ABB INDUSTRIAL DRIVES

ACS880-01 drives (0.55 to 250 kW, 0.75 to 350 hp)

Hardware manual

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ACS880-01 drives
(0.55 to 250 kW, 0.75 to 350 hp)

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1

Safety instructions

Contents of this chapter

This chapter contains the safety instructions which you must obey when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive, motor or driven equipment. Read the safety instructions before you work on the unit.

Use of warnings and notes in this manual

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment and advise on how to avoid the danger. The following warning symbols are used in this manual:

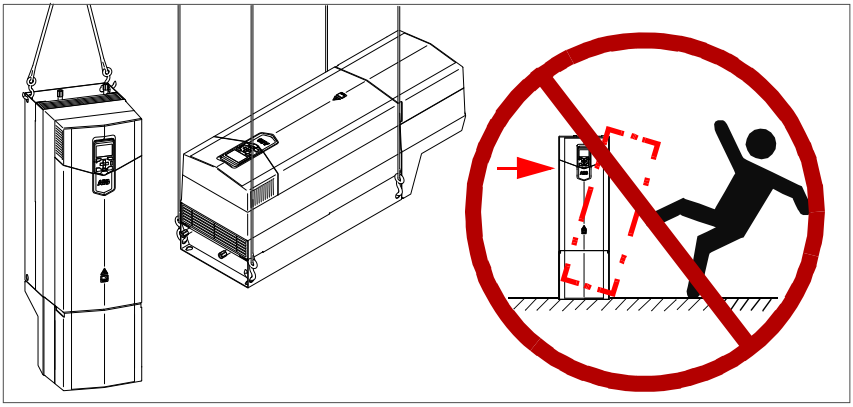
Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.
General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.
Electrostatic sensitive devices warning warns of electrostatic discharge which can damage the equipment.

General safety in installation, start-up and maintenance

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

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

- Use safety shoes with a metal toe cap to avoid foot injury. Wear protective gloves and long sleeves. Some parts have sharp edges.
- Handle the unit carefully.
- For frame sizes R6 to R9: Lift the drive using the lifting eyes of the unit. Do not tilt the drive. **The drive is heavy and its center of gravity is high.**



- Beware of hot surfaces. Some parts, such as heatsinks of power semiconductors, remain hot for a while after disconnection of the electrical supply.
- Keep the drive in its package or protect it from dust and metal shavings from drilling and grinding until you install it. Protect the installed drive against dust and metal shavings. Electrically conductive debris inside the drive can cause damage or malfunction.
- Vacuum clean the area below the drive before the start-up to prevent the drive cooling fan from drawing the dust inside the drive.
- Do not cover the air inlet and outlet when the drive runs.
- Make sure that there is sufficient cooling. See sections *Examining the installation site* on page *45* and *Losses, cooling data and noise* on page *212* for more information.

- Before you connect voltage to the drive, make sure that the drive covers are on. Keep the covers on during the operation.
- Before you adjust the drive operation limits, make sure that the motor and all driven equipment can operate throughout the set operation limits.
- Before you activate the automatic fault reset or automatic restart functions of the drive control program, make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault or supply break. If these functions are activated, the installation must be clearly marked as defined in IEC/EN 61800-5-1, subclause 6.5.3, for example, "THIS MACHINE STARTS AUTOMATICALLY".
- The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors.
- Make sure that any safety circuits (for example, emergency stop and Safe torque off) are validated in start-up. See chapter *Start-up* for reference of the validation instructions.

Note:

- Do not control the motor with the disconnector at the drive power supply; instead, use the control panel start and stop keys or commands through the I/O terminals of the drive.
- If you select an external source for start command and it is ON, the drive will start immediately after an input voltage break or fault reset unless the drive is configured for 3-wire (a pulse) start/stop.
- Depending on the wiring and parametrization of the drive, the stop key on the control panel may not stop the drive.
- Only authorized persons are allowed to repair a malfunctioning drive.

Electrical safety in installation, start-up and maintenance

Precautions before electrical work

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

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

1 Clearly identify the work location.

2 Disconnect all possible voltage sources. Lock and tag.
- Open the main disconnector at the power supply of the drive.
- Make sure that reconnection is not possible.
- Disconnect any external power sources from the control circuits.
- After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.

Never work on the drive, motor cable or motor when main power is applied. 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.

3 Protect any other energized parts in the work location against contact.

4 Take special precautions when close to bare conductors.

5 Measure that the installation is de-energized.
- Use a multimeter with an impedance of at least 1 Mohm.
- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding terminal (PE) is close to 0 V.
- Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) is close to 0 V.

6 Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.

7 Install temporary grounding as required by the local regulations.

8 Ask for a permit to work from the person in control of the electrical installation work.

Additional instructions and notes

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

- A drive with EMC filter options +E200 or +E202 connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, check if you must disconnect the EMC filter. See sections *When to disconnect EMC filter (options +E200 and +E202) or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *106* and *Guidelines for installing the drive to a TT system* on page *107*.

  WARNING! Do not install the drive with EMC filter options +E200 and +E202 connected to a system that the filter is not suitable for. This can cause danger, or damage the drive.

  Note: When EMC filter +E200 and +E202 is disconnected, the drive EMC compatibility is considerably reduced.

- A drive with the ground-to-phase varistor connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, check if you must disconnect the varistor. See sections *When to disconnect EMC filter (options +E200 and +E202) or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *106* and *Guidelines for installing the drive to a TT system* on page *107*.

  WARNING! Do not install the 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.

- Do not make any insulation or voltage withstand tests on the drive.

Note:

- The motor cable terminals on the drive are at a dangerously high voltage when the input power is on, regardless of whether the motor is running or not.
- The DC terminals (UDC+, UDC-) carry a dangerous DC voltage (over 500 V) when internally connected to the intermediate DC circuit.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the terminals of relay outputs (XRO1, XRO2 and XRO3).
- The Safe torque off function does not remove the voltage from the main and auxiliary circuits. The function is ineffective against deliberate sabotage or misuse.

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

Grounding

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

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

- If you are not a qualified electrical professional, do not do grounding work.
- Always ground the drive, the motor and adjoining equipment to the protective earth (PE) bus of the power supply. This is necessary for the personnel safety. Correct grounding also reduces electromagnetic emission and interference.
- Make sure that the conductivity of the protective earth (PE) conductors is sufficient. See section *Selecting the power cables* on page *77*. Obey the local regulations.
- In a multiple-drive installation, connect each drive separately to protective earth (PE) bus of the power supply.
- Connect the power cable shields to the protective earth (PE) terminals of the drive.
- Make a 360° grounding of the power and control cable shields at the cable entries to suppress electromagnetic disturbances.

Note:

- You can use power cable shields as grounding conductors only when their conductivity is sufficient.

- Standard EN 61800-5-1 (section 4.3.5.5.2.) and UL 68100-5-1 require that as the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth (PE) connection. In addition,
  - install a second protective earth conductor of the same cross-sectional area as the original protective earthing conductor,

  or
  - install a protective earth conductor with a cross-section of at least 10 mm^2 Cu or 16 mm^2 Al,

  or
  - install a device which automatically disconnects the supply if the protective earth conductor breaks.

Additional instructions for permanent magnet motor drives

Safety in installation, start-up and maintenance

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

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

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

Before installation and maintenance work on the drive:

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

  Start-up and operation:
  - Make sure that the operator cannot run the motor over the rated speed. Motor overspeed causes overvoltage that can damage or destroy the capacitors in the intermediate circuit of the drive.

2

Introduction to the manual

Contents of this chapter

This chapter describes the manual. It contains a flowchart of steps for checking the delivery, installing and starting up the drive. The flowchart refers to chapters/sections in this manual and to other manuals.

Applicability

The manual applies to the ACS880-01 drives.

Target audience

This manual is intended for people who plan the installation, install, start-up, use and service the drive. Read the manual before working on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

The manual is written for readers worldwide. Both SI and imperial units are shown. Special instructions for installations in North America are given.

Purpose of the manual

This manual contains the instructions and information for the basic drive configuration. The chapters of the manual are briefly described below.

Contents of the manual

Safety instructions gives safety instructions for the installation, start up, operation and maintenance of the drive.

Introduction to the manual introduces the manual.

Operation principle and hardware description describes the drive.

Mechanical installation describes how to install the basic drive mechanically.

Guidelines for planning the electrical installation contains instructions for the motor and cable selection, protections and cable routing.

Electrical installation gives instructions on wiring the drive.

Installation checklist contains a list for checking the mechanical and electrical installation of the drive.

Start-up describes the start-up procedure of the drive.

Fault tracing describes the fault tracing of the drive.

Maintenance contains preventive maintenance instructions.

Technical data contains the technical specifications of the drive, eg, the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings.

Dimension drawings contains dimension drawings of the drives and auxiliary components.

The Safe torque off function describes the Safe torque off function of the drive and gives instructions on its implementing.

Resistor braking describes selection, protection and wiring of brake choppers and resistors. The chapter also contains technical data.

Common mode, du/dt and sine filters describes selection external filters for the drive.

Related documents

Drive hardware manuals and guides	Code (English)
Drive/converter/inverter safety instructions	*3AXD50000037978*
ACS880-01 drives hardware manual	*3AUA0000078093*
ACS880-01 quick installation guide for frames R1 to R3	*3AUA0000085966*
ACS880-01 quick installation guide for frames R4 and R5	*3AUA0000099663*
ACS880-01 quick installation guide for frames R6 to R9	*3AUA0000099689*
ACS880-01 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement	*3AUA0000145446*
ACS880-01 +N7502 drives for SynRM motors (0.8 to 200 kW) supplement	*3AXD50000029482*
ACS880-01 assembly drawings for cable entry boxes of IP21 frames R5 to R9	*3AUA0000119627*

ACS880-01, ACS580-01, ACH580-01, ACQ580-01 UK gland plate (+H358) installation guide	3AXD50000034735
ACS880-01 drives and ACS880-04 drive modules common DC systems application guide	3AUA0000127818
ACS880-01/04 +C132 marine type-approved drives supplement	3AXD50000010521
ACx-AP-x assistant control panels user's manual	3AUA0000085685
Vibration dampers for ACS880-01 drives (frames R4 and R5, option +C131) installation guide	3AXD50000010497
Vibration dampers for ACS880-01, ACS880-11 and ACS880-31 drives (frames R6 to R9, option +C131) installation guide	3AXD50000013389
ACS880 frames R1 to R11 EMC filter and ground-to-phase varistor disconnecting instructions	3AUA0000125152
ACS880-01…+C135 drives with flange mounting kit supplement	3AXD50000349814
Flange mounting kit quick installation guide for ACS880-01 frames R1 to R3	3AXD50000026158
Flange mounting kit quick installation guide for ACS880-01 frames R4 to R5	3AXD50000026159
Flange mounting kit quick installation guide for ACS880-01 and ACX580-01 frames R6 to R9	3AXD50000019099
Common mode filter kit for ACS880-01 drives (frame R6, option +E208) installation guide	3AXD50000015178
Common mode filter kit for frames R7 and R8, option +E208 installation guide	3AXD50000015179
Common mode filter kit for ACS880-01 drives (frame R9, option +E208) installation guide	3AXD50000015201
Converter modules capacitor reforming instructions	3BFE64059629
ACS880-01 drives recycling instructions and environmental information	3AUA0000149383

Drive firmware manuals and guides

ACS880 primary control program firmware manual	3AUA0000085967
Quick start-up guide for ACS880 drives with primary control program	3AUA0000098062

Option manuals and guides

Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

The code below opens an online listing of the manuals applicable to the product:

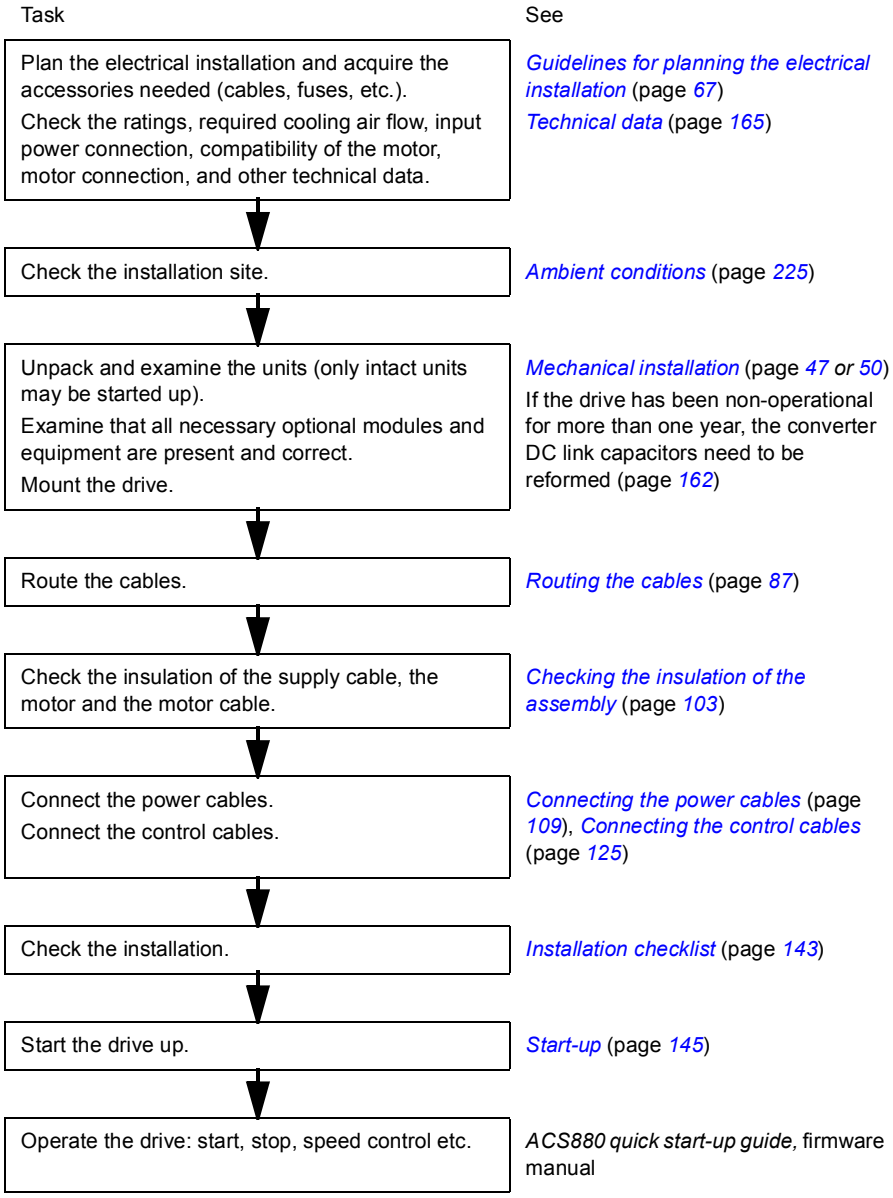
ACS880-01 manuals

Categorization by frame size and option code

The instructions, technical data and dimension drawings which concern only certain drive frame sizes are marked with the symbol of the frame size (R1, R2, etc.). The frame size is marked on the type designation label.

The instructions and technical data which concern only certain optional selections are marked with option codes (such as +E200). The options included in the drive can be identified from the option codes visible on the type designation label. The option selections are listed in section *Type designation key* on page *37*.

Quick installation and commissioning flowchart



Terms and abbreviations

Term/ Abbreviation	Explanation
DC link	DC circuit between rectifier and inverter
DC link capacitors	Energy storage which stabilizes the intermediate circuit DC voltage
DPMP-01	Control panel mounting platform (flush)
DPMP-02	Control panel mounting platform (surface)
Drive	Frequency converter for controlling AC motors
EFB	Embedded fieldbus
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EMT	Electrical metallic tubing
FAIO-01	Optional analog I/O extension module
FCAN-01	Optional FCAN-01 CANopen adapter module
FCNA-01	Optional ControlNet™ adapter module
FDCO-01/02	Optional DDCS communication module
FDIO-01	Optional digital /O extension module
FDNA-01	Optional DeviceNet™ adapter module
FECA-01	Optional EtherCAT adapter module
FEIP-21	Optional EtherNet/IP adapter module
FEN-01	Optional TTL incremental encoder interface module
FEN-11	Optional TTL absolute encoder interface module
FEN-21	Optional resolver interface module
FEN-31	Optional HTL incremental encoder interface module
FENA-21	Optional Ethernet adapter module for EtherNet/IP, Modbus TCP and PROFINET IO protocols
FEPL-02	Optional Ethernet POWERLINK adapter module
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
FMBT-21	Optional Modbus/TCP adapter module
FPBA-01	Optional PROFIBUS adapter module
FPNO-21	Optional PROFINET IO adapter module
FPTC-01	Optional thermistor protection module for ACS880 drives
FPTC-02	Optional ATEX-certified thermistor protection module for ACS880 drives
FSE-31	Optional pulse encoder interface module
FSO-12	Optional functional safety module
FSO-21	Optional functional safety module

Term/ Abbreviation	Explanation
Frame (size)	Refers to drive physical size, for example R3. The type designation label attached to the drive shows the frame of the drive, see section *Type designation key* on page *37*.
IGBT	Insulated gate bipolar transistor; a voltage-controlled semiconductor type widely used in inverters due to their easy controllability and high switching frequency.
Inverter	Converts direct current and voltage to alternating current and voltage.
I/O	Input/Output
Parameter	User-adjustable operation instruction to the drive, or signal measured or calculated by the drive
PLC	Programmable logic controller
PROFIBUS, PROFIBUS DP, PROFINET IO	Registered trademarks of PI - PROFIBUS & PROFINET International
PTC	Positive temperature coefficient (PTC) refers to materials that experience an increase in electrical resistance when their temperature is raised.
R1…R9	Frame size designation of the drive
Rectifier	Converts alternating current and voltage to direct current and voltage.
STO	Safe Torque Off. See chapter *The Safe torque off function* on page *259*.
ZCON	Control board in which the control program runs.
ZCU	Control board built in a housing. The external I/O control signals are connected to the control unit, or optional I/O extensions mounted on it.
ZGAB	Brake chopper adapter board in frames R8 to R9
ZGAD	Gate driver adapter board in frames R6 to R9
ZINT	Main circuit board
ZMU	The memory unit attached to the control unit of the drive

3

Operation principle and hardware description

Contents of this chapter

This chapter briefly describes the operation principle and construction of the drive.

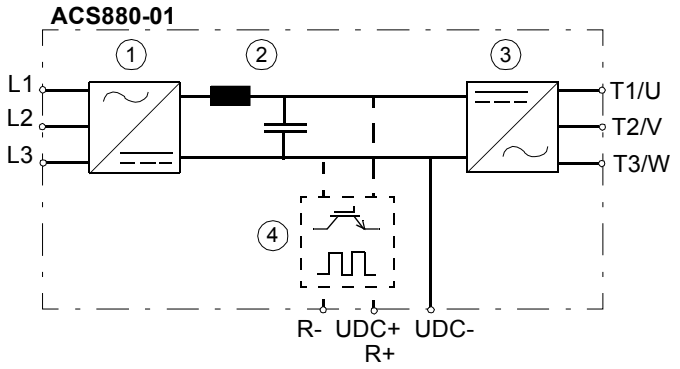
Product overview

The ACS880-01 is a drive for controlling asynchronous AC induction motors, permanent magnet synchronous motors, AC induction servomotors and ABB synchronous reluctance motors (SynRM motors).

The main cooling air fan of the drive is speed controlled and the auxiliary cooling fan on/off controlled.

Main circuit

The main circuit of the drive is shown below.



1	Rectifier. Converts alternating current and voltage to direct current and voltage.
2	DC link. DC circuit between rectifier and inverter.
3	Inverter. Converts direct current and voltage to alternating current and voltage.
4	Brake chopper. Conducts the surplus energy from the intermediate DC circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor. User obtains and installs the brake resistor when needed.

Layout (IP21, UL Type 1)

The components of the standard IP21 drive are shown below (view of frame R5).

1 Control panel
2 Front cover
3 Cable entry box
4 Four fastening points at the back of the unit
5 Heatsink
6 Lifting holes

Layout (IP55, option +B056)

The components of the IP55 drive (option +B056) are shown below (view of frame R4).

1 Control panel behind the control panel cover
2 Front cover
3 Four fastening points at the back of the unit
4 Heatsink
5 Lifting holes

Layout (UL Type 12, option +B056)

The components of the UL Type 12 drive (option +B056) are shown below (view of frame R6).

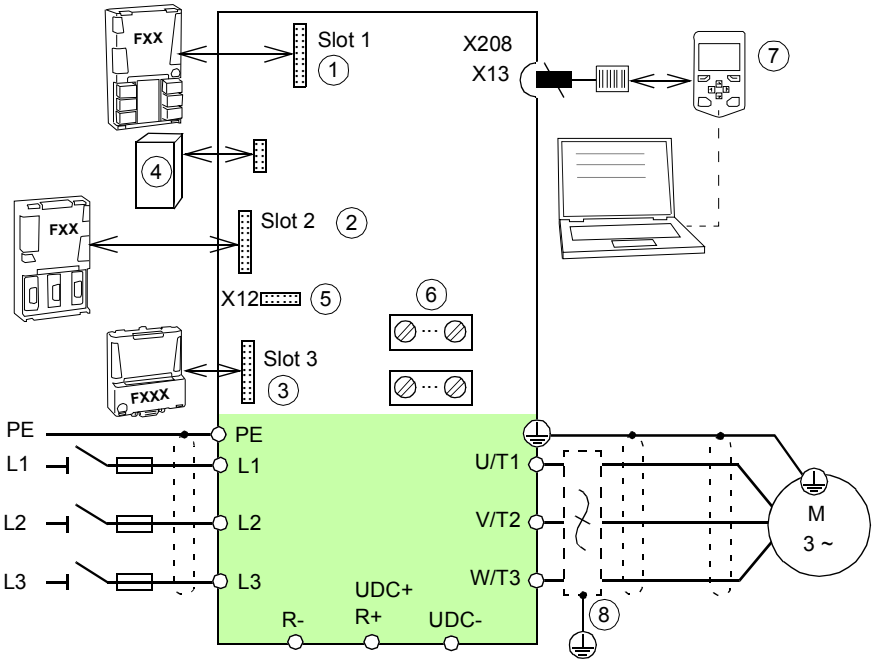
1 Control panel behind the control panel cover
2 Front cover
3 Four fastening points at the back of the drive
4 Heatsink
5 Lifting holes
6 Hood (included in frames R4 to R9)

Layout (IP20 – UL Open Type, options +P940 and +P944)

See *ACS880 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement* (3AUA0000145446 [English]).

Overview of power and control connections

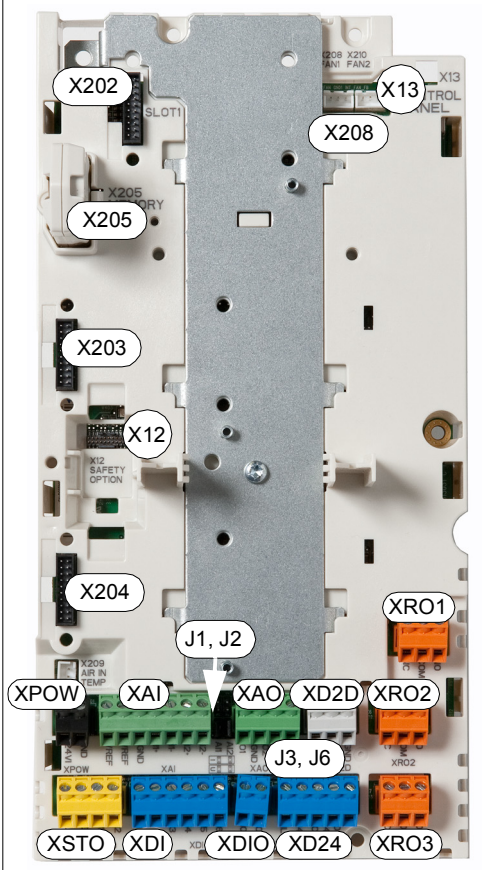
The diagram shows the power connections and control interfaces of the drive.



1 2 3	Analog and digital I/O extension modules, feedback interface modules and fieldbus communication modules can be inserted into slots 1, 2 and 3. See section *Type designation key*, page *37*.
4	Memory unit, see page *163*.
5	Connector for safety functions modules, see page *138*.
6	See page *35*, *Default I/O connection diagram* (page *126*) and *Control unit (ZCU-12) connection data* (page *221*).
7	See section *Control panel*, page *36*.
8	du/dt, common mode or sine filter (optional), see page *289*.

External control connection terminals

The layout of external control connection terminals of the drive is shown below.



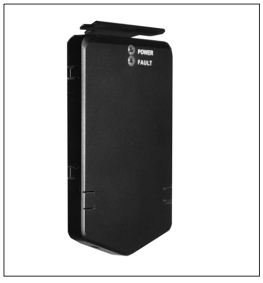
	Description
XPOW	External power input
XAI	Analog inputs
XAO	Analog outputs
XD2D	Drive-to-drive link
XRO1	Relay output 1
XRO2	Relay output 2
XRO3	Relay output 3
XD24	Start interlock connection (DIIL) and +24 V output
XDIO	Digital input/outputs
XDI	Digital inputs
XSTO	Safe torque off connection
X12	Connector for safety functions modules (optional)
X13	Control panel connection
X202	Option slot 1
X203	Option slot 2
X204	Option slot 3
X205	Memory unit connection
X208	Auxiliary cooling fan connection
J1, J2	Voltage/Current selection jumpers (J1, J2) for analog inputs
J3, J6	Drive-to-drive link termination jumper (J3), common digital input ground selection jumper (J6)

Control panel

The control panel can be removed by pulling it forward from the top edge and reinstalled in reverse order. For the use of the control panel, see the firmware manual or *ACS-AP assistant control panels user's manual* (3AUA0000085685 [English]).


Control panel mounting platform cover

In deliveries without control panel (option + 0J400) the control panel mounting platform is covered. The indication LEDs on the platform are visible through the protective cover. **Note**: The cover is not included with options +0J400+P940 and +0J400+P944.

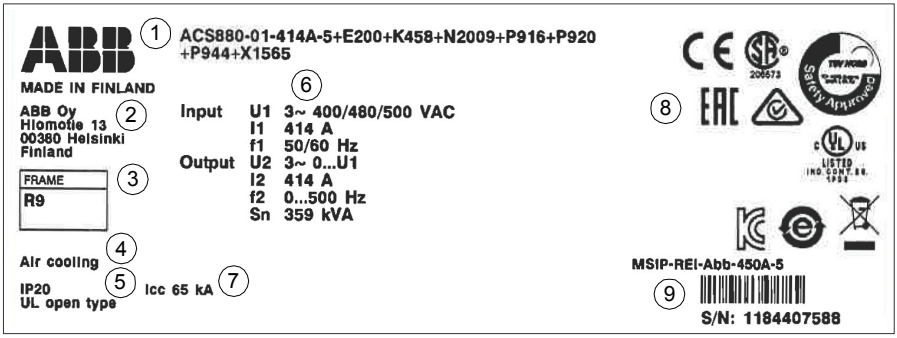


Control panel door mounting kits

Door mounting kits for the control panel are available. For more information see *DPMP-01 mounting platform installation guide* (3AUA0000100140 [English]) or *DPMP-02/03 mounting platform installation guide* (3AUA0000136205 [English].

Type designation label

The type designation label includes an IEC and NEMA rating, appropriate markings, a type designation and a serial number, which allow identification of each unit. The type designation label is located on the front cover. An example label is shown below.



No.	Description
1	Type designation, see section *Type designation key* on page *37*.
2	Manufacturing address
3	Frame size
4	Cooling method
5	Degree of protection
6	Ratings in the supply voltage range, see section *Ratings* on page *166*.
7	Short-circuit withstand strength, see section *Electrical power network specification* on page *220*.
8	Valid markings
9	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.

Type designation key

The type designation contains information on the specifications and configuration of the drive. The first digits from left express the basic configuration, eg, ACS880-01-12A6-3 The optional selections are given thereafter, separated by plus signs, eg, +L519. The main selections are described below. Not all selections are available for all types. For more information, refer to *ACS880-01 Ordering Information* (3AXD10000014923), available on request.

CODE	DESCRIPTION
Basic codes	
ACS880	Product series
01	When no options are selected: Wall mounted drive, IP21 (UL Type 1), ACS-AP-W assistant control panel with Bluetooth connection, no EMC filter, DC choke, ACS880 primary control program, Safe torque off function, cable entry box, brake chopper in frames R1 to R4, coated boards, printed multilingual quick guides and CD containing all manuals.
Size	
xxxx	Refer to the rating tables, page *166*
Voltage range	
2	208…240 V
3	380…415 V
5	380…500 V
7	525…690 V
Option codes (plus codes)	
Degree of protection	
B056	IP55 (UL Type 12)
Construction	
C205	Marine product certification for DNV-GL. Requires option +C132.
C206	Marine product certification for ABS. Requires option +C132.
C207	Marine product certification for Lloyd's register. Requires option +C132.
C208	Marine product certification for RINA. Requires option +C132.
C209	Marine product certification for BV. Requires option +C132.
C210	Marine product certification for NK. Requires option +C132.
C131	Vibration dampers for frames R4 to R9
C132	Marine type-approved drive. Requires option +C131 in wall installations for frames R4 to R9. Includes common mode filter for frames R6 to R9.
C135	Drive for flange mounting. Removes the cable entry box. Available only with options +P940 and +P944. Not possible to order with option +C132.
Resistor braking	
D150	Brake chopper for frames R5 and up
Filters	
E200	EMC filter for second environment TN (grounded) system, category C3.
E201	EMC filter for second environment IT (ungrounded) system, Category C3: 230 V frames R6 to R8, 400 V and 500 V frames R6 to R9 and 690 V frames R7 to R9. Category C4: 230 V, 400 V and 500 V frames R1 to R5, and 690 V frames R3, R5 and R6.
E202	EMC filter for first environment TN (grounded) system, category C2. Available for 230 V frames R1 to R8, 400 V and 500 V frames R1 to R9.

CODE	DESCRIPTION
E208	Common mode filter for frames R6 to R9
Cable entry box	
H358	UK cable entry box
Control panel	
0J400	No control panel. Includes control panel holder cover. **Note**: You need at least one loose control panel to be able to commission the drive.
J425	ACS-AP-I Assistant control panel
Fieldbus adapters	
K451	FDNA-01 DeviceNet™ adapter module
K454	FPBA-01 PROFIBUS DP adapter module
K457	FCAN-01 CANopen adapter module
K458	FSCA-01 RS-485 adapter module
K462	FCNA-01 ControlNet™ adapter module
K469	FECA-01 EtherCAT adapter module
K470	FEPL-02 Ethernet POWERLINK adapter module
K475	FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus/TCP and PROFINET IO protocols, 2-port
K490	FEIP-21 EtherNet/IP adapter module
K491	FMBT-21 Modbus/TCP adapter module
K492	FPNO-21 PROFINET IO adapter module
I/O extensions and feedback interfaces	
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L502	FEN-31 HTL incremental encoder interface module
L503	FDCO-01 optical DDCS communication adapter module
L508	FDCO-02 optical DDCS communication adapter module
L516	FEN-21 resolver interface module
L517	FEN-01 TTL incremental encoder interface module
L518	FEN-11 absolute encoder interface module
L521	FSE-31 pulse encoder interface module
L525	FAIO-01 analog I/O extension module
L526	FDIO-01 digital I/O extension module
L536	FPTC-01 Thermistor protection module for ACS880 drives
L537	FPTC-02 ATEX-certified thermistor protection module, EX II (2) GD for ACS880 drives. Requires option +Q971.
Control programs	
N5000	Winder control program. Includes memory unit license +N8021.
N5050	Crane control program. Includes memory unit license +N8015.

CODE	DESCRIPTION
N5100	Winch control program. Includes memory unit license +N8017.
N5150	Centrifuge/Decanter control program. Includes memory unit license +N8025.
N5200	PCP (Progressive cavity pump) control program. Includes memory unit license +N8019.
N5250	Rod pump control program. Includes memory unit license +N8019
N5300	Test bench control program
N5350	Cooling tower control program. Includes memory unit license +N8029.
N5450	Override control program
N5500	Spinning and traverse control program. Includes memory unit license +N8023.
N5600	ESP (Electrical submersible pump) control program. Includes memory unit license +N8019.
N5650	Tower crane control program. Includes memory unit license +N8015.
N7502	Primary control program SynRM (synchronous reluctance motor)
N8010	Drive application programming. IEC 61131-3 programming.
Specialties	
P904	Extended warranty
P940	Version for cabinet mounting. Drive without front cover and cable entry box. Includes control panel. **Note**: With option +0J400 does not include control panel holder cover.
P944	Version for cabinet mounting. Drive without cable entry box. Includes control panel. **Note**: With option +0J400 does not include control panel holder cover.
ATEX-certified function	
Q971	ATEX-certified Safe motor disconnection function using the Safe torque off function
Safety functions modules	
Q972	FSO-21 safety functions module
Q973	FSO-12 safety functions module
Q982	PROFIsafe safety communication. Requires safety functions module FSO-12 (option Q973) or FSO-21 (option Q972) and PROFINET adapter FENA-21 (option K475).
Full set of printed manuals in selected language. Note: The delivered manual set may include manuals in English if the translation is not available.	
R700	English
R701	German
R702	Italian
R703	Dutch
R704	Danish
R705	Swedish
R706	Finnish
R707	French
R708	Spanish

CODE	DESCRIPTION
R709	Portuguese
R711	Russian
R712	Chinese
R713	Polish
R714	Turkish
Control units	
V993	ZCU-11 control unit

4

Mechanical installation

Contents of this chapter

This chapter tells how to check the installation site, unpack, check the delivery and install the drive mechanically.

Cabinet installation (options +P940 and +P944)

See *ACS880 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement* (3AUA0000145446 [English]).

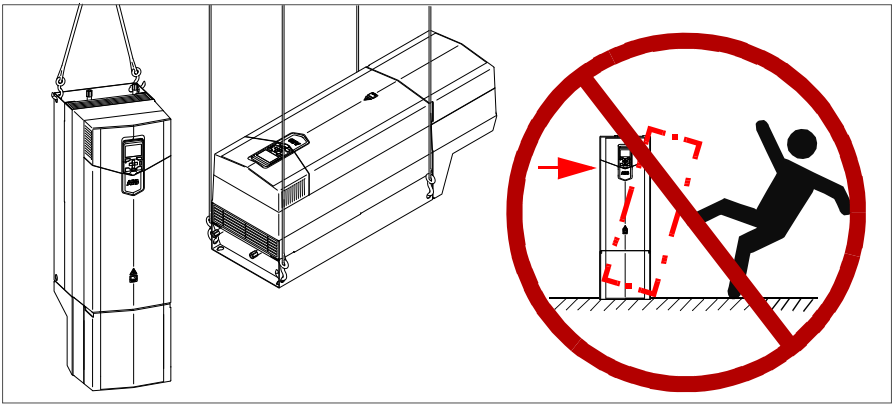
Flange mounting (option +C135)

See the following supplements:

- *ACS880-01…+C135 drives with flange mounting kit supplement* (3AXD50000349814 [English])
- *Flange mounting kit quick installation guide for ACS880-01 frames R1 to R3* (3AXD50000026158 [English]) or
- *Flange mounting kit quick installation guide for ACS880-01 frames R4 to R5* (3AXD50000026159 [English]) or
- *Flange mounting kit quick installation guide for ACS880-01 and ACX580-01 frames R6 to R9* (3AXD50000019099 [English]).

