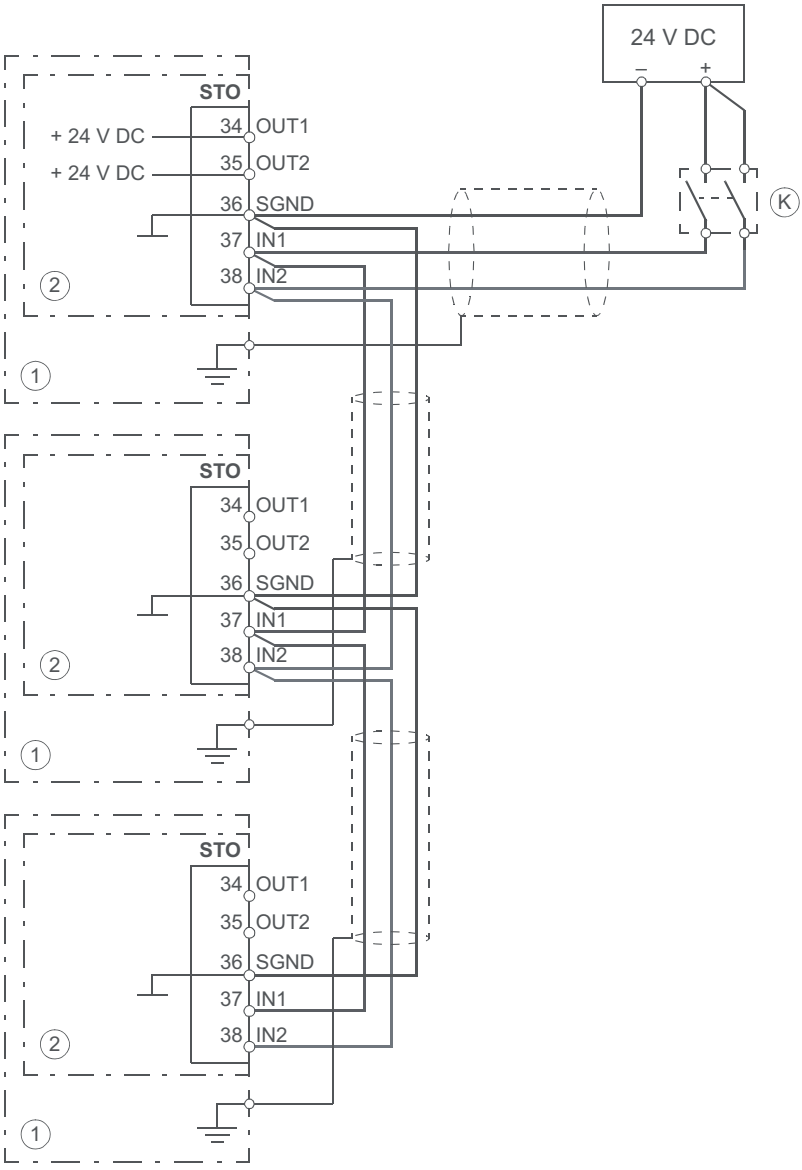
1	Drive
2	Safety PLC
3	Safety relay
4	+24 V DC external power supply

Multiple ACS580-01 drives, internal +24 V DC power supply



1	Drive
2	Control unit

Multiple ACS580-01 drives, external +24 V DC power supply



1	Drive
2	Control unit

Activation switch

In the wiring diagrams above, the activation switch has the designation (K). This represents a component such as a manually operated switch, an emergency stop push button switch, or the contacts of a safety relay or safety PLC.

- If a manually operated activation switch is used, the switch must be of a type that can be locked out to the open position.
- The STO inputs must be switched on/off within 200 ms of each other.
- A CPTC-02 thermistor protection module can also be used. For more information, see the module documentation.

Cable types and lengths

- Double-shielded twisted-pair cable is recommended.
- Maximum cable lengths:
  - 300 m (1000 ft) between activation switch (K) and drive control unit
  - 60 m (200 ft) between multiple drives
  - 60 m (200 ft) between external power supply and first drive unit.

Note: A short-circuit in the wiring between the switch and an STO terminal causes a dangerous fault. Therefore, it is recommended to use a safety relay (including wiring diagnostics), or a wiring method (shield grounding, channel separation) which reduces or eliminates the risk caused by the short-circuit.

Note: The voltage at the STO input terminals of the drive must be at least 13 V DC to be interpreted as “1”. The pulse tolerance of the input channels is 1 ms.

Grounding of protective shields

- Ground the shield in the cabling between the activation switch and the control unit at the control unit.
- Ground the shield in the cabling between two control units at one control unit only.

Operation principle

1. The Safe torque off activates (the activation switch is opened, or safety relay contacts open).
2. The STO inputs of the drive control unit de-energize.
3. The control unit cuts off the control voltage from the output IGBTs.
4. The control program generates an indication as defined by parameter *31.22* (see the firmware manual of the drive).

   The parameter selects which indications are given when one or both STO signals are switched off or lost. The indications also depend on whether the drive is running or stopped when this occurs.

Note: This parameter does not affect the operation of the STO function itself. The STO function will operate regardless of the setting of this parameter: a running drive will stop upon removal of one or both STO signals, and will not start until both STO signals are restored and all faults reset.

Note: The loss of only one STO signal always generates a fault as it is interpreted as a malfunction of STO hardware or wiring.

5. The motor coasts to a stop (if running). The drive cannot restart while the activation switch or safety relay contacts are open. After the contacts close, a reset may be needed (depending on the setting of parameter *31.22*). A new start command is required to start the drive.

Start-up including validation test

To ensure the safe operation of a safety function, validation is required. The final assembler of the machine must validate the function by performing a validation test. The validation test must be performed

- at initial start-up of the safety function
- after any changes related to the safety function (circuit boards, wiring, components, settings, etc.)
- after any maintenance work related to the safety function
- after a drive firmware update.

Competence

The validation test of the safety function must be carried out by an competent person with adequate expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6. The test procedures and report must be documented and signed by this person.

Validation test reports

Signed validation test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, references to failure reports and resolution of failures. Any new validation tests performed due to changes or maintenance shall be logged into the logbook.

Validation test procedure

After wiring the Safe torque off function, validate its operation as follows.

Note: If a CPTC-02 module is installed, refer to its documentation.

Action	☑
 **WARNING!** Obey the *Safety instructions*, page *15*. If you ignore them, injury or death, or damage to the equipment can occur.	☐
Make sure that the drive can be run and stopped freely during start-up.	☐
Stop the drive (if running), switch the input power off and isolate the drive from the power line using a disconnector.	☐
Check the STO circuit connections against the wiring diagram.	☐
Close the disconnector and switch the power on.	☐
Test the operation of the STO function when the motor is stopped. • Give a stop command for the drive (if running) and wait until the motor shaft is at a standstill. Make sure that the drive operates as follows: • Open the STO circuit. The drive generates an indication if one is defined for the 'stopped' state in parameter *31.22* (see the firmware manual). • Give a start command to verify that the STO function blocks the drive's operation. The drive generates a warning. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the drive and check that the motor runs normally.	☐
Test the operation of the STO function when the motor is running. • Start the drive and make sure the motor is running. • Open the STO circuit. The motor should stop. The drive generates an indication if one is defined for the 'running' state in parameter *31.22* (see the firmware manual). • Reset any active faults and try to start the drive. • Make sure that the motor stays at a standstill and the drive operates as described above in testing the operation when the motor is stopped. • Close the STO circuit. • Reset any active faults. Restart the drive and check that the motor runs normally.	☐

Action	☑
Test the operation of the failure detection of the drive. The motor can be stopped or running. • Open the 1st channel of the STO circuit (wire coming to IN1). If the motor was running, it should coast to a stop. The drive generates a *FA81 Safe torque off 1 loss* fault indication (see the firmware manual). • Give a start command to verify that the STO function blocks the drive's operation. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the drive and check that the motor runs normally. • Open the 2nd channel of the STO circuit (wire coming to IN2). If the motor was running, it should coast to a stop. The drive generates a *FA82 Safe torque off 2 loss* fault indication (see the firmware manual). • Give a start command to verify that the STO function blocks the drive's operation. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the drive and check that the motor runs normally.	☐
Document and sign the validation test report which verifies that the safety function is safe and accepted for operation.	☐

Use

1. Open the activation switch, or activate the safety functionality that is wired to the STO connection.
2. The STO inputs on the drive control unit de-energize, and the drive control unit cuts off the control voltage from the output IGBTs.
3. The control program generates an indication as defined by parameter *31.22* (see the firmware manual of the drive).
4. The motor coasts to a stop (if running). The drive will not restart while the activation switch or safety relay contacts are open.
5. Deactivate the STO by closing the activation switch, or reseting the safety functionality that is wired to the STO connection.
6. Reset any faults before restarting.

WARNING! The Safe torque off function does not disconnect the voltage of the main and auxiliary circuits from the drive. Therefore maintenance work on electrical parts of the drive or the motor can only be carried out after isolating the drive from the supply and all other voltage sources.

WARNING! The drive cannot detect or memorize any changes in the STO circuitry when the drive control unit is not powered. If both STO circuits are closed and a level-type start signal is active when the power is restored, it is possible that the drive starts without a fresh start command. Take this into account in the risk assessment of the system.
This is also valid when the drive is only powered by a CMOD-xx multifunction extension module.

WARNING! (With permanent magnet motors or synchronous reluctance [SynRM] motors only)
In case of a multiple IGBT power semiconductor failure, the drive can produce an alignment torque which maximally rotates the motor shaft by 180/*p* degrees (with permanent magnet motors) or 180/2*p* degrees (with synchronous reluctance [SynRM] motors) regardless of the activation of the Safe torque off function. *p* denotes the number of pole pairs.