Safety

WARNING! For frame sizes R6 to R9: Use the lifting eyes of the drive when you lift the drive. Do not tilt the drive. **The drive is heavy and its center of gravity is high. An overturning drive can cause physical injury.**



Examining the installation site

The drive must be installed in an upright position with the cooling section against a wall.

IP21 and IP55 frames R1 to R9 can be mounted side by side.

UL Type 1 frames R1 to R9 can be mounted side by side.

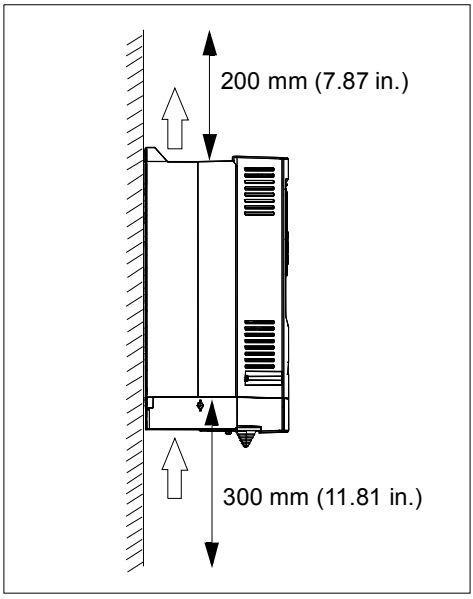
UL Type 12 frames R1 to R3 can be mounted side by side.

UL Type 12 frames R4 to R9 need 100 mm (4 in) between the hoods.

Note: Mounting the drives right next to each other side to side can make it difficult to read the serial number and rating information on the type designation label.

Make sure that the installation site agrees with these requirements:

- The installation site has sufficient ventilation to remove heat from the drive. See section *Losses, cooling data and noise* on page *212*.
- The operation conditions of the drive agree with the specifications in section *Ambient conditions* (page *225*).
- The wall is vertical, not flammable and strong enough to hold the weight of the drive. See page *210*.
- The material below the installation is not flammable.
- There is enough free space above the drive (200 mm [7.87 in.) and below the drive (300 mm [11.81 in.] when measured from the drive base without the cable box) for cooling air flow, service and maintenance. There is enough free space in front of the drive for operation, service and maintenance.



Required tools

- Drill and drill bits
- Screwdriver and/or wrench with bits. The drive cover has Torx screws.

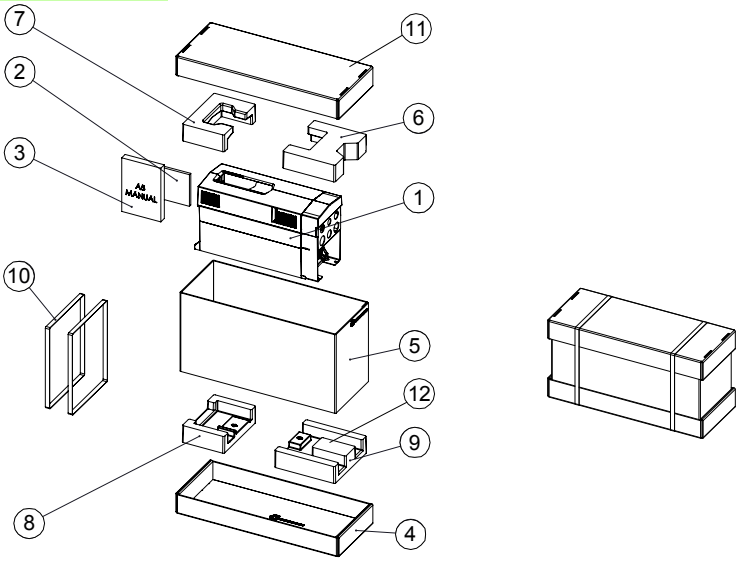
Moving the drive

Move the transport package by pallet truck to the installation site.

Unpacking and examining the delivery (frames R1 to R5)

This illustration shows the layout of the transport package. Examine that all items are present and there are no signs of damage. Read the data on the type designation label of the drive to make sure that the drive is of the correct type.

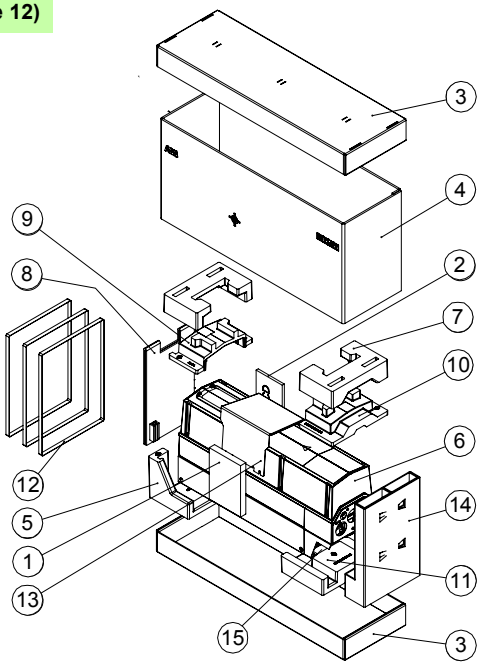
IP21 (UL Type 1)



Item	Description	Item	Description
1	Drive with factory installed options. Control cable grounding shelf. Romex connectors in IP21 frames R1 to R3 in a plastic bag inside the cable entry box.	6…9	Cushions
2	Manuals CD	10	PET straps
3	Printed quick guides and manuals, multilingual residual voltage warning sticker	11	Top cardboard cover
4	Cardboard tray	12	Vibration damper package (option +C131) Frame R4 and IP55 (UL Type 12) frame R5: below the cable entry box IP21 (UL Type 1) frame R5: inside the cable entry box
5	Cardboard sleeve	-	-

To unpack:
- Cut the straps (10).
- Remove the top cardboard cover (11) and cushions (6...9).
- Lift the cardboard sleeve (5).
- Lift the drive.

IP55 (UL Type 12)

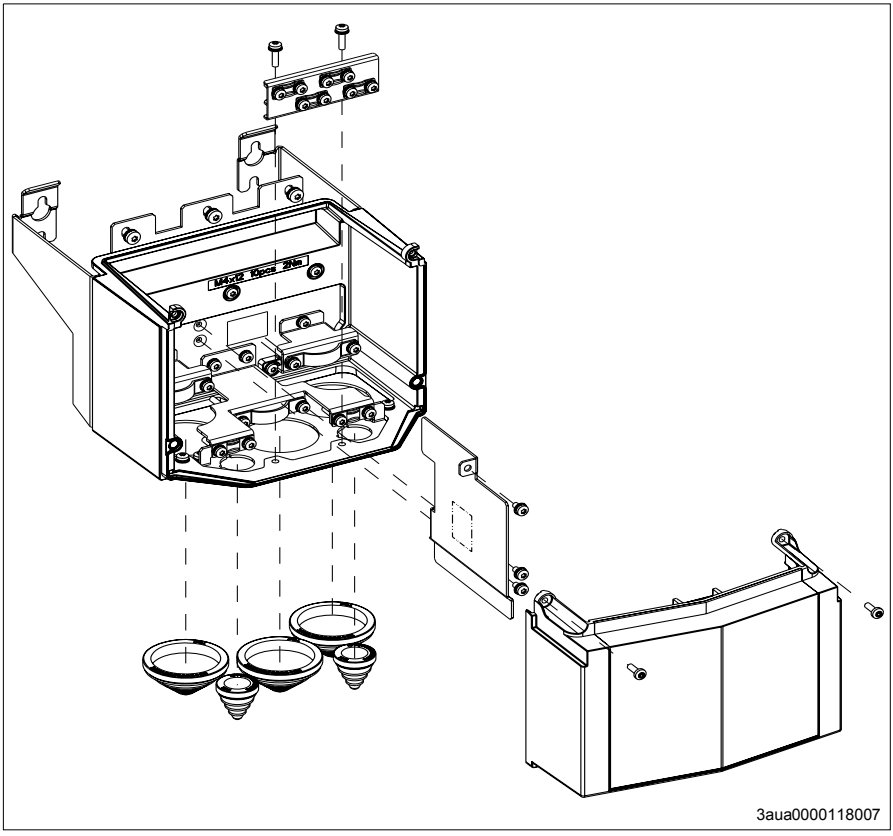


Item	Description	Item	Description
1	Printed quick guides and manuals, multilingual residual voltage warning sticker	7…11	Cushions and cardboard support
2	Manuals CD	12	PET straps
3	Cardboard tray + top cardboard cover	13	Hood included in frames R4 and R5. The hood is required only in UL Type 12 installations.
4	Cardboard sleeve	14	Support
5	Cushion	15	Vibration damper package (option +C131)
6	Drive with factory installed options. Control cable grounding shelf.	-	-

To unpack:
- Cut the straps (12).
- Remove the top cardboard cover (3) and cushions (5, 7...11).
- Lift the cardboard sleeve (4).
- Lift the drive.

Frame R5 cable entry box (IP21, UL Type 1)

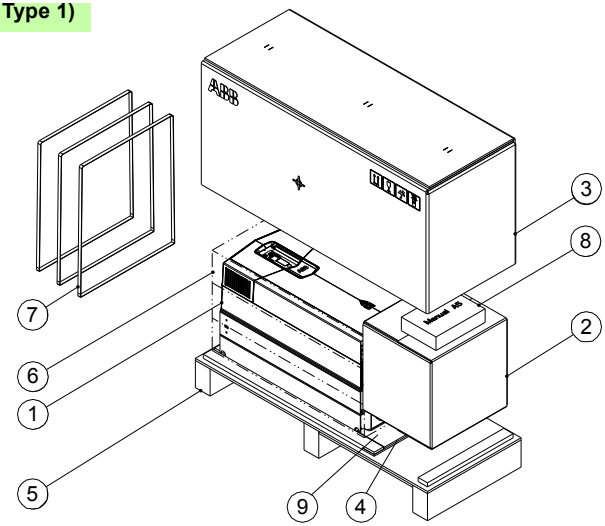
This illustration shows the contents of the cable entry box package. The package also includes an assembly drawing which shows how to install the cable entry box to the drive module frame.



Unpacking and examining the delivery (frames R6 and R7)

This illustration shows the layout of the transport package. Examine that all items are present and there are no signs of damage. Read the data on the type designation label of the drive to make sure that the drive is of the correct type.

IP21 (UL Type 1)



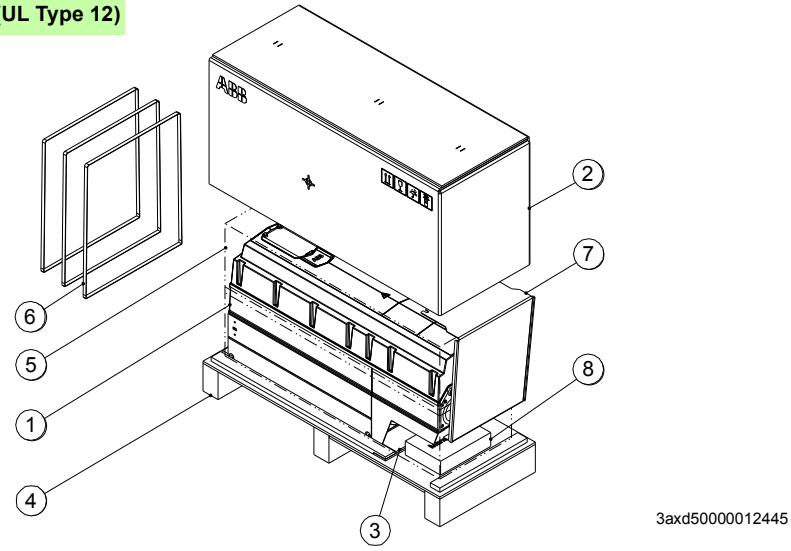
3axd50000012445

Item	Description	Item	Description
1	Drive with factory installed options	6	Cushion
2	Cable entry box. Power and control cable grounding shelves in a plastic bag, assembly drawing. **Note**: The cable entry box is mounted to the IP55 drive module frame at the factory.	7	Straps
3	Cardboard cover	8	Printed quick guides and manuals CD and multilingual residual voltage warning sticker
4	Stopper	9	Vibration damper package (option +C131). For frame R6: inside the cable entry box.
5	Pallet tray	-	-

To unpack:

- Cut the straps (7).
- Remove the top cardboard cover (3) and cushion (6).
- Attach lifting hooks to the lifting eyes of the drive. Lift the drive with a hoist.

IP55 (UL Type 12)



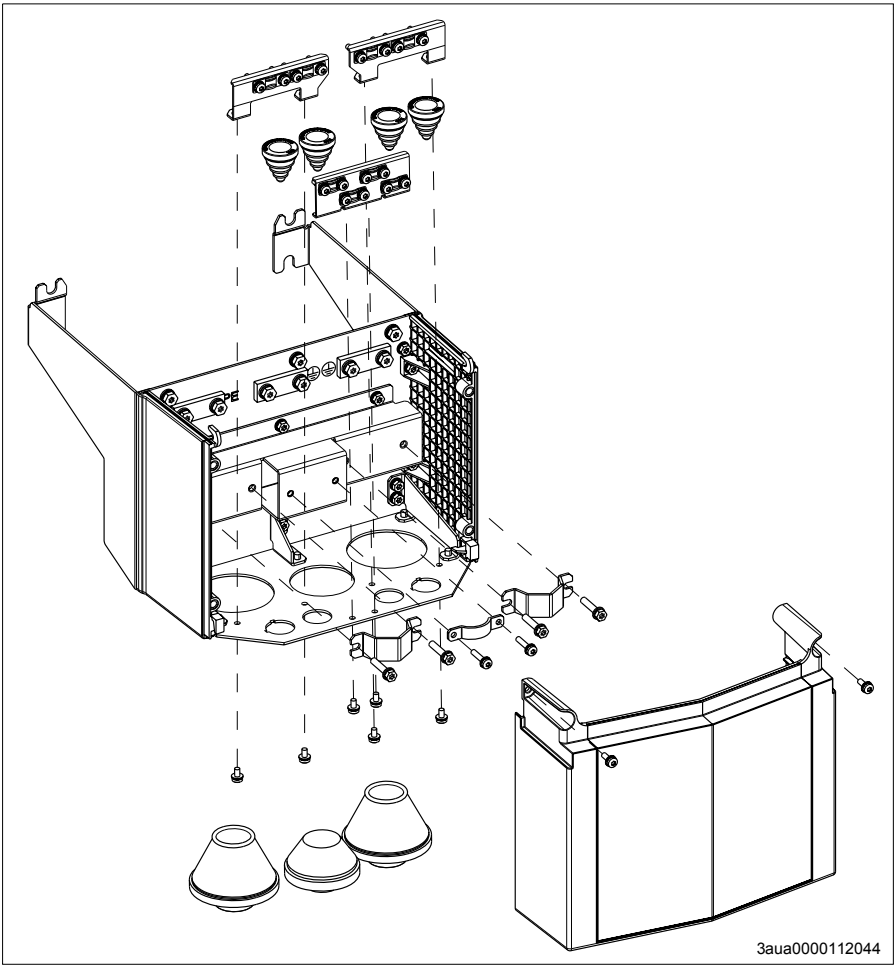
Item	Description	Item	Description
1	Drive with factory installed options	5	Cushion
2	Cardboard cover	6	Straps
3	Stopper	7	Hood (required only in UL Type 12 installation)
4	Pallet tray	8	Printed quick guides and manuals CD and multilingual residual voltage warning sticker

To unpack:

- Cut the straps (6).
- Remove the top cardboard cover (2) and cushion (5).
- Attach lifting hooks to the lifting eyes of the drive. Lift the drive with a hoist.

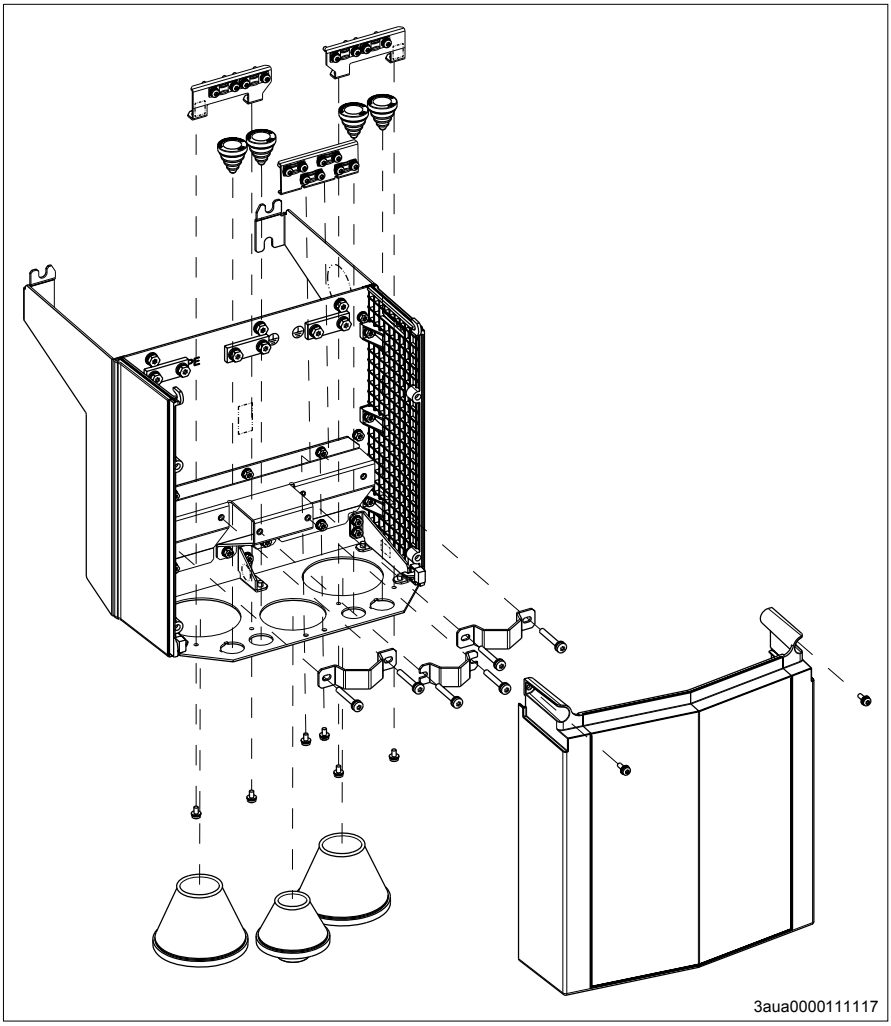
Frame R6 cable entry box (IP21, UL Type 1)

This illustration shows the contents of the cable entry box package. The package also includes an assembly drawing which shows how to install the cable entry box to the drive module frame.



Frame R7 cable entry box (IP21, UL Type 1)

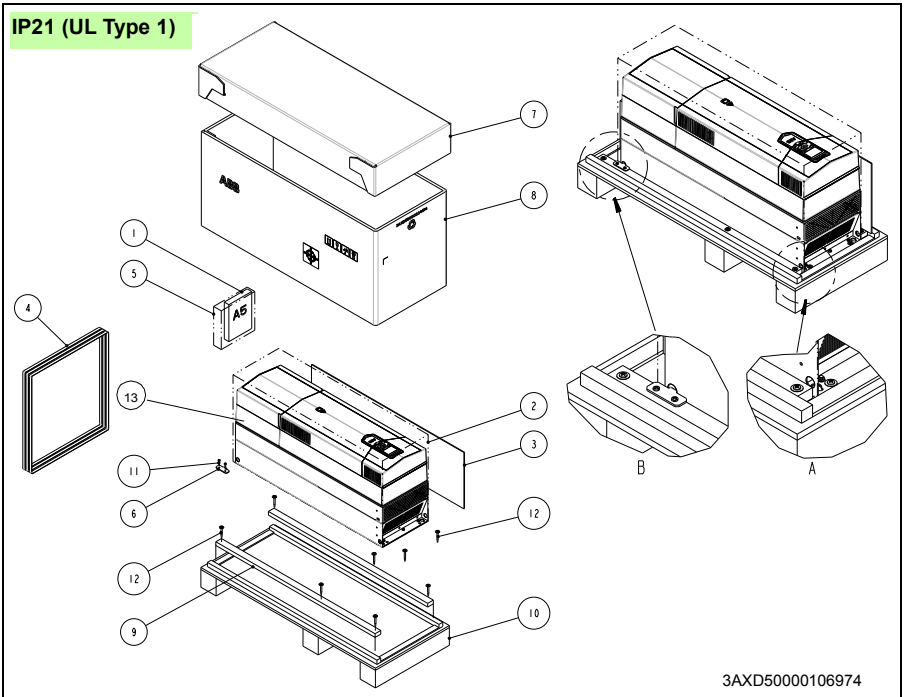
This illustration shows the contents of the cable entry box package. The package also includes an assembly drawing which shows how to install the cable entry box to the drive module frame.



Unpacking and examining the delivery (frames R8 and R9)

This illustration shows the layout of the transport package. Examine that all items are present and there are no signs of damage. Read the data on the type designation label of the drive to make sure that the drive is of the correct type.

IP21 (UL Type 1)



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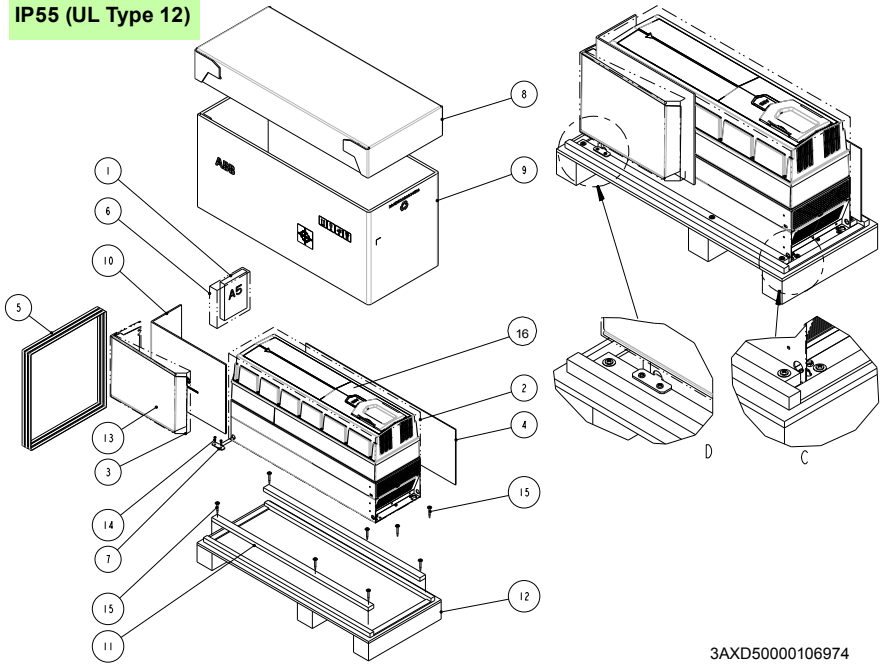
Item	Description	Item	Description
1	Printed quick guides and manuals, multilingual residual voltage warning sticker, Manuals CD	7	Cardboard tray
2	VCI bag	8	Cardboard sleeve
3	Mounting template	9	Plywood support (not in R9)
4	PET straps	10	Pallet tray
5	Plastic bag	11, 12	Screw
6	Packing bracket	13	Drive with factory installed options

To unpack:

- Cut the straps (4).
- Remove the tray (7) and cardboard sleeve (8).
- Open the VCI bag (2).
- Undo the attaching screws (a, b).
- Lift the drive.

IP55 (UL Type 12)



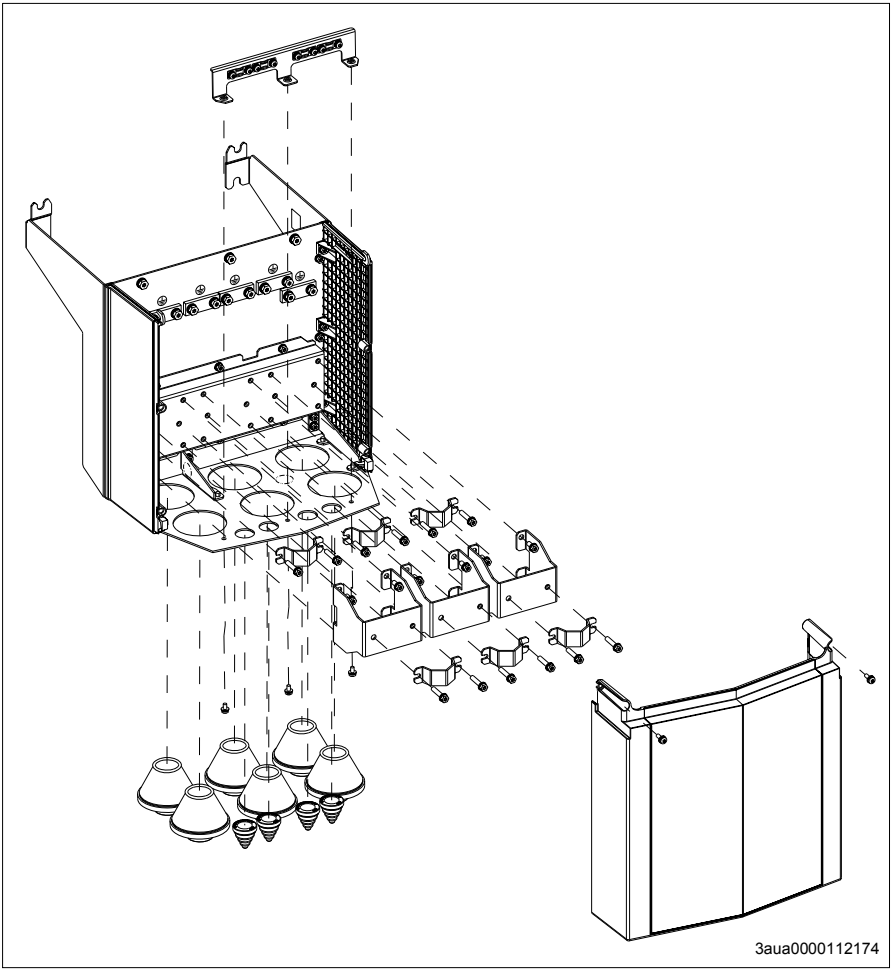
Item	Description	Item	Description
1	Printed quick guides and manuals, multilingual residual voltage warning sticker, Manuals CD	9	Cardboard sleeve
2	VCI bag	10	Not included
3	Bubble wrap	11	Plywood support (not in R9)
4	Mounting template	12	Pallet tray
5	PET straps	13	UL Type 12 hood
6	Plastic bag	14, 15	Screw
7	Packing bracket	16	Drive with factory installed options
8	Cardboard tray	-	-

To unpack:

- Cut the straps (5).
- Remove the tray (8) and cardboard sleeve (9).
- Remove the VCI bag (2).
- Undo the attaching screws (c, d).
- Lift the drive.

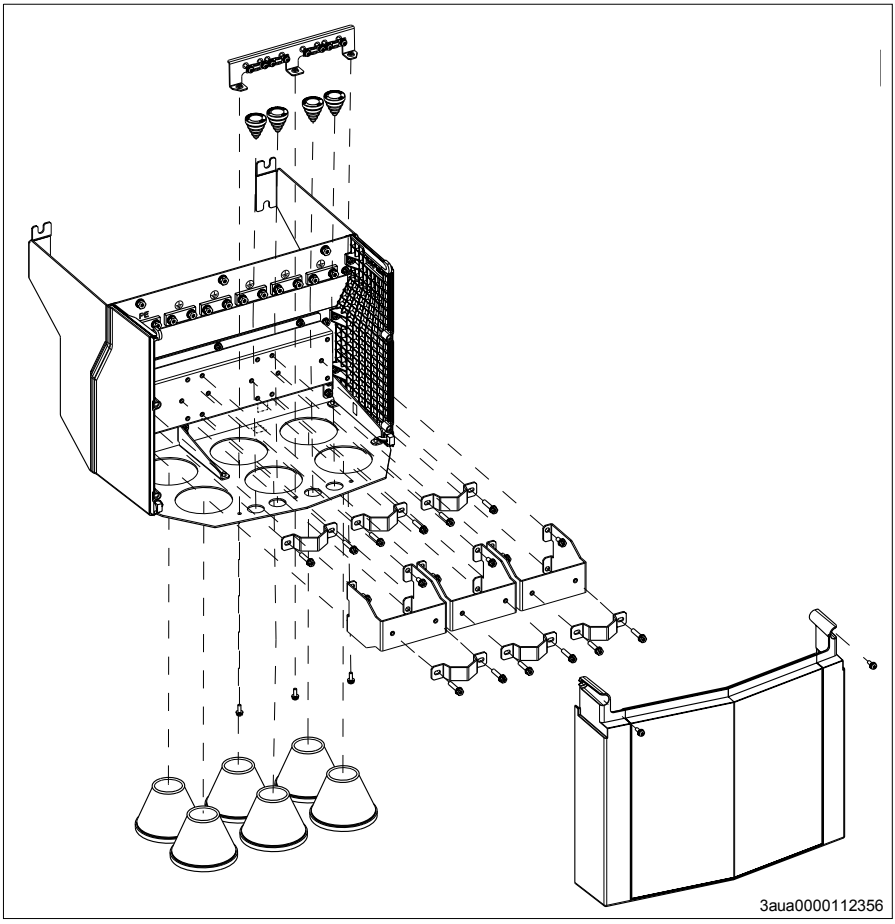
Frame R8 cable entry box (IP21, UL Type 1)

This illustration shows the contents of the cable entry box package. There is also an assembly drawing which shows how to install the cable entry box to the drive module frame.



Frame R9 cable entry box (IP21, UL Type 1)

This illustration shows the contents of the cable entry box package. The package also includes an assembly drawing which shows how to install the cable entry box to the drive module frame.



Installing the drive

This section tells you how to install the drive on wall without vibration dampers.

Vibration dampers (option +C131)

Marine type approval (option +C132) requires the installation of vibration dampers for frames R4 to R9 in wall installations. See *Vibration dampers for ACS880-01 drives (frames R4 and R5, option +C131) installation guide* (3AXD50000010497 [English]) or *Vibration dampers for ACS880-01 drives (frames R6 to R9, option +C131) installation guide* (3AXD50000010497 [English]). The guide is included in the vibration damper package and on the manuals CD.

UK gland plate (option +H358)

If you have option +H358, see *ACS880-01, ACS580-01, ACH580-01, ACQ580-01 UK gland plate (+H358) installation guide* (3AXD50000034735).

Flange mounting kit (option +C135)

See the following supplements:

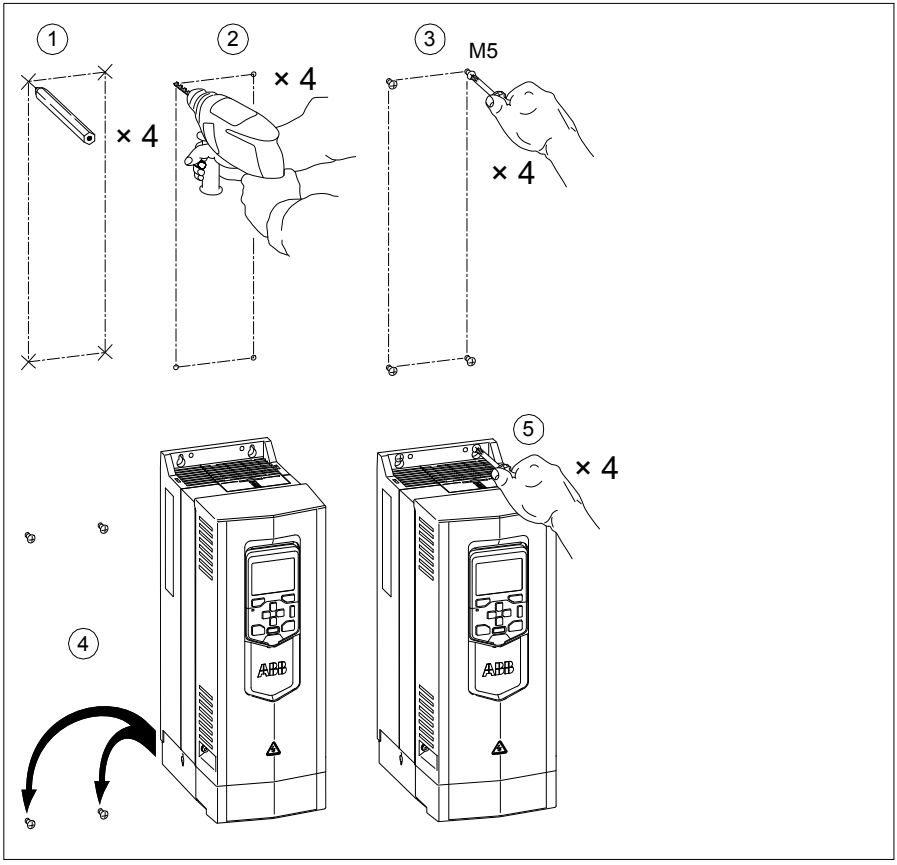
- *ACS880-01…+C135 drives with flange mounting kit supplement* (3AXD50000349814 [English])
- *Flange mounting kit quick installation guide for ACS880-01 frames R1 to R3* (3AXD50000026158 [English]) or
- *Flange mounting kit quick installation guide for ACS880-01 frames R4 to R5* (3AXD50000026159 [English]) or
- *Flange mounting kit quick installation guide for ACS880-01 and ACX580-01 frames R6 to R9* (3AXD50000019099 [English]).

Cabinet installation (option +P940)

This section gives the basic cabinet installation instructions for the drive. For more information, see *ACS880-01 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement* (3AUA0000145446 [English]).

Frames R1 to R4 (IP21, UL Type 1)

1. See the dimensions in chapter *Dimension drawings*. Mark the locations for the four mounting holes.
2. Drill the mounting holes.
3. Insert anchors or plugs into the holes and start the screws or bolts into the anchors or plugs. Drive the screws or bolts long enough into the wall to make them carry the weight of the drive.
4. Position the drive onto the bolts on the wall.
5. Tighten the bolts in the wall securely.

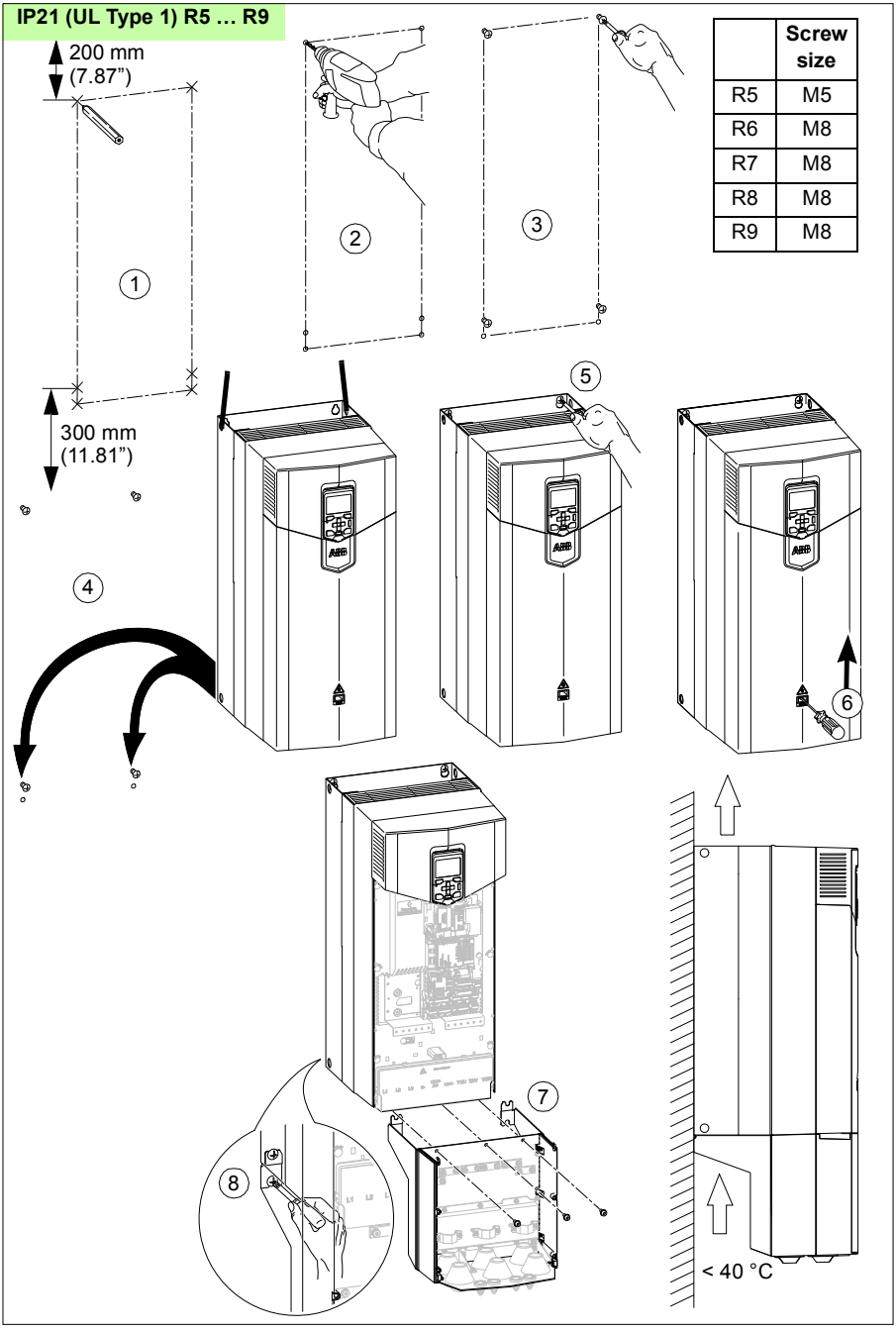


Frames R5 to R9 (IP21, UL Type 1)

1. See the dimensions in chapter *Dimension drawings*. Mark the locations for the four or six mounting holes.

   Note: The lowest holes/mounting screws or bolts are not necessarily needed. If you use also them, you can replace the drive module without removing the cable entry box from the wall.

2. Drill the mounting holes.
3. Insert fixings anchors or plugs into the holes. Start the two upper bolts and the two lowest bolts into the anchors or plugs. Drive the bolts long enough into the wall to make them carry the weight of the drive.
4. Position the drive module onto the bolts on the wall.
5. Tighten the upper mounting bolts in the wall securely.
6. Remove the front cover.
7. Attach the cable entry box to the drive frame. For instructions, see the assembly drawing in the cable entry box. A view of frame R8 is shown below.
8. Tighten the lower mounting bolts in the wall securely.



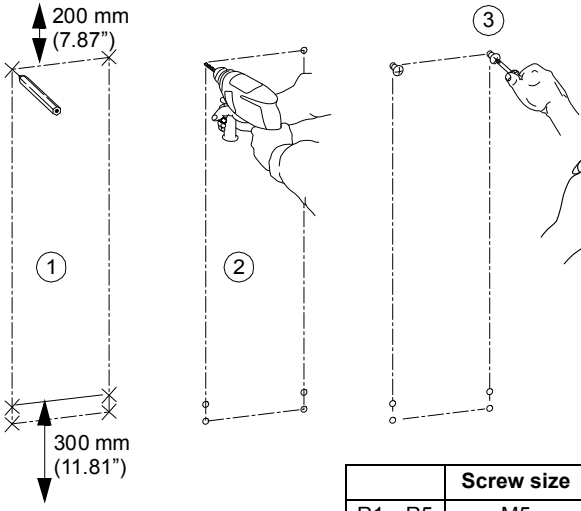
	Screw size
R5	M5
R6	M8
R7	M8
R8	M8
R9	M8

Frames R1 to R9 (IP55, UL Type 12)

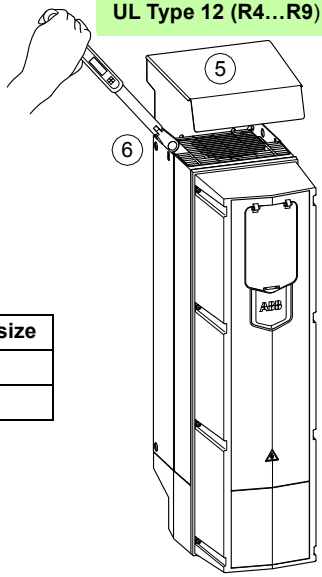
Note: Do not open or remove the cable entry box for easier installation. The gaskets do not fulfill the degree of protection if the box is opened.

1. See the dimensions in chapter *Dimension drawings*. Mark the locations for the four or six mounting holes. The lowest holes are not necessarily needed.
2. Drill the mounting holes.
3. Insert fixings anchors or plugs into the holes.
4. Start the upper bolts into the mounting holes. Drive the bolts long enough into the wall to make them carry the weight of the drive.
5. Position the drive onto the upper bolts on the wall. Lift the drive with another person as it is heavy.
6. For UL Type 12 drives of frames R4 to R9: Put the hood onto the upper bolts.
7. Tighten the upper bolts in the wall securely.
8. Start the lower bolts into the mounting holes.
9. Tighten the lower bolts in the wall securely.

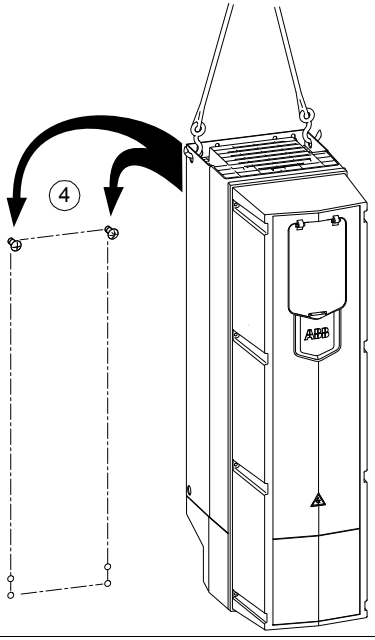
IP55 (UL Type 12) R1…R9

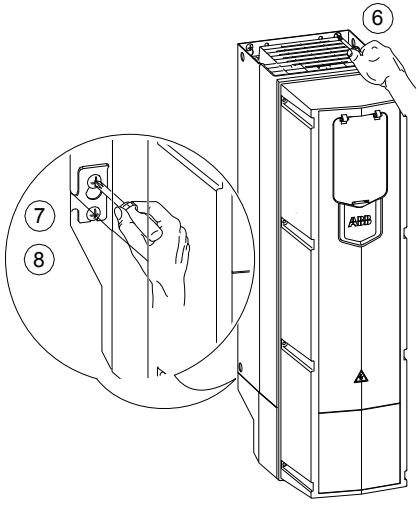


UL Type 12 (R4…R9)



	Screw size
R1…R5	M5
R6…R9	M8

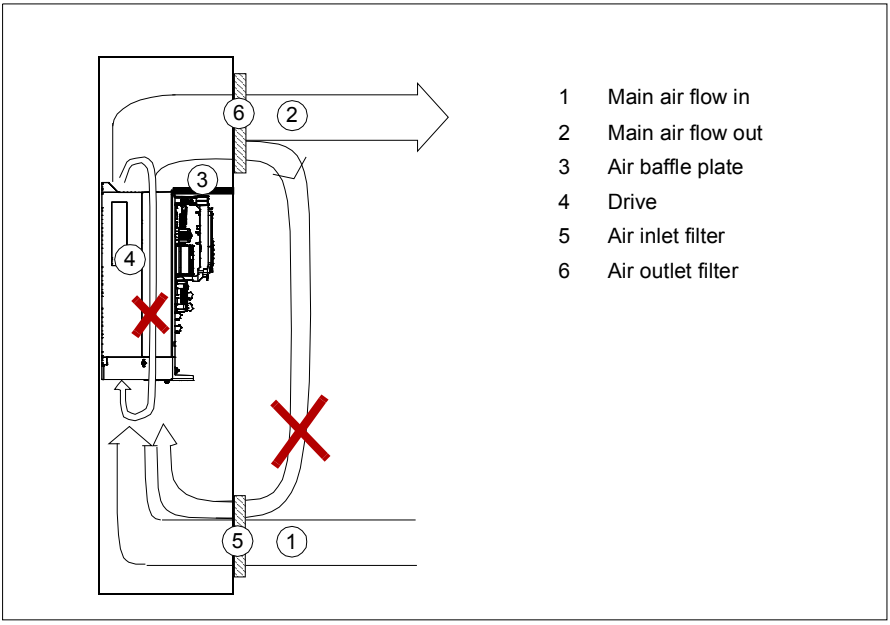




Cooling

Make sure that there is sufficient cooling:

- Make sure that the temperature of the cooling air that goes into the drive does not exceed +40 °C (+104 °F).
- Prevent cooling air recirculation inside the cabinet. You can use air baffle plates or an extra fan at the inlet or outlet of the cabinet. If you use a fan, ABB recommends an inlet fan with a filter. Such a fan causes an overpressure inside the cabinet which helps to keep the dust out.
- Prevent cooling air recirculation outside the cabinet. Let the outlet air away from the inlet: to the other side of the cabinet or upwards.
- Make sure that there is sufficient cooling in the room in which the cabinet is placed.



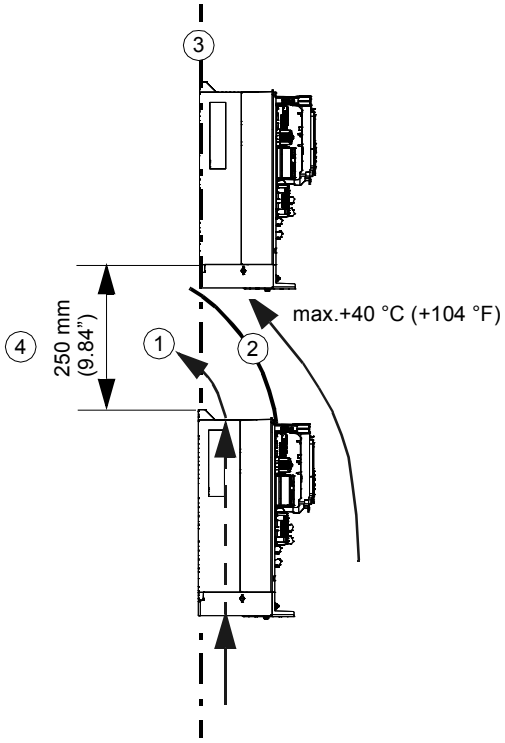
Note: You can remove the front cover of the drive module for better cooling.

Grounding inside the cabinet

Leave the contact surfaces of the attaching points of the drive unpainted (bare metal-to-metal contact). The drive frame will be grounded to the PE busbar of the cabinet via the attaching surfaces, screws and the cabinet frame. Alternatively, use a separate grounding conductor between the PE terminal of the drive and the PE busbar of the cabinet.

Installing drives above one another

Make sure that the outlet cooling air flows away from the drive above.



1 Air flow through the drive
2 Air baffle
3 Mounting plate that allows air through flow
4 Minimum spacing between the drives

5

Guidelines for planning the electrical installation

Contents of this chapter

This chapter contains instructions for planning the electrical installation of the drive. Some instructions are mandatory to follow in every installation, others provide useful information that only concerns certain applications.

Limitation of liability

The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

Selecting the supply disconnecting device

Install a hand-operated input disconnecting device between the AC power source and the drive. The disconnecting device must be of a type that can be locked to the open position for installation and maintenance work.

European Union

To meet the European Union Directives, according to standard EN 60204-1, *Safety of Machinery*, the disconnecting device must be one of the following types:

- switch-disconnector of utilization category AC-23B (EN 60947-3)
- disconnector that has an auxiliary contact that in all cases causes switching devices to break the load circuit before the opening of the main contacts of the disconnector (EN 60947-3)
- circuit breaker suitable for isolation in accordance with EN 60947-2.

Other regions

The disconnecting device must conform to the applicable local safety regulations.

Selecting and dimensioning the main contactor

If a main contactor is used, its utilization category (number of operations under load) must be AC-1 according to IEC 60947-4, *Low-voltage switchgear and controlgear*. Dimension the main contactor according to the nominal voltage and current of the drive.

Checking the compatibility of the motor and drive

Use an asynchronous AC induction motor, permanent magnet synchronous motor, AC induction servomotor or ABB synchronous reluctance motor (SynRM motor) with the drive. Several induction motors can be connected to the drive at a time.

Select the motor size and drive type from to the rating tables in chapter *Technical data* on basis of the AC line voltage and motor load. Use the DriveSize PC tool if you need to tune the selection more in detail.

Ensure that the motor withstands the maximum peak voltage in the motor terminals. See the *Requirements table* on page *69*. For basics of protecting the motor insulation and bearings in drive systems, refer to section *Protecting the motor insulation and bearings* below.

Note:

- Consult the motor manufacturer before using a motor whose nominal voltage differs from the AC line voltage connected to the drive input.
- The voltage peaks at the motor terminals are relative to the supply voltage of the drive, not the drive output voltage.
- If the motor and drive are not of the same size, consider the following operation limits of the drive control program:
  - motor nominal voltage range 1/6 ... 2 · U_N
  - motor nominal current range 1/6 ... 2 · I_N of the drive in DTC control and 0 ... 2 · I_N in scalar control. The control mode is selected by a drive parameter.

Protecting the motor insulation and bearings

The drive employs modern IGBT inverter technology. Regardless of frequency, the drive output comprises pulses of approximately the drive DC bus voltage with a very short rise time. The pulse voltage can almost double at the motor terminals, depending on the attenuation and reflection properties of the motor cable and the terminals. This can cause additional stress on the motor and motor cable insulation.

Modern variable speed drives with their fast rising voltage pulses and high switching frequencies can generate current pulses that flow through the motor bearings. This can gradually erode the bearing races and rolling elements.

Optional du/dt filters protect motor insulation system and reduce bearing currents. Optional common mode filters mainly reduce bearing currents. Insulated N-end (non-drive end) bearings protect the motor bearings.

Requirements table

The following table shows how to select the motor insulation system and when an optional drive du/dt and common mode filters and insulated N-end (non-drive end) motor bearings are required. Ignoring the requirements or improper installation may shorten motor life or damage the motor bearings and voids the warranty.

Motor type	Nominal AC supply voltage	Requirement for		
		Motor insulation system	ABB du/dt and common mode filters, insulated N-end motor bearings	
			P_N < 100 kW and frame size < IEC 315	100 kW ≤ P_N < 350 kW or IEC 315 ≤ frame size < IEC 400
			P_N < 134 hp and frame size < NEMA 500	134 hp ≤ P_N < 469 hp or NEMA 500 ≤ frame size ≤ NEMA 580
ABB motors				
Random-wound M2_,M3_ and M4_	U_N ≤ 500 V	Standard	-	+ N
	500 V < U_N ≤ 600 V	Standard	+ du/dt	+ du/dt + N
		or		
		Reinforced	-	+ N
	600 V < U_N ≤ 690 V (cable length ≤ 150 m)	Reinforced	+ du/dt	+ du/dt + N
	600 V < U_N ≤ 690 V (cable length > 150 m)	Reinforced	-	+ N
Form-wound HX_ and AM_	380 V < U_N ≤ 690 V	Standard	n.a.	+ N + CMF
Old* form-wound HX_ and modular	380 V < U_N ≤ 690 V	Check with the motor manufacturer.	+ du/dt with voltages over 500 V + N + CMF	
Random-wound HX_ and AM_ **	0 V < U_N ≤ 500 V	Enamelled wire with fiber glass taping	+ N + CMF	
	500 V < U_N ≤ 690 V		+ du/dt + N + CMF	
HDP	Consult the motor manufacturer.			

* manufactured before 1.1.1998

** For motors manufactured before 1.1.1998, check for additional instructions with the motor manufacturer.

Motor type	Nominal AC supply voltage	Requirement for		
		Motor insulation system	ABB du/dt and common mode filters, insulated N-end motor bearings	
			P_N < 100 kW and frame size < IEC 315	100 kW ≤ P_N < 350 kW or IEC 315 ≤ frame size < IEC 400
			P_N < 134 hp and frame size < NEMA 500	134 hp ≤ P_N < 469 hp or NEMA 500 ≤ frame size ≤ NEMA 580
Non-ABB motors				
Random-wound and form-wound	$U_N \leq 420$ V	Standard: $\hat{U}_{LL}$ = 1300 V	-	+ N or CMF
	420 V < $U_N \leq$ 500 V	Standard: $\hat{U}_{LL}$ = 1300 V	+ du/dt	+ du/dt + (N or CMF)
		or		
		Reinforced: $\hat{U}_{LL}$ = 1600 V, 0.2 microsecond rise time	-	+ N or CMF
	500 V < $U_N \leq$ 600 V	Reinforced: $\hat{U}_{LL}$ = 1600 V	+ du/dt	+ du/dt + (N or CMF)
		or		
		Reinforced: $\hat{U}_{LL}$ = 1800 V	-	+ N or CMF
	600 V < $U_N \leq$ 690 V	Reinforced: $\hat{U}_{LL}$ = 1800 V	+ du/dt	+ du/dt + N
		Reinforced: $\hat{U}_{LL}$ = 2000 V, 0.3 microsecond rise time ***	-	N + CMF

*** If the intermediate DC circuit voltage of the drive is increased from the nominal level by resistor braking, check with the motor manufacturer if additional output filters are needed in the applied drive operation range.

The abbreviations used in the table are defined below.

Abbr.	Definition
U_N	Nominal AC line voltage
$\hat{U}_{LL}$	Peak line-to-line voltage at motor terminals which the motor insulation must withstand
P_N	Motor nominal power
du/dt	du/dt filter at the output of the drive. Available from ABB as an optional add-on kit.
CMF	Common mode filter. Depending on the drive type, CMF is available from ABB as an optional add-on kit.
N	N-end bearing: insulated motor non-drive end bearing
n.a.	Motors of this power range are not available as standard units. Consult the motor manufacturer.

Additional requirements for explosion-safe (EX) motors

If you will use an explosion-safe (EX) motor, follow the rules in the requirements table above. In addition, consult the motor manufacturer for any further requirements.

Additional requirements for ABB motors of types other than M2_, M3_, M4_, HX_ and AM_

Use the selection criteria given for non-ABB motors.

Additional requirements for the braking applications

When the motor brakes the machinery, the intermediate circuit DC voltage of the drive increases, the effect being similar to increasing the motor supply voltage by up to 20 percent. Consider this voltage increase when specifying the motor insulation requirements if the motor will be braking a large part of its operation time.

Example: Motor insulation requirement for a 400 V AC line voltage application must be selected as if the drive were supplied with 480 V.

Additional requirements for ABB high-output and IP23 motors

The rated output power of high output motors is higher than what is stated for the particular frame size in EN 50347 (2001). This table shows the requirements for ABB random-wound motor series (for example, M3AA, M3AP and M3BP).

Nominal mains voltage (AC line voltage)	**Requirement for**			
	Motor insulation system	**ABB du/dt and common mode filters, insulated N-end motor bearings**		
		P_N < 100 kW	**100 kW ≤ P_N < 200 kW**	**P_N ≥ 200 kW**
		P_N < 140 hp	**140 hp ≤ P_N < 268 hp**	**P_N ≥ 268 hp**
$U_N \leq 500$ V	Standard	-	+ N	+ N + CMF
500 V < $U_N \leq 600$ V	Standard	+ du/dt	+ du/dt + N	+ du/dt + N + CMF
	or			
	Reinforced	-	+ N	+ N + CMF
600 V < $U_N \leq 690$ V	Reinforced	+ du/dt	+ du/dt + N	+ du/dt + N + CMF

Additional requirements for non-ABB high-output and IP23 motors

The rated output power of high output motors is higher than what is stated for the particular frame size in EN 50347 (2001). The table below shows the requirements for random-wound and form-wound non-ABB motors.

Nominal AC line voltage	Requirement for		
	Motor insulation system	ABB du/dt filter, insulated N-end bearing and ABB common mode filter	
		P_N < 100 kW or frame size < IEC 315	100 kW ≤ P_N < 350 kW or IEC 315 ≤ frame size < IEC 400
		P_N < 134 hp or frame size < NEMA 500	134 hp ≤ P_N < 469 hp or NEMA 500 ≤ frame size ≤ NEMA 580
$U_N \leq 420$ V	Standard: $\hat{U}_{LL}$ = 1300 V	+ N or CMF	+ N + CMF
420 V < $U_N \leq 500$ V	Standard: $\hat{U}_{LL}$ = 1300 V	+ du/dt + (N or CMF)	+ du/dt + N + CMF
	or		
	Reinforced: $\hat{U}_{LL}$ = 1600 V, 0.2 microsecond rise time	+ N or CMF	+ N + CMF
500 V < $U_N \leq 600$ V	Reinforced: $\hat{U}_{LL}$ = 1600 V	+ du/dt + (N or CMF)	+ du/dt + N + CMF
	or		
	Reinforced: $\hat{U}_{LL}$ = 1800 V	+ N or CMF	+ N + CMF
600 V < $U_N \leq 690$ V	Reinforced: $\hat{U}_{LL}$ = 1800 V	+ du/dt + N	+ du/dt + N + CMF
	Reinforced: $\hat{U}_{LL}$ = 2000 V, 0.3 microsecond rise time ***	N + CMF	N + CMF

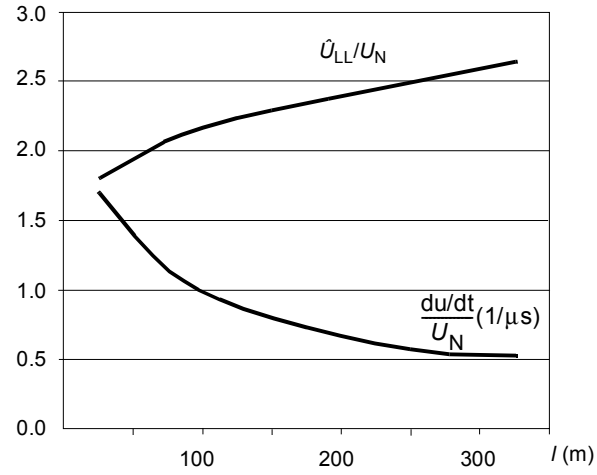
*** If the intermediate DC circuit voltage of the drive is increased from the nominal level by resistor braking, check with the motor manufacturer if additional output filters are needed in the applied drive operation range.

Additional data for calculating the rise time and the peak line-to-line voltage

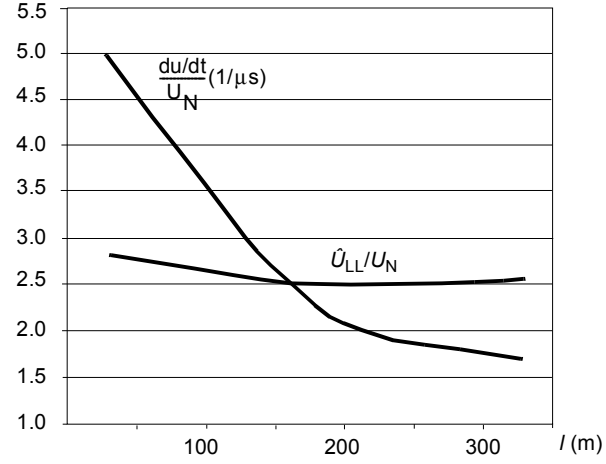
If you need to calculate the actual peak voltage and voltage rise time considering the actual cable length, proceed as follows:

- Peak line-to line voltage: Read the relative $\hat{U}_{LL}/U_N$ value from the appropriate diagram below and multiply it by the nominal supply voltage (U_N).
- Voltage rise time: Read the relative values $\hat{U}_{LL}/U_N$ and (du/dt)/U_N from the appropriate diagram below. Multiply the values by the nominal supply voltage (U_N) and substitute into equation $t = 0.8 \cdot \hat{U}_{LL}/(du/dt)$.

A



B



A	Drive with du/dt filter
B	Drive without du/dt filter
l	Motor cable length
$\hat{U}_{LL}/U_N$	Relative peak line-to-line voltage
$(du/dt)/U_N$	Relative du/dt value
Note: ÛLL and du/dt values are approximately 20% higher with resistor braking.	

Additional note for sine filters

Sine filters protect the motor insulation system. Therefore, du/dt filter can be replaced with a sine filter. The peak phase-to-phase voltage with the sine filter is approximately $1.5 \cdot U_N$.

Selecting the power cables

General guidelines

Select the input power and motor cables **according to local regulations**:

- **Current**: Select a cable capable of carrying the drive nominal current. See section *Ratings* (page *166*) for the rated currents.
- **Temperature**: Select a cable rated for at least 70 °C maximum permissible temperature of conductor in continuous use.
  For frame R3 drives with option +B056 (IP55, UL Type 12) and ambient temperature above 39 °C (102 °F), select a cable rated for at least 75 °C maximum permissible temperature of conductor in continuous use.
  For North America, power cables must be rated for 75 °C (167 °F) or higher.
- **Voltage**: 600 V AC cable is accepted for up to 500 V AC. 750 V AC cable is accepted for up to 600 V AC. For 690 V AC rated equipment, the rated voltage between the conductors of the cable should be at least 1 kV.
- **Conductivity:** The inductance and impedance of the PE conductor/cable (grounding wire) must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs). See the table on page *78*.

To comply with the EMC requirements of the CE mark, use one of the approved cable types in section *Recommended power cable types* on page *78*.

Symmetrical shielded cable reduces electromagnetic emission of the whole drive system as well as the stress on motor insulation, bearing currents and wear.

Metal conduit reduces electromagnetic emission of the whole drive system.

The protective conductor must always have an adequate conductivity.

Unless local wiring regulations state otherwise, the cross-sectional area of the protective conductor must agree with the conditions that require automatic disconnection of the supply required in 411.3.2. of IEC 60364-4-41:2005 and be capable of withstanding the prospective fault current during the disconnection time of the protective device.

The cross-sectional area of the protective conductor can either be selected from the table below or calculated according to 543.1 of IEC 60364-5-54.

This table below shows the minimum cross-sectional area related to the phase conductor size according to IEC 61800-5-1 when the phase conductor and the protective conductor are made of the same metal. If this is not so, the cross-sectional

area of the protective earthing conductor shall be determined in a manner which produces a conductance equivalent to that which results from the application of this table.

Cross-sectional area of the phase conductors S (mm^2)	Minimum cross-sectional area of the corresponding protective conductor S_p (mm^2)
$S \leq 16$	S
$16 < S \leq 35$	16
$35 < S$	S/2

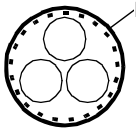
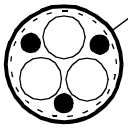
See the IEC/EN 61800-5-1 and UL 68100-5-1 requirement on grounding in the Note on page *19*.

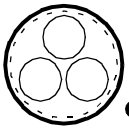
Additional guidelines, IEC

Obey these additional guidelines for IEC with the general guidelines in section *General guidelines* on page *77*.

Recommended power cable types

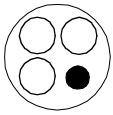
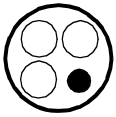
This table shows the recommended power cable types. Check with local / state / country electrical codes for allowance.

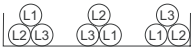
Cable type	Use as input power cabling	Use as motor cabling
 Symmetrical shielded (or armored) cable with three phase conductors and concentric PE conductor as shield (or armor)	Yes	Yes
 Symmetrical shielded (or armored) cable with three phase conductors and symmetrically constructed PE conductor and a shield (or armor)	Yes	Yes

Cable type	Use as input power cabling	Use as motor cabling
 Symmetrical shielded (or armored) cable with three phase conductors and a shield (or armor), and separate PE conductor/cable[1)]	Yes	Yes

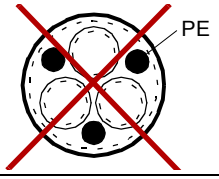
[1)] A separate PE conductor is required if the conductivity of the shield (or armor) is not sufficient for the PE use. For IEC 61800-5-1 requirements, see page *80* page.

Power cable types for limited use

Cable type	Use as input power cabling	Use as motor cabling
 Four-conductor cabling in PVC conduit or jacket (three phase conductors and PE)	Yes with phase conductor smaller than 10 mm^2 (8 AWG).	Yes with phase conductor smaller than 10 mm^2 (8 AWG), or motors up to 30 kW (40 hp). **Note:** Shielded or armored cable, or cabling in metal conduit is always recommended to minimize radio frequency interference
 Four-conductor cabling in metal conduit (three phase conductors and PE), eg, EMT, or four-conductor armored cable	Yes	Yes with phase conductor smaller than 10 mm^2 (8 AWG) or motors up to 30 kW (40 hp).
 Well-shielded (Al/Cu shield or armor) four-conductor cable (three phase conductors and a PE)	Yes	Yes with motors up to 100 kW (135 hp). A potential equalization between the frames of motor and driven equipment is required.

Cable type	Use as input power cabling	Use as motor cabling
 A single-core cable system: three phase conductors and PE conductor on cable tray  Preferable cable arrangement to avoid voltage or current unbalance between the phases	Yes  **WARNING!** If you use unshielded high-power input power cables in an IT network, make sure that the non-conductive outer sheath (jacket) of the cables have good contact with a properly grounded conductive surface, for example, install the cables on a properly grounded cable tray. Otherwise voltage may become present on the non-conductive outer sheath of the cables, and there is even a risk of an electric shock.	No

Not allowed power cable types

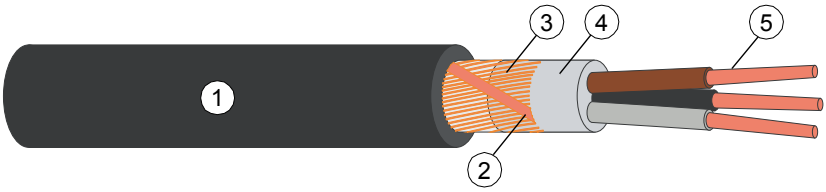
	Symmetrical shielded cable with individual shields for each phase conductor is not allowed on any cable size for input and motor cabling.

Power cable shield

If the motor cable shield is used as the sole protective earth conductor of the motor, make sure that the conductivity of the shield is sufficient. See subsection *General guidelines* on page 77, or IEC 61800-5-1.

To effectively suppress radiated and conducted radio-frequency emissions, the cable shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminum shield. The minimum requirement of the motor cable shield of the drive is shown below. It consists of a

concentric layer of copper wires with an open helix of copper tape or copper wire. The better and tighter the shield, the lower the emission level and bearing currents.



1	Insulation jacket
2	Copper wire screen
3	Helix of copper tape or copper wire
4	Inner insulation
5	Cable core

Additional guidelines, North America

Obey these additional guidelines for North America with the general guidelines in section General guidelines on page 92.

ABB recommends the use of conduit for power wiring to the drive and between the drive and the motor(s). Due to the variety of application needs, metallic and non-metallic conduit can be used. ABB prefers the use of metallic conduit. Where permitted, non-metallic conduit may be used.

The following tables show examples of various materials and methods for wiring the drive in the intended application. See NFPA (NEC 70)[1] along with state and local codes for the appropriate materials for your application.

1) National Fire Protection Association (National Electric Code 70).

In all applications, ABB prefers the use of VFD (variable-frequency drive) cable between drive and motor(s).

Conduit - Metallic[1, 3]	Notes
Electrical metallic tubing: Type EMT	• Symmetrical shielded VFD cable is preferred. • Use separate conduit run for each motor.[4] • Do not run power feed wiring and motor wiring in the same conduit.
Rigid metal conduit: Type RMC	
Liquid-tight flexible metal electrical conduit: Type LFMC	

Conduit - Non-metallic[2,3]	Notes
Liquid-tight flexible nonmetallic conduit: Type LFNC	• Symmetrical shielded VFD cable is preferred. • Use separate conduit run for each motor.[4] • Do not run power feed wiring and motor wiring in the same conduit.[4]

Wireways[3]	Notes
Metallic	• Symmetrical shielded VFD cable is preferred. • Use output conductors require separation from motor feed and other low voltage conductors. • Do not run outputs of multiple drives in parallel. Bundle each cable together and use separator where possible.

Free air[3]	Notes
Enclosures, air handlers, etc.	• Symmetrical shielded VFD cable is preferred. • Allowed internally in enclosures when in accordance with UL.

[1] Metallic conduit may be used as an additional ground path, provided this path is a solid path capable of handling ground currents.

[2] Non-metallic conduit use underground is allowed; however, these installations inherently have an increased chance for nuisance problems due to the potential for water/moisture in the conduit. Water/moisture in the conduit increases the likelihood of VFD faults or warnings. Proper installation is required to insure there is no intrusion of water/moisture.

[3] See NFPA NEC 70, UL, and local codes for your application.

[4] See routing instructions in section *General guidelines, North America* on page *89*.

Conductor type

The following table includes various conductor types that can be connected to the drive. For optimal drive performance, VFD cable is preferred. When not available, see the following standards in the footnotes below.

Conductor type		Notes[1, 2]
Copper	Allowed	All frames
Aluminum (UL installations)	Not allowed	All frames
Aluminum (IEC installations)	Not allowed	Frames R1…R4
	Allowed	Frames R5…R9

[1] The selection of cable sizing/type is based on NFPA NEC 70 Table 310.15 (B) (16), formerly table 310.16, for copper wires is based on 75 °C (167 °F), and wire insulation at 30 °C (86 °F) ambient temperature. Not more than three current-carrying conductors in raceway or cable or earth (directly buried). For other ambient temperatures addition derating may be required.

See 310.15(B)(2)(a) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F).

See to 310.15(B)(3)(a) for more than three current-carrying conductors.

For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive. See also page *218* for the accepted cable sizes of the drive.

[2] Select cable size/type is based on CSA 22.1 latest acceptable revision for your area.

Typical power cable sizes

The table below gives copper and aluminum cable types with concentric copper shield for the drives with nominal current. For terminal and entry data for power cables, see page *217*.