Notes:

- If a running drive is stopped by using the Safe torque off function, the drive will cut off the motor supply voltage and the motor will coast to a stop. If this causes danger or is not otherwise acceptable, stop the drive and machinery using the appropriate stop mode before activating the Safe torque off function.
- The Safe torque off function overrides all other functions of the drive unit.
- The Safe torque off function is ineffective against deliberate sabotage or misuse.
- The Safe torque off function has been designed to reduce the recognized hazardous conditions. In spite of this, it is not always possible to eliminate all potential hazards. The assembler of the machine must inform the final user about the residual risks.

Maintenance

After the operation of the circuit is validated at start-up, the STO function shall be maintained by periodic proof testing. In high demand mode of operation, the maximum proof test interval is 20 years. In low demand mode of operation, the maximum proof test interval is 5 or 2 years; see section *Safety data* (page *377*). It is assumed that all dangerous failures of the STO circuit are detected by the proof test. To perform the proof test, do the *Validation test procedure* (page *372*).

Note: See also the Recommendation of Use CNB/M/11.050 (published by the European co-ordination of Notified Bodies) concerning dual-channel safety-related systems with electromechanical outputs:

- When the safety integrity requirement for the safety function is SIL 3 or PL e (cat. 3 or 4), the proof test for the function must be performed at least every month.
- When the safety integrity requirement for the safety function is SIL 2 (HFT = 1) or PL d (cat. 3), the proof test for the function must be performed at least every 12 months.

The STO function does not contain any electromechanical components.

In addition to proof testing, it is a good practice to check the operation of the function when other maintenance procedures are carried out on the machinery.

Include the Safe torque off operation test described above in the routine maintenance program of the machinery that the drive runs.

If any wiring or component change is needed after start up, or the parameters are restored, do the test given in section *Validation test procedure* (page *372*).

Use only spare parts approved by ABB.

Record all maintenance and proof test activities in the machine logbook.

Competence

The maintenance and proof test activities of the safety function must be carried out by a competent person with adequate expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6.

Fault tracing

The indications given during the normal operation of the Safe torque off function are selected by drive parameter *31.22*.

The diagnostics of the Safe torque off function cross-compare the status of the two STO channels. In case the channels are not in the same state, a fault reaction function is performed and the drive trips on an “STO hardware failure” fault. An attempt to use the STO in a non-redundant manner, for example activating only one channel, will trigger the same reaction.

See the firmware manual of the drive control program for the indications generated by the drive, and for details on directing fault and warning indications to an output on the control unit for external diagnostics.

Any failures of the Safe torque off function must be reported to ABB.

Safety data

The safety data for the Safe torque off function is given below.

Note: The safety data is calculated for redundant use, and does not apply if both STO channels are not used.

Frame size	SIL/ SILCL	PL	SFF (%)	PFH (T_1 = 20 a) (1/h)	PFD_{avg} (T_1 = 2 a)	PFD_{avg} (T_1 = 5 a)	$MTTF_D$ (a)	DC (%)	Cat.	SC	HFT	CCF	T_M (a)
U_n = 230 V													
R1	3	e	>99	2.79E-09	2.34E-05	5.83E-05	2755	≥90	3	3	1	80	20
R2	3	e	>99	2.79E-09	2.34E-05	5.83E-05	2756	≥90	3	3	1	80	20
R3	3	e	>99	2.59E-09	2.28E-05	5.69E-05	2856	≥90	3	3	1	80	20
R4	3	e	>99	2.59E-09	2.28E-05	5.67E-05	2870	≥90	3	3	1	80	20
R5	3	e	>99	3.94E-09	2.28E-05	5.69E-05	2856	≥90	3	3	1	80	20
R6	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20
R7	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20
R8	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20
U_n = 400 V													
R1	3	e	>99	2.55E-09	2.24E-05	5.59E-05	2918	≥90	3	3	1	80	20
R2	3	e	>99	2.55E-09	2.24E-05	5.59E-05	2918	≥90	3	3	1	80	20
R3	3	e	>99	2.62E-09	2.31E-05	5.75E-05	2823	≥90	3	3	1	80	20
R4	3	e	>99	2.59E-09	2.28E-05	5.67E-05	2870	≥90	3	3	1	80	20
R5	3	e	>99	2.59E-09	2.28E-05	5.68E-05	2868	≥90	3	3	1	80	20
R6	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20
R7	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20
R8	3	e	>99	4.22E-09	3.69E-05	9.24E-05	8792	≥90	3	3	1	80	20
R9	3	e	>99	4.22E-09	3.69E-05	9.24E-05	8792	≥90	3	3	1	80	20
U_n = 600 V													
R2	3	e	>99	2.67E-09	2.24E-05	5.57E-05	2920	≥90	3	3	1	80	20
R3	3	e	>99	2.61E-09	2.30E-05	5.72E-05	2840	≥90	3	3	1	80	20
R5	3	e	>99	2.59E-09	2.28E-05	5.69E-05	2933	≥90	3	3	1	80	20
R7	3	e	>99	4.25E-09	3.72E-05	9.29E-05	6443	≥90	3	3	1	80	20
R8	3	e	>99	4.25E-09	3.72E-05	9.29E-05	6443	≥90	3	3	1	80	20
R9	3	e	>99	4.25E-09	3.72E-05	9.29E-05	6443	≥90	3	3	1	80	20

3AXD10000776787 A, 3AXD10000015777 N

- The following temperature profile is used in safety value calculations:
  - 670 on/off cycles per year with $\triangle T$ = 71.66 °C
  - 1340 on/off cycles per year with $\triangle T$ = 61.66 °C
  - 30 on/off cycles per year with $\triangle T$ = 10.0 °C
  - 32 °C board temperature at 2.0% of time
  - 60 °C board temperature at 1.5% of time
  - 85 °C board temperature at 2.3% of time.

- The STO is a type A safety component as defined in IEC 61508-2.
- Relevant failure modes:
  - The STO trips spuriously (safe failure)
  - The STO does not activate when requested
  - A fault exclusion on the failure mode “short circuit on printed circuit board” has been made (EN 13849-2, table D.5). The analysis is based on an assumption that one failure occurs at one time. No accumulated failures have been analyzed.
- STO response times:
  - 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
- Indication delays:
  - STO fault indication (parameter *31.22*) delay: < 500 ms
  - STO warning indication (parameter *31.22*) delay: < 1000 ms.

Abbreviations

Abbr.	Reference	Description
Cat.	EN ISO 13849-1	Classification of the safety-related parts of a control system in respect of their resistance to faults and their subsequent behavior in the fault condition, and which is achieved by the structural arrangement of the parts, fault detection and/or by their reliability. The categories are: B, 1, 2, 3 and 4.
CCF	EN ISO 13849-1	Common cause failure (%)
DC	EN ISO 13849-1	Diagnostic coverage
HFT	IEC 61508	Hardware fault tolerance
$MTTF_D$	EN ISO 13849-1	Mean time to dangerous failure: (Total number of life units) / (Number of dangerous, undetected failures) during a particular measurement interval under stated conditions
PFD_{avg}	IEC 61508	Average probability of dangerous failure on demand, that is, mean unavailability of a safety-related system to perform the specified safety function when a demand occurs
PFH	IEC 61508	Average frequency of dangerous failures per hour, that is, average frequency of a dangerous failure of a safety related system to perform the specified safety function over a given period of time
PL	EN ISO 13849-1	Performance level. Levels a…e correspond to SIL.
SC	IEC 61508	Systematic capability
SFF	IEC 61508	Safe failure fraction (%)
SIL	IEC 61508	Safety integrity level (1…3)
SILCL	IEC/EN 62061	Maximum SIL (level 1…3) that can be claimed for a safety function or subsystem
STO	IEC/EN 61800-5-2	Safe torque off
T_1	IEC 61508-6	Proof test interval. T_1 is a parameter used to define the probabilistic failure rate (PFH or PFD) for the safety function or subsystem. Performing a proof test at a maximum interval of T_1 is required to keep the SIL capability valid. The same interval must be followed to keep the PL capability (EN ISO 13849) valid. See also section *Maintenance* on page *375*.
T_M	EN ISO 13849-1	Mission time: the period of time covering the intended use of the safety function/device. After the mission time elapses, the safety device must be replaced. Note that any T_M values given cannot be regarded as a guarantee or warranty.

TÜV certificate

The TÜV certificate is available on the Internet at www.abb.com/drives/document.

Declarations of conformity

EU Declaration of Conformity

Machinery Directive 2006/42/EC

We

Manufacturer:	ABB Oy
Address:	Hiomotie 13, 00380 Helsinki, Finland.
Phone:	+358 10 22 11

declare under our sole responsibility that the following product:

Frequency converter

ACS580-01

with regard to the safety functions

- **Safe Torque Off**
- **Safe stop 1 (SS1-t, with FSPS-21 PROFIsafe module, +Q986)**

is in conformity with all the relevant safety component requirements of 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 62061:2005 + AC:2010 + A1:2013 + A2:2015	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 requirements
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

The following other standards have 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(s) referred in this Declaration of conformity fulfil(s) the relevant provisions of other European Union Directives which are notified in Single EU Declaration of conformity 3AXD10000497690.

Person authorized to compile the technical file:

Name and address: Jussi Vesti, Hiomotie 13, 00380 Helsinki, Finland.

Helsinki, March 30, 2021
Signed for and on behalf of:

Tuomo Tarula
Local Division Manager, ABB Oy

Harri Mustonen
Product Unit Manager, ABB Oy

Document number 3AXD10000302783

Declaration of Conformity

Supply of Machinery (Safety) Regulations 2008

We

Manufacturer:	ABB Oy
Address:	Hiomotie 13, 00380 Helsinki, Finland.
Phone:	+358 10 22 11

declare under our sole responsibility that the following product:

Frequency converter

ACS580-01

with regard to the safety functions

- **Safe Torque Off**
- **Safe stop 1 (SS1-t, with FSPS-21 PROFIsafe module, +Q986)**

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EN 61800-5-2:2007	Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional
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EN ISO 13849-1:2015	Safety of machinery – Safety-related parts of control systems. Part 1: General requirements
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

The following other standards have 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(s) referred in this declaration of conformity fulfil(s) the relevant provisions of other UK statutory requirements, which are notified in a single declaration of conformity 3AXD10001325742.

Person authorized to compile the technical file:

Name and address: Jussi Vesti, Hiomotie 13, 00380 Helsinki, Finland.

Helsinki, March 30, 2021
Signed for and on behalf of:

Tuomo Tarula
Local Division Manager, ABB Oy

Harri Mustonen
Product Unit Manager, ABB Oy

Document number 3AXD10001329534

14

Optional I/O extension and adapter modules

Contents of this chapter

This chapter describes how to install and start up the optional CHDI-01, CMOD-01, andCMOD-02 extension modules and CBAI-01 adapter module. The chapter also contains diagnostics and technical data.

CHDI-01 115/230 V digital input extension module

Safety instructions

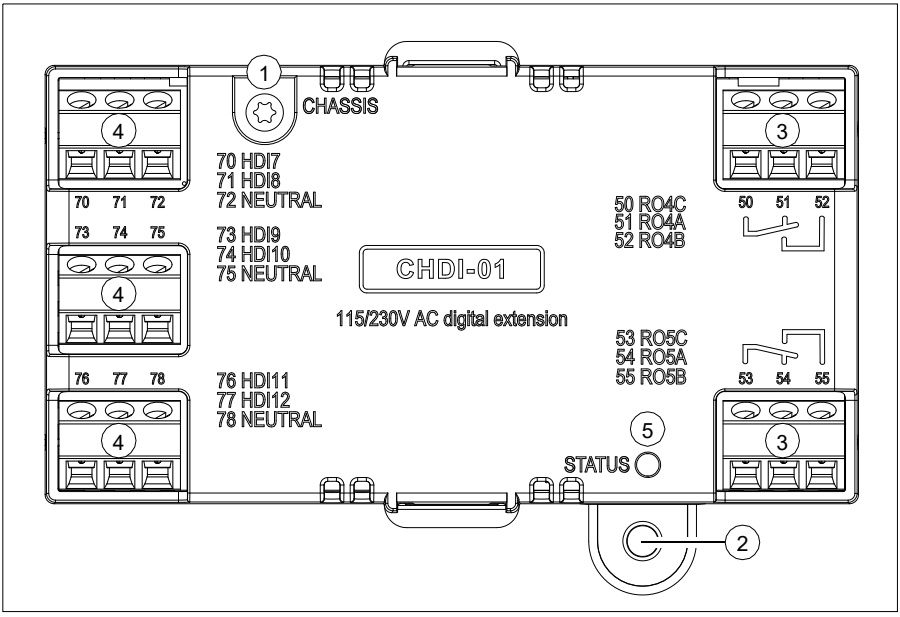
WARNING! Obey the safety instructions for the drive. If you ignore the safety instructions, injury or death can occur.

Hardware description

Product overview

The CHDI-01 115/230 V digital input extension module expands the inputs of the drive control unit. It has six high voltage inputs and two relay outputs.

Layout



Item	Description	Additional information
1	Grounding screw	-
2	Hole for mounting screw	-
3	3-pin terminal blocks for relay outputs	Page *385*
4	3-pin terminal block for 115/230 V inputs	Page *385*
5	Diagnostic LED	Page *387*

Mechanical installation

Necessary tools and instructions

- Screwdriver and a set of suitable bits.

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - CHDI-01 high voltage digital extension module
   - mounting screw.
3. Make sure that there are no signs of damage.

Installing the module

Note: Frame R1: Do not install this module before you have installed the power cables as it would cover the power terminals,

See section *Installing option modules* on page *157* (IEC) or *Installing option modules* on page *211* (North America).

Electrical installation

Warnings

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 work.

Make sure that the drive is disconnected from the input power during installation. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.

Necessary tools and instructions

- Screwdriver and a set of suitable bits
- Cabling tools

Terminal designations

For more detailed information on the connectors, see section *Technical data* on page *396*.

Relay outputs

Marking		Description
50	RO4C	Common, C
51	RO4A	Normally closed, NC
52	RO4B	Normally open, NO
53	RO5C	Common, C
54	RO5A	Normally closed, NC
55	RO5B	Normally open, NO

115/230 V inputs

Marking		Description
70	HDI7	115/230 V input 1
71	HDI8	115/230 V input 2
72	NEUTRAL[1)]	Neutral point

Marking		Description
73	HDI9	115/230 V input 3
74	HDI10	115/230 V input 4
75	NEUTRAL[1)]	Neutral point
76	HDI11	115/230 V input 5
77	HDI12	115/230 V input 6
78	NEUTRAL[1)]	Neutral point

[1)] Neutral points 72, 75 and 78 are connected.

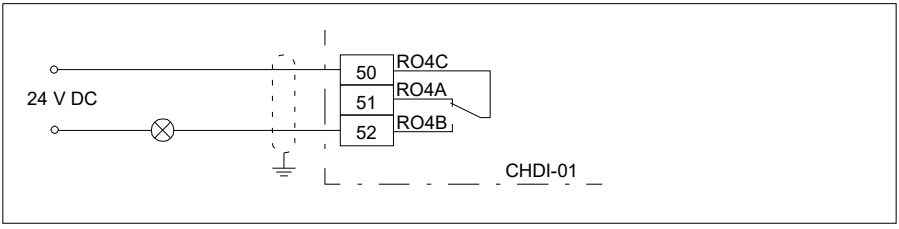
General cabling instructions

Obey the instructions given in chapter *Guidelines for planning the electrical installation* on page *81*.

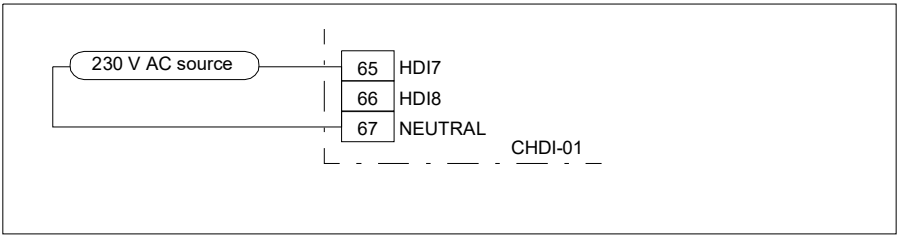
Wiring

Connect the external control cables to the applicable module terminals. Ground the outer shield of the cables 360 degrees under a grounding clamp on the grounding shelf of the control cables.

Relay output connection example



Digital input connection example



Start-up

Setting the parameters

1. Power up the drive.
2. If no warning is shown,
   - make sure that the value of both parameter 15.02 Detected extension module and parameter 15.01 Extension module type is CHDI-01.

   If warning A7AB Extension I/O configuration failure is shown,
   - make sure that the value of parameter 15.02 Detected extension module is CHDI-01.
   - set parameter 15.01 Extension module type to CHDI-01.

   You can now see the parameters of the extension module in parameter group 15 I/O extension module.
3. Set the parameters of the extension module to applicable values.

Parameter setting example for relay output

This example shows how make relay output RO4 of the extension module indicate the reverse direction of rotation of the motor with a one-second delay.

Parameter	Setting
15.07 RO4 source	Reverse
15.08 RO4 ON delay	1 s
15.09 RO4 OFF delay	1 s

Diagnostics

Faults and warning messages

Warning A7AB Extension I/O configuration failure.

LEDs

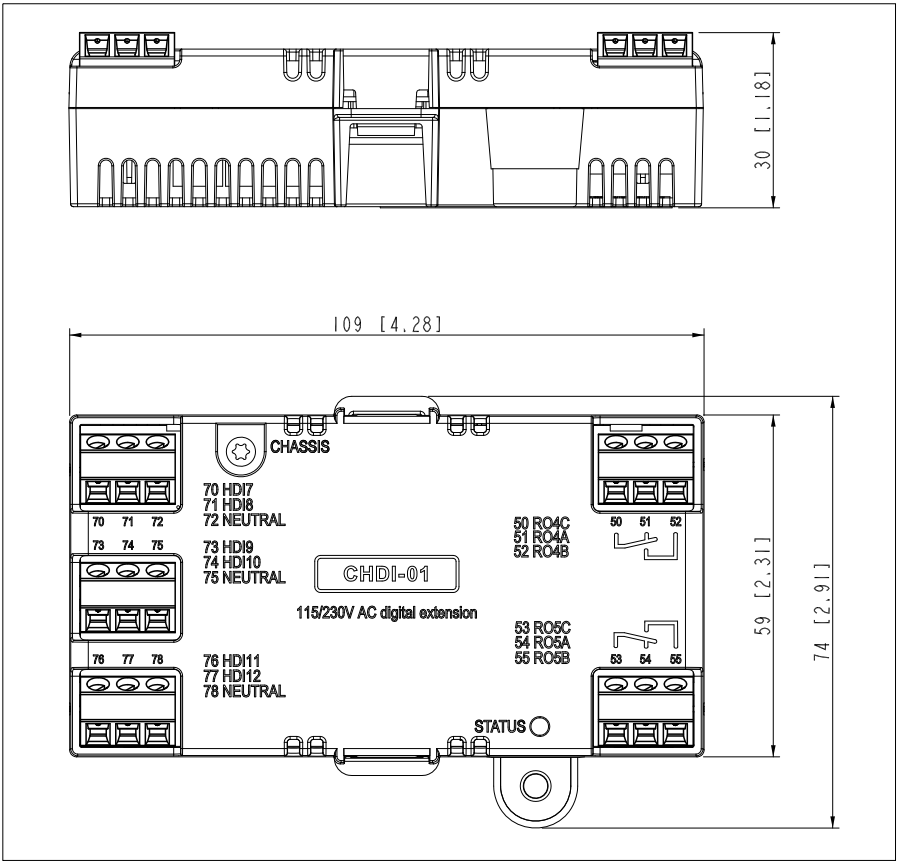
The extension module has one diagnostic LED.