Drive type ACS880-01-	Frame size	IEC [1]		UL (NEC) [2]	
		Cu cable type	Al cable type	Cu cable type	Al cable type
		mm^2	mm^2	AWG/kcmil	AWG/kcmil
U_N = 230 V					
04A6-2	R1	3×1.5	-	14	-
06A6-2	R1	3×1.5	-	14	-
07A5-2	R1	3×1.5	-	14	-
10A6-2	R1	3×1.5	-	14	-
16A8-2	R2	3×6	-	14	-
24A3-2	R2	3×6	-	10	-
031A-2	R3	3×10	-	10	-
046A-2	R4	3×16	3×35	6	-
061A-2	R4	3×25	3×35	4	-

Drive type ACS880-01-	Frame size	IEC [1]		UL (NEC) [2]	
		Cu cable type	Al cable type	Cu cable type	Al cable type
		mm²	mm²	AWG/kcmil	AWG/kcmil
075A-2	R5	3×35	3×50	4	-
087A-2	R5	3×35	3×70	3	-
115A-2	R6	3×50	3×70	1/0	-
145A-2	R6	3×95	3×120	2/0	-
170A-2	R7	3×120	3×150	3/0	-
206A-2	R7	3×150	3x240	2 × 1	-
274A-2	R8	2 × (3x95) [3]	2 × (3×120)	2 × 2/0	-
U_N = 400 V					
02A4-3	R1	3x1.5	-	14	-
03A3-3	R1	3x1.5	-	14	-
04A0-3	R1	3x1.5	-	14	-
05A6-3	R1	3x1.5	-	14	-
07A2-3	R1	3x1.5	-	14	-
09A4-3	R1	3x1.5	-	14	-
12A6-3	R1	3x1.5	-	14	-
017A-3	R2	3x6	-	10	-
025A-3	R2	3x6	-	10	-
032A-3	R3	3x10	-	8	-
038A-3	R3	3x10	-	8	-
045A-3	R4	3x16	3x25	6	-
061A-3	R4	3x25	3x25	4	-
072A-3	R5	3x35	3x35	3	-
087A-3	R5	3x35	3x50	3	-
105A-3	R6	3x50	3x70	1	-
145A-3	R6	3x95	3x95	2/0	-
169A-3	R7	3x120	3x150	3/0	-
206A-3	R7	3x150	3x185	250 MCM	-
246A-3	R8	2 × (3x70) [3]	2 × (3x95)	300 MCM	-
293A-3	R8	2 × (3x95) [3]	2 × (3x120)	2 × 3/0	-
363A-3	R9	2 × (3x120)	2 × (3x185)	2 × 4/0	-
430A-3	R9	2 × (3x150)	2 × (3x240)	2 × 250 MCM	-
U_N = 500 V					
02A1-5	R1	3x1.5	-	14	
03A0-5	R1	3x1.5	-	14	-
03A4-5	R1	3x1.5	-	14	-
04A8-5	R1	3x1.5	-	14	-
05A2-5	R1	3x1.5	-	14	-
07A6-5	R1	3x1.5	-	14	-

Drive type ACS880-01-	Frame size	IEC [1]		UL (NEC) [2]	
		Cu cable type	Al cable type	Cu cable type	Al cable type
		mm^2	mm^2	AWG/kcmil	AWG/kcmil
11A0-5	R1	3x1.5	-	14	-
014A-5	R2	3x6	-	10	-
021A-5	R2	3x6	-	10	-
027A-5	R3	3x10	-	8	-
034A-5	R3	3x10	-	8	-
040A-5	R4	3x16	3x35	6	-
052A-5	R4	3x25	3x35	4	-
065A-5	R5	3x35	3x50	3	-
077A-5	R5	3x35	3x70	3	-
096A-5	R6	3x50	3x70	1	-
124A-5	R6	3x95	3x120	2/0	-
156A-5	R7	3x120	3x150	3/0	-
180A-5	R7	3x150	3x240	250 MCM	-
240A-5	R8	2 × (3x70) [3]	2 × (3x95)	300 MCM	-
260A-5	R8	2 × (3x70) [3]	2 × (3x95)	2 × 2/0	-
302A-5	R9	2 × (3x95)	2 × (3x120)	2 × 3/0	-
361A-5	R9	2 × (3x120)	2 × (3x185)	2 × 250 MCM	-
414A-5	R9	2 × (3x150)	2 × (3x240)	2 × 250 MCM	-
U_N = 690 V					
07A4-7	R3	3x1.5	-	14	-
09A9-7	R3	3x1.5	-	14	-
14A3-7	R3	3x2.5	-	14	-
019A-7	R3	3x4	-	12	-
023A-7	R3	3x6	-	10	-
027A-7	R3	3x10	-	8	-
07A3-7	R5	3x1.5	-	14	12
09A8-7	R5	3x1.5	-	14	12
14A2-7	R5	3x2.5	-	14	12
018A-7	R5	3x4	-	12	10
022A-7	R5	3x6	-	10	8
026A-7	R5	3x10	3x25	8	6
035A-7	R5	3x10	3x25	8	6
042A-7	R5	3x16	3x25	6	4
049A-7	R5	3x16	3x25	6	4
061A-7	R6	3x25	3x35	4	3
084A-7	R6	3x35	3x50	3	2
098A-7	R7	3x50	3x70	2	1/0
119A-7	R7	3x70	3x95	1/0	3/0

Drive type ACS880-01-	Frame size	IEC [1]		UL (NEC) [2]	
		Cu cable type	Al cable type	Cu cable type	Al cable type
		mm^2	mm^2	AWG/kcmil	AWG/kcmil
142A-7	R8	3x95 [3]	3x120	2/0	4/0
174A-7	R8	3x120 [3]	3x185	4/0	300
210A-7	R9	3x185	2 × (3x95)	300 MCM	2 × 3/0
271A-7	R9	3x240	2 × (3x120)	400 MCM	2 × 4/0

3AXD00000588487

1) The cable sizing is based on max. 9 cables laid on a cable ladder side by side, three ladder type trays one on top of the other, ambient temperature 30 °C, PVC insulation, surface temperature 70 °C (EN 60204-1 and IEC 60364-5-52/2001). For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive. See also page *217* for the accepted cable sizes of the drive.

2) The cable sizing is based on NEC Table 310-16 for copper wires, 75 °C (167 °F) wire insulation at 40 °C (104 °F) ambient temperature. Not more than three current-carrying conductors in raceway or cable or earth (directly buried). For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive. See also page *218* for the accepted cable sizes of the drive.

3) The biggest cable size accepted by the connection terminals of frame R8 is 2 × (3×150). Biggest possible cable size is 3x240 or 400 MCM if the terminal type is changed and the cable entry box is not used.

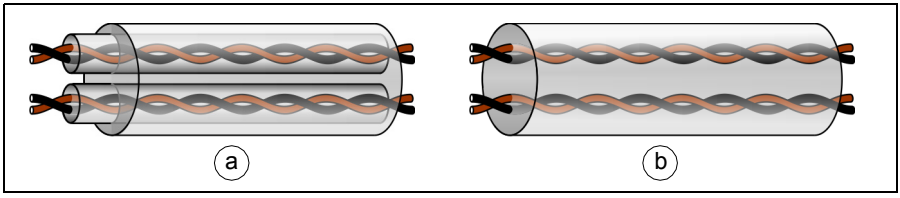
Selecting the control cables

Shielding

All control cables must be shielded.

Use a double-shielded twisted pair cable for analog signals. This type of cable is recommended for the pulse encoder signals also. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double-shielded cable (figure a below) is the best alternative for low-voltage digital signals but single-shielded (b) twisted pair cable is also acceptable.



Signals in separate cables

Run analog and digital signals in separate, shielded cables.

Never mix 24 V DC and 115/230 V AC signals in the same cable.

Signals allowed to be run in the same cable

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. The relay-controlled signals should be run as twisted pairs.

Relay cable

The cable type with braided metallic screen (for example ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Control panel cable

In remote use, the cable connecting the control panel to the drive must not exceed 100 m (330 ft). Cable type: shielded CAT 5e or better Ethernet patch cable with RJ-45 ends.

Drive composer PC tool cable

Connect the Drive composer PC tool to the drive through the USB port of the control panel. Use a USB type A (PC) - type B (control panel) cable. The maximum length of the cable is 3 m (9.8 ft).

Routing the cables

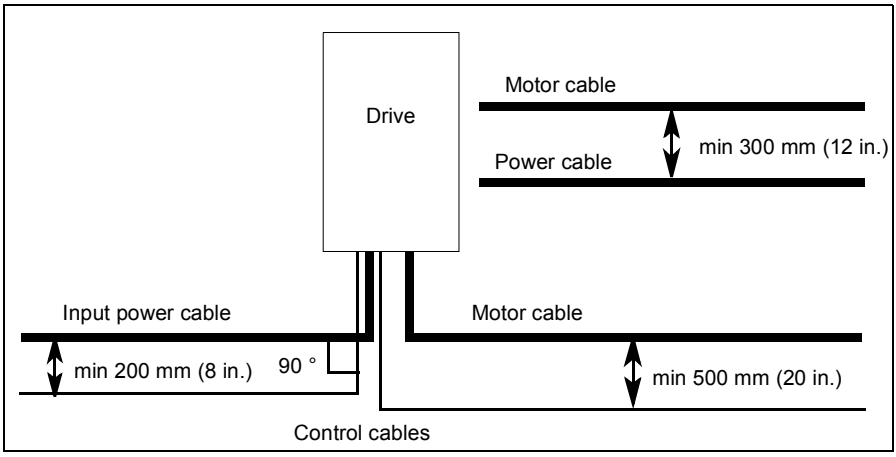
General guidelines, IEC

Route the motor cable away from other cable routes. Motor cables of several drives can be run in parallel installed next to each other. The motor cable, input power cable and control cables should be installed on separate trays. Avoid long parallel runs of motor cables with other cables in order to decrease electromagnetic interference caused by the rapid changes in the drive output voltage.

Where control cables must cross power cables, ensure they are arranged at an angle as near to 90 degrees as possible. Do not run extra cables through the drive.

The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminum tray systems can be used to improve local equalizing of potential.

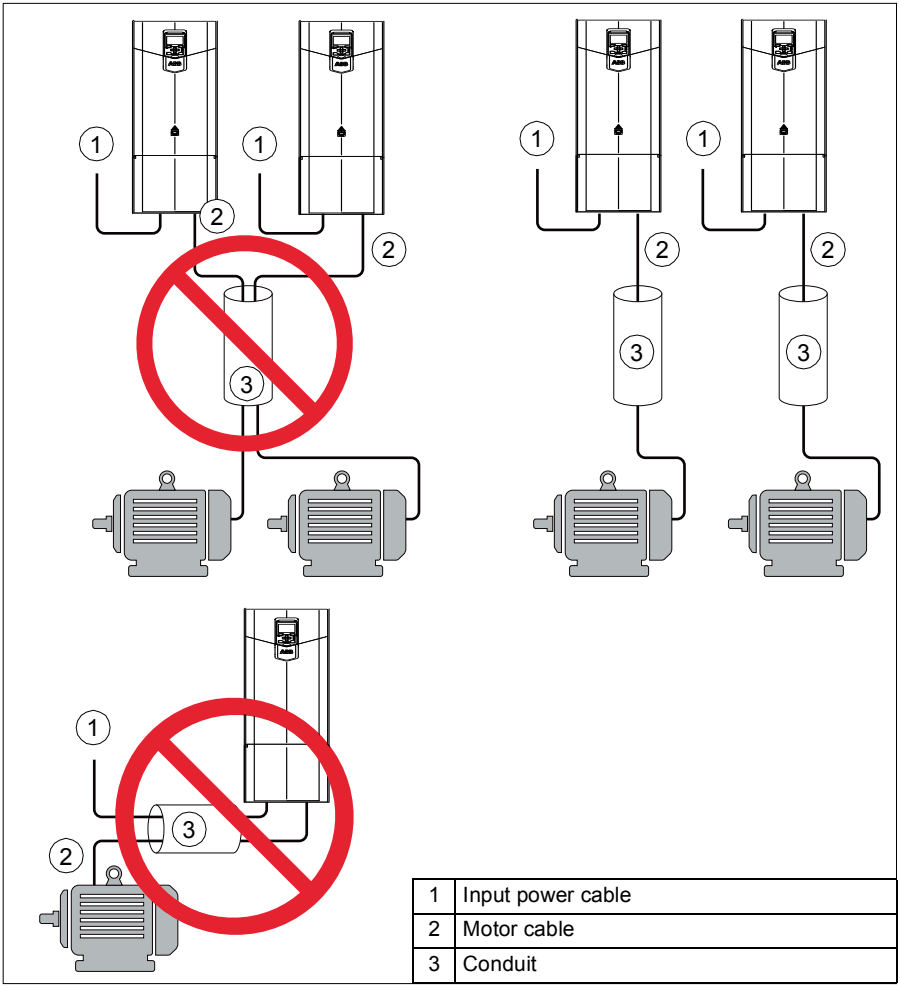
A diagram of the cable routing is shown below.



General guidelines, North America

Obey the these rules for routing with conduits:

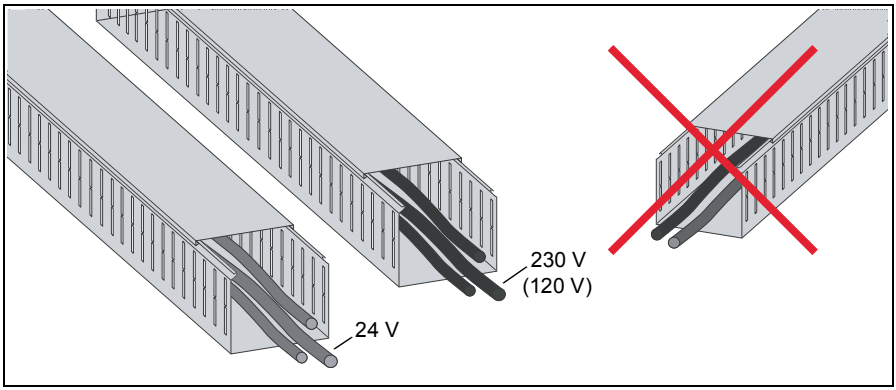
- Do not run power supply wiring and motor wiring in the same conduit.
- Use separate conduit run for each motor.
- Do not run power feed and drive output in same conduit.
- Do not run multiple drive outputs in same conduit.



1	Input power cable
2	Motor cable
3	Conduit

Separate control cable ducts

Wire 24 V and 230 V (120 V) control cables in separate ducts unless the 24 V cable is insulated for 230 V (120 V) or insulated with an insulation sleeving for 230 V (120 V).



Continuous motor cable shield or enclosure for equipment on the motor cable

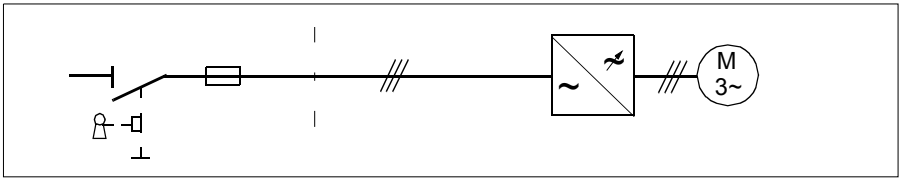
To minimize the emission level when safety switches, contactors, connection boxes or similar equipment are installed on the motor cable between the drive and the motor:

- European Union: Install the equipment in a metal enclosure with 360 degree grounding for the shields of both the incoming and outgoing cable, or connect the shields of the cables otherwise together.
- North America: Install the equipment in a metal enclosure in a way that the conduit or motor cable shielding runs consistently without breaks from the drive to the motor.

Implementing short-circuit and thermal overload protection

Protecting the drive and input power cable in short-circuits

Protect the drive and input cable with fuses as follows:



Size the fuses at the distribution board according to instructions given in chapter *Technical data*. The fuses will protect the input cable in short-circuit situations, restrict drive damage and prevent damage to adjoining equipment in case of a short-circuit inside the drive.

Circuit breakers

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. Your local ABB representative can help you in selecting the breaker type when the supply network characteristics are known.

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.

Note: Fuses must be used with circuit breakers in the USA.

For approved circuit breakers, see *Circuit breakers* on page *206*.

Protecting the motor and motor cable in short-circuits

The drive protects the motor cable and motor in a short-circuit situation when the motor cable is sized according to the nominal current of the drive. No additional protection devices are needed.

Protecting the drive and the input power and motor cables against thermal overload

The drive protects itself and the input and motor cables against thermal overload when the cables are sized according to the nominal current of the drive. No additional thermal protection devices are needed.

WARNING! If the drive is connected to multiple motors, use a separate circuit breaker or fuses for protecting each motor cable and motor against overload. The drive overload protection is tuned for the total motor load. It may not trip due to an overload in one motor circuit only.

Protecting the motor against thermal overload

According to regulations, the motor must be protected against thermal overload and the current must be switched off when overload is detected. The drive includes a motor thermal protection function that protects the motor and switches off the current when necessary. Depending on a drive parameter value, the function either monitors a calculated temperature value (based on a motor thermal model) or an actual

temperature indication given by motor temperature sensors. The user can tune the thermal model further by feeding in additional motor and load data.

The most common temperature sensors are:

- motor sizes IEC180…225: thermal switch, eg, Klixon
- motor sizes IEC200…250 and larger: PTC or Pt100.

See the firmware manual for more information on the motor thermal protection, and the connection and use of the temperature sensors.

Protecting the drive against ground faults

The drive is equipped with an internal ground fault protective function to protect the unit against ground faults in the motor and motor cable. This is not a personnel safety or a fire protection feature. The ground fault protective function can be disabled with a parameter. For more detailed information, see the firmware manual.

Residual current device compatibility

The drive is suitable to be used with residual current devices of Type B.

Note: The EMC filter of the drive includes capacitors connected between the main circuit and the frame. These capacitors and long motor cables increase the ground leakage current and may cause fault current circuit breakers to function.

Connecting drives to a common DC system

See *ACS880-01 drives and ACS880-04 drive modules common DC systems application guide* (3AUA0000127818 [English]).

Implementing the Emergency stop function

For safety reasons, install the emergency stop devices at each operator control station and at other operating stations where emergency stop may be needed. You can use the Safe torque off function of the drive to implement the Emergency stop function. See chapter *The Safe torque off function* on page *259*.

Note: Pressing the stop key ⏚ on the control panel of the drive does not generate an emergency stop of the motor or separate the drive from dangerous potential.

Implementing the Safe torque off function

See chapter *The Safe torque off function* on page *259*.

Implementing the safety functions provided with the FSO safety functions module (options +Q972 and +Q973)

The drive can be equipped with a safety functions module as factory installed (option +Q973 or +Q972). The module is also available as a retrofit kit. The safety functions module enables the implementation of functions such as Safe brake control (SBC), Safe stop 1 (SS1), Safe stop emergency (SSE), Safely limited speed (SLS) and Safe maximum speed (SMS).

The settings of the FSO-xx are at default when delivered from the factory. The wiring of the external safety circuit and configuration of the FSO-xx module are the responsibility of the machine builder.

The FSO-xx reserves the standard Safe torque off (STO) connection of the drive control unit. STO can still be utilized by other safety circuits through the FSO-xx.

For the installation of the safety functions module, see section *Installation of safety functions modules* on page *138*. For wiring instructions, safety data and more information on the option, see *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

Declaration of Conformity

See page *232*.

Implementing the ATEX-certified Safe motor disconnection function (option +Q971)

With option +Q971, the drive supplies ATEX-certified safe motor disconnection without contactor that uses the drive Safe torque off function. For more information, see *ACS880 ATEX-certified Safe disconnection function application guide* (3AUA0000132231 [English]). See also section *Deratings for special settings in the drive control program* on page *178*.

Implementing the Power-loss ride-through function

Implement the power-loss ride-through function as follows:

- Check that the power-loss ride-through function of the drive is enabled with parameter **30.31 Undervoltage control** in the ACS880 primary control program.
- If the installation is equipped with a main contactor, prevent its tripping at the input power break. For example, use a time delay relay (hold) in the contactor control circuit.

WARNING! Make sure that the flying restart of the motor will not cause any danger. If you are in doubt, do not implement the Power-loss ride-through function.

Using power factor compensation capacitors with the drive

Power factor compensation is not needed with AC drives. However, if a drive is to be connected in a system with compensation capacitors installed, note the following restrictions.

WARNING! Do not connect power factor compensation capacitors or harmonic filters to the motor cables (between the drive and the motor). They are not meant to be used with AC drives and can cause permanent damage to the drive or themselves.

If there are power factor compensation capacitors in parallel with the three phase input of the drive:

1. Do not connect a high-power capacitor to the power line while the drive is connected. The connection will cause voltage transients that may trip or even damage the drive.
2. If capacitor load is increased/decreased step by step when the AC drive is connected to the power line, ensure that the connection steps are low enough not to cause voltage transients that would trip the drive.
3. Check that the power factor compensation unit is suitable for use in systems with AC drives, ie, harmonic generating loads. In such systems, the compensation unit should typically be equipped with a blocking reactor or harmonic filter.

Using a contactor between the drive and the motor

Implementing the control of the output contactor depends on how you select the drive to operate. See also section *Implementing a bypass connection* on page *95*.

When you have selected to use DTC motor control mode and motor ramp stop, open the contactor as follows:

1. Give a stop command to the drive.
4. Wait until the drive decelerates the motor to zero speed.
5. Open the contactor.

When you have selected to use DTC motor control mode and motor coast stop, or scalar control mode, open the contactor as follows:

1. Give a stop command to the drive.
2. Open the contactor.

WARNING! When the DTC motor control mode is in use, never open the output contactor while the drive controls the motor. The DTC motor control operates extremely fast, much faster than it takes for the contactor to open its contacts. When the contactor starts opening while the drive controls the motor, the DTC control will try to maintain the load current by immediately increasing the drive output voltage to the maximum. This will damage, or even burn the contactor completely.

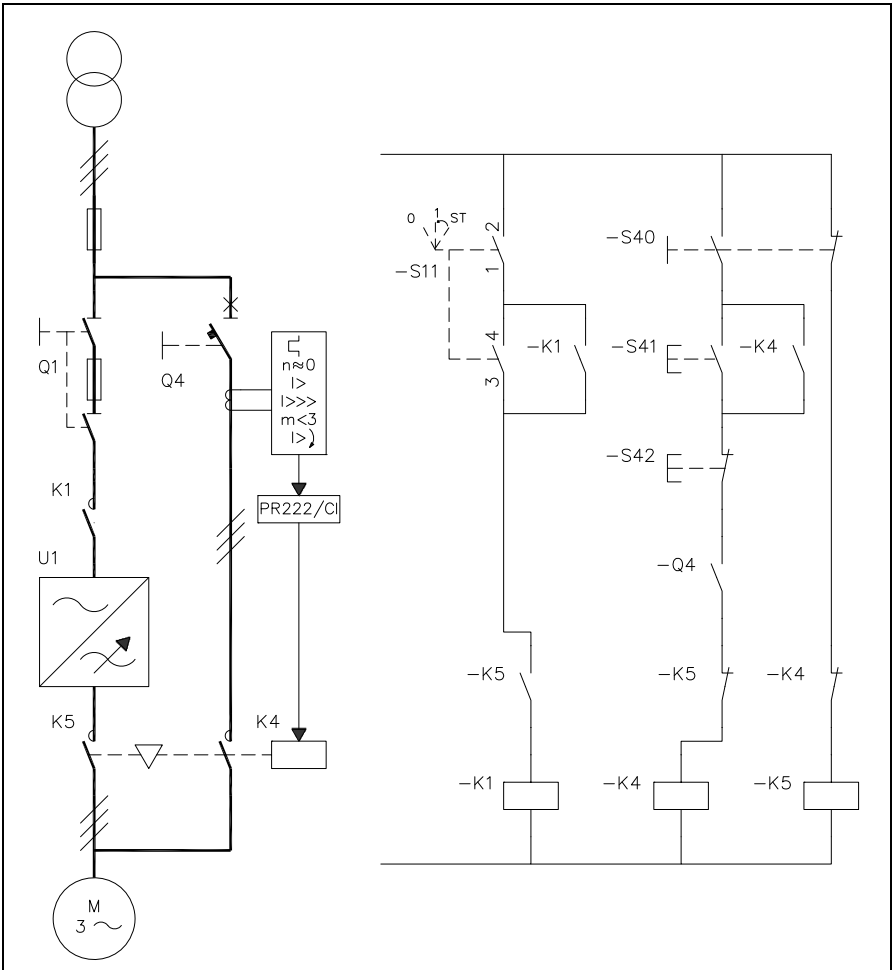
Implementing a bypass connection

If bypassing is required, employ mechanically or electrically interlocked contactors between the motor and the drive and between the motor and the power line. Make sure with interlocking that the contactors cannot be closed simultaneously. The installation must be clearly marked as defined in IEC/EN 61800-5-1, subclause 6.5.3, for example, “THIS MACHINE STARTS AUTOMATICALLY”.

WARNING! Never connect the drive output to the electrical power network. The connection may damage the drive.

Example bypass connection

An example bypass connection is shown below.



Q1	Drive main switch	S11	Drive main contactor on/off control
Q4	Bypass circuit breaker	S40	Motor power supply selection (drive or direct-on-line)
K1	Drive main contactor	S41	Start when motor is connected direct-on-line
K4	Bypass contactor	S42	Stop when motor is connected direct-on-line
K5	Drive output contactor		

Switching the motor power supply from drive to direct-on-line

1. Stop the drive and the motor with the drive control panel (drive in local control mode) or with the external stop signal (drive in remote control mode).
2. Open the main contactor of the drive with S11.
3. Switch the motor power supply from the drive to direct-on-line with S40.
4. Wait for 10 seconds to allow the motor magnetization to die away.
5. Start the motor with S41.

Switching the motor power supply from direct-on-line to drive

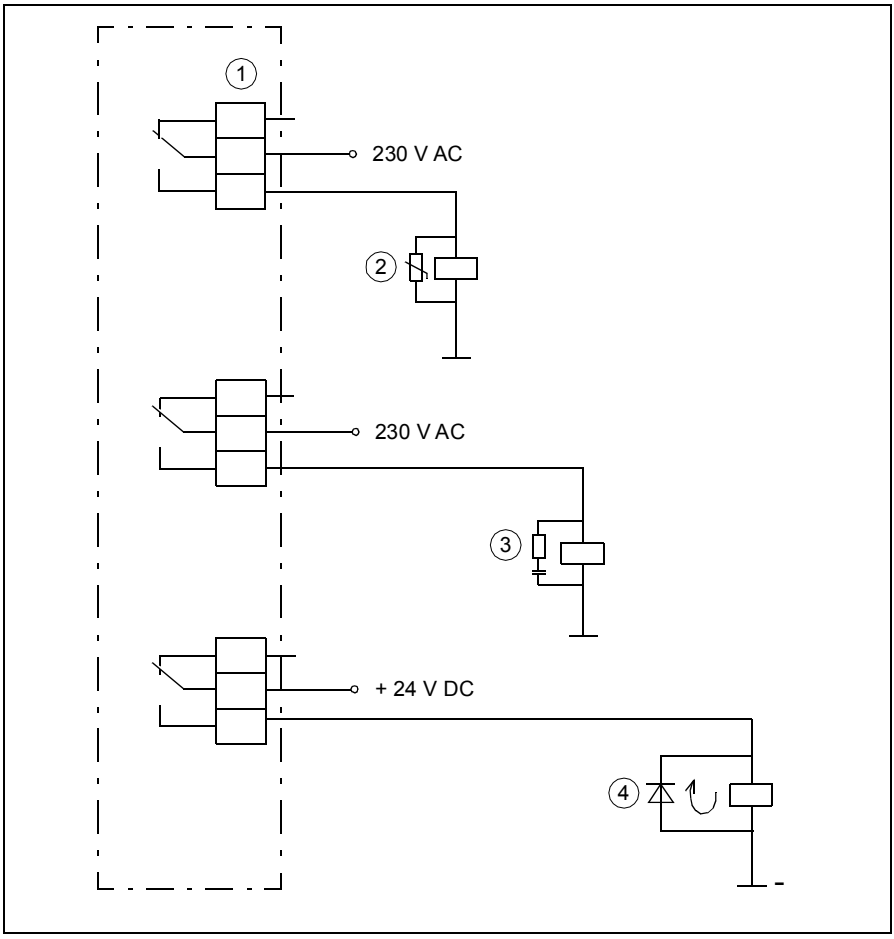
1. Stop the motor with S42.
2. Switch the motor power supply from direct-on-line to the drive with S40.
3. Close the main contactor of the drive with switch S11 (-> turn to position ST for two seconds and leave at position 1).
4. Start the drive and the motor with the drive control panel (drive in local control mode) or with the external start signal (drive in remote control mode).

Protecting the contacts of relay outputs

Inductive loads (relays, contactors, motors) cause voltage transients when switched off.

The relay contacts on the drive control unit are protected with varistors (250 V) against overvoltage peaks. In spite of this, it is highly recommended that inductive loads are equipped with noise attenuating circuits (varistors, RC filters [AC] or diodes [DC]) in order to minimize the EMC emission at switch-off. If not suppressed, the disturbances may connect capacitively or inductively to other conductors in the control cable and form a risk of malfunction in other parts of the system.

Install the protective component as close to the inductive load as possible. Do not install protective components at the relay outputs.



1) Relay outputs; 2) Varistor; 3) RC filter; 4) diode

Implementing a motor temperature sensor connection

WARNING! IEC 60664 and IEC 61800-5-1 require double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.

To connect a motor temperature sensor and other similar components to the drive, you have four alternatives:

1. If there is double or reinforced insulation between the sensor and the live parts of the motor, you can connect the sensor directly to the inputs of the drive.
2. If there is basic insulation between the sensor and the live parts of the motor, you can connect the sensor to the analog/digital inputs of the drive if all circuits connected to the drive's digital and analog inputs (typically extra-low voltage circuits) are protected against contact and insulated with basic insulation from other low-voltage circuits. The insulation must be rated for the same voltage level as the drive main circuit. Note that extra-low voltage circuits (such as 24 V DC) typically do not meet these requirements.
3. You can connect the sensor to the drive via an option module.The sensor and the module must form a double or reinforced insulation between the motor live parts and the drive control unit. See section *Connection of motor temperature sensor to the drive via an option module* (page *100*).
4. You can connect the sensor to a digital input of the drive via a customer's external relay. The sensor and the relay must form a double or reinforced insulation between the motor live parts and the drive control unit. See section *Connection of motor temperature sensor to the drive via a relay* (page *101*).

Connection of motor temperature sensor to the drive via an option module

This table shows:

- option module types that you can use for the motor temperature sensor connection
- insulation or isolation level that each option module forms between its temperature sensor connector and other connectors
- temperature sensor types that you can connect to each option module
- temperature sensor insulation requirement in order to form, together with the insulation of the option module, a double or reinforced insulation between the motor live parts and the drive control unit.

Extension module		Temperature sensor type			Temperature sensor insulation requirement
Type	**Insulation/Isolation**	**PTC**	**KTY**	**Pt100, Pt1000**	
FIO-11	Galvanic isolation between sensor connector and other connectors (including drive control unit connector)	-	X	X	Reinforced insulation
FEN-xx	Galvanic isolation between sensor connector and other connectors (including drive control unit connector)	X	X	-	Reinforced insulation
FAIO-01	Basic insulation between sensor connector and drive control unit connector. No insulation between sensor connector and other IO connectors.	X	X	X	Basic insulation. Connectors of extension module other than sensor connector must be left unconnected.
FPTC-xx	Reinforced insulation between sensor connector and other connectors (including drive control unit connector).	X	-	-	No special requirement

For more information, see sections:

- section *AI1 and AI2 as Pt100, Pt1000, PTC and KTY84 sensor inputs (XAI, XAO)* on page *128*
- section *DI6 (XDI:6) as PTC sensor input* on page*130*
- *FPTC-01 thermistor protection module (option +L536) for ACS880 drives user's manual* (3AXD50000027750 [English])
- *FPTC-02 ATEX-certified thermistor protection module Ex II (2) GD (option +L537+Q971) for ACS880 drives user's manual* (3AXD50000027782 [English]).

Connection of motor temperature sensor to the drive via a relay

PTC (IEC 60800-5-1)

Class A. This table shows the insulation requirement for a customer's external relay, and the insulation requirement for the sensor to fulfill decisive voltage class A (double insulation).

PTC relay		Temperature sensor insulation requirement
Type	**Insulation**	
External relay	Basic insulation 6 kV	Basic insulation

Class B. Decisive voltage class B (basic insulation) is provided with a 6 kV relay. Circuits connected to all motor protection relay inputs and outputs must be protected against direct contact.

Pt100 (IEC 60800-5-1)

Class B. Decisive voltage class B (basic insulation) can be achieved when there is basic insulation between the sensor and live parts of the motor. Circuits connected to all motor protection relay inputs and outputs must be protected against direct contact.

Pt100 relay		Temperature sensor insulation requirement between sensor and live parts of motor
Type	**Insulation**	
External relay	Basic insulation 6 kV	Basic insulation

6

Electrical installation

Contents of this chapter

This chapter gives instructions on wiring the drive.

Warnings

WARNING! Only qualified electrical professionals are allowed to carry out the work described in this chapter. Obey the *Safety instructions* in the first chapter of this manual. Ignoring the safety instructions can cause physical injury or death.

Make sure that the drive is disconnected from the input power during installation. If you need to disconnect the drive, wait for 5 minutes after disconnecting the input power before you start the work.

Checking the insulation of the assembly

Drive

Do not make any voltage tolerance or insulation resistance tests on any part of the drive as testing can damage the drive. Every drive has been tested for insulation between the main circuit and the chassis at the factory. Also, there are voltage-limiting circuits inside the drive which cut down the testing voltage automatically.

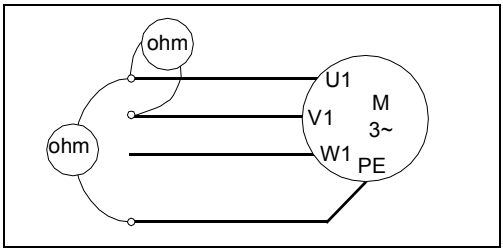
Input power cable

Check the insulation of the input cable according to local regulations before connecting it to the drive.

Motor and motor cable

Check the insulation of the motor and motor cable as follows:

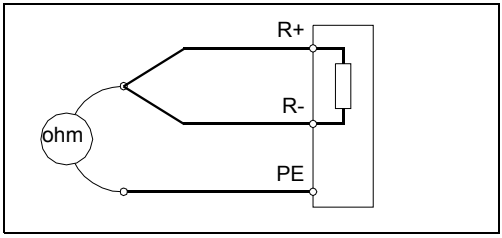
1. Check that the motor cable is disconnected from the drive output terminals T1/U, T2/V and T3/W.
2. Measure the insulation resistance between each phase conductor and then between each phase conductor and the Protective Earth conductor using a measuring voltage of 1000 V DC. The insulation resistance of an ABB motor must exceed 100 Mohm (reference value at 25 °C or 77 °F). For the insulation resistance of other motors, please consult the manufacturer's instructions. **Note:** Moisture inside the motor casing will reduce the insulation resistance. If moisture is suspected, dry the motor and repeat the measurement.



Brake resistor assembly

Check the insulation of the brake resistor assembly (if present) as follows:

1. Check that the resistor cable is connected to the resistor, and disconnected from the drive output terminals R+ and R-.
2. At the drive end, connect the R+ and R- conductors of the resistor cable together. Measure the insulation resistance between the combined conductors and the PE conductor by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.



Checking the compatibility with IT (ungrounded), corner-grounded delta, midpoint-grounded delta, and TT systems

The standard drive can be an be installed to a symmetrically grounded TN-S system. For other systems, see sections *EMC filter options +E200 and +E202*, *Ground-to-phase varistor* and *Corner-grounded and midpoint-grounded 690 V delta systems* below.

EMC filter options +E200 and +E202

A drive with EMC filter options +E200 and +E202 connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, you may need to disconnect the EMC filter. See sections *When to disconnect EMC filter (options +E200 and +E202) or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *106* and *Guidelines for installing the drive to a TT system* on page *107*.