Color	Description
Green	The extension module is powered up.

Technical data

Dimension drawing:

The dimensions are in millimeters and [inches].



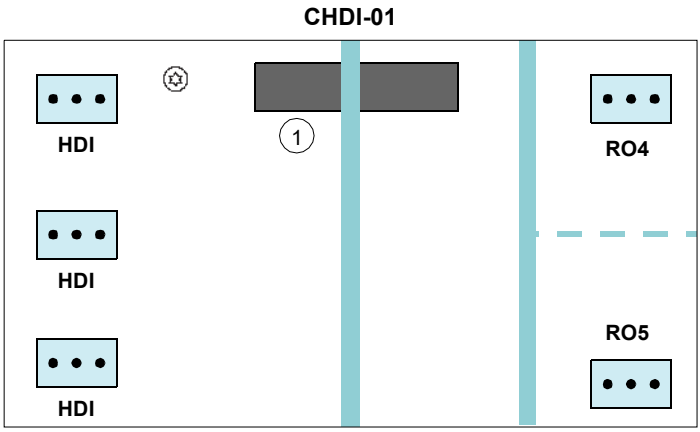
Installation: Into an option slot on the drive control unit

Degree of protection: IP20

Ambient conditions: See the drive technical data.

Package: Cardboard

Isolation areas:



Symbol	Description
1	Plugged to drive **SLOT2**
	Reinforced insulation (IEC 61800-5-1:2007)
	Functional insulation (IEC 61800-5-1:2007)

Relay outputs (50…52, 53…55):

- Wire size max. 1.5 mm^2
- Minimum contact rating: 12 V / 10 mA
- Maximum contact rating: 250 V AC / 30 V DC / 2 A
- Maximum breaking capacity: 1500 VA

115/230 V inputs (70…78):

- Wire size max. 1.5 mm^2
- Input voltage: 115…230 V AC ±10%
- Maximum current leakage in digital off state: 2 mA

CMOD-01 multifunction extension module (external 24 V AC/DC and digital I/O)

Safety instructions

WARNING! Obey the safety instructions for the drive. If you ignore the safety instructions, injury or death can occur.

Hardware description

Product overview

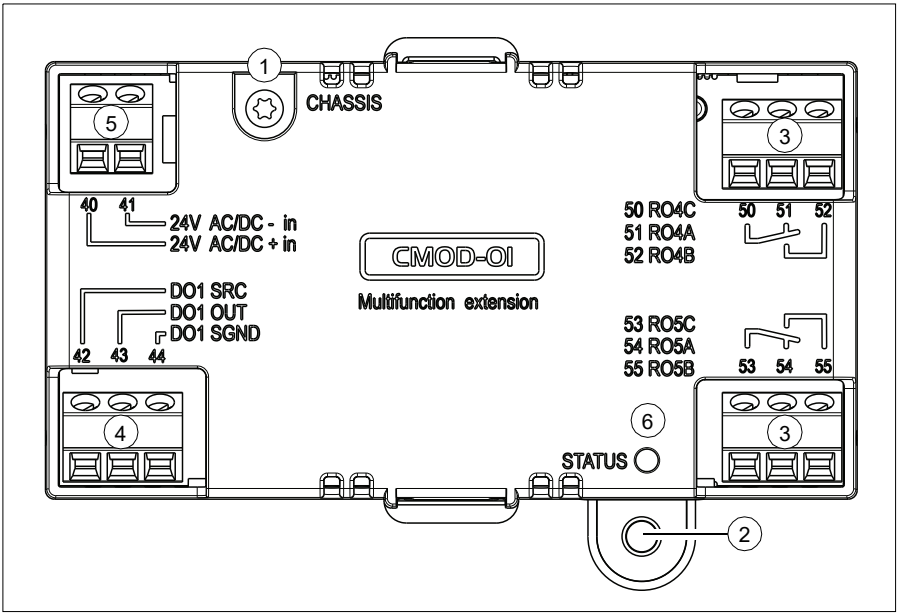
The CMOD-01 multifunction extension module (external 24 V AC/DC and digital I/O) expands the outputs of the drive control unit. It has two relay outputs and one transistor output, which can function as a digital or frequency output.

In addition, the extension module has an external power supply interface, which can be used to power up the drive control unit in case the drive power supply fails. If you do not need the back-up power supply, you do not have to connect it because the module is powered from the drive control unit by default.

Note: In frames R6…R9 do not use CMOD-01 module power terminals for external 24 V AC/DC supply. Connect the external supply directly to terminals 40 and 41 on the control unit.

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

Layout



Item	Description	Additional information
1	Grounding screw	Page *391*
2	Hole for mounting screw	Page *391*
3	3-pin terminal blocks for relay outputs	Page *392*
4	3-pin terminal block for transistor output	Page *392*
5	2-pin terminal block for external power supply	Page *392*
6	Diagnostic LED	Page *395*

Mechanical installation

Necessary tools and instructions

- Screwdriver and a set of suitable bits.

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - CMOD-01 multifunction extension module
   - mounting screw.
3. Make sure that there are no signs of damage.

Installing the module

Note: Frame R1: Do not install this module before you have installed the power cables as it would cover the power terminals,

See section *Installing option modules* on page *157* (IEC) or *Installing option modules* on page *211* (North America).

Electrical installation

Warnings

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 work.

Make sure that the drive is disconnected from the input power during installation. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.

Necessary tools and instructions

- Screwdriver and a set of suitable bits
- Cabling tools

Terminal designations

For more detailed information on the connectors, see section *Technical data* on page *396*.

Relay outputs

Marking		Description
50	RO4C	Common, C
51	RO4A	Normally closed, NC
52	RO4B	Normally open, NO
53	RO5C	Common, C
54	RO5A	Normally closed, NC
55	RO5B	Normally open, NO

Transistor output

Marking		Description
42	DO1 SRC	Source input
43	DO1 OUT	Digital or frequency output
44	DO1 SGND	Ground (earth) potential

External power supply

The external power supply is needed only if you want to connect an external back-up power supply for the drive control unit.

Note: Frames R1…R5 need CMOD-01 for connecting external power supply, frames R6…R9 have corresponding terminals 40 and 41 on the control unit.

Marking		Description
40	24V AC/DC + in	External 24 V (AC/DC) input
41	24V AC/DC - in	External 24 V (AC/DC) input

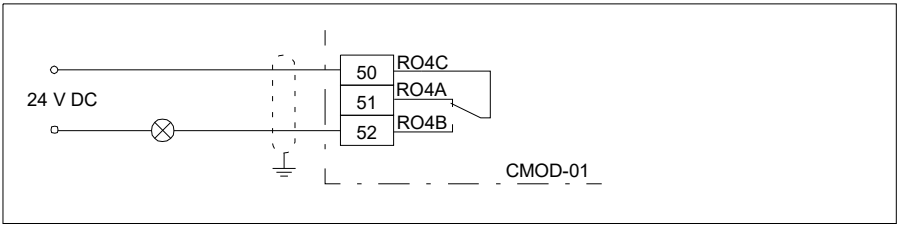
General cabling instructions

Obey the instructions given in chapter *Guidelines for planning the electrical installation* on page *81*.

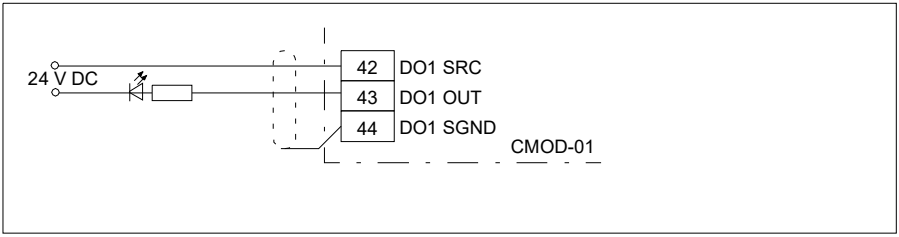
Wiring

Connect the external control cables to the applicable module terminals. Ground the outer shield of the cables 360 degrees under a grounding clamp on the grounding shelf of the control cables.

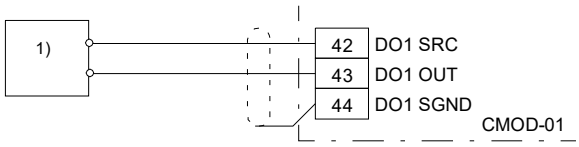
Relay output connection example



Digital output connection example

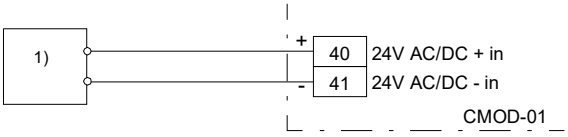


Frequency output connection example



1) An externally supplied frequency indicator which provides, for example:
- a 40 mA / 12 V DC power supply for the sensor circuit (CMOD frequency output)
- suitable voltage pulse input (10 Hz … 16 kHz).

External power supply connection example



1) External power supply, 24 V AC/DC

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

Start-up

Setting the parameters

1. Power up the drive.
2. If no warning is shown,
   - make sure that the value of both parameter 15.02 Detected extension module and parameter 15.01Extension module type is CMOD-01.

   If warning A7AB Extension I/O configuration failure is shown,
   - make sure that the value of parameter 15.02 Detected extension module is CMOD-01.
   - set parameter 15.01 Extension module type to CMOD-01.

   You can now see the parameters of the extension module in parameter group 15 I/O extension module.
3. Set the parameters of the extension module to applicable values.

Examples are given below.

Parameter setting example for relay output

This example shows how make relay output RO4 of the extension module indicate the reverse direction of rotation of the motor with a one-second delay.

Parameter	Setting
15.07 RO4 source	Reverse
15.08 RO4 ON delay	1 s
15.09 RO4 OFF delay	1 s

Parameter setting example for digital output

This example shows how to make digital output DO1 of the extension module indicate the reverse direction of rotation of the motor with a one-second delay.

Parameter	Setting
15.22 DO1 configuration	Digital output
15.23 DO1 source	Reverse
15.24 DO1 ON delay	1 s
15.25 DO1 OFF delay	1 s

Parameter setting example for frequency output

This example shows how to make digital output DO1 of the extension module indicate the motor speed 0... 1500 rpm with a frequency range of 0...10000 Hz.

Parameter	Setting
15.22 DO1 configuration	Frequency output
15.33 Freq out 1 source	01.01
15.34 Freq out 1 src min	0
15.35 Freq out 1 src max	1500.00
15.36 Freq out 1 at src min	1000 Hz
15.37 Freq out 1 at src max	10000 Hz

Diagnostics

Faults and warning messages

Warning A7AB Extension I/O configuration failure.

LEDs

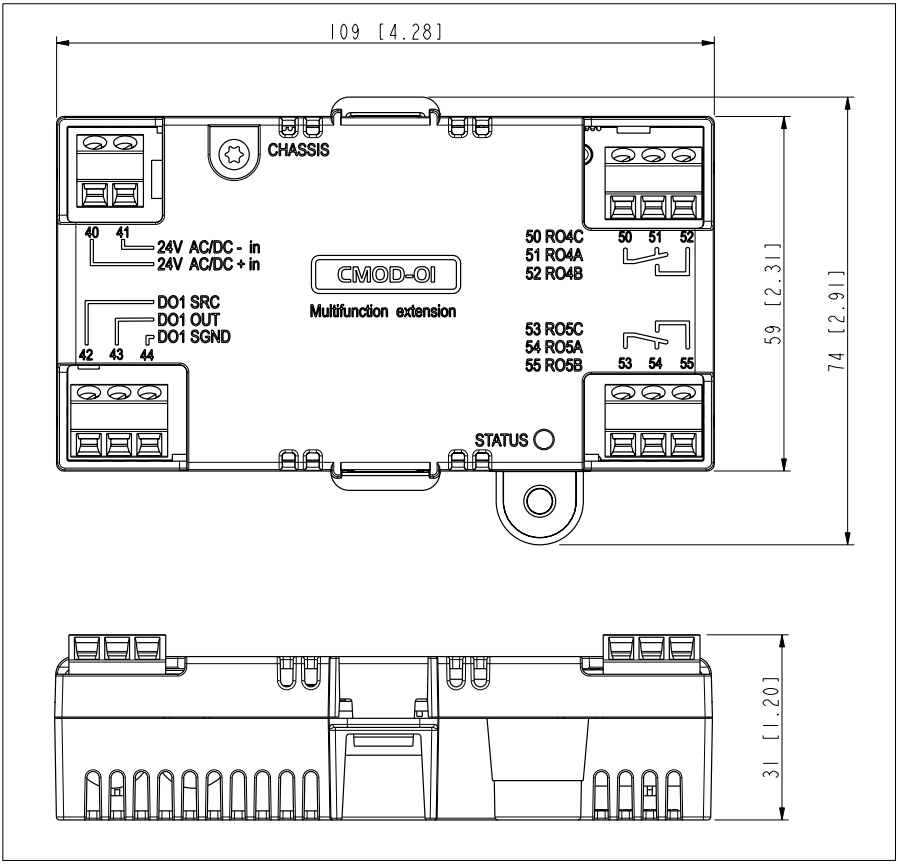
The extension module has one diagnostic LED.

Color	Description
Green	The extension module is powered up.

Technical data

Dimension drawing:

The dimensions are in millimeters and [inches].



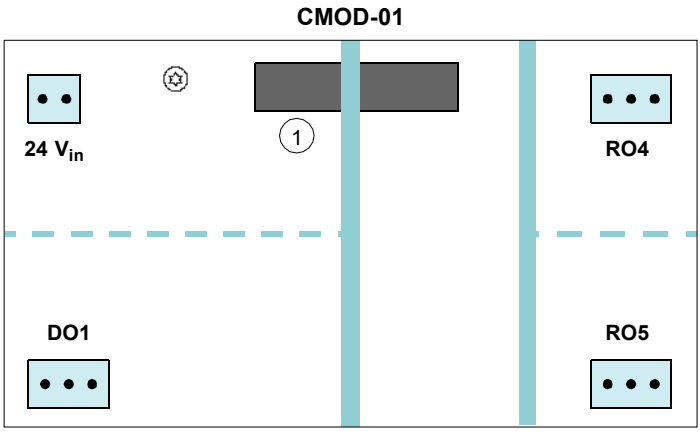
Installation: Into an option slot on the drive control unit

Degree of protection: IP20

Ambient conditions: See the drive technical data.

Package: Cardboard

Isolation areas:



Symbol	Description
1	Plugged to drive **SLOT2**
	Reinforced insulation (IEC 61800-5-1:2007)
	Functional insulation (IEC 61800-5-1:2007)

Relay outputs (50…52, 53…55):

- Wire size max. 1.5 mm^2
- Minimum contact rating: 12 V / 10 mA
- Maximum contact rating: 250 V AC / 30 V DC / 2 A
- Maximum breaking capacity: 1500 VA

Transistor output (42…44):

- Wire size max. 1.5 mm^2
- Type: Transistor output PNP
- Maximum load: 4 kohm
- Maximum switching voltage: 30 V DC
- Maximum switching current: 100 mA / 30 V DC, short-circuit protected
- Frequency: 10 Hz … 16 kHz
- Resolution: 1 Hz
- Inaccuracy: 0.2%

External power supply (40…41):

- Wire size max. 1.5 mm^2
- 24 V AC / V DC ±10% (GND, user potential)
- Maximum current consumption: 25 W, 1.04 A at 24 V DC

CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface)

Safety instructions

WARNING! Obey the safety instructions for the drive. If you ignore the safety instructions, injury or death can occur.

Hardware description

Product overview

The CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface) has a motor thermistor connection for supervising the motor temperature and one relay output, which indicates the thermistor status. The thermal relay output can be connected to Safe Torque off input to trigger the STO when CMOD-02 has detected overtemperature.

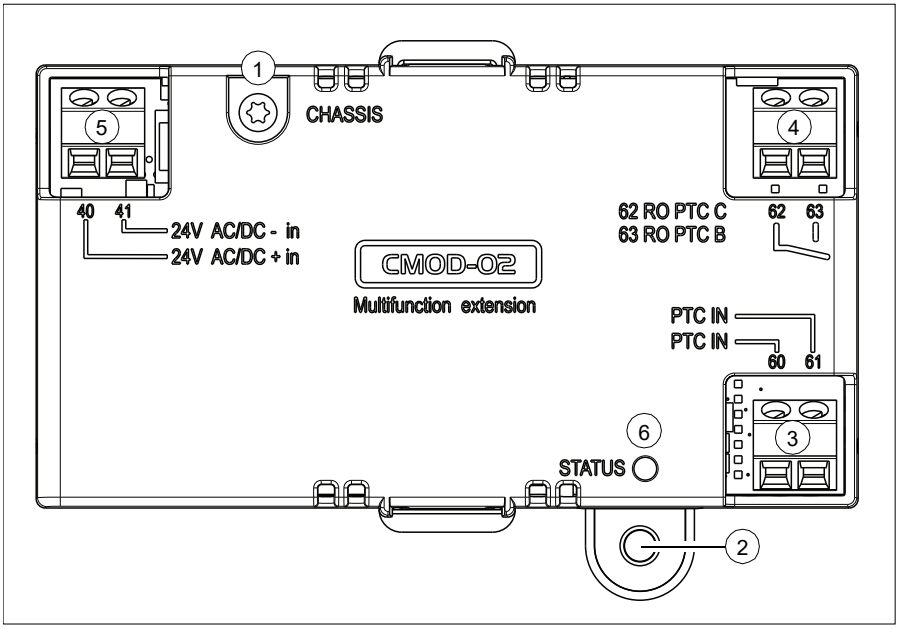
In addition, the extension module has an external power supply interface, which can be used to power up the drive control unit in case the drive power supply fails. If you do not need the back-up power supply, you do not have to connect it because the module is powered from the drive control unit by default.

There is reinforced insulation between the motor thermistor connection, the relay output and the drive control unit interface. Thus, you can connect a motor thermistor to the drive through the extension module.

Note: In frames R6…R9 do not use CMOD-01 module power terminals for external 24 V AC/DC supply. Connect the external supply directly to terminals 40 and 41 on the control unit.

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

Layout



Item	Description	Additional information
1	Grounding screw	Page *400*
2	Hole for mounting screw	Page *400*
3	2-pin terminal block for motor thermistor connection	Page *401*
4	2-pin terminal block for relay output	Page *401*
5	2-pin terminal block for external power supply	Page *401*
6	Diagnostic LED	Page *404*

Mechanical installation

Necessary tools and instructions

- Screwdriver and a set of suitable bits

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - CMOD-02 multifunction extension module
   - mounting screw
3. Make sure that there are no signs of damage.

Installing the module

Note: Frame R1: Do not install this module before you have installed the power cables as it would cover the power terminals,

See section *Installing option modules* on page *157* (IEC) or *Installing option modules* on page *211* (North America).

Electrical installation

Warnings

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 work.

Make sure that the drive is disconnected from the input power during installation. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.

Necessary tools and instructions

- Screwdriver and a set of suitable bits
- Cabling tools

Terminal designations

For more detailed information on the connectors, see section *Technical data* on page *405*.

Motor thermistor connection

Marking		Description
60	PTC IN	PTC connection
61	PTC IN	Ground (earth) potential

Relay output

Marking		Description
62	RO PTC C	Common, C
63	RO PTC B	Normally open, NO

External power supply

The external power supply is needed only if you want to connect an external back-up power supply for the drive control unit.