WARNING! Do not install the drive with EMC filter options +E200 and +E202 connected to a system that the filter is not suitable for. This can cause danger, or damage the drive.

Note: When EMC filter +E200 or +E202 is disconnected, the drive EMC compatibility is considerably reduced.

Ground-to-phase varistor

A drive with the ground-to-phase varistor connected can be installed to a symmetrically grounded TN-S system. If you install the drive to another system, you may need to disconnect the varistor. See sections *When to disconnect EMC filter (options +E200 and +E202) or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems* on page *106* and *Guidelines for installing the drive to a TT system* on page *107*.

WARNING! Do not install the 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.

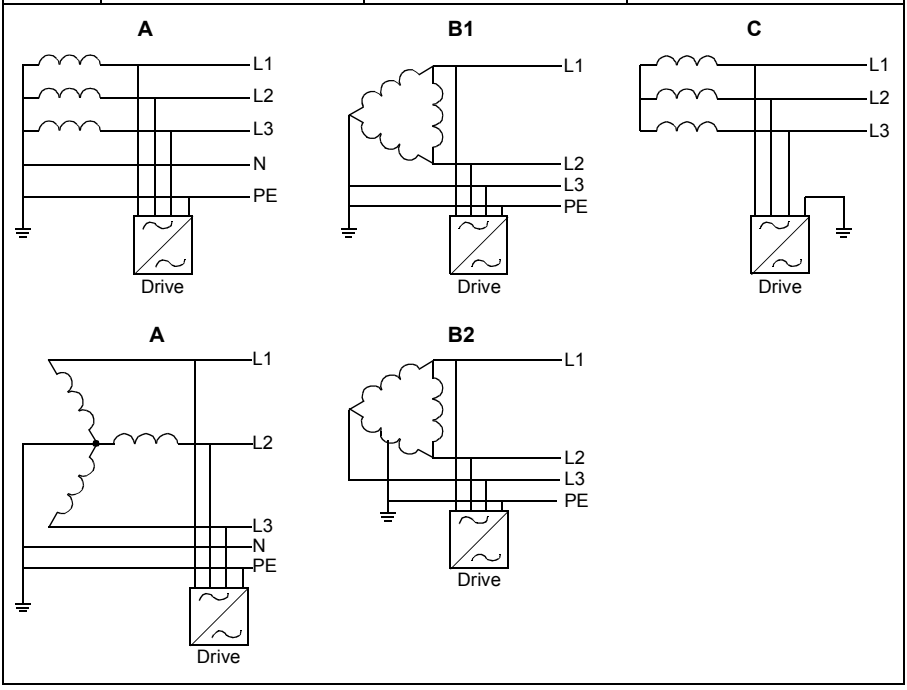
Corner-grounded and midpoint-grounded 690 V delta systems

WARNING! Do not install the drive on a 690 V corner-grounded or midpoint-grounded delta system. Disconnecting the EMC filter and ground-to-phase varistor does not prevent damage to the drive.

When to disconnect EMC filter (options +E200 and +E202) or ground-to-phase varistor: TN-S, IT, corner-grounded delta and midpoint-grounded delta systems

Check from this table if you have to disconnect the EMC filter (EMC AC and EMC DC screws) with options +E200 and +E202 or the ground-to-phase varistor (VAR screw). For instructions on how to do this, see *ACS880 frames R1 to R11 EMC filter and ground-to-phase varistor disconnecting instructions* (3AUA0000125152 [English]).

Frame size	Symmetrically grounded TN systems (TN-S systems), ie. center-grounded wye (A)	Corner-grounded (B1) and midpoint-grounded delta systems (B2)	IT systems (ungrounded or high-resistance grounded [>30 ohms]) (C)
R1…R4	Do not disconnect EMC or VAR screws	Do not disconnect EMC or VAR screws	Disconnect EMC AC, EMC DC, VAR *)
R5		Do not disconnect EMC AC or VAR. Disconnect EMC DC.	Disconnect EMC AC, EMC DC, VAR (2×VAR with +E200 and +E202) *)
R6…R9		Do not disconnect EMC AC or VAR. Disconnect EMC DC.	Disconnect EMC AC, EMC DC, VAR *)



* With option +E201, remove EMC AC, EMC DC and VAR screws if not removed at the factory. For more information, contact ABB.

Note: These are the EMC filter and varistor screws of different drive frame sizes.

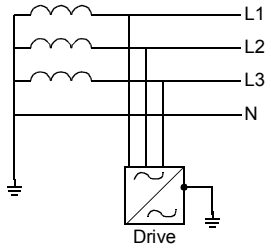
Frame size	EMC filter (+E200 and +E202) screws	Ground-to-phase varistor screws
R1…R4	EMC AC, EMC DC	VAR
R5	EMC AC, EMC DC	VAR (2×VAR with +E200 and +E202)
R6…R9	EMC AC, EMC DC	VAR

Guidelines for installing the drive to a TT system

The drive can be connected to a TT system under these conditions:

1. Residual current device has been installed in the supply system.
2. These screws have been disconnected. Otherwise EMC filter and ground-to-phase varistor capacitor leakage current will cause the residual current device to trip.

Frame size	EMC filter (+E200, +E202) screws	Ground-to-phase varistor screws with +E200, +E202
R1…R4	EMC AC, EMC DC	VAR
R5	EMC AC, EMC DC	2×VAR
R6…R9	EMC AC, EMC DC	VAR



3AXD10000681917

Note:

- Because the EMC filter screws have been disconnected, ABB does not guarantee the EMC category.
- ABB does not guarantee the functioning of the ground leakage detector built inside the drive.
- In large systems the residual current device can trip without a real reason.

Identifying different types of electrical power systems

To identify the electrical power system type, find out the supply transformer connection. If that is not possible, measure these voltages at the distribution board before you connect power to the drive:

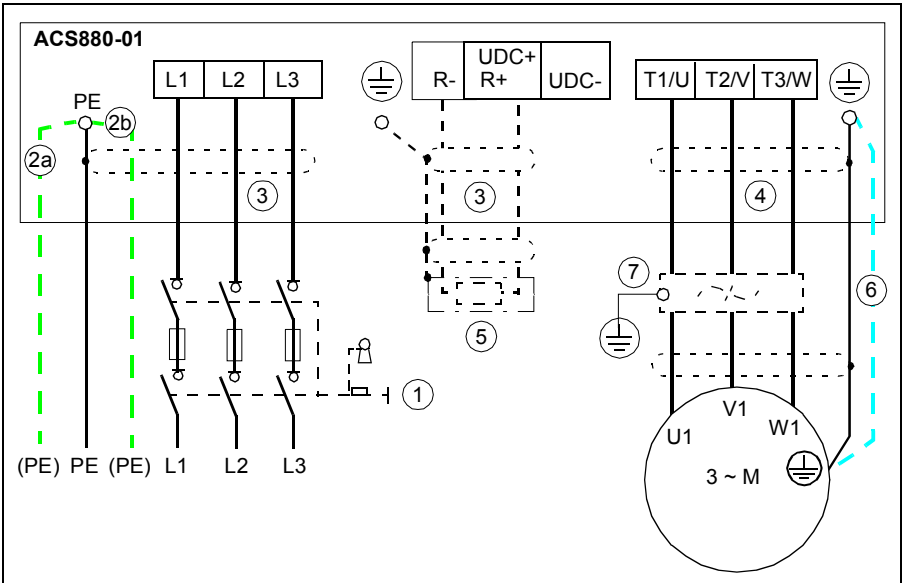
1. input voltage line to line (U_{L-L})
2. input voltage line 1 to ground (U_{L1-G})
3. input voltage line 2 to ground (U_{L2-G})
4. input voltage line 3 to ground (U_{L3-G}).

The line-to-ground voltages in relation to the line-to-line voltage of the electrical power system types are shown below.

U_{L-L}	U_{L1-G}	U_{L2-G}	U_{L3-G}	Electrical power system type
X	0.58·X	0.58·X	0.58·X	Symmetrically grounded TN system (TN-S system)
X	1.0·X	1.0·X	0	Corner-grounded delta system (nonsymmetrical)
X	0.866·X	0.5·X	0.5·X	Midpoint-grounded delta system (nonsymmetrical)
X	Varying level versus time	Varying level versus time	Varying level versus time	IT systems (ungrounded or high-resistance-grounded [>30 ohms]) nonsymmetrical

Connecting the power cables

Connection diagram



1	For alternatives, see section *Selecting the supply disconnecting device* on page *67*.
2	Use a separate grounding PE cable (2a) or a cable with a separate PE conductor (2b) if the conductivity of the shield does not meet the requirements for the PE conductor (see page *77*).
3	360-degree grounding is recommended if shielded cable is used. Ground the other end of the input cable shield or PE conductor at the distribution board.
4	360-degree grounding is required.
5	External brake resistor
6	Use a separate grounding cable if the shield does not meet the requirements of IEC 61800-5-1 (see page *77*) and there is no symmetrically constructed grounding conductor in the cable (see page *80*).
7	du/dt filter or sine filter (optional, see page *289*).

Note:

If there is a symmetrically constructed grounding conductor on the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the drive and motor ends.

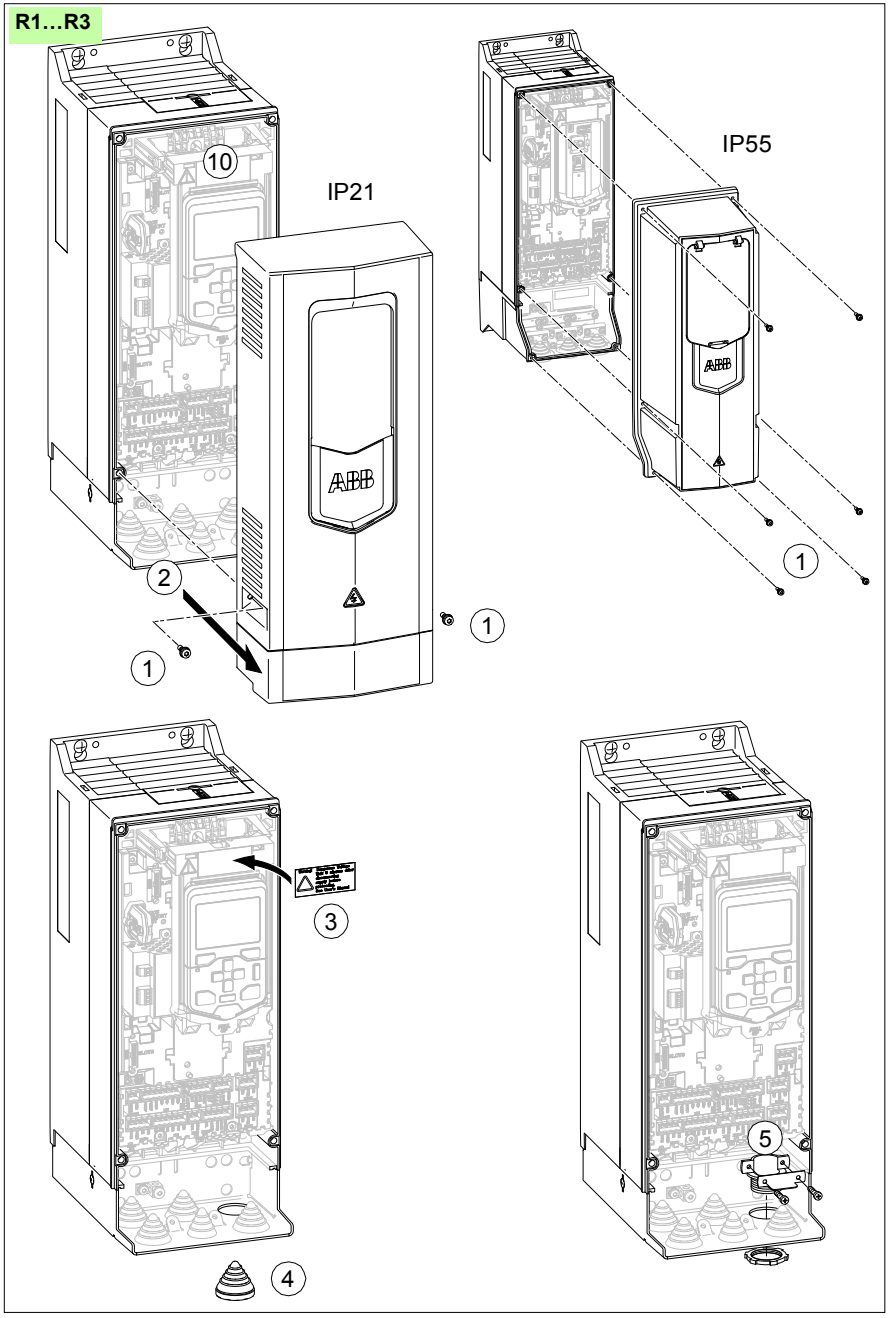
Do not use an asymmetrically constructed motor cable for motors above 30 kW (see page *77*). Connecting its fourth conductor at the motor end increases bearing currents and causes extra wear.

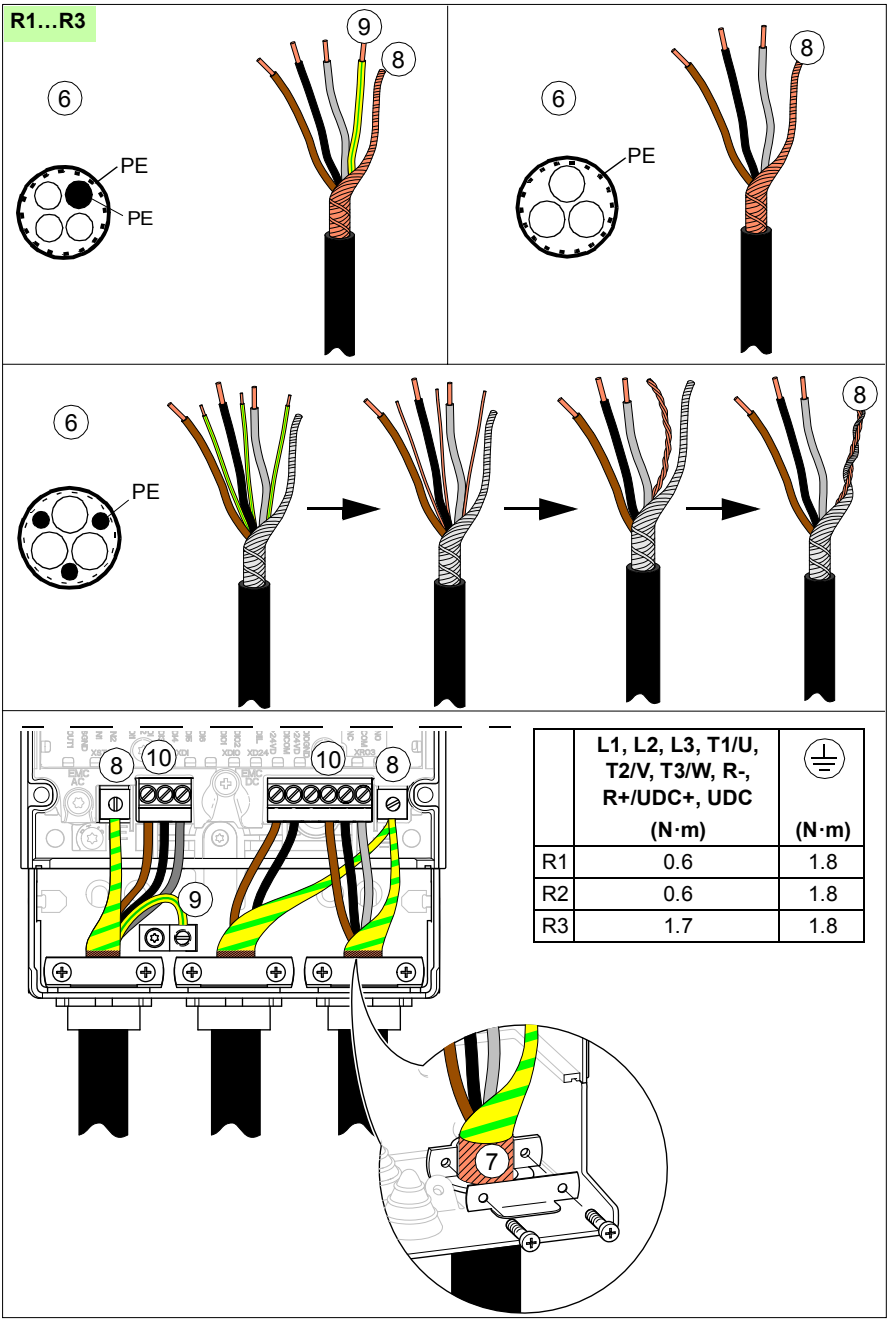
Connection procedure for frames R1 to R3

1. Undo the mounting screws at the sides of the front cover.
2. Remove the cover by sliding it forward.
3. Attach the residual voltage warning sticker in the local language to the control panel mounting platform.
4. Remove the rubber grommets from the entry plate for the cables to be connected.
5. IP21 units: Fasten the cable connectors (included in the delivery in a plastic bag) to the cable entry plate holes.
6. Prepare the input power and motor cable ends as illustrated in the figure.

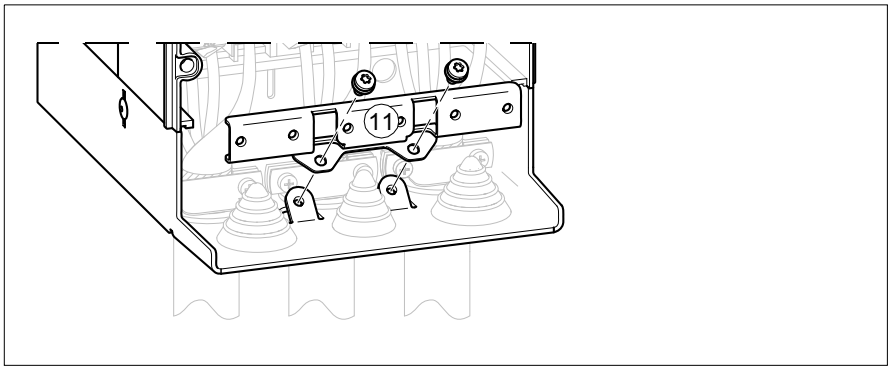
   Note: Bare shield will be grounded 360 degrees.
7. IP21 units: Ground the shields 360 degrees in the connectors by tightening the connector onto the stripped part of the cable. IP55 units: Tighten the clamps onto the stripped part of the cables. Mind the sharp edges.
8. Connect the twisted shields of the power cables to the grounding terminals.
9. Connect the additional PE conductor (if used, see page *19*) of the input cable to the grounding terminal.
10. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals and the phase conductors of the motor cable to the T1/U, T2/V and T3/W terminals. Connect the brake resistor conductors (if present) to the R+ and R- terminals. Tighten the screws to the torque given in the figure below.
11. Install the control cable grounding shelf in the cable entry box.
12. Secure the cables outside the unit mechanically.

Note: For US cable conduit installation, see the quick installation guide.


R1…R3
10
IP21
IP55
2
1
1
1
3
4
5



	L1, L2, L3, T1/U, T2/V, T3/W, R-, R+/UDC+, UDC (N·m)	⏚ (N·m)
R1	0.6	1.8
R2	0.6	1.8
R3	1.7	1.8



Connection procedure for frames R4 and R5

1. Remove the front cover. IP21 units: Release the retaining clip with a screwdriver (a) and lift the cover from the bottom outwards (b).
2. For IP21 drives: Remove the cable entry box cover by undoing the mounting screw.
3. For frame R4: Remove the EMC shroud that separates the input and output cabling if needed for easier installation.
4. Remove the shroud on the power cable terminals by releasing the clips and lifting the shroud up from the sides with a screwdriver (a). Knock out holes in the shroud for the cables to be installed (b).
5. Attach the residual voltage warning sticker in the local language next to the control unit top.
6. Cut adequate holes into the rubber grommets. Slide the grommets onto the cables. Slide the cables through the holes of the bottom plate and attach the grommets to the holes.
7. Prepare the ends of the input power and motor cables as illustrated in the figure.

   Note: Bare shield will be grounded 360 degrees under the grounding clamp.
8. Ground the cable shields 360 degrees under the grounding clamps. Mind the sharp edges.
9. Connect the twisted cable shields to the grounding terminals.
10. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals and the phase conductors of the motor cable to the T1/U, T2/V and T3/W terminals. Tighten the screws to the torque given in the figure below.

    Note for aluminum cables: Apply grease onto the conductor ends before you put them into the terminals.

Note for cable lug installation (frame R5): Detach the connector and install a cable lug to the terminal post as follows:

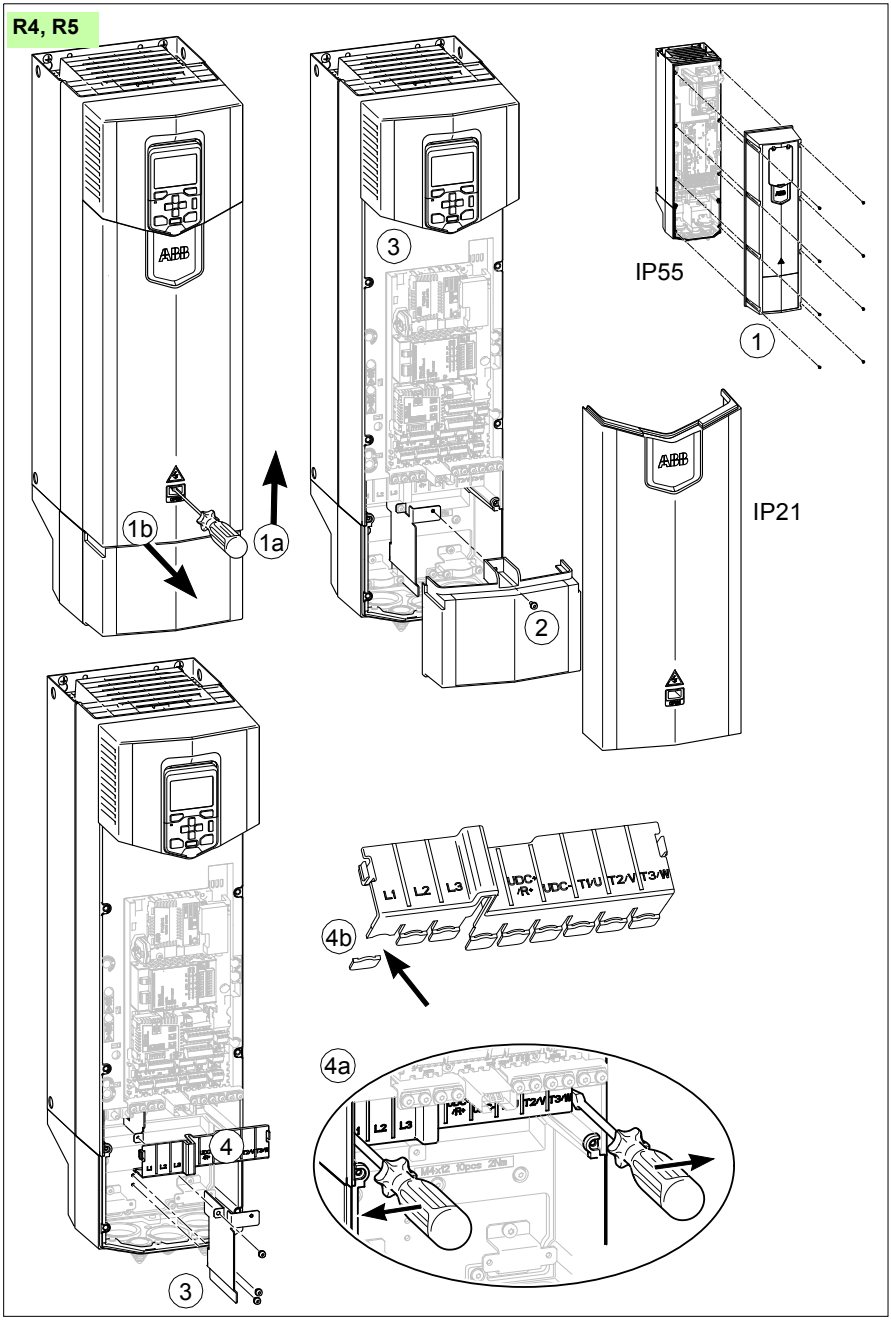
- Remove the combi screw that attaches the connector to its terminal post and pull the connector off.
- Attach the cable lug to the conductor.
- Put the cable lug onto the terminal post. Start the nut, and turn it at least two rotations by hand.

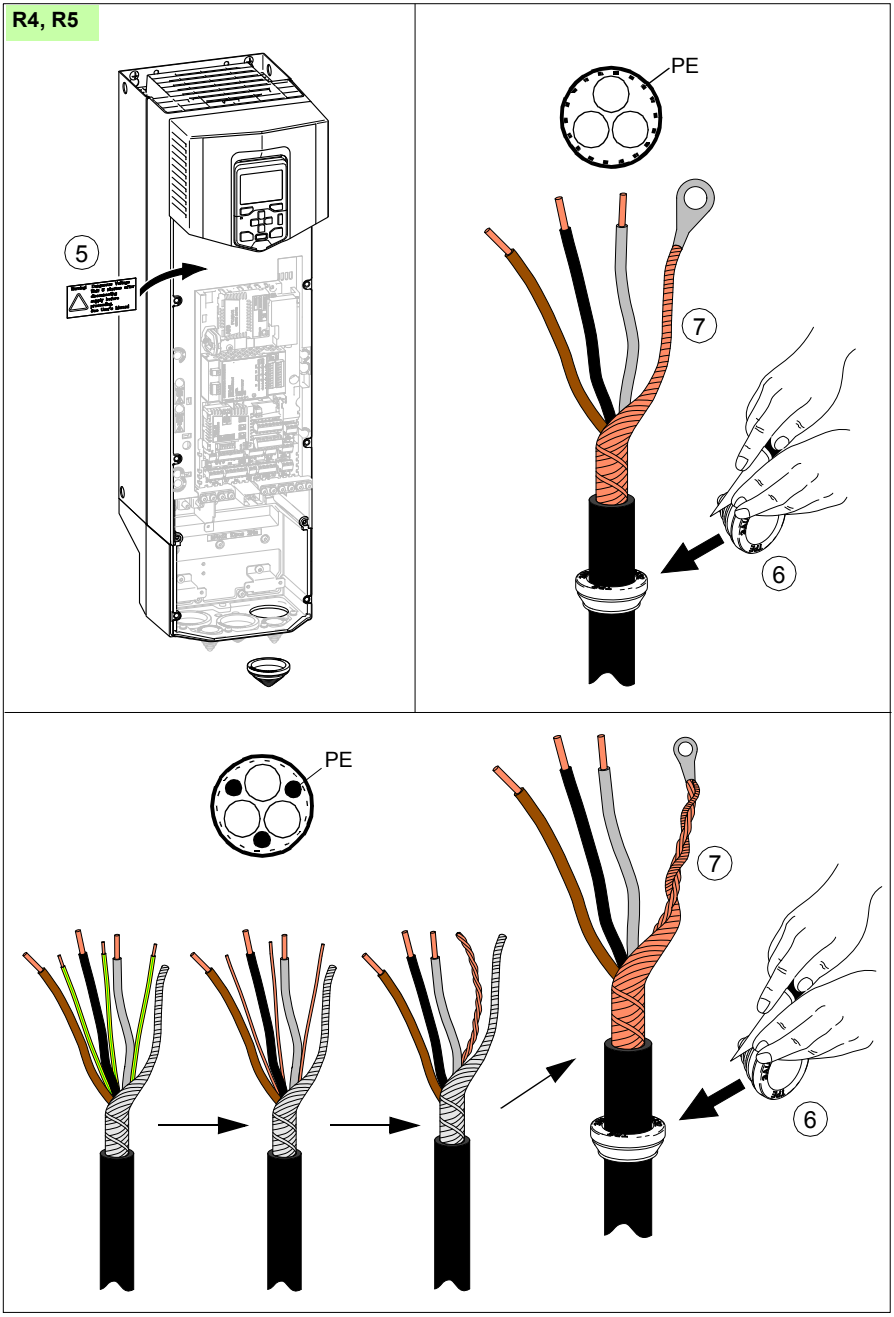
WARNING! Before using tools, make sure that the nut/screw is not cross-threading. Cross-threading will damage the drive and cause danger.

- Tighten the nut to a torque of 5 N·m.

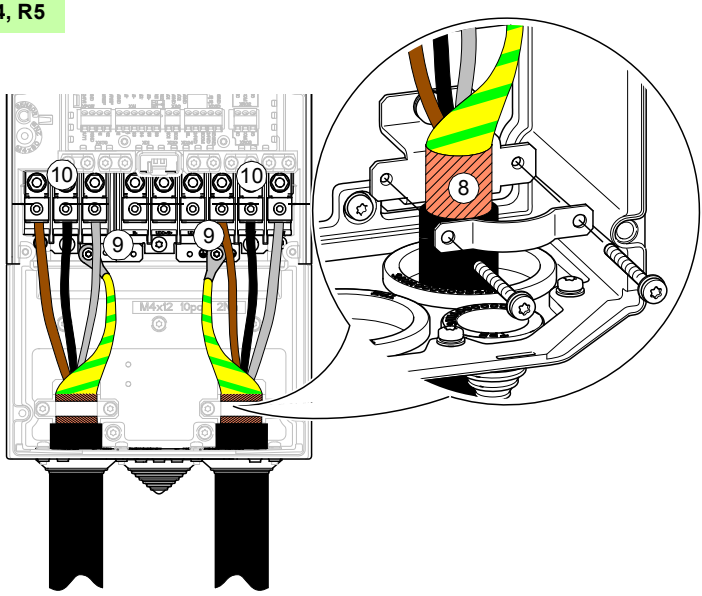
11. Install the EMC shroud separating the input and output cabling if not installed yet.
12. Units with option +D150: Slide the brake resistor cable through the brake resistor and control cable clamp assembly. Connect the conductors to the R+ and R- terminals and tighten to the torque given in the figure.
13. Reinstall the shroud on the power terminals.
14. Secure the cables outside the unit mechanically. Install the rubber grommets to the unused entry plate holes.

Note for US cable conduit installation: See the quick installation guide. In case of a cable lug installation, use UL listed cable lugs and tools to agree with UL requirements. See page *219*.

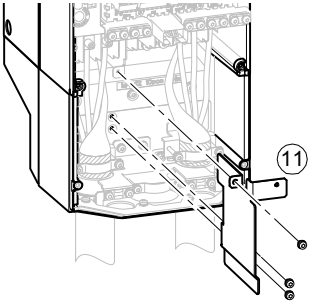

R4, R5
IP55
1
3
1b
1a
2
IP21
4b
L1
L2
L3
UDC+
/R+
UDC-
T1/U
T2/V
T3/W
4a
4
3

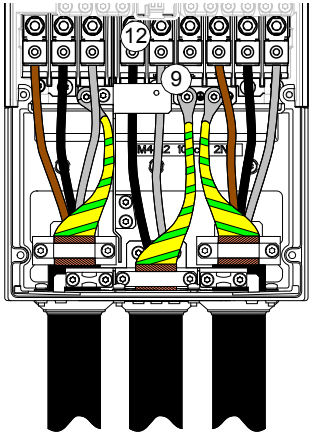

R4, R5
5
PE
7
6
PE
7
6

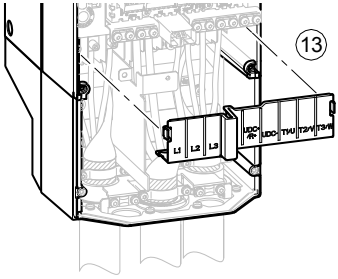
R4, R5



	L1, L2, L3, T1/U, T2/V, T3/W (N·m)	R-, R+/UDC+, UDC- (N·m)	⏚ (N·m)
R4	3.3	3.3	2.9
R5	5.6	5.6	2.9







Connection procedure for frames R6 to R9

Note: For frames R6 to R9 with option +H358, see also *ACS880-01, ACS580-01, ACH580-01, ACQ580-01 UK gland plate (+H358) installation guide* (3AXD50000034735 [English]).

1. Remove the front cover: For IP21 drives: Release the retaining clip with a screwdriver (a) and pull the cover by the bottom outwards (b).
2. For IP21 drives: Remove the cable entry box cover by undoing the mounting screws.
3. Attach the residual voltage warning sticker in the local language next to the control unit.
4. Remove the side plates of the cable entry box by undoing the mounting screws.
5. Remove the shroud on the power cable terminals by releasing the clips on the sides with a screwdriver and lifting (a). Knock out holes for the cables to be installed (b).
6. If parallel cables are installed (frames R8 and R9): Knock out the shrouds on the power cable terminals for the cables to be installed.
7. Prepare the ends of the input power and motor cables as illustrated in the figure. **Note**: Bare shield will be grounded 360 degrees under the clamp.
8. Cut adequate holes into the rubber grommets (a). Slide the grommets onto the cables. Slide the cables through the holes of the bottom plate and attach the grommets to the holes (b).
9. Tighten the clamp onto the stripped part of the cable. Mind the sharp edges.
10. Fasten the twisted shields of the cables under the grounding clamps.
11. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals and the phase conductors of the motor cable to the T1/U, T2/V and T3/W terminals. Tighten the screws to the torque given in the figure.

    Note 1 for frames R8 and R9: if you put only one conductor to the connector, ABB recommends that you put it under the upper pressure plate.

    Note 2 for frames R8 and R9: We do not recommend that you detach the connectors. If you do, detach and reinstall the connector as follows.
    L1, L2 and L3 terminals
    - Remove the combi screw that attaches the connector to its terminal post, and pull the connector off.
    - Put the conductor under the connector pressure plate and pretighten the conductor.
    - Put the connector back onto the terminal post. Start the combi screw, and turn it at least two rotations by hand.

WARNING! Before using tools, make sure that the nut/screw is not cross-threading. Cross-threading will damage the drive and cause danger.

- Tighten the combi screw to a torque of 30 N·m.
- Tighten the conductor(s) to 40 N·m for frame R8 or to 70 N·m for frame R9.

T1/U, T2/V and T3/W terminals

- Remove the nut that attaches the connector to its busbar.
- Put the conductor under the connector pressure plate and pretighten the conductor.
- Put the connector back to its busbar. Start the nut, and turn it at least two rotations by hand.

WARNING! Before using tools, make sure that the nut/screw is not cross-threading. Cross-threading will damage the drive and cause danger.

- Tighten the nut to a torque of 30 N·m.
- Tighten the conductor(s) to 40 N·m for frame R8 or to 70 N·m for frame R9.

Note for cable lug installation (frames R6 to R9): Detach the connector and install a cable lug to the terminal post / busbar as follows:

- Remove the combi screw that attaches the connector to its terminal post / busbar, and pull the connector off.
- Attach the cable lug to the conductor.
- Put the cable lug onto the terminal post / busbar. Start the nut, and turn it at least two rotations by hand.

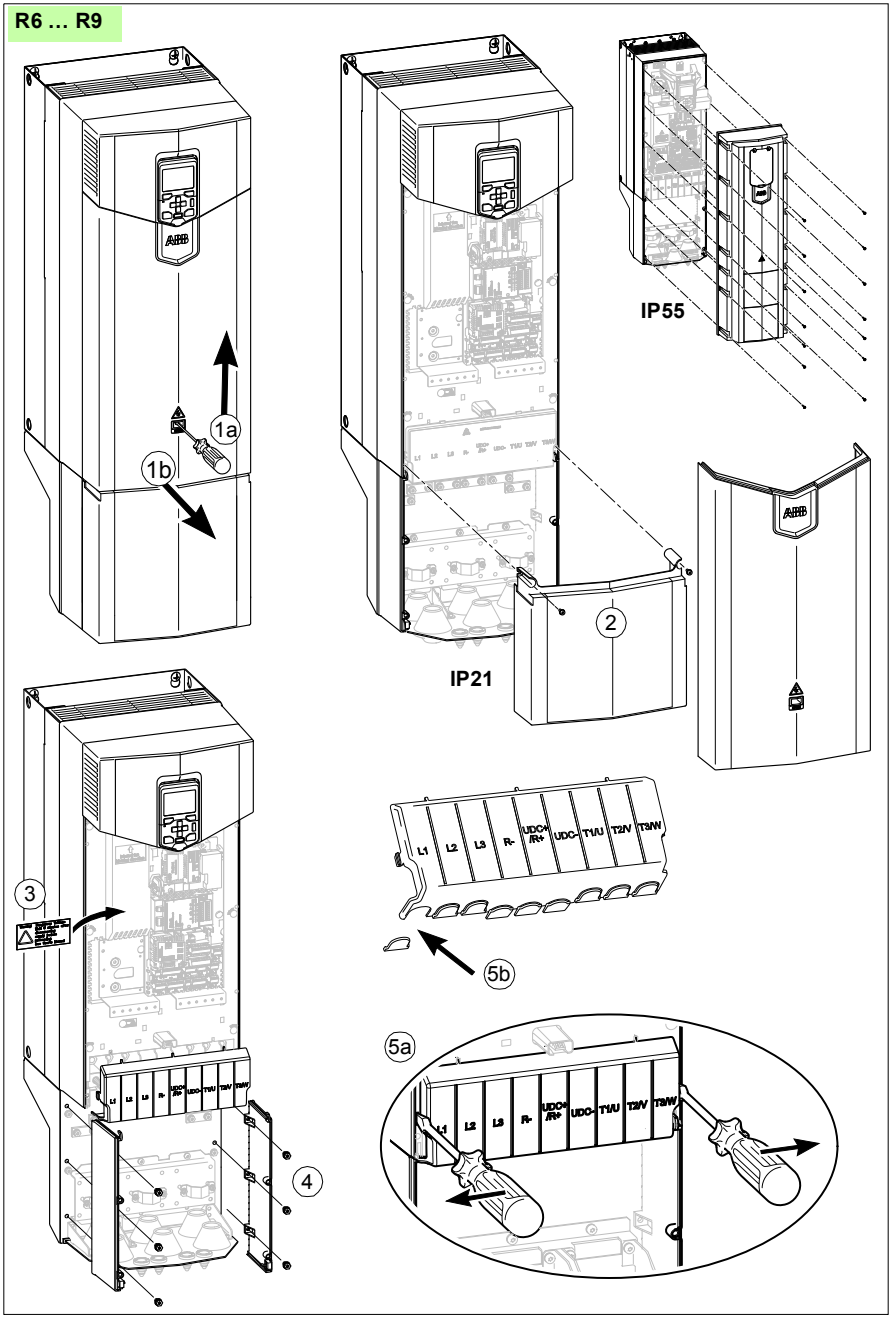
WARNING! Before using tools, make sure that the nut/screw is not cross-threading. Cross-threading will damage the drive and cause danger.

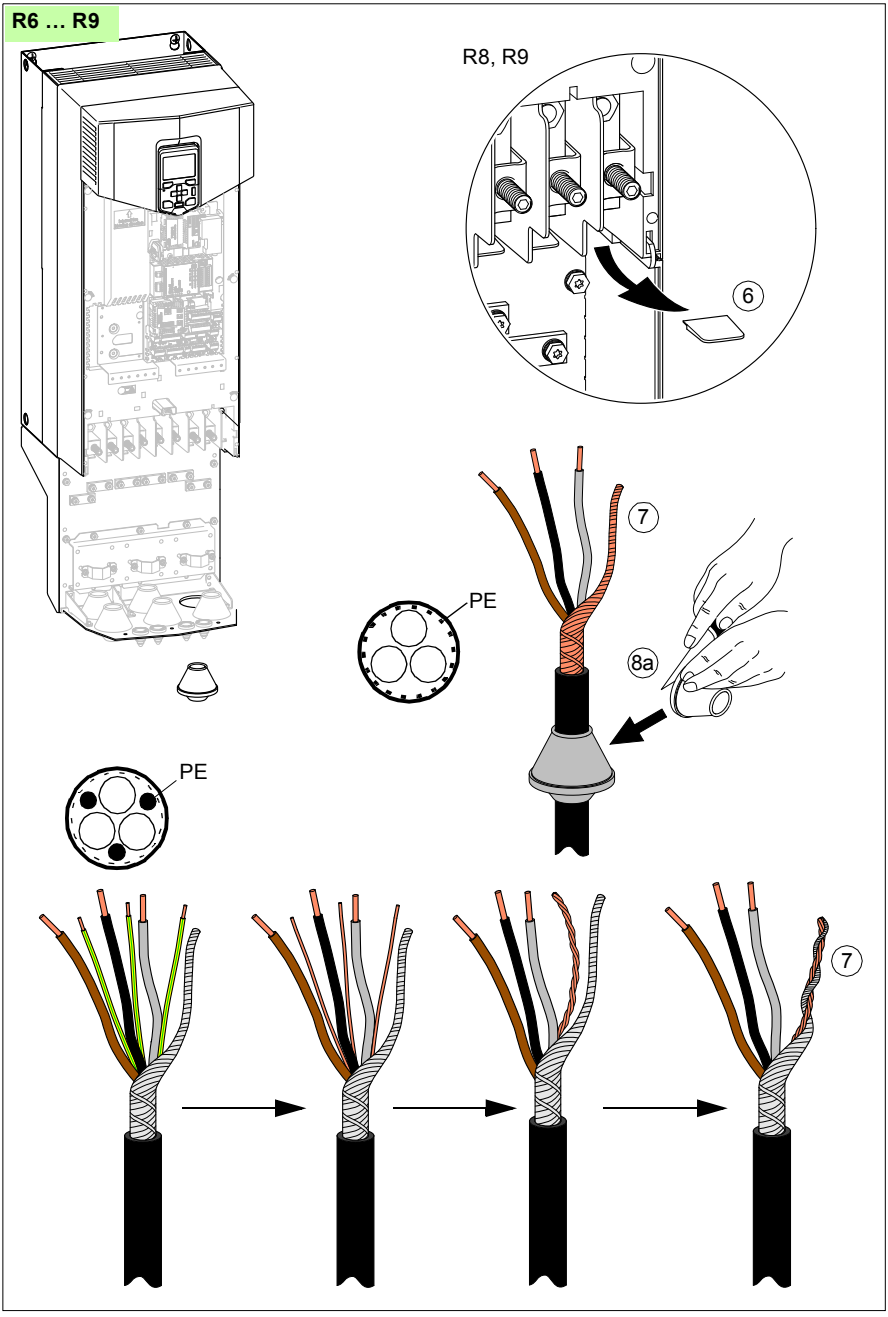
- Tighten the nut to a torque of 16 N·m (frames R6 and R7) and to a torque of 30 N·m (frames R8 and R9).

12. Units with option +D150: Connect the brake resistor cable conductors to the R+ and R- terminals.
13. If parallel cables are installed (frames R8 and R9), install the grounding shelves for them. Repeat steps 8 to 12.
14. Reinstall the shroud on the power terminals.
15. Reinstall the side plates of the cable entry box.
16. Install the control cable grounding shelf in the cable entry box.

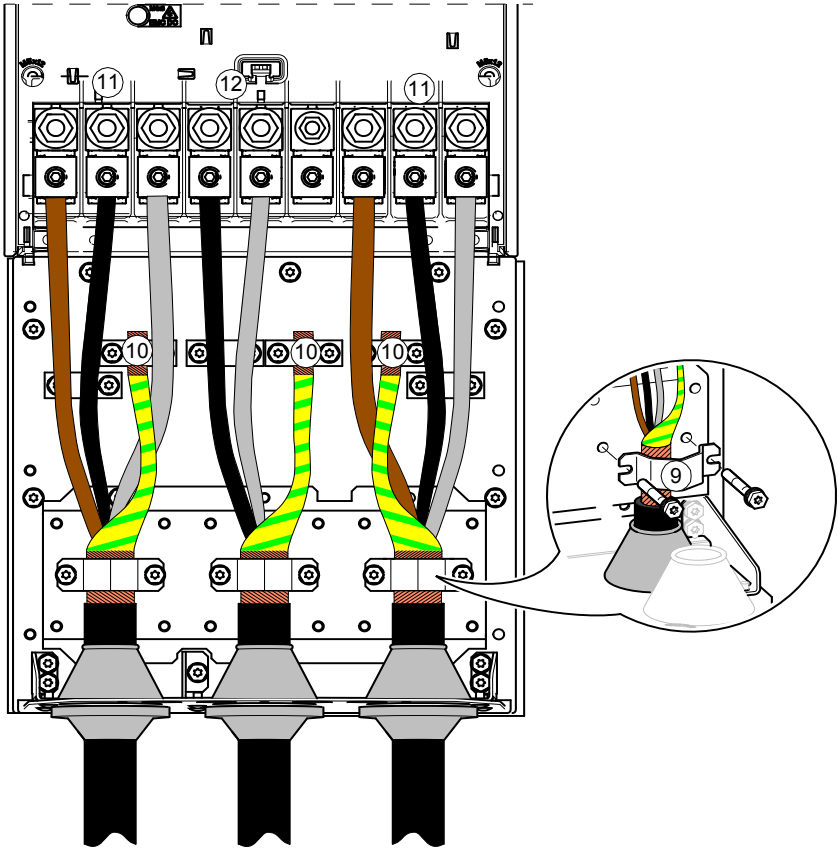
17. Secure the cables outside the unit mechanically. Install the rubber grommets to the unused entry plate holes.

Note for US cable conduit installation: See the quick installation guide. In case of a cable lug installation, use UL listed cable lugs and tools to agree with UL requirements. See page 219.


R6 … R9
1a
1b
IP55
IP21
2
3
4
5a
5b
L1
L2
L3
R-
UDC+/R+
UDC-
T1/U
T2/V
T3/W


R6 … R9
R8, R9
6
7
PE
8a
PE
7

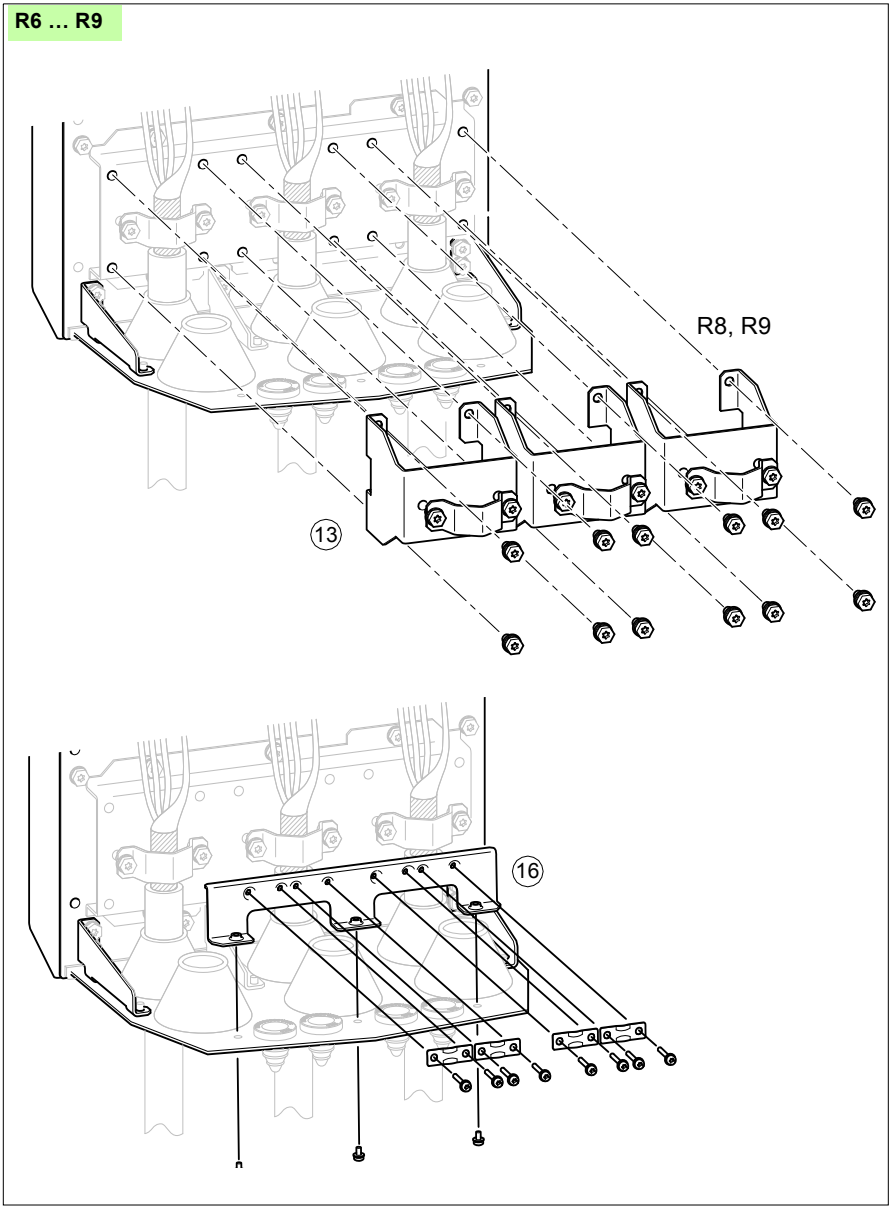
R6 … R9



Frame	L1, L2, L3, T1/U, T2/V, T3/W		R-, R+/UDC+, UDC-		⏚
	T **(Wire screw)**		***T*** **(Wire screw)**		***T***
	M…	**N·m**	**M…**	**N·m**	**N·m**
R6	M10	30	M8	20	9.8
R7	M10	40 (30*)	M10	30	9.8
R8	M10	40	M10	40	9.8
R9	M12	70	M12	70	9.8

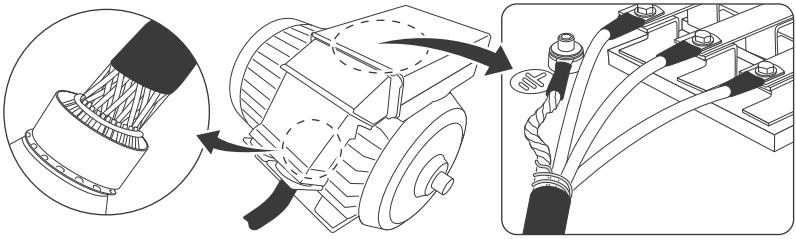
* for 525…690 V drives

R6 … R9



Grounding the motor cable shield at the motor end

Always ground the motor cable shield at the motor end. For minimum radio frequency interference, ground the motor cable shield 360 degrees at the entry of the motor terminal box.



DC connection

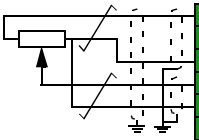
The UDC+ and UDC- terminals are intended for common DC configurations of a number of drives, allowing regenerative energy from one drive to be utilized by the other drives in motoring mode. Contact your local ABB representative for further instructions.

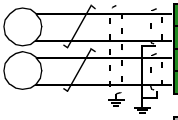
Connecting the control cables

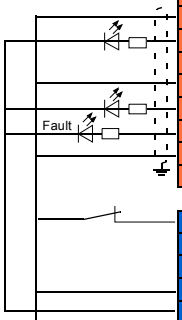
See section *Default I/O connection diagram* below for the default I/O connections of the Factory macro of ACS880 primary control program. For other macros and control programs, see the firmware manual. Connect the cables as described under *Control cable connection procedure* on page *131*.

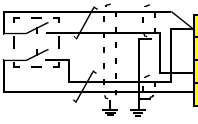
Default I/O connection diagram

Wire sizes:
0.5 … 2.5 mm^2 (24…12 AWG)
Tightening torques: 0.5 N·m (5 lbf·in) for both stranded and solid wiring.









XPOW	External power input	
1	+24VI	24 V DC, 2 A
2	GND	
XAI	Reference voltage and analog inputs	
1	+VREF	10 V DC, R_L 1…10 kohm
2	-VREF	-10 V DC, R_L 1…10 kohm
3	AGND	Ground
4	AI1+	**Speed reference** 0(2)…10 V, R_{in} > 200 kohm [1]
5	AI1-	
6	AI2+	By default not in use. 0(4)…20 mA, R_{in} = 100 ohm [2]
7	AI2-	
J1	J1	AI1 current/voltage selection jumper
J2	J2	AI2 current/voltage selection jumper
XAO	Analog outputs	
1	AO1	**Motor speed rpm** 0…20 mA, R_L < 500 ohm
2	AGND	
3	AO2	**Motor current** 0…20 mA, R_L < 500 ohm
4	AGND	
XD2D	Drive-to-drive link	
1	B	Drive-to-drive link
2	A	
3	BGND	
J3	J3	Drive-to-drive link termination switch
XRO1, XRO2, XRO3	Relay outputs	
11	NC	**Ready** 250 V AC / 30 V DC 2 A
12	COM	
13	NO	
21	NC	**Running** 250 V AC / 30 V DC 2 A
22	COM	
23	NO	
31	NC	**Faulted(-1)** 250 V AC / 30 V DC 2 A
32	COM	
33	NO	
XD24	Digital interlock	
1	DIIL	Run enable
2	+24VD	+24 V DC 200 mA [3]
3	DICOM	Digital input ground
4	+24VD	+24 V DC 200 mA [3]
5	DIOGND	Digital input/output ground
J6		Ground selection switch
XDIO	Digital input/outputs	
1	DIO1	Output: Ready
2	DIO2	Output: Running
XDI	Digital inputs	
1	DI1	Stop (0) / Start (1)
2	DI2	Forward (0) / Reverse (1)
3	DI3	Reset
4	DI4	Acceleration & deceleration select [4]
5	DI5	Constant speed 1 (1 = On)
6	DI6	By default not in use.
XSTO	Safe torque off	
1	OUT1	Safe torque off. Both circuits must be closed for the drive to start.
2	SGND	
3	IN1	
4	IN2	
X12	Safety functions module connection	
X13	Control panel connection	
X205	Memory unit connection	

See the next page for the notes.

Notes:

[1] Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected with jumper J1. Change of setting requires reboot of control unit.

[2] Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected with jumper J2. Change of setting requires reboot of control unit.

[3] Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.

[4] 0 = open, 1 = closed

DI4	Ramp times according to
0	Parameters 23.12 and 23.13
1	Parameters 23.14 and 23.15

Further information on the usage of the connectors and jumpers is given in the sections below. See also section *Control unit (ZCU-12) connection data* on page *221*.

Jumpers and switches

Jumper/ Switch	Description	Positions
J1 (AI1)	Determines whether analog input AI1 is used as a current or voltage input.	 Current (I)
		 Voltage (U)
J2 (AI2)	Determines whether analog input AI2 is used as a current or voltage input.	 Current (I)
		 Voltage (U)
J3	Drive-to-drive link termination. Must be set to terminated position when the drive is the last unit on the link.	 Bus is terminated.
		 Bus is not terminated.
J6	Common digital input ground selection switch. Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). See *Ground isolation diagram* on page *224*.	 DICOM and DIOGND connected (default).
		 DICOM and DIOGND separated.

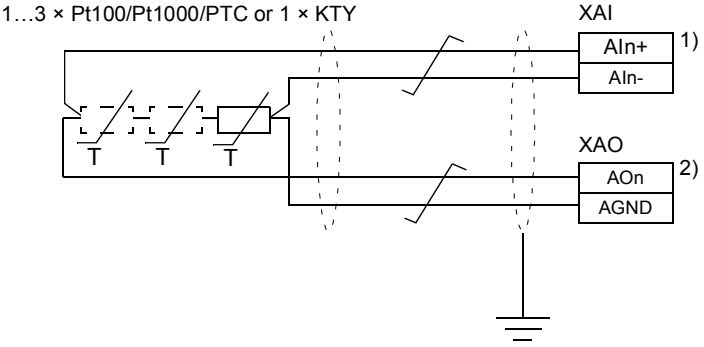
External power supply for the control unit (XPOW)

External +24 V (2 A) power supply for the control unit can be connected to terminal block XPOW. Using an external supply is recommended if

- the control board needs to be kept operational during input power breaks, for example, due to continuous fieldbus communication
- immediate restart is needed after power breaks (that is, no control board power up delay is allowed).

AI1 and AI2 as Pt100, Pt1000, PTC and KTY84 sensor inputs (XAI, XAO)

Three Pt100, Pt1000 and PTC sensors or one KTY84 sensor for motor temperature measurement can be connected between an analog input and output as shown below. Leave the other end of the shield unconnected or ground it indirectly via a few nanofarads high-frequency capacitor, for example, 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points.



1) Set the input type to voltage with switch J1 for analog input AI1or with J2 for analog input AI2. Set the appropriate analog input unit to V (volt) in parameter group **12 Standard AI**.
2) Select the excitation mode in parameter group **13 Standard AO**.

WARNING! As the inputs pictured above are not insulated according to IEC 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfill the requirement, the I/O board terminals must be protected against contact and must not be connected to other equipment or the temperature sensor must be isolated from the I/O terminals.

Drive-to-drive link (XD2D)

The drive-to-drive link is a daisy-chained RS-485 transmission line that can be used for

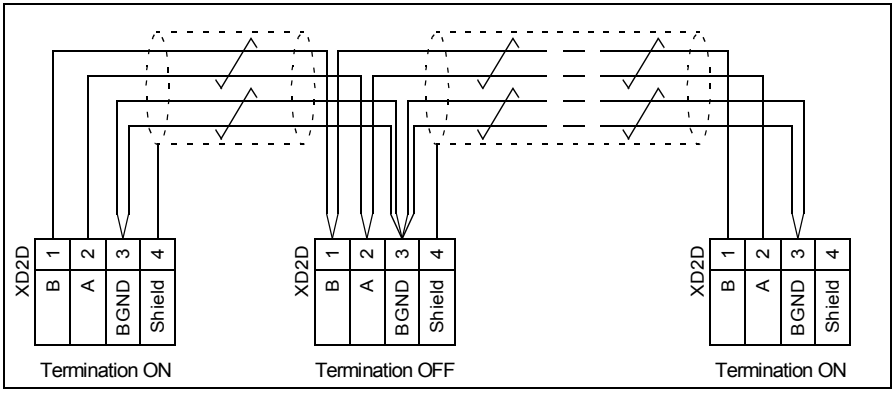
- basic master/follower communication with one master drive and multiple followers
- fieldbus control through the embedded fieldbus interface (EFB), and
- drive-to-drive (D2D) communication implemented by application programming.

See the firmware manual of the drive for the related parameter settings.

Set termination activation jumper J3 (see section *Jumpers and switches* on page *127*) next to this terminal block to the ON position on the drives at the ends of the drive-to-drive link. On intermediate drives, set the jumper to the OFF position.

Use shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 to 165 ohm, for example Belden 9842) for the wiring. For best immunity, ABB recommends a high quality cable. Keep the cable as short as possible. Avoid unnecessary loops and running the cable near power cables (such as motor cables).

The following diagram shows the wiring of the drive-to-drive link.

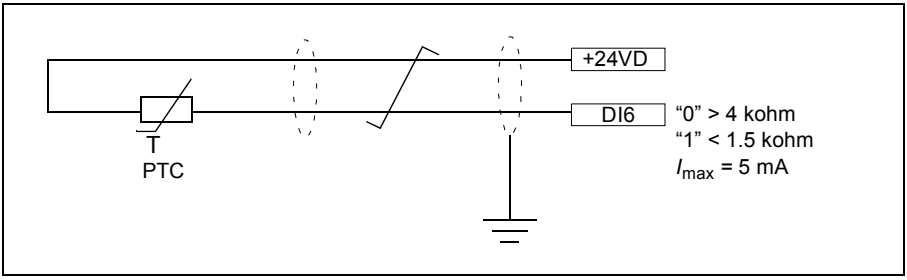


DIIL input (XD24:1)

The DIIL input can be selected as the source of, for example, an emergency stop command or an external event. See the firmware manual for more information.

DI6 (XDI:6) as PTC sensor input

A PTC sensor can be connected to this input for motor temperature measurement as follows. The sensor resistance must not exceed the threshold resistance of the digital input at the motor normal operating temperature. Do not connect both ends of the cable shield directly to ground. Leave the other end of the shield unconnected or ground it indirectly via a few nanofarads high-frequency capacitor, for example, 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points. See the firmware manual for parameter settings.



WARNING! As the inputs pictured above are not insulated according to IEC 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfill the requirement, the I/O board terminals must be protected against contact and must not be connected to other equipment or the temperature sensor must be isolated from the I/O terminals.

Safe torque off (XSTO)

For the drive to start, both connections (OUT1 to IN1 and IN2) must be closed. By default, the terminal block has jumpers to close the circuit. Remove the jumpers before connecting an external Safe torque off circuitry to the drive. See page *259*.

Safety functions module connection (X12)

See section *Implementing the safety functions provided with the FSO safety functions module (options +Q972 and +Q973)* on page *93*, and *FSO-12 safety functions module user’s manual* (3AXD50000015612 [English]) or *FSO-21 safety functions module user’s manual* (3AXD50000015614 [English]).

Control cable connection procedure

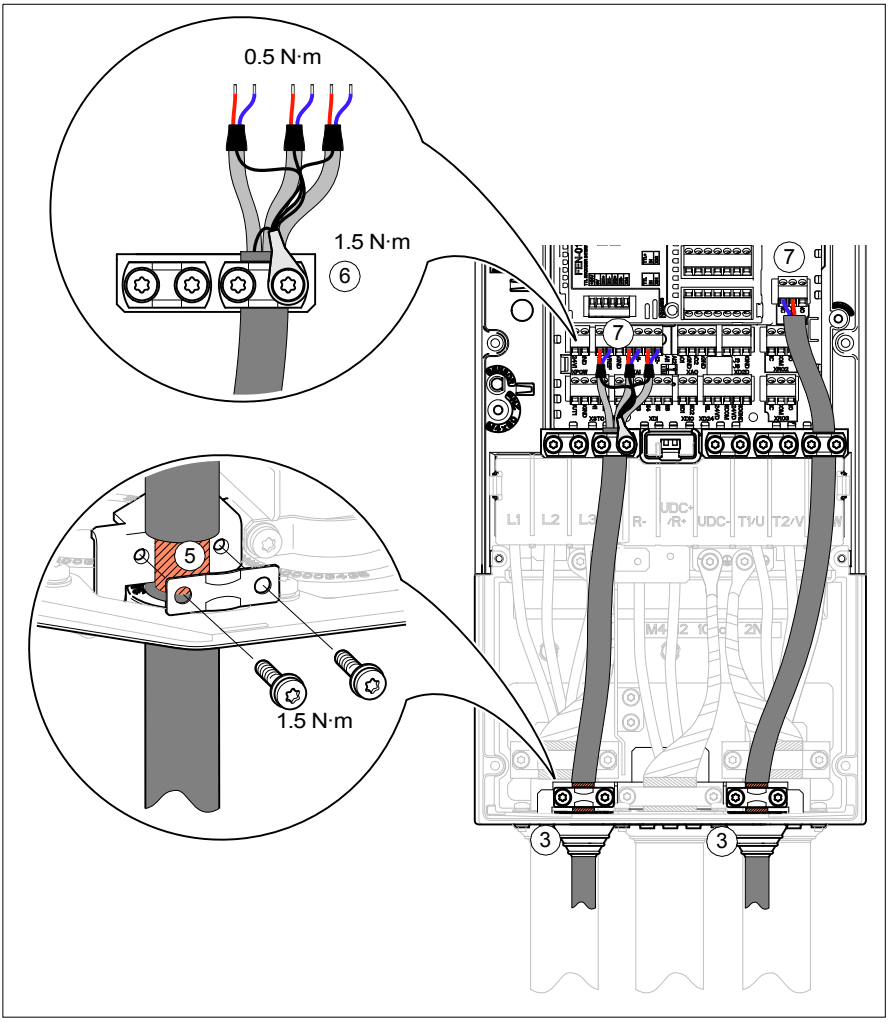
WARNING! Follow the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover(s). See section *Connecting the power cables* starting from page *109*.
3. Cut adequate holes into the rubber grommets and slide the grommets onto the cables. Slide the cables through the holes of the bottom plate and attach the grommets to the holes.
4. Route the cables as shown on page *132*.
5. Ground the outer shields of all control cables 360 degrees at a grounding clamp in the cable entry box, see page *132*. Tighten the clamp to 1.5 N·m (13 lbf·in). Keep the shields continuous as close to the terminals of the control unit as possible. Secure the cables mechanically at the clamps below the control unit. Frames R1 to R3: Ground also the pair-cable shields and grounding wires at the cable entry box grounding clamp.
6. Frames R4 to R9: Ground the pair-cable shields and all grounding wires to the clamp below the control unit, see page *132*.
7. Connect the conductors to the appropriate terminals (see page *126)* of the control unit and tighten to 0.5 N·m (5 lbf·in).
8. For connecting the fieldbus cables, see appropriate quick installation guide:

ACS880-01 quick installation guide for frames R1 to R3	*3AUA0000085966*
ACS880-01 quick installation guide for frames R4 and R5	*3AUA0000099663*
ACS880-01 quick installation guide for frames R6 to R9	*3AUA0000099689*

Note:

- Leave the other ends of the control cable shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, eg, 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are *in the same ground line* with no significant voltage drop between the end points.
- Keep any signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.

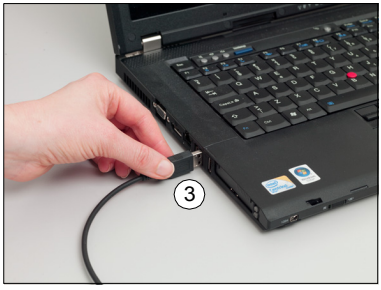

0.5 N·m
1.5 N·m
6
7
7
5
1.5 N·m
3
3
L1
L2
L3
R-
UDC+
/R+
UDC-
T1/U
T2/V

Connecting a PC

WARNING! Do not connect the PC directly to the control panel connector of the control unit as this can cause damage.

Connect a PC to the drive with an USB data cable (USB Type A <-> USB Type Mini-B) as follows:

1. Lift the USB connector cover from bottom upwards.
2. Insert the USB cable Mini-B plug in the control panel USB connector.
3. Insert the USB cable A-plug in the USB connector of the PC. -> The panel displays: USB connected.

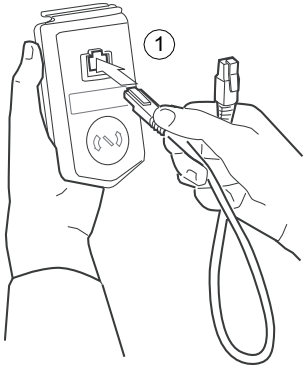


Controlling several drives through the panel bus

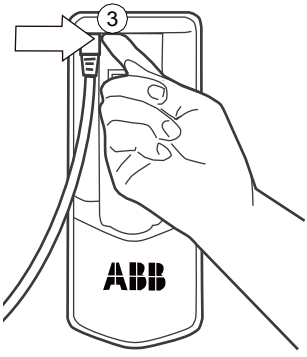
One control panel (or PC) can be used to control several drives by constructing a panel bus.

1. Connect the panel to one drive using an Ethernet (eg. CAT5E) cable.
   Note for IP55 (UL Type 12) drives: Remove the front cover and put the cables through the control cable entries.
   - Use **Menu** – **Settings** – **Edit texts** – **Drive** to give a descriptive name to the drive.
   - Use parameter **49.01** to assign the drive with a unique node ID number.
   - Set other parameters in group **49** if necessary.
   - Use parameter **49.06** to validate any changes.

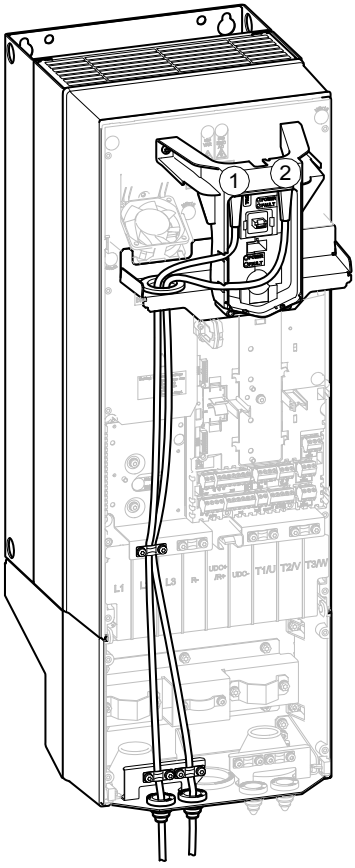
   Repeat the above for each drive.
2. With the panel connected to one drive, link the drives together using Ethernet cables. (Each panel platform has two connectors.)
3. In the last drive, switch bus termination on. With a panel platform, move the terminating switch into the outer position.Termination should be off on all other units.
4. On the control panel, switch on the panel bus functionality (**Options** – **Select drive** – **Panel bus**). The unit to be controlled can now be selected from the list under **Options** – **Select drive**.
5. If a PC is connected to the control panel, the drives on the panel bus are automatically displayed in the Drive composer tool.
6. For IP55 (UL Type 12) drives, Install the front cover.



IP21 (UL Type 1)



IP55 (UL Type 12)



Installing optional modules

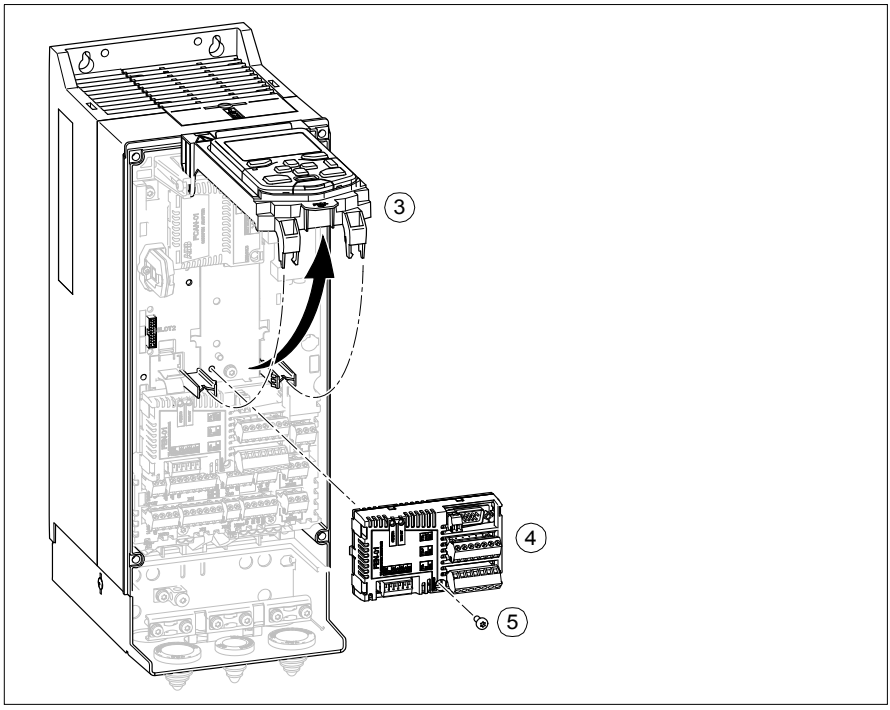
Note: In frames R1 and R2, 90° connector cannot be used in Slot 1. In other frames, there is 50 to 55 mm free space for the connector and its cable available on Slots 1, 2 and 3.