Note: Frames R1…R5 need CMOD-01 for connecting external power supply, frames R6…R9 have corresponding terminals 40 and 41 on the control unit.

Marking		Description
40	24V AC/DC + in	External 24 V (AC/DC) input
41	24V AC/DC - in	External 24 V (AC/DC) input

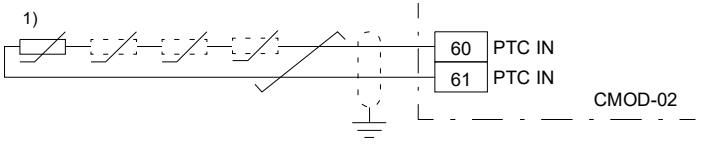
General cabling instructions

Obey the instructions given in chapter *Guidelines for planning the electrical installation* on page *81*.

Wiring

Connect the external control cables to the applicable module terminals. Ground the outer shield of the cables 360 degrees under a grounding clamp on the grounding shelf of the control cables

Motor thermistor connection example

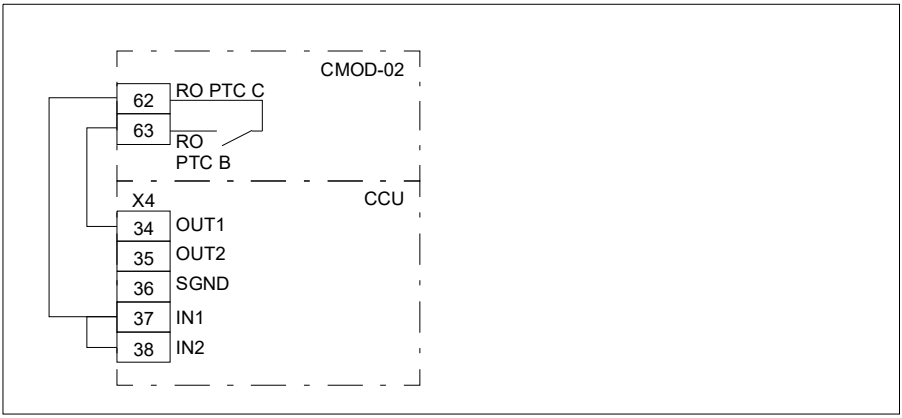


1) One or 3…6 PTC thermistors connected in series.

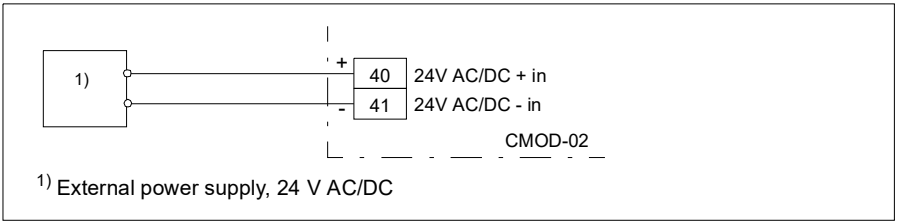
The PTC input is reinforced/double insulated. If the motor part of the PTC sensor and wiring are reinforced/double insulated, voltages on the PTC wiring are within SELV limits.

If the motor PTC circuit is not reinforced/double insulated (ie, it is basic insulated), it is mandatory to use reinforced/double insulated wiring between the motor PTC and CMOD-02 PTC terminal.

Relay output connection example



Power supply connection example



1) External power supply, 24 V AC/DC

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

Start-up

Setting the parameters

1. Power up the drive.
2. If no warning is shown,
   - make sure that the value of both parameter 15.02 Detected extension module and parameter 15.01 Extension module type is CMOD-02.

   If warning A7AB Extension I/O configuration failure is shown,
   - make sure that the value of parameter 15.02 Detected extension module is CMOD-02.
   - set parameter 15.01 Extension module type to CMOD-02.

You can now see the parameters of the extension module in parameter group 15 I/O extension module.

Diagnostics

Faults and warning messages

Warning A7AB Extension I/O configuration failure.

LEDs

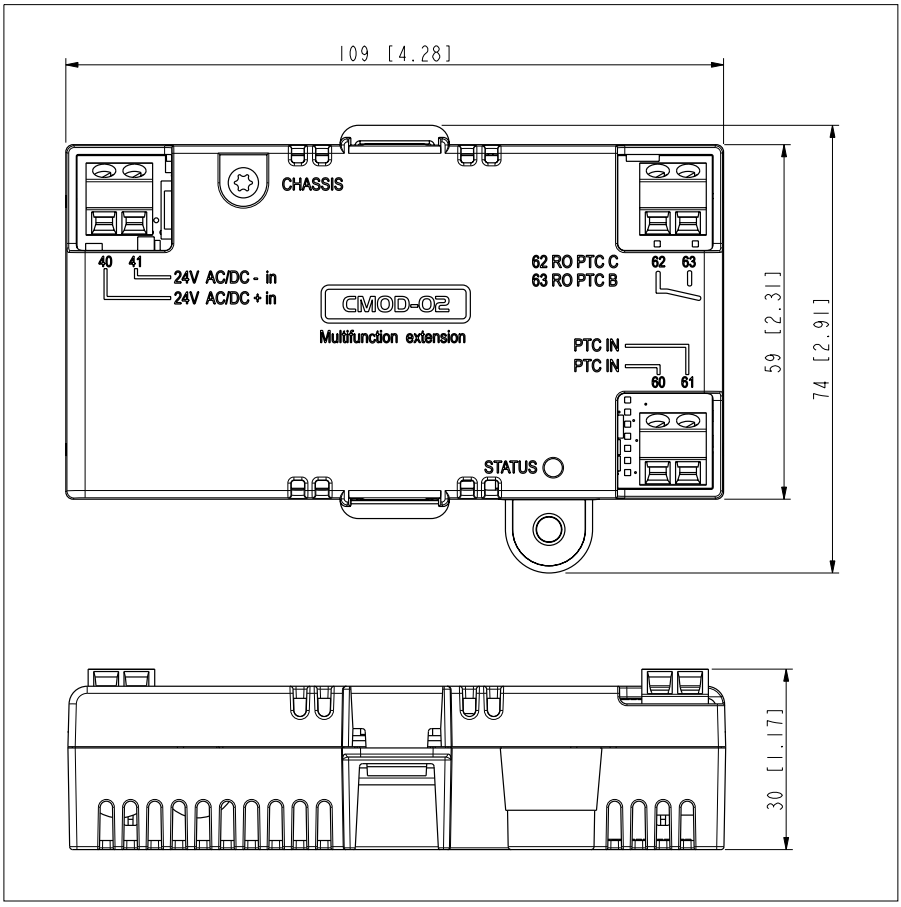
The extension module has one diagnostic LED.

Color	Description
Green	The extension module is powered up.

Technical data

Dimension drawing:

The dimensions are in millimeters and [inches].



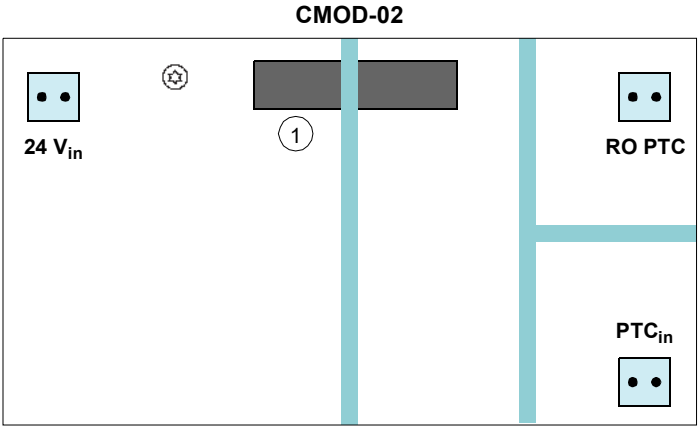
Installation: Into an option slot on the drive control unit

Degree of protection: IP20

Ambient conditions: See the drive technical data.

Package: Cardboard

Isolation areas:



Symbol	Description
1	Plugged to drive **SLOT2**
	Reinforced insulation (IEC 61800-5-1:2007)
	Functional insulation (IEC 61800-5-1:2007)

Motor thermistor connection (60…61):

- Wire size max. 1.5 mm^2
- Supported standards: DIN 44081 and DIN 44082
- Number of PTC thermistor relays: 1 or 3…6 in series
- Triggering threshold: 3.6 kohm ±10%
- Recovery threshold: 1.6 kohm ±10%
- PTC terminal voltage: $\leq$ 5.0 V
- PTC terminal current: < 1 mA
- Short-circuit detection: < 50 ohm ±10%

Relay output (62…63):

- Wire size max. 1.5 mm^2
- Maximum contact rating: 250 V AC / 30 V DC / 5 A
- Maximum breaking capacity: 1000 VA

External power supply (40…41):

- Wire size max. 1.5 mm^2
- 24 V AC / V DC ±10% (GND, user potential)
- Maximum current consumption: 25 W, 1.04 A at 24 V DC

CBAI-01 bipolar analog IO adapter module

Safety instructions

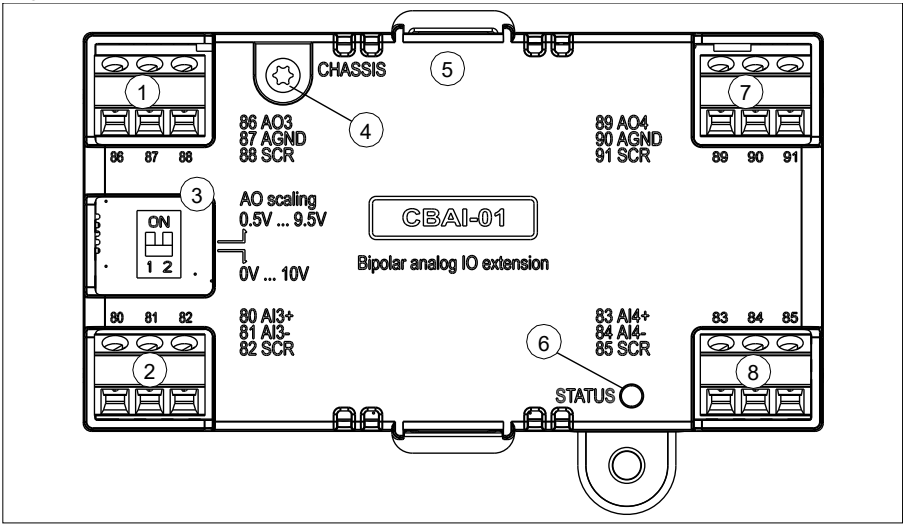
WARNING! Obey the safety instructions for the drive. If you ignore the safety instructions, injury or death can occur.