Mechanical installation of I/O extension, fieldbus adapter and pulse encoder interface modules

See page *34* for the available slots for each module. Install the optional modules as follows:

WARNING! Follow the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover (see the section *Connecting the power cables* starting from page *109*.
3. Frames R1 to R3: Pull the control panel mounting platform upwards to gain access to the optional module slots.
4. Insert the module carefully into its position on the control unit.
5. Tighten the mounting screw torque of 0.8 N·m. **Note:** The screw tightens the connections and grounds the module. It is essential for fulfilling the EMC requirements and for proper operation of the module.



Wiring I/O extension, fieldbus adapter and pulse encoder interface modules

See the appropriate optional module manual for specific installation and wiring instructions. See page *132* for the routing of the cables.

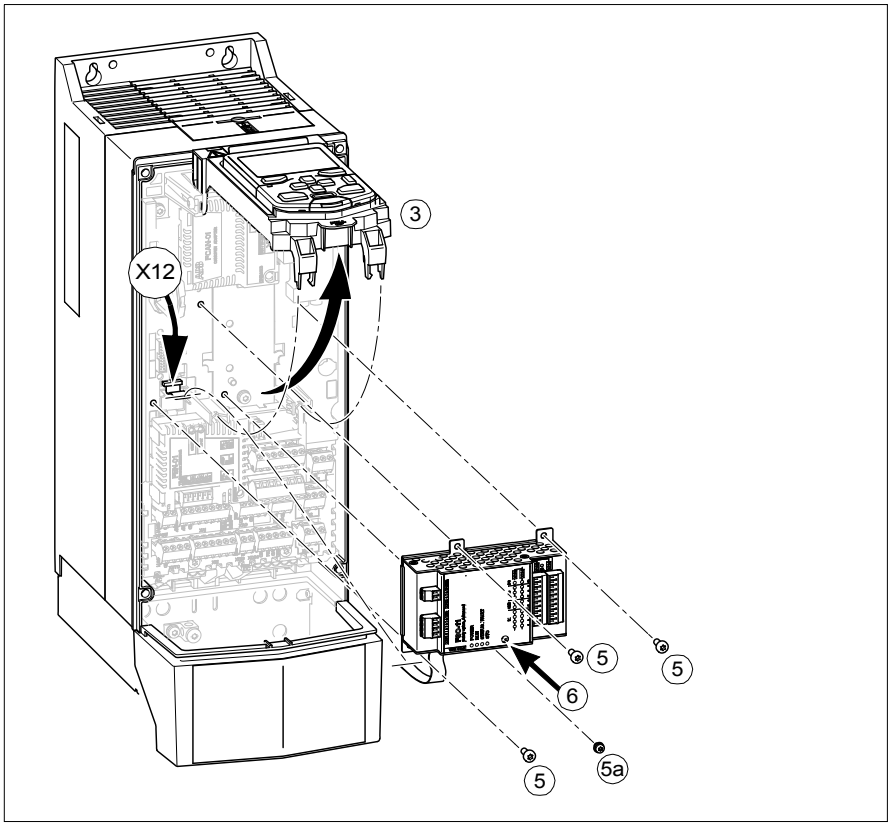
Installation of safety functions modules

The safety functions module can be mounted onto Slot 2 on the control unit or, in frames R7 to R9, also next to the control unit.

Installation procedure into Slot 2

WARNING! Follow the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

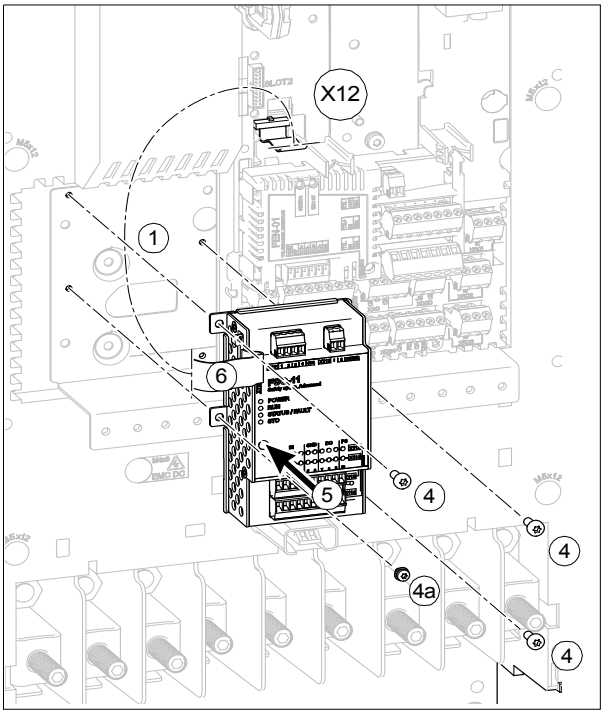
1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover (see the section *Connecting the power cables* on page *109*).
3. Frames R1 to R3: Pull the control panel mounting platform upwards to gain access to the optional module slots.
4. Insert the module carefully into its position on the control unit.
5. Attach the module with four screws. **Note:** The grounding screw (a) is essential for fulfilling the EMC requirements and for proper operation of the module.
6. Tighten the grounding screw of the electronics to 0.8 N·m.
7. Connect the data communication cable to slot X110 on the module and to connector X12 on the drive control unit.
8. Connect the Safe torque off wires to connector X111 on the module and to connector XSTO on the drive module control unit as shown in section *Wiring* on page *260*.
9. Connect the external +24 V power supply cable to connector X112.
10. Connect the other wires as shown in *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).


X12
3
5
5
6
5
5a

Installation next to the control unit on frames R7 to R9

WARNING! Follow the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover (see page *121*).
3. Insert the module carefully into its position.
4. Attach the module with four screws. **Note:** Correct installation of the grounding screw (a) is essential for fulfilling the EMC requirements and for proper operation of the module.
5. Tighten the grounding screw of the electronics to 0.8 N·m.
6. Connect the data communication cable to slot X110 on the module and to connector X12 on the drive control unit.
7. Connect the Safe torque off wires to connector X111 on the module and to connector XSTO on the drive module control unit as shown in section *Wiring* on page *260*.
8. Connect the external +24 V power supply cable to connector X112.
9. Connect the other wires as shown in *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).


X12
1
6
5
4
4
4a
4

7

Installation checklist

Contents of this chapter

This chapter contains a list for checking the mechanical and electrical installation of the drive.

Checklist

Check the mechanical and electrical installation of the drive before start-up. Go through the checklist together with another person.

WARNING! Only qualified electricians are allowed to carry out the work described below. Follow the complete safety instructions of the drive. Ignoring the safety instructions can cause injury or death. Open the main disconnector of the drive and lock it to open position. Measure to ensure that the drive is not powered.

☑	**Check that …**
☐	The ambient operating conditions meet the specification in chapter *Technical data*.
☐	If the drive will be connected to an IT (ungrounded) supply network: Optional EMC filters of type +E200 and +E202 have been disconnected. See the electrical installation instructions (page *105*).
☐	If the drive has been stored over a year: The electrolytic DC capacitors in the DC link of the drive have been reformed. See page *162*.
☐	There is an adequately sized protective earth (ground) conductor between the drive and the switchboard.

☑	**Check that …**
☐	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. Check the type designation label.
☐	The input power cable has been connected to appropriate terminals, the phase order is right, and the terminals have been 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.
☐	No power factor compensation capacitors have been connected to the motor cable.
☐	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.

8

Start-up

Contents of this chapter

This chapter describes the start-up procedure of the drive.

Start-up procedure

1. Run setup of the drive control program according to the start-up instructions given in *Quick start-up guide for ACS880 primary control program* or in the firmware manual.
   - For drives with resistor braking (option +D150): see also section *Start-up* on page 279.
   - For drives with ABB sine filter, check that parameter **95.15 Special HW settings** is set to **ABB sine filter**. For other sine filters, see *Sine filter hardware manual* (3AXD50000016814 [English]).
   - For drives with ABB motors in explosive atmospheres, see also *ACS880 drives with ABB motors in explosive atmospheres* (3AXD50000019585 [English]).
2. Validate the Safe torque off function according to the instructions given in chapter *The Safe torque off function* on page 259.
3. Validate the safety functions (option +Q973 or +Q972) as described in *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

9

Fault tracing

Contents of this chapter

This chapter describes the fault tracing possibilities of the drive.

LEDs

Where	LED	Color	When the LED is lit
Control panel mounting platform	POWER	Green	Control unit is powered and +15 V is supplied to the control panel.
	FAULT	Red	Drive in fault state.

Warning and fault messages

See the firmware manual for the descriptions, causes and remedies of the drive control program warning and fault messages.

10

Maintenance

Contents of this chapter

This chapter contains preventive maintenance instructions.

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.

Descriptions of symbols

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

Recommended annual maintenance actions by the user

ABB recommends these annual inspections to ensure the highest reliability and optimum performance.

Action	Target
P	Quality of supply voltage
I	Spare parts
P	DC circuit capacitor reforming, spare modules and spare capacitors
I	Tightness of terminals
I	Dustiness, corrosion or temperature
I	Heat sink cleaning

Recommended maintenance intervals after start-up

Component	Years from start-up							
	3	6	9	12	15	18	20	21
Cooling								
Main cooling fan (frames R1 to R9)			R			R		
Auxiliary cooling fan for circuit boards (frames R1 to R9)			R			R		
Auxiliary cooling fan IP55 (frames R8 and R9)			R			R		
Aging								
Battery for ZCU control unit		R		R		R		
Battery for control panel			R			R		

4FPS10000239703

Heatsink

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

WARNING! Obey the safety instructions, page 16. 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. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the cooling fan(s). See section *Fans* below.
3. Blow clean compressed air (not humid or oily) 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, perform the cleaning in another room.
4. Refit the cooling fan.

Fans

The lifespan of the cooling fans of the drive depend on the running time of the fan, ambient temperature and dust concentration. See the firmware manual for the actual signal which indicates the running time of the cooling fan.

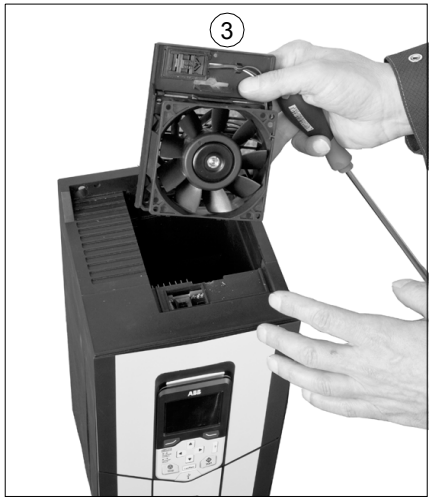
Reset the running time signal after a fan replacement. Also, reset the maintenance counter, if used.

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

Replacing the main cooling fan of frames R1 to R3

WARNING! Obey the safety instructions, page 16. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

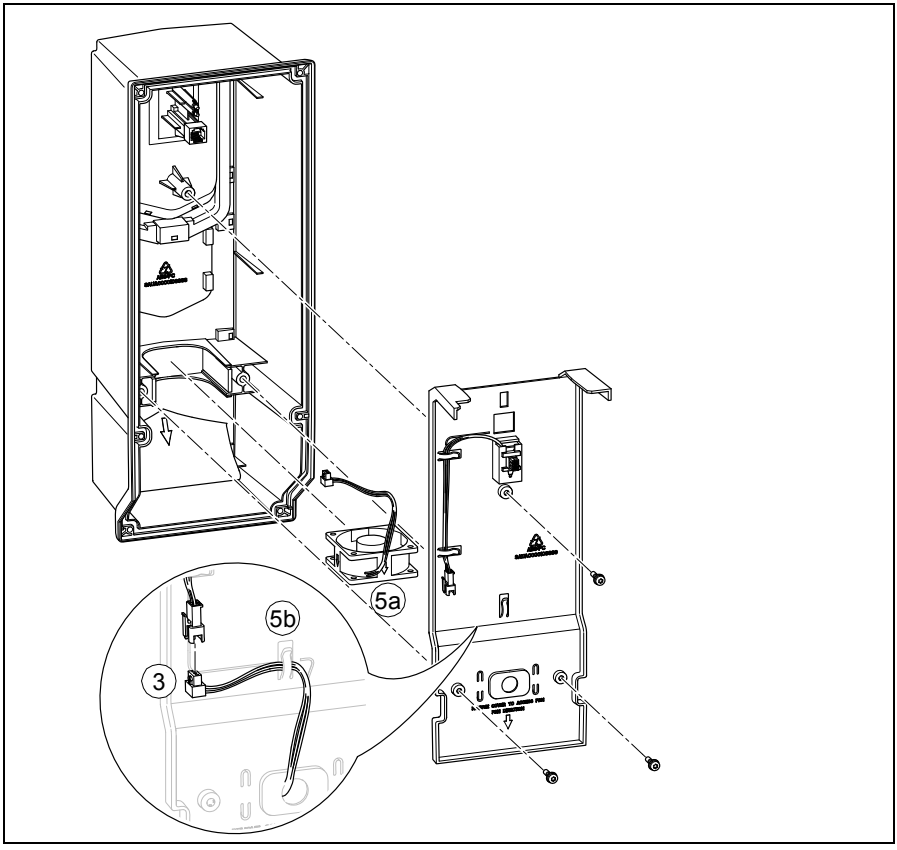
1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Release the retaining clip by pushing with a flat screwdriver and turning to the right.
3. Lift the fan assembly up.
4. Install the new fan assembly in reverse order. Make sure that the fan blows upwards.
5. Reset the counter (if used) in group 5 in the primary control program.



Replacing the auxiliary cooling fan of IP55 frames R1 to R3

WARNING! Obey the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover by undoing the mounting screws at the sides.
3. Unplug the fan power supply wires.
4. Lift the fan off.
5. Install the new fan in reverse order. Make sure that the arrow (a) on the fan points down. **Note**: Bundle the wires under the clip (b) otherwise the cover will not fit properly.



Replacing the main cooling fan of frames R4 and R5

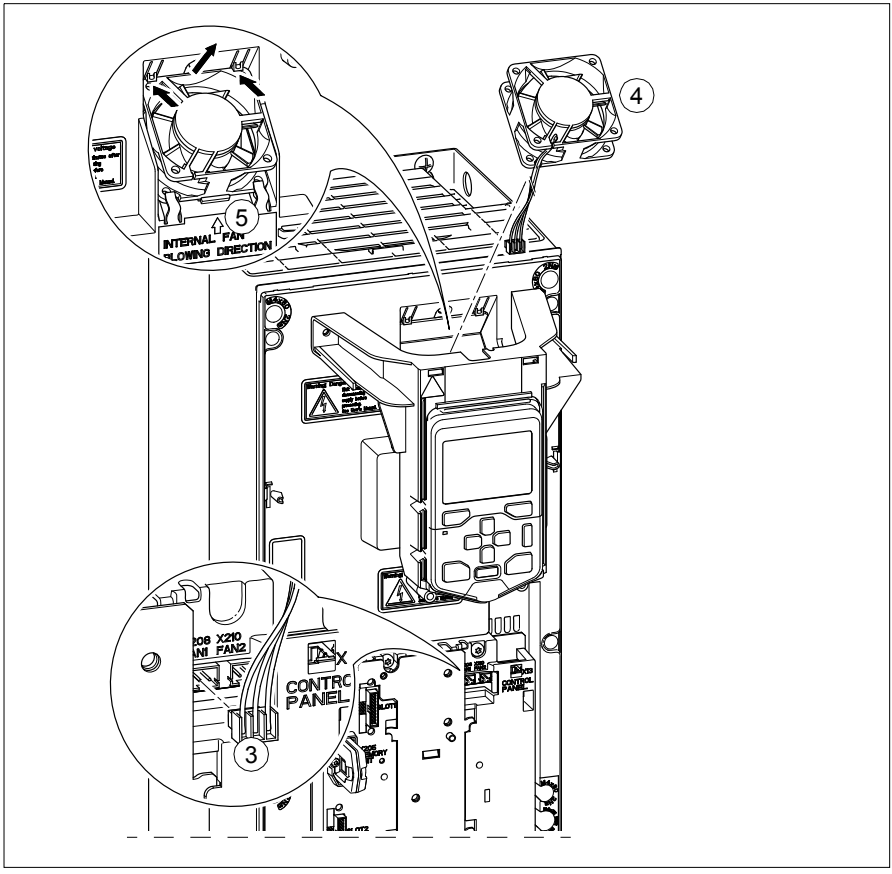
WARNING! Obey the safety instructions, page 16. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Lift the fan mounting plate up from the front edge.
3. Unplug the power supply wires.
4. Lift the fan assembly off.
5. Install the new fan assembly in reverse order. Make sure that the fan blows upwards.
6. Reset the counter (if used) in group 5 in the primary control program.

Replacing the auxiliary cooling fan of frames R4 and R5 (IP55 and option +C135) and IP21 frame R5 types ACS880-01-xxxx-7

WARNING! Obey the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

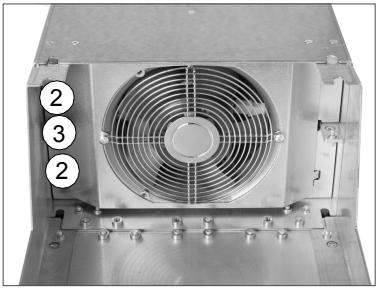
1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front cover. See page *115*.
3. Unplug the fan power supply wires.
4. Lift the fan up.
5. Install the new fan in reverse order. Make sure that the arrow in the fan points to the direction marked on the drive frame.

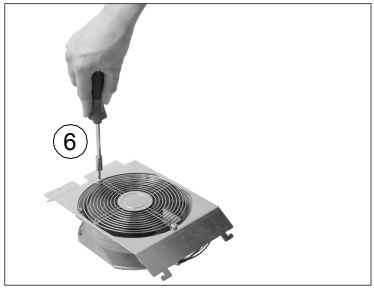


Replacing the main cooling fan of frames R6 to R8

WARNING! Obey the safety instructions, page 16. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Undo the mounting screws of the fan mounting plate (view from bottom below).
3. Pull the fan mounting plate down from the side edge.
4. Unplug the power supply wires.
5. Lift the fan mounting plate off.
6. Remove the fan from the mounting plate.
7. Install the new fan in reverse order. Make sure that the fan blows upwards.
8. Reset the counter (if used) in group 5 in the primary control program.

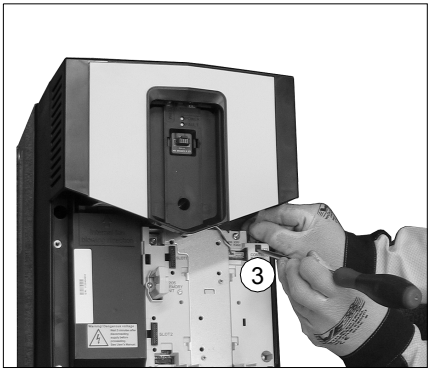


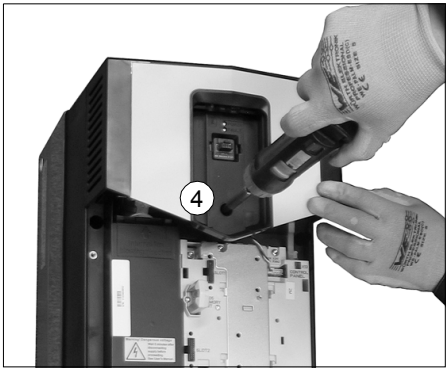


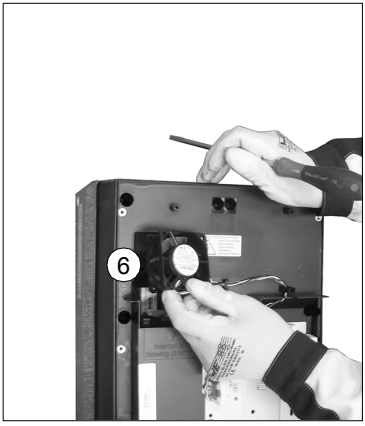
Replacing the auxiliary cooling fan of frames R6 to R9

WARNING! Obey the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the lower front cover (see page *118*).
3. Unplug the control panel power supply wires from the control unit terminal X13 and the auxiliary cooling fan power supply wires from the terminal X208:FAN2.
4. Remove the upper front cover.
5. Release the retaining clips.
6. Lift the fan up.
7. Install the new fan in reverse order. Make sure that the arrow on the fan points up.



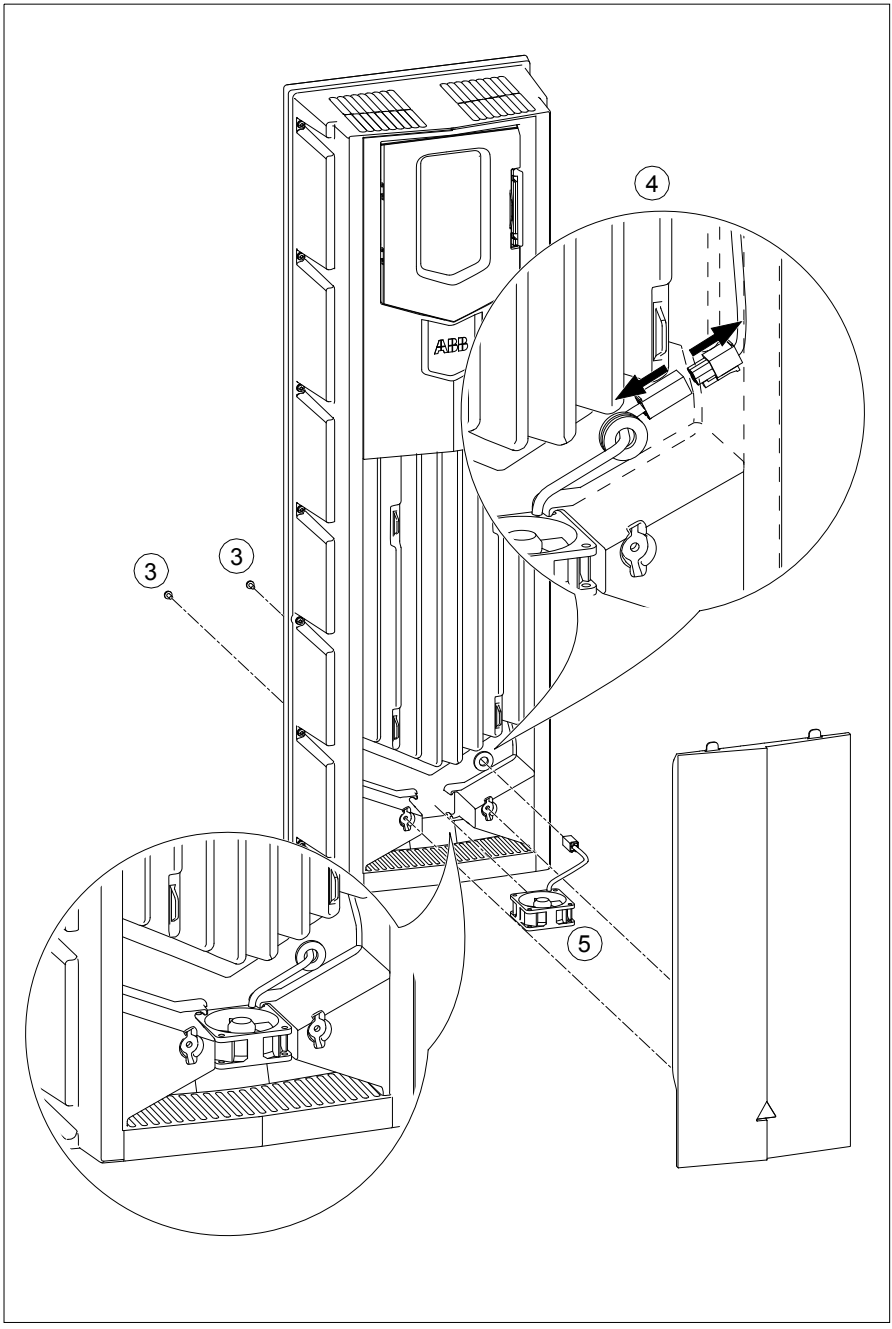




Replacing the IP55 auxiliary cooling fan of frames R8 and R9

WARNING! Obey the safety instructions, page 16. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

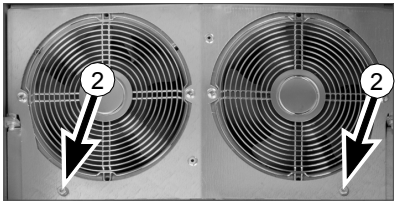
1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the IP55 front cover.
3. Remove the lower front cover from the IP55 cover.
4. Unplug the fan power supply wires.
5. Remove the fan.
6. Install the new fan in reverse order. Make sure that the arrow on the fan points up.
7. Reset the counter (if used) in group 5 in the primary control program.

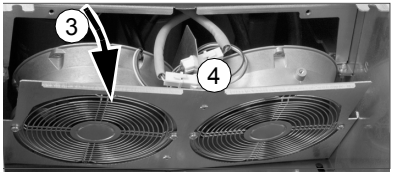

4
3
3
5

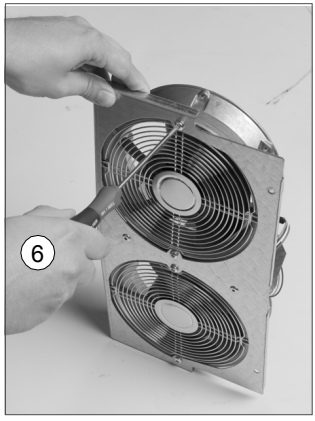
Replacing the main cooling fans of frame R9

WARNING! Obey the safety instructions, page 16. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Undo the two mounting screws of the fan mounting plate (view from drive bottom below).
3. Turn the mounting plate downwards.
4. Disconnect the fan power supply wires.
5. Remove the fan mounting plate.
6. Remove the fan by undoing the two mounting screws.
7. Install the new fan in reverse order. Make sure that the fan blows upwards.
8. Reset the counter (if used) in group 5 in the primary control program.







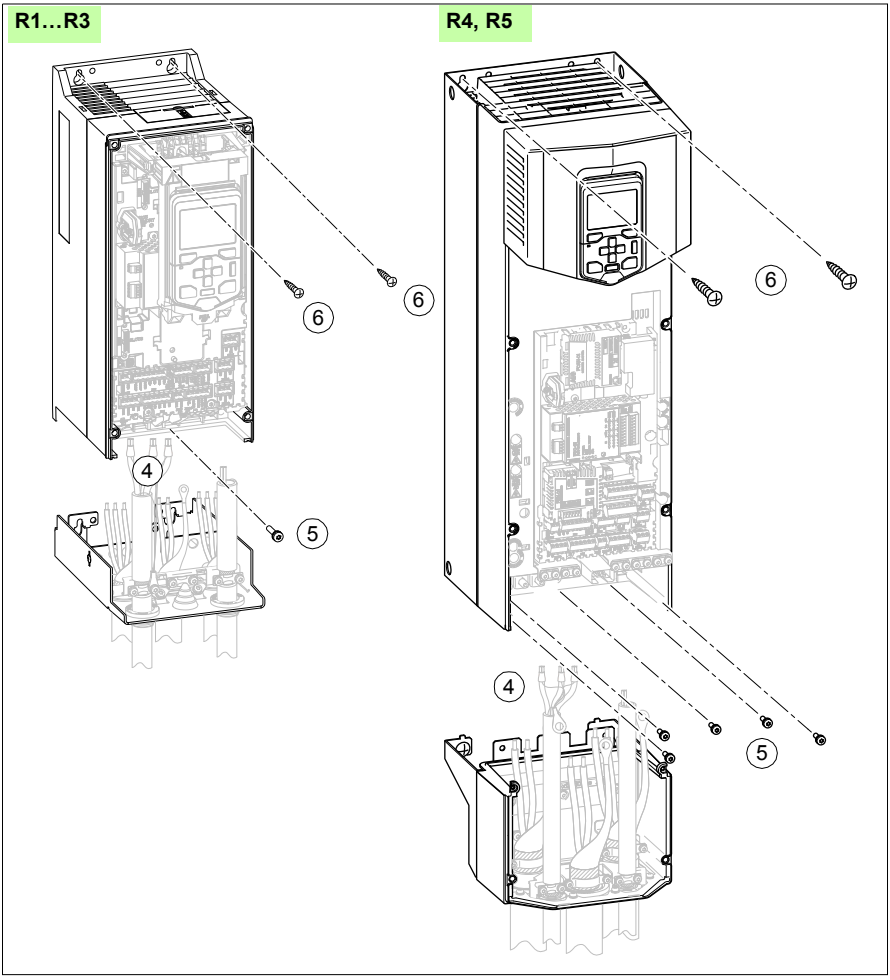
Replacing the drive (IP21, UL Type 1, frames R1 to R9)

This section gives instructions for replacing the drive module without the cable entry box. This allows you to leave the cables installed (except from disconnecting the conductors).

Note for IP55 (UL Type 12) drives: It is not allowed to remove the cable entry box.

WARNING! Obey the safety instructions, page *16*. Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Disconnect the drive from the power line. Lock the main disconnecting device and ensure by measuring that there is no voltage.
2. Remove the front covers. See section *Connection procedure for frames R1 to R3* on page *110* or *Connection procedure for frames R4 and R5* on page *113*.
3. For frames R6 to R9: Remove the side plates of the cable entry box by loosening the mounting screws.
4. Disconnect the power and control cables.
5. Undo the screw(s) that fasten the drive module to the cable entry box.
6. Undo the two screws or bolts that fasten the drive module to the wall from top.
7. Undo the two screws or bolts which attach the drive module and cable entry box to the wall. Leave the lower wall mounting screws of the cable box in place.
8. Lift the drive off.
9. Install the new drive module in reverse order.



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.

In frames R1 to R3, the capacitors are integrated to the ZINT board and in frames R4 to R5 to the ZMAC board. In frames R6 to R9, the capacitors are separate.

Capacitor failure is usually followed by damage to the unit and an input cable fuse failure, or a fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not use other than ABB 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 *37* 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).

Memory unit

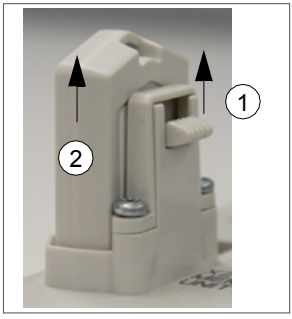
When a drive is replaced, the parameter settings can be retained by transferring the memory unit from the defective drive to the new drive. The memory unit is located on the control unit, see page *35*.

WARNING! Do not remove or insert a memory unit when the drive is powered or the control unit is powered from an external power source.

After power-up, the drive will scan the memory unit. If different parameter settings are detected, they are copied to the drive. This may take several minutes.

Replacing the memory unit

Pull the clip at the back of the memory unit up and take the unit off. Replace the unit in reverse order.



Replacing the control panel battery

The battery is housed on the rear of the control panel. Replace with a new CR 2032 battery. Dispose the old battery according to local disposal rules or applicable laws.

Replacing the control unit battery

For instructions how to replace the control unit battery, contact ABB service center.

Replacing safety functions modules (FSO-12, option +Q973 and FSO-21, option +Q972)

Do not repair safety functions modules. Replace a faulty module with a new one as described under *Installation of safety functions modules* on page *138*.

11

Technical data

Contents of this chapter

This chapter contains the technical specifications of the drive, for example, the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings.

Marine type-approved drives (option +C132)

See *ACS880-01/04 +C132 marine type-approved drives supplement* (3AXD50000010521 [English]) for the ratings, marine-specific data and reference to valid marine type approvals.

Drives for SynRM motors

See *ACS880-01 +N7502 drives for SynRM motors supplement* (3AXD50000029482 [English]) for the ratings, fuses and other technical data.

Ratings

The nominal ratings for the drives with 50 Hz and 60 Hz supply are given below. The symbols are described below the table.