Hardware description

Product overview

The CBAI-01 transforms up to two bipolar analog inputs (eg. -10…+10 V) to respective unipolar analog inputs 0…+10 V. It includes two bipolar analog inputs, two unipolar analog outputs, and a switch which can be used to select scaling of the analog output level.

Layout



Item	Description	Additional information
1	Analog output 3	Page *409*
2	Analog input 3	Page *409*
3	Analog output scale switch	Page *414*
4	Grounding hole	-
5	Control unit interface (slot 2)	-
6	Diagnostic LED	Page *412*
7	Analog output 4	Page *409*
8	Analog input 4	Page *409*

Mechanical installation

Necessary tools and instructions

- Screwdriver and a set of suitable bits.

Unpacking and examining the delivery

1. Open the option package. Make sure that the package contains:
   - CBAI-01 bipolar analog IO adapter module
   - mounting screw.
2. Make sure that there are no signs of damage.

Installing the module

Note: Frame R1: Do not install this module before you have installed the power cables as it would cover the power terminals,

See section *Installing option modules* on page *157* (IEC) or *Installing option modules* on page *211* (North America).

Electrical installation

Warnings

WARNING! Obey the instructions in chapter *Safety instructions* on page *15*. 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 work.

Make sure that the drive is disconnected from the input power during installation. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.

Necessary tools and instructions

- Screwdriver and a set of suitable bits
- Cabling tools

Terminal designations

For more detailed information on the connectors, see section *Technical data* on page *413*.

Analog inputs

Marking		Description
80	AI3+	Analog input positive signal
81	AI3-	Analog input negative signal
82	SCR	Cable shield connection (routed directly to output SCR)
83	AI4+	Analog input positive signal
84	AI4-	Analog input negative signal
85	SCR	Cable shield connection (routed directly to output SCR)

Analog outputs

Marking		Description
86	AO3	Analog output signal
87	AGND	Analog ground potential
88	SCR	Cable shield connection (routed directly to input SCR)

89	AO4	Analog output signal
90	AGND	Analog ground potential
91	SCR	Cable shield connection (routed directly to input SCR)

General cabling instructions

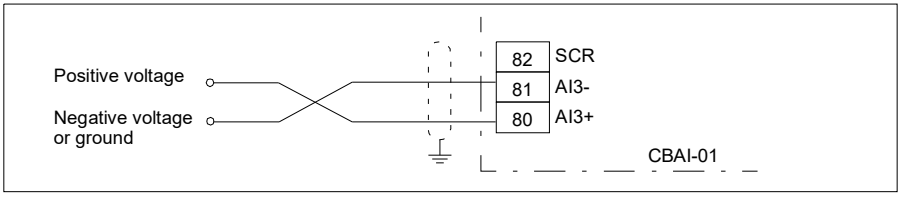
Obey the instructions given in chapter *Guidelines for planning the electrical installation* on page *81*.

Wiring

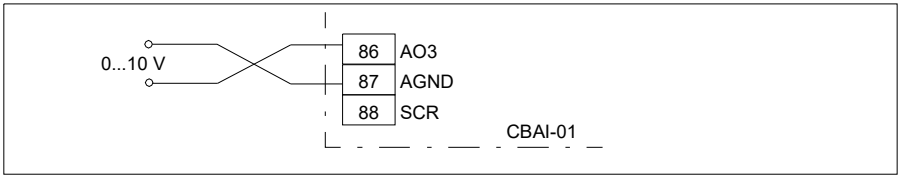
Connect the external control cables to the applicable module terminals. Ground the outer shield of the cables 360 degrees under a grounding clamp on the grounding shelf of the control cables.

Note: Do not connect both ends of the cable shields directly to ground.

Analog input connection example

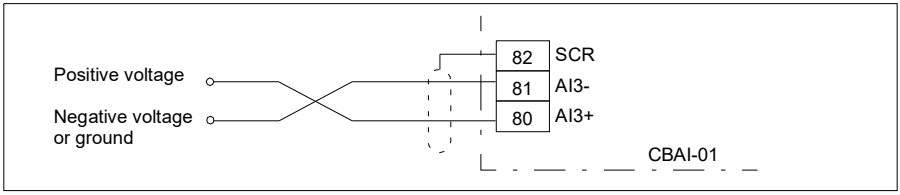


Analog output connection example

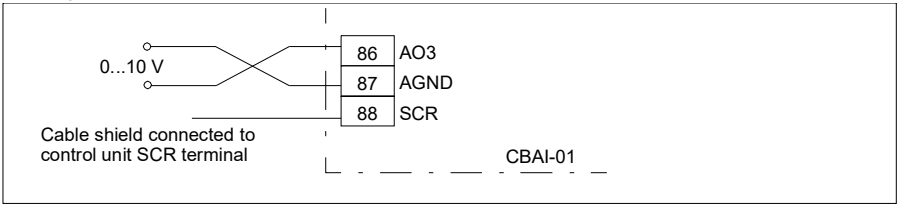


An alternative way to make the connection is to connect the cable shield to the SCR terminal of the control unit.

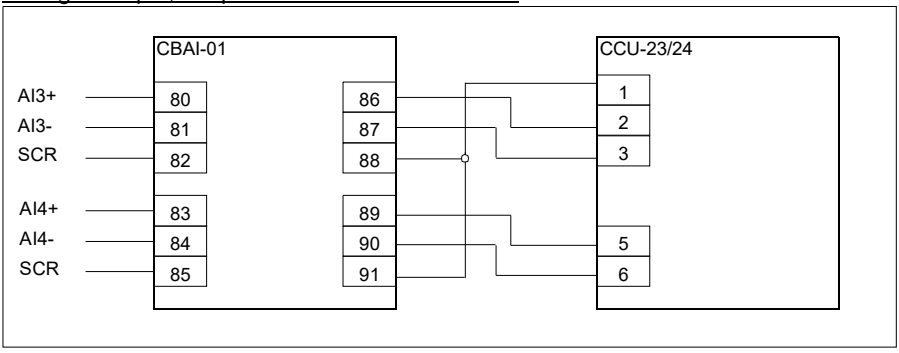
Analog input connection example 2



Analog output connection example 2



Wiring example, adapter module and control unit



Start-up

Setting the parameters

1. Power up the drive.
2. Verify that the diagnostic LED is on.

Parameter setting example for AI1 (control unit)

This example shows how to set the control unit parameters for a bipolar speed reference ranging from -50…50 Hz, with detection of a wire break between the adapter module and the control unit of the drive.

Parameter	Setting	Default
12.17 AI1 min	0.5 V	4.000 mA or 0.000 V
12.18 AI1 max	9.5 V	20.000 mA or 10.000 V
12.19 AI1 scaled at AI1 min	-50	0.000
12.20 AI1 scaled at AI1 max	50	50

32.05 Supervision 1 function	Low	Disabled
32.06 Supervision 1 action	Fault	No action
32.07 Supervision 1 signal	AI1	Frequency
32.09 Supervision 1 low	0.4	0.00

Diagnostics

LEDs

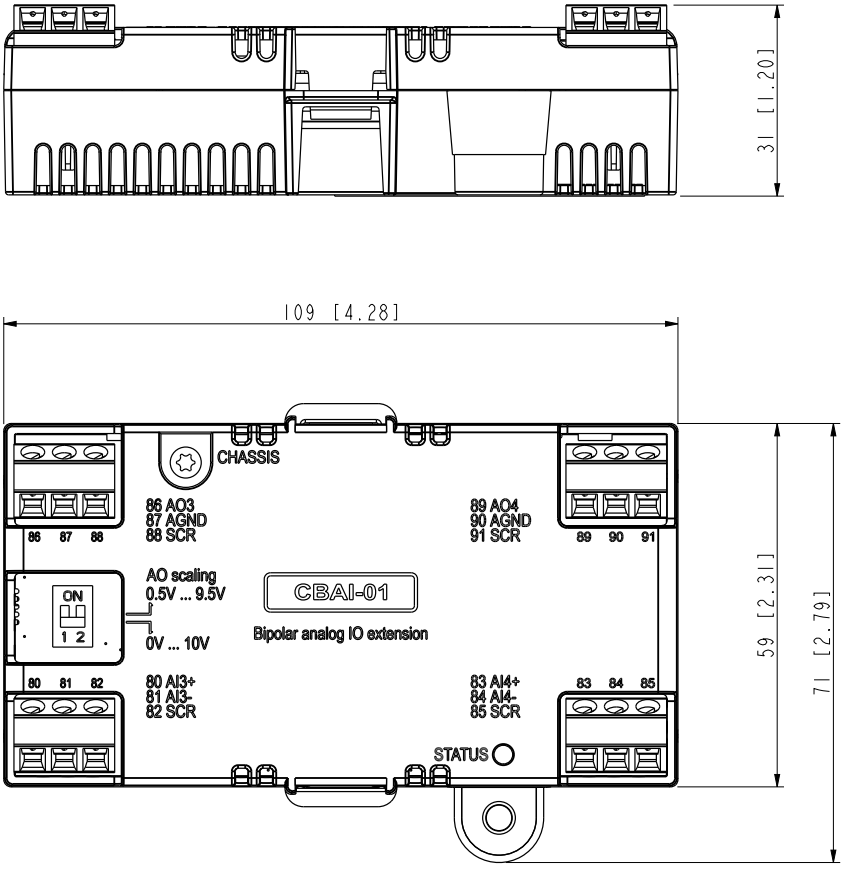
The adapter module has one diagnostic LED.

Color	Description
Green	The adapter module is powered up.

Technical data

Dimension drawing

The dimensions are in millimeters and [inches].



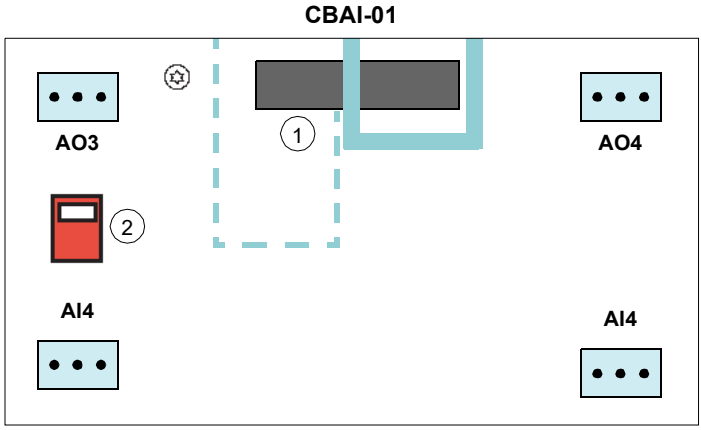
Installation: Into an option slot on the drive control unit

Degree of protection: IP20

Ambient conditions: See the drive technical data.

Package: Cardboard

Isolation areas:



Symbol	Description
1	Plugged to drive **SLOT2**
2	**SWITCH**
	Reinforced insulation (IEC 61800-5-1:2007)
	Functional insulation (IEC 61800-5-1:2007)

Analog inputs (80...82, 83...85)

- Wire size max. 1.5 mm^2
- Input voltage (AI+ and AI-): -10 V … +10 V
- Input resistance: > 200 kohm
- Optional cable shield connection

Analog outputs (86...88, 89...91)

- Wire size max. 1.5 mm^2
- Output voltage (AO and AGND): 0 V … 10 V
- Output resistance: < 20 ohm
- Recommended load: > 10 kohm
- Inaccuracy: typical ± 1%, max. ± 1.5% of full scale
- Optional cable shield connection

Analog output scale switch

- ON state: 0.5 V … 9.5 V range in use
- OFF state: 0 V … 10 V range in use

15

Common mode, d*u*/d*t* and sine filters

Content of this chapter

This chapter describes how to select external filters for the drive.

Common mode filters

When is a common mode filter needed?

See section *Examining the compatibility of the motor and drive*, page *83*.

Common mode filter kits are available from ABB, see the table on page *416*. A kit includes three wound cores. For installation instructions of the cores, see the instruction included in the core package.

d*u*/d*t* filters

When is a d*u*/d*t* filter needed?

See section *Examining the compatibility of the motor and drive*, page *83*.

See the table of d*u*/d*t* filters on page *416*.

Common mode filter types

IEC ratings at U_n = 400 V and 480 V, UL (NEC) ratings at U_n = 480 V

For common mode filters for smaller types, contact your local representative.

Type ACS580 -01-	Common mode filters ABB drives	Frame size	North American type ACS580-01
062A-4	64315811	R4	052A-4
073A-4	64315811	R4	065A-4
088A-4	64315811	R5	078A-4
106A-4	64315811	R5	096A-4
145A-4	3AXD50000017269	R6	124A-4
169A-4	3AXD50000017270	R7	156A-4
206A-4	3AXD50000017270	R7	180A-4
246A-4	3AXD50000018001	R8	240A-4
293A-4	3AXD50000018001	R8	260A-4
363A-4	3AXD50000017940	R9	361A-4
430A-4	3AXD50000017940	R9	414A-4

d*u*/d*t* filter types

IEC ratings at U_n = 230 V, UL (NEC) ratings at U_n = 208/230 V

Type ACS580 -01-	d*u*/d*t* filters ABB drives	Frame size	North American type ACS580-01
04A7-2	NOCH0016-6x	R1	04A6-2
06A7-2	NOCH0016-6x	R1	06A6-2
07A6-2	NOCH0016-6x	R1	07A5-2
012A-2	NOCH0016-6x	R1	10A6-2
018A-2	NOCH0016-6x	R1	017A-2
025A-2	NOCH0030-6x	R2	024A-2
032A-2	NOCH0030-6x	R2	031A-2
047A-2	NOCH0070-6x	R3	046A-2
060A-2	NOCH0070-6x	R3	059A-2
-	NOCH0070-6x	R4	075A-2
089A-2	NOCH0070-6x	R5	088A-2
115A-2	NOCH0120-6x	R5	114A-2
144A-2	FOCH0260-70	R6	143A-2
171A-2	FOCH0260-70	R7	169A-2
213A-2	FOCH0260-70	R7	211A-2
276A-2	FOCH0260-70	R8	273A-2

IEC ratings at U_n = 400 V and 480 V, UL (NEC) ratings at U_n = 480 V

Type ACS580 -01-	*du/dt* filters ABB drives	Frame size	North American type ACS580-01
02A7-4	NOCH0016-6x	R1	02A1-4
03A4-4	NOCH0016-6x	R1	03A0-4
04A1-4	NOCH0016-6x	R1	03A5-4
05A7-4	NOCH0016-6x	R1	04A8-4
07A3-4	NOCH0016-6x	R1	06A0-4
09A5-4	NOCH0016-6x	R1	07A6-4
12A7-4	NOCH0016-6x	R1	012A-4
018A-4	NOCH0016-6x or NOCH0030-6x	R2	014A-4
026A-4	NOCH0030-6x	R2	023A-4
033A-4	NOCH0070-6x	R3	027A-4
039A-4	NOCH0070-6x	R3	034A-4
046A-4	NOCH0070-6x	R3	044A-4
062A-4	NOCH0070-6x	R4	052A-4
073A-4	NOCH0070-6x or NOCH0120-6x	R4	065A-4
088A-4	NOCH0120-6x	R5	078A-4
106A-4	NOCH0120-6x	R5	096A-4
145A-4	FOCH0260-70	R6	124A-4
169A-4	FOCH0260-70	R7	156A-4
206A-4	FOCH0260-70	R7	180A-4
246A-4	FOCH0260-70	R8	240A-4
293A-4	FOCH0260-70	R8	260A-4
363A-4	FOCH0320-50	R9	361A-4
430A-4	FOCH0320-50	R9	414A-4

Description, installation and technical data of the FOCH filters

See *FOCH du/dt filters hardware manual* (3AFE68577519 [English]).

Description, installation and technical data of the NOCH filters

See *AOCH and NOCH du/dt filters hardware manual* (3AFE58933368 [English]).

Sine filters

Selecting a sine filter for the drive

IEC ratings at U_n = 400 V and 480 V, UL (NEC) ratings at U_n = 480 V

Type ACS580 -01-	Sine filter type		Frame size	North American type ACS580-01
	IP00	IP20		
02A7-4	B84143V0006R231	B84143V0004R229 + B84143Q0002R229	R1	02A1-4
03A4-4	B84143V0006R231	B84143V0004R229 + B84143Q0002R229	R1	03A0-4
04A1-4	B84143V0006R231	B84143V0004R229 + B84143Q0002R229	R1	03A5-4
05A7-4	B84143V0006R231	B84143V0006R229 + B84143Q0002R229	R1	04A8-4
07A3-4	B84143V0007R231	B84143V0011R229 + B84143Q0004R229	R1	06A0-4
09A5-4	B84143V0012R231	B84143V0011R229 + B84143Q0004R229	R1	07A6-4
12A7-4	B84143V0012R231	B84143V0016R229 + B84143Q0006R229	R1	012A-4
018A-4	B84143V0016R229	B84143V0016R229 + B84143Q0006R229	R2	014A-4
026A-4	B84143V0038R231	B84143V0025R229 + B84143Q0008R229	R2	023A-4
033A-4	B84143V0038R231	B84143V0033R229 + B84143Q0008R229	R3	027A-4
039A-4	B84143V0038R231	B84143V0050R229 + B84143Q0010R229	R3	034A-4
046A-4	B84143V0043R231	B84143V0050R229 + B84143Q0010R229	R3	044A-4
062A-4	B84143V0064R231	B84143V0066R229 + B84143Q0010R229	R4	052A-4
073A-4	B84143V0064R231	B84143V0066R229 + B84143Q0010R229	R4	065A-4
088A-4	B84143V0077R231	B84143V0095R229 + B84143Q0012R229	R5	078A-4
106A-4	B84143V0091R231	B84143V0095R229 + B84143Q0012R229	R5	096A-4
145A-4	B84143V0145R231	B84143V0162S229 + B84143Q0014R229	R6	124A-4
169A-4	B84143V0209R231	B84143V0162S229 + B84143Q0014R229	R7	156A-4
206A-4	B84143V0209R231	B84143V0230S229 + B84143Q0016R229	R7	180A-4

Type ACS580 -01-	Sine filter type		Frame size	North American type ACS580-01
	IP00	IP20		
246A-4	B84143V0209R231	B84143V0230S229 + B84143Q0016R229	R8	240A-4
293A-4	B84143V0249R231	B84143V0390S229 + B84143Q0018R229	R8	260A-4
363A-4	B84143V0390S229	B84143V0390S229 + B84143Q0018R229	R9	361A-4
430A-4	B84143V0390S229	B84143V0390S229 + B84143Q0018R229	R9	414A-4

Description, installation and technical data

See *Sine filters hardware manual* (3AXD50000016814 [English]).

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

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Your comments on our manuals are welcome. Navigate to new.abb.com/drives/manuals-feedback-form.

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3AXD50000044794 Rev C (EN) 2021-07-19