IEC RATINGS										
Drive type ACS880-01-	Frame size	Input rating	Output ratings							
			Nominal use				Light-overload use		Heavy-duty use	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	A	A	kW	kVA	A	kW	A	kW
U_N = 230 V										
04A6-2	R1	4.6	6.3	4.6	0.75	1.8	4.4	0.75	3.7	0.55
06A6-2	R1	6.6	7.8	6.6	1.1	2.6	6.3	1.1	4.6	0.75
07A5-2	R1	7.5	11.2	7.5	1.5	3.0	7.1	1.5	6.6	1.1
10A6-2	R1	10.6	12.8	10.6	2.2	4.2	10.1	2.2	7.5	1.5
16A8-2	R2	16.8	18.0	16.8	4.0	7	16.0	4.0	10.6	2.2
24A3-2	R2	24.3	28.6	24.3	5.5	10	23.1	5.5	16.8	4.0
031A-2	R3	31.0	41	31	7.5	12	29.3	7.5	24.3	5.5
046A-2	R4	46	64	46	11	18	44	11	38	7.5
061A-2	R4	61	76	61	15	24	58	15	45	11.0
075A-2	R5	75	104	75	18.5	30	71	18.5	61	15
087A-2	R5	87	122	87	22	35	83	22	72	18.5
115A-2	R6	115	148	115	30	46	109	30	87	22.0
145A-2	R6	145	178	145	37	58	138	37	105	30.0
170A-2	R7	170	247	170	45	68	162	45	145	37
206A-2	R7	206	287	206	55	82	196	55	169	45
274A-2	R8	274	362	274	75	109	260	75	213	55
U_N = 400 V										
02A4-3	R1	2.4	3.1	2.4	0.75	1.7	2.3	0.75	1.8	0.55
03A3-3	R1	3.3	4.1	3.3	1.1	2.3	3.1	1.1	2.4	0.75
04A0-3	R1	4.0	5.6	4.0	1.5	2.8	3.8	1.5	3.3	1.1
05A6-3	R1	5.6	6.8	5.6	2.2	3.9	5.3	2.2	4.0	1.5
07A2-3	R1	8.0	9.5	8.0	3.0	5.5	7.6	3.0	5.6	2.2
09A4-3	R1	10.0	12.2	10.0	4.0	6.9	9.5	4.0	8.0	3.0
12A6-3	R1	12.9	16.0	12.9	5.5	8.9	12.0	5.5	10.0	4.0
017A-3	R2	17	21	17	7.5	12	16	7.5	12.6	5.5
025A-3	R2	25	29	25	11	17	24	11	17	7.5
032A-3	R3	32	42	32	15	22	30	15	25	11
038A-3	R3	38	54	38	18.5	26	36	18.5	32	15.0
045A-3	R4	45	64	45	22	31	43	22	38	18.5
061A-3	R4	61	76	61	30	42	58	30	45	22
072A-3	R5	72	104	72	37	50	68	37	61	30

IEC RATINGS										
Drive type ACS880-01-	**Frame size**	**Input rating**	**Output ratings**							
			Nominal use				**Light-overload use**		**Heavy-duty use**	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	**A**	**A**	**kW**	**kVA**	**A**	**kW**	**A**	**kW**
087A-3	R5	87	122	87	45	60	83	45	72	37
105A-3	R6	105	148	105	55	73	100	55	87	45
145A-3	R6	145	178	145	75	100	138	75	105	55
169A-3	R7	169	247	169	90	117	161	90	145	75
206A-3	R7	206	287	206	110	143	196	110	169	90
246A-3	R8	246	350	246	132	170	234	132	206	110
293A-3	R8	293	418	293	160	203	278	160	246*	132
363A-3	R9	363	498	363	200	251	345	200	293	160
430A-3	R9	430	545	430	250	298	400	200	363**	200
U_N = 400 V / 500 V										
02A1-5	R1	2.1	3.1	2.1	0.75	1.8	2.0	0.55	1.7	0.55
03A0-5	R1	3.0	4.1	3.0	1.1	2.6	2.8	1.1	2.1	0.75
03A4-5	R1	3.4	5.6	3.4	1.5	2.9	3.2	1.5	3.0	1.1
04A8-5	R1	4.8	6.8	4.8	2.2	4.2	4.6	2.2	3.4	1.5
05A2-5	R1	5.2	9.5	5.2	3.0	4.5	5.0	3.0	4.8	2.2
07A6-5	R1	7.6	12.2	7.6	4.0	6.6	7.2	4.0	5.2	3.0
11A0-5	R1	11.0	16.0	11.0	5.5	9.5	10.4	5.5	7.6	4.0
014A-5	R2	14	21	14	7.5	12	13	7.5	11	5.5
021A-5	R2	21	29	21	11	18	19	11	14	7.5
027A-5	R3	27	42	27	15	23	26	15	21	11
034A-5	R3	34	54	34	18.5	29	32	18.5	27	15
040A-5	R4	40	64	40	22	35	38	22	34	19
052A-5	R4	52	76	52	30	45	49	30	40	22
065A-5	R5	65	104	65	37	56	62	37	52	30
077A-5	R5	77	122	77	45	67	73	45	65	37
096A-5	R6	96	148	96	55	83	91	55	77	45
124A-5	R6	124	178	124	75	107	118	75	96	55
156A-5	R7	156	247	156	90	135	148	90	124	75
180A-5	R7	180	287	180	110	156	171	110	156	90
240A-5	R8	240	350	240	132	208	228	132	180	110
260A-5	R8	260	418	260	160	225	247	160	240*	132
361A-5	R9	361	542	361	200	313	343	200	302	200
414A-5	R9	414	542	414	250	359	393	250	361 **	200
U_N = 690 V										
07A4-7	R3	7.4	12.2	7.4	5.5	8.8	7.0	5.5	5.6	4
09A9-7	R3	9.9	18	9.9	7.5	11.8	9.4	7.5	7.4	5.5

IEC RATINGS										
Drive type ACS880-01-	**Frame size**	**Input rating**	**Output ratings**							
			Nominal use				**Light-overload use**		**Heavy-duty use**	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	**A**	**A**	**kW**	**kVA**	**A**	**kW**	**A**	**kW**
14A3-7	R3	14.3	22	14.3	11	17	13.6	11	9.9	7.5
019A-7	R3	19	29	19	15	23	18	15	14.3	11
023A-7	R3	23	38	23	18.5	27	22	18.5	19	15
027A-7	R3	27	46	27	22	32	26	22	23	18.5
07A3-7	R5	7.3	12.2	7.3	5.5	8.7	6.9	5.5	5.6	4
09A8-7	R5	9.8	18	9.8	7.5	11.7	9.3	7.5	7.3	5.5
14A2-7	R5	14.2	22	14.2	11	17	13.5	11	9.8	7.5
018A-7	R5	18	29	18	15	22	17	15	14.2	11
022A-7	R5	22	44	22	18.5	26	21	18.5	18	15
026A-7	R5	26	54	26	22	31	25	22	22	18.5
035A-7	R5	35	64	35	30	42	33	30	26	22
042A-7	R5	42	70	42	37	50	40	37	35	30
049A-7	R5	49	71	49	45	59	47	45	42	37
061A-7	R6	61	104	61	55	73	58	55	49	45
084A-7	R6	84	124	84	75	100	80	75	61	55
098A-7	R7	98	168	98	90	117	93	90	84	75
119A-7	R7	119	198	119	110	142	113	110	98	90
142A-7	R8	142	250	142	132	170	135	132	119	110
174A-7	R8	174	274	174	160	208	165	160	142	132
210A-7	R9	210	384	210	200	251	200	200	174	160
271A-7	R9	271	411	271	250	324	257	250	210	200

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UL (NEC) RATINGS										
Drive type ACS880-01-	**Frame size**	**Input rating**	**Output ratings**							
			Max. current	**App. power**	**Light-overload use**			**Heavy-duty use**		
		I_1	I_{max}	S_n	I_{Ld}	P_{Ld}		I_{Hd}	P_{Hd}	
		A	**A**	**kVA**	**A**	**kW**	**hp**	**A**	**kW**	**hp**
U_N = 230 V										
04A6-2	R1	4.4	6.3	1.8	4.4	0.75	1.0	3.7	0.55	0.75
06A6-2	R1	6.3	7.8	2.6	6.3	1.1	1.5	4.6	0.75	1.0
07A5-2	R1	7.1	11.2	3.0	7.1	1.5	2.0	6.6	1.1	1.5
10A6-2	R1	10.1	12.8	4.2	10.1	2.2	3.0	7.5	1.5	2.0
16A8-2	R2	16.0	18.0	7	16.0	4.0	5.0	10.6	2.2	3.0
24A3-2	R2	23.1	28.6	10	23.1	5.5	7.5	16.8	4.0	5.0
031A-2	R3	29.3	41	12	29.3	7.5	10	24.3	5.5	7.5
046A-2	R4	44	64	18	44	11	15	38	7.5	10
061A-2	R4	58	76	24	58	15	20	45	11.0	15
075A-2	R5	71	104	30	71	18.5	25	61	15	20
087A-2	R5	83	122	35	83	22	30	72	18.5	25
115A-2	R6	109	148	46	109	30	40	87	22.0	30
145A-2	R6	138	178	58	138	37	50	105	30.0	40
170A-2	R7	162	247	68	162	45	60	145	37	50
206A-2	R7	196	287	82	196	55	75	169	45	60
274A-2	R8	260	362	109	260	75	100	213	55	75

UL (NEC) RATINGS										
Drive type ACS880-01-	Frame size	Input rating	Output ratings							
			Max. current	App. power	Light-overload use			Heavy-duty use		
		I_1	I_{max}	S_n	I_{Ld}	P_{Ld}		I_{Hd}	P_{Hd}	
		A	A	kVA	A	kW	hp	A	kW	hp
U_N = 460 V										
02A1-5	R1	2.1	3.1	1.8	2.1	0.75	1.0	1.7	0.55	0.75
03A0-5	R1	3.0	4.1	2.6	3.0	1.1	1.5	2.1	0.75	1.0
03A4-5	R1	3.4	5.6	2.9	3.4	1.5	2.0	3.0	1.1	1.5
04A8-5	R1	4.8	6.8	4.2	4.8	2.2	3.0	3.4	1.5	2.0
05A2-5	R1	5.2	9.5	4.5	5.2	3.0	3.0	4.8	1.5	2.0
07A6-5	R1	7.6	12.2	6.6	7.6	4.0	5.0	5.2	2.2	3.0
11A0-5	R1	11	16.0	9.5	11	5.5	7.5	7.6	4.0	5.0
014A-5	R2	14	21	12	14	7.5	10	11	5.5	7.5
021A-5	R2	21	29	18	21	11	15	14	7.5	10
027A-5	R3	27	42	23	27	15	20	21	11	15
034A-5	R3	34	54	29	34	18.5	25	27	15	20.0
040A-5	R4	40	64	35	40	22	30	34	18.5	25
052A-5	R4	52	76	45	52	30	40	40	22	30
065A-5	R5	65	104	56	65	37	50	52	30	40
077A-5	R5	77	122	67	77	45	60	65	37	50
096A-5	R6	96	148	83	96	55	75	77	45	60
124A-5	R6	124	178	107	124	75	100	96	55	75
156A-5	R7	156	247	135	156	90	125	124	75	100
180A-5	R7	180	287	156	180	110	150	156	90	125
240A-5	R8	240	350	208	240	132	200	180	110	150
260A-5	R8	260	418	225	260	132	200	240*	110	150
302A-5	R9	302	498	262	302	200	250	260	132	200
361A-5	R9	361	542	313	361	200	300	302	200	250
414A-5	R9	414	542	359	414***	250	350	361**	200	300

UL (NEC) RATINGS										
Drive type ACS880-01-	Frame size	Input rating	Output ratings							
			Max. current	App. power	Light-overload use			Heavy-duty use		
		I_1	I_{max}	S_n	I_{Ld}	P_{Ld}		I_{Hd}	P_{Hd}	
		A	A	kVA	A	kW	hp	A	kW	hp
U_N = 575 V										
07A4-7	R3	7.0	12.2	8.8	7.0	4.0	5.0	5.6	3.0	3.0
09A9-7	R3	9.4	18	11.8	9.4	5.5	7.5	7.4	4.0	5.0
14A3-7	R3	13.6	22	17	13.6	7.5	10	9.9	5.5	7.5
019A-7	R3	18	29	23	18	11	15	14.3	7.5	10
023A-7	R3	22	38	27	22	15	20	19	11	15
027A-7	R3	27	46	32	27	18.5	25	23	15	20
07A3-7	R5	9	12.2	8.7	9	5.5	7.5	6.1	4.0	5.0
09A8-7	R5	11	18	11.7	11	7.5	10	9	5.5	7.5
14A2-7	R5	17	22	17	17	11	15	11	7.5	10
018A-7	R5	22	29	22	22	15	20	17	11	15
022A-7	R5	27	44	26	27	18.5	25	22	15	20
026A-7	R5	32	54	31	32	22	30	27	18.5	25
035A-7	R5	41	64	42	41	30	40	32	22	30
042A-7	R5	52	70	50	52	37	50	41	30	40
049A-7	R5	52	71	59	52	37	50	41	30	40
061A-7	R6	62	104	73	62	45	60	52	37	50
084A-7	R6	77	124	100	77	55	75	62	45	60
098A-7	R7	99	168	117	99	75	100	77	55	75
119A-7	R7	125	198	142	125	90	125	99	75	100
142A-7	R8	144	250	170	144	110	150	125	90	125
174A-7 (See Note 3 below)	R8	180	274	208	180	132	200	144	110	150
210A-7	R9	242	384	251	242	160	250	192	132	200
271A-7 (See Note 4 below)	R9	271	411	324	271	200	250	242*	160	250

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Definitions

U_N	Nominal voltage of the drive
I_1	Nominal rms input current
I_2	Nominal output current (available continuously with no over-loading)
P_N	Typical motor power in no-overload use

I_{Ld}	Continuous rms output current allowing 10% overload for 1 minute every 5 minutes
P_{Ld}	Typical motor power in light-overload use
I_{max}	Maximum output current. Available for 10 seconds at start. then as long as allowed by drive temperature.
I_{Hd}	Continuous rms output current allowing 50% overload for 1 minute every 5 minutes. * Continuous rms output current allowing 30% overload for 1 minute every 5 minutes. ** Continuous rms output current allowing 25% overload for 1 minute every 5 minutes. *** Continuous rms output current allowing 35% overload for 1 minute every 5 minutes in IEC ratings. **** Continuous rms output current allowing 35% overload for 1 minute every 5 minutes in NEMA ratings.
P_{Hd}	Typical motor power in heavy-duty use

Note 1: The ratings apply at an ambient temperature of 40 °C (104 °F).

Note 2: To achieve the rated motor power given in the table, the rated current of the drive must be higher than or equal to the rated motor current.

The DriveSize dimensioning tool available from ABB is recommended for selecting the drive, motor and gear combination.

Note 3 – **ACS880-01-174A-7 amp rating:** The drive can deliver 192 A continuously with no overload.

Note 4 – ACS880-01-271A-7 power rating: The power rating is as per NEC Table 42.1. However, the drive can be used for a typical 4-pole motor rated to 300 hp meeting NEMA MG 1 Table 12-11 minimum efficiency standard (EPAct efficiency electrical motors) if motor full load current is not more than 271 A.

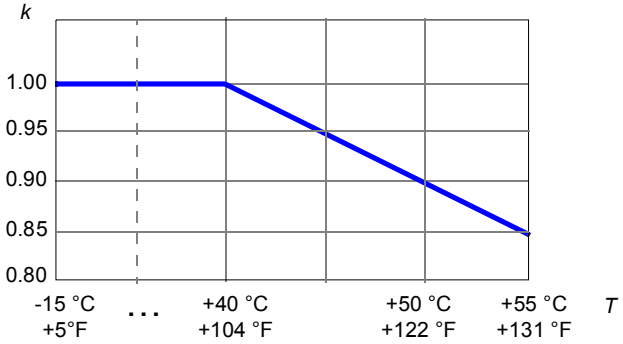
Derating

Ambient temperature derating

IP21 (UL Type 1) drive types and other IP55 (UL Type 12) types than listed in the following subheadings

In the temperature range +40…55 °C (+104…131 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F).

To calculate the output current, multiply the current in the ratings table by the derating factor (*k*):

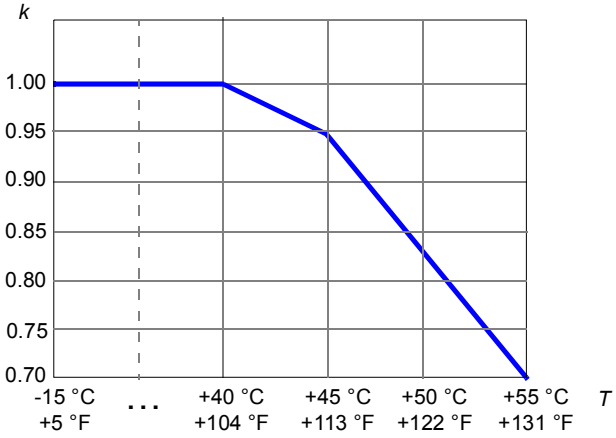


IP55 (UL Type 12) drive types -274A-2, 293A-3, -260A-5, -302A-5 and -174A-7

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…55 °C (+113…131 °F), the rated output current is derated by 2.5% for every added 1 °C (1.8 °F).

To calculate the output current, multiply the current in the ratings table by the derating factor (*k*):

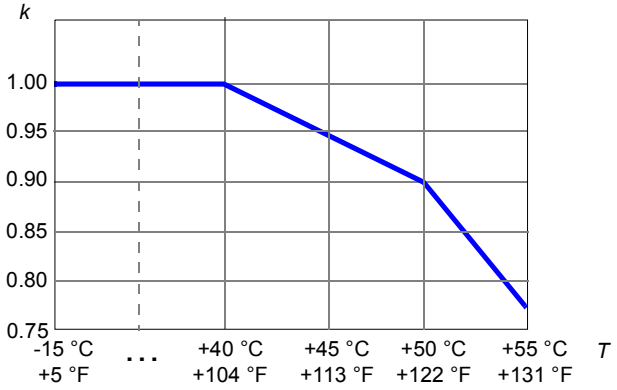


IP55 (UL Type 12) drive type -240A-5

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).

In the temperature range +50…55 °C (+122…131 °F), the rated output current is derated by 2.5% for every added 1 °C (1.8 °F).

To calculate the output current, multiply the current in the ratings table by the derating factor (*k*):



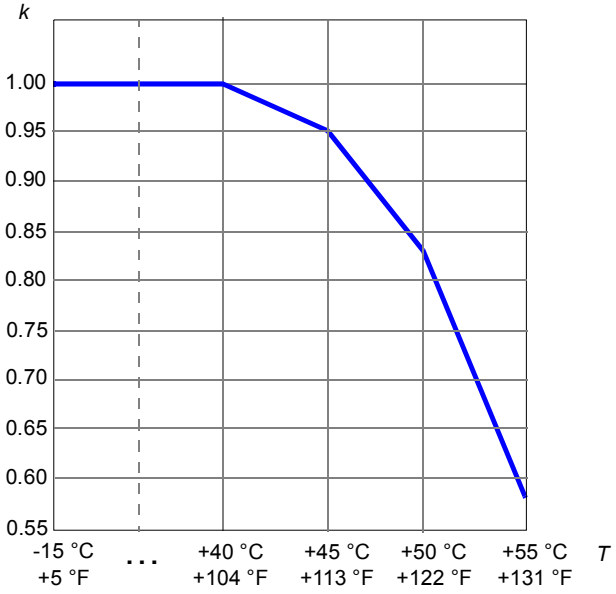
IP55 (UL Type 12) drive types -363A-3 and -361A-5

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).

In the temperature range +50…55 °C (+122…131 °F), the rated output current is derated by 5% for every added 1 °C (1.8 °F).

To calculate the output current, multiply the current in the ratings table by the derating factor (*k*):

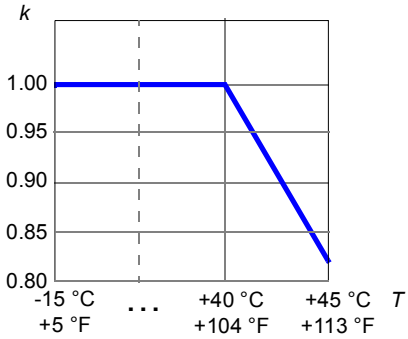


IP55 (UL Type 12) drive type -210A-7

In the temperature range +40…45 °C (+104…113 °F), the rated output current is derated by 3.5% for every added 1 °C (1.8 °F).

The maximum temperature is 45 °C (113 °F).

To calculate the output current, multiply the current in the ratings table by the derating factor (*k*):



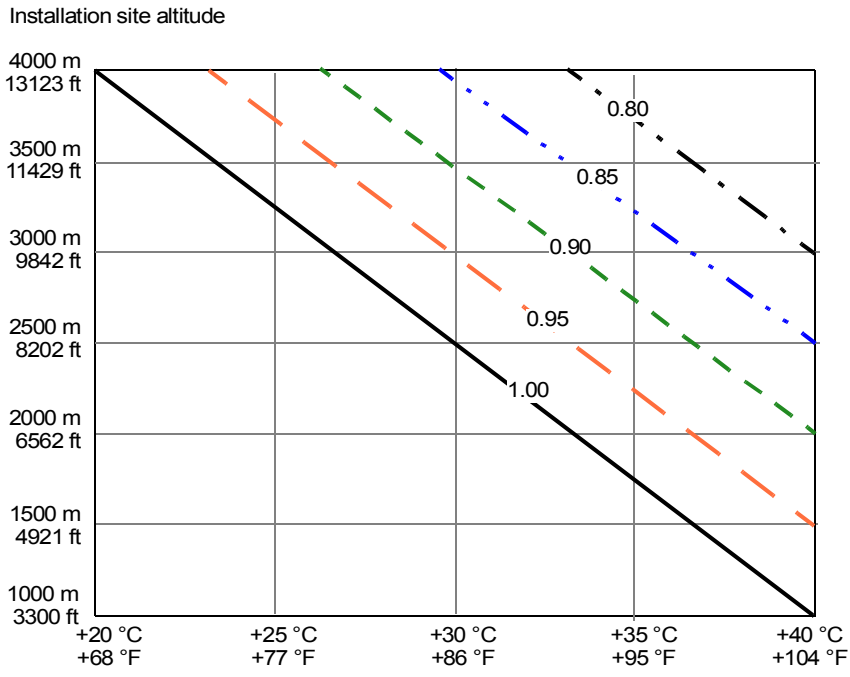
IP55 (UL Type 12) types -430A-3, -414A-5 and -271A-7

The maximum ambient temperature is 35 °C (95 °F).

Altitude derating

At altitudes from 1000 to 4000 m (3300 to 13123 ft) above sea level, the derating is 1% for every 100 m (328 ft). 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 PC tool.



	Derating factor 1.00
	Derating factor 0.95
	Derating factor 0.9
	Derating factor 0.85
	Derating factor 0.80

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.

Deratings for special settings in the drive control program

Enabling special settings in the drive control program can require output current derating.

Ex motor, sine filter, low noise

Deratings are needed in these cases:

- drive is used with an ABB motor for explosive atmospheres (Ex) and *EX motor* in Parameter **95.15 Special HW settings** is enabled
- sine filter given in the selection table on page *291* is used and *ABB Sine filter* in Parameter **95.15 Special HW settings** is enabled
- *Low noise* optimization is selected in Parameter **97.09 Switching freq mode**.

Note: If Ex motors are used together with sine filters, *EX motor* in Parameter **95.15 Special HW settings** is disabled and *ABB Sine filter* in Parameter **95.15 Special HW settings** is enabled. Obey the instructions of the motor manufacturer.

Drive type ACS880-01-	Output ratings							
	EX motor (ABB Ex motors)				ABB Sine filter			
	Nominal use		Light-duty use	Heavy-duty use	Nominal use		Light-duty use	Heavy-duty use
	I_N	P_N	I_{Ld}	I_{Hd}	I_N	P_N	I_{Ld}	I_{Hd}
	A	kW	A	A	A	kW	A	A
U_N = 230 V								
04A6-2	4.6	0.75	4.4	3.7	4.3	0.55	4.1	3.5
06A6-2	6.6	1.1	6.3	4.6	6.2	0.8	5.9	4.3
07A5-2	7.5	1.5	7.1	6.6	7.4	1.5	7.0	6.2
10A6-2	10.6	2.2	10.1	7.5	10.0	2.2	9.5	7.4
16A8-2	16.8	4.0	16.0	10.6	15.9	4.0	15.1	10.0
24A3-2	24.3	5.5	23.1	16.8	23.1	5.5	21.9	15.9
031A-2	31	7.5	29.3	24.3	30.5	7.5	29.0	23.1
046A-2	46	11.0	44	38	43.0	11.0	41	31
061A-2	61	15	58	45	58	15	55	41
075A-2	75	19	71	61	65	15	62	55
087A-2	87	22	83	72	77	18.5	73	62
115A-2	106	22	101	87	100	22	95	73
145A-2	134	30	127	105	126	30	120	95
170A-2	161	37	153	134	153	37	145	120
206A-2	195	45	185	161	186	45	177	145
274A-2	251	55	238	195	233	55	221	169
U_N = 400 V								
02A4-3	2.4	0.75	2.3	1.80	2.3	0.75	2.2	1.7
03A3-3	3.3	1.1	3.1	2.4	3.1	1.1	2.9	2.3
04A0-3	4.0	1.5	3.8	3.3	3.8	1.5	3.6	3.1
05A6-3	5.6	2.2	5.3	4.0	5.3	2.2	5.0	3.8
07A2-3	8.0	3.0	7.6	5.6	7.2	3.0	6.8	5.3
09A4-3	10.0	4.0	9.5	8.0	9.2	4.0	8.7	7.2

Drive type ACS880-01-	Output ratings							
	EX motor (ABB Ex motors)				ABB Sine filter			
	Nominal use		Light-duty use	Heavy-duty use	Nominal use		Light-duty use	Heavy-duty use
	I_N	P_N	I_{Ld}	I_{Hd}	I_N	P_N	I_{Ld}	I_{Hd}
	A	kW	A	A	A	kW	A	A
12A6-3	12.9	5.5	12.0	10.0	12.1	5.5	11.5	9.2
017A-3	17	8	16	12.6	16	7.5	15	12
025A-3	25	11	24	17	24	11	23	16
032A-3	32	15	30	25	31	15	29	23
038A-3	38	19	36	32	37	18.5	35	31
045A-3	45	22	43	38	43	22	41	36
061A-3	61	30	58	45	58	30	55	43
072A-3	72	37	68	61	64	30	61	58
087A-3	87	45	83	72	77	37	73	64
105A-3	97	45	92	87	91	45	86	77
145A-3	134	55	127	97	126	55	120	91
169A-3	160	75	152	134	152	75	144	126
206A-3	195	90	185	160	186	90	177	152
246A-3	225	110	214	195	209	110	199	186
293A-3	269	132	256	225*	249	132	237	209*
363A-3	325	160	309	269	296	160	281	249
430A-3	385	200	366	325**	352	160	334	296**
U_N = 500 V								
02A1-5	2.1	0.75	2.0	1.7	1.9	0.55	1.8	1.5
03A0-5	3.0	1.1	2.8	2.1	2.8	0.75	2.7	1.9
03A4-5	3.4	1.5	3.2	3.0	3.1	1.1	2.9	2.8
04A8-5	4.8	2.2	4.6	3.4	4.4	1.5	4.2	3.1
05A2-5	5.2	3.0	5.0	4.8	4.8	2.2	4.6	4.4
07A6-5	7.6	4.0	7.2	5.2	7.0	3.0	6.7	4.8
11A0-5	11.0	5.5	10.4	7.6	10.2	4.0	9.7	7.0
014A-5	14	7.5	13	11	13	5.5	12	10.2
021A-5	21	11.0	19	14	19	7.5	18	13
027A-5	27	15	26	21	25	11.0	24	19.0
034A-5	34	18.5	32	27.0	31	15	29	25
040A-5	40	22	38	34	34	18.5	32	31.0
052A-5	52	30	49	40	44	22	42	34
065A-5	65	37	62	52	52	30	49	44
077A-5	77	45	73	65	61	37	58	52
096A-5	88	45	84	77	82	45	78	61
124A-5	115	55	109	88	104	55	99	82

Drive type ACS880-01-	Output ratings							
	EX motor (ABB Ex motors)				ABB Sine filter			
	Nominal use		Light-duty use	Heavy-duty use	Nominal use		Light-duty use	Heavy-duty use
	I_N	P_N	I_{Ld}	I_{Hd}	I_N	P_N	I_{Ld}	I_{Hd}
	A	kW	A	A	A	kW	A	A
156A-5	147	75	140	115	140	75	133	104
180A-5	170	90	162	147	161	90	153	140
240A-5	220	110	209	170	204	110	194	161
260A-5	238	132	226	220*	221	110	210	204*
302A-5	270	160	257	238	242	132	230	221
361A-5	322	200	306	270	289	160	275	242
414A-5	370	200	352	322**	332	200	315	289**
U_N = 690 V								
07A4-7	7.4	5.5	7.0	5.6	7.0	4.0	6.7	5.6
09A9-7	9.9	7.5	9.4	7.4	9.4	5.5	8.9	7.0
14A3-7	14.3	11	13.6	9.9	13.6	7.5	12.9	9.4
019A-7	19	15	18	14.3	18	11	17	14
023A-7	23	18.5	22	19	22	15	21	18
027A-7	27	22	26	23	26	18.5	25	22
07A3-7	7.3	5.5	6.9	5.6	6.9	4.0	6.6	5.5
09A8-7	9.8	7.5	9.3	7.3	9.3	5.5	8.8	6.9
14A2-7	14.2	11	13.5	10	13.5	7.5	12.8	9.3
018A-7	18	15	17	14	17	11	16	14
022A-7	22	18.5	21	18.0	21	15	20	17
026A-7	26	22	25	22	24	18.5	22.8	21
035A-7	35	30	33	26	33	22	31	24
042A-7	42	37	40	35	40	30	38	33
049A-7	49	45	47	42	46	37	44	40
061A-7	61	55	58	49	49	45	47	46
084A-7	84	75	80	61	68	55	65	49
098A-7	98	90	93	84	83	75	79	68
119A-7	119	110	113	98	101	90	96	83
142A-7	126	110	120	119	112	90	106	90
174A-7	154	132	146	126	137	110	130	112
210A-7	184	160	175	154	161	132	153	137
271A-7	238	200	226	184	207	160	197	161

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U_N	Supply voltage range
I_N	Nominal output current (available continuously with no over-loading)
P_N	Typical motor power in no-overload use

I_{Ld}	Continuous rms output current allowing 10% overload for 1 minute every 5 minutes
I_{Hd}	Continuous rms output current allowing 50% overload for 1 minute every 5 minutes. * Continuous rms output current allowing 30% overload for 1 minute every 5 minutes. ** Continuous rms output current allowing 25% overload for 1 minute every 5 minutes.
P_{Hd}	Typical motor power in heavy-duty use
Note 1: The ratings apply at an ambient temperature of 40 °C (104 °F).	

Drive type ACS880-01-	**Output ratings with selection Low noise optimization of parameter 97.09 Switching freq mode**		
	Nominal use	**Light- duty use**	**Heavy-duty use**
	I_N	**I_{Ld}**	**I_{Hd}**
	A	**A**	**A**
U_N = 230 V			
04A6-2	4.1	3.9	3.3
06A6-2	5.9	5.6	4.1
07A5-2	6.7	6.4	5.9
10A6-2	9.5	9.0	6.7
16A8-2	15.0	14.3	9.5
24A3-2	22.0	20.9	15.0
031A-2	30.0	28.5	22.0
046A-2	41.0	39.0	30.0
061A-2	56	53	41
075A-2	56	53	47
087A-2	67	64	56
115A-2	94	89	67
145A-2	118	112	94
170A-2	146	139	118
206A-2	178	169	146
274A-2	216	205	178
U_N = 400 V			
02A4-3	2.2	2.1	1.7
03A3-3	3.0	2.9	2.2
04A0-3	3.6	3.4	3.0
05A6-3	5.0	4.8	3.6
07A2-3	6.5	6.2	5.0
09A4-3	8.5	8.1	6.5
12A6-3	11.3	10.7	8.5
017A-3	15	14.3	11.3

Drive type ACS880-01-	Output ratings with selection Low noise optimization of parameter 97.09 Switching freq mode		
	Nominal use	Light- duty use	Heavy-duty use
	I_N	I_{Ld}	I_{Hd}
	A	A	A
025A-3	22	20.9	15.0
032A-3	30	29	22
038A-3	35	33	30
045A-3	41	39	35
061A-3	56	53	41
072A-3	56	53	47
087A-3	67	64	56
105A-3	86	82	67
145A-3	118	112	86
169A-3	146	139	118
206A-3	178	169	146
246A-3	194	184	178
293A-3	236	224	194*
363A-3	274	260	236
430A-3	325	309	274**
U_N = 500 V			
02A1-5	1.8	1.7	1.4
03A0-5	2.6	2.5	1.8
03A4-5	2.9	2.8	2.6
04A8-5	4.1	3.9	2.9
05A2-5	4.4	4.2	4.1
07A6-5	6.5	6.2	4.4
11A0-5	9.4	8.9	6.5
014A-5	12.0	11.4	9.4
021A-5	18.0	17.1	12.0
027A-5	23.0	21.9	18.0
034A-5	29	28	23
040A-5	29	28	23
052A-5	37	35	29
065A-5	39	37	33
077A-5	46	44	39
096A-5	72	68	46
124A-5	93	88	72
156A-5	133	126	93
180A-5	153	145	133
240A-5	191	181	153
260A-5	206	196	191*

Drive type ACS880-01-	Output ratings with selection Low noise optimization of parameter 97.09 Switching freq mode		
	Nominal use	Light- duty use	Heavy-duty use
	I_N	I_{Ld}	I_{Hd}
	A	A	A
302A-5	206	196	191
361A-5	258	245	206
414A-5	296	281	258**
U_N = 690 V			
07A4-7	7.0	6.7	5.6
09A9-7	9.4	8.9	7.0
14A3-7	13.6	12.9	9.4
019A-7	18	17	14
023A-7	22	21	18
027A-7	26	25	22
07A3-7	6.9	6.6	5.5
09A8-7	9.3	8.8	6.9
14A2-7	13.5	12.8	9.3
018A-7	17	16	14
022A-7	21	20	17
026A-7	24	22.8	21
035A-7	33	31	24
042A-7	40	38	33
049A-7	46	44	40
061A-7	49	47	46
084A-7	68	65	49
098A-7	83	79	68
119A-7	101	96	83
142A-7	101	96	84
174A-7	122	116	101
210A-7	138	131	122
271A-7	178	169	138

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U_N	Supply voltage range
I_N	Nominal output current (available continuously with no over-loading)
P_N	Typical motor power in no-overload use
I_{Ld}	Continuous rms output current allowing 10% overload for 1 minute every 5 minutes

I_{Hd}	Continuous rms output current allowing 50% overload for 1 minute every 5 minutes. * Continuous rms output current allowing 30% overload for 1 minute every 5 minutes. ** Continuous rms output current allowing 25% overload for 1 minute every 5 minutes.
P_{Hd}	Typical motor power in heavy-duty use
Note 1: The ratings apply at an ambient temperature of 40 °C (104 °F).	

High speed mode

Selection **High speed mode** of parameter **95.15 Special HW settings** improves control performance at high output frequencies. ABB recommends it to be selected with output frequency of 120 Hz and above.

This table gives the drive ratings for the maximum output frequency when **High speed mode** in parameter **95.15 Special HW settings** is enabled: With output frequencies smaller than this recommended maximum output frequency, the current derating is less than the values given in the table. Contact ABB for operation above the recommended maximum output frequency or for the output current derating with output frequencies above 120 Hz and below the maximum output frequency.

At the output frequency 120 Hz no derating.

Drive module type ACS880-01-	Output ratings with selection High speed mode of parameter 95.15 Special HW settings			
	Maximum output frequency			
	f_{max}	Nominal use	Light-duty use	Heavy-duty use
		I_N	I_{Ld}	I_{Hd}
	Hz	A	A	A
U_N = 230 V				
04A6-2	500	4.1	3.9	3.3
06A6-2	500	5.9	5.6	4.1
07A5-2	500	6.7	6.4	5.9
10A6-2	500	9.5	9.0	6.7
16A8-2	500	15.0	14.3	9.5
24A3-2	500	22.0	20.9	15.0
031A-2	500	30.0	28.5	22.0
046A-2	500	41.0	39.0	30.0
061A-2	500	56	53	41
075A-2	500	56	53	47
087A-2	500	67	64	56
115A-2	500	84	80	67
145A-2	500	106	101	84
170A-2	500	135	128	106
206A-2	500	165	157	135
274A-2	500	189	180	165
U_N = 400 V				
02A4-3	500	2.2	2.1	1.7
03A3-3	500	3.0	2.9	2.2
04A0-3	500	3.6	3.4	3.0
05A6-3	500	5.0	4.8	3.6
07A2-3	500	6.5	6.2	5.0
09A4-3	500	8.5	8.1	6.5

Drive module type ACS880-01-	Output ratings with selection High speed mode of parameter 95.15 Special HW settings			
	Maximum output frequency			
	f_{max}	Nominal use	Light-duty use	Heavy-duty use
		I_N	I_{Ld}	I_{Hd}
	Hz	A	A	A
12A6-3	500	11.3	10.7	8.5
017A-3	500	15	14.3	11.3
025A-3	500	22	20.9	15.0
032A-3	500	30	29	22
038A-3	500	35	33	30
045A-3	500	41	39	35
061A-3	500	56	53	41
072A-3	500	56	53	47
087A-3	500	67	64	56
105A-3	500	77	73	67
145A-3	500	106	101	77
169A-3	500	135	128	106
206A-3	500	165	157	135
246A-3	500	170	162	143
293A-3	500	202	192	170*
363A-3	500	236	224	202
430A-3	500	280	266	236**
U_N= 500 V				
02A1-5	500	1.8	1.7	1.4
03A0-5	500	2.6	2.5	1.8
03A4-5	500	2.9	2.8	2.6
04A8-5	500	4.1	3.9	2.9
05A2-5	500	4.4	4.2	4.1
07A6-5	500	6.5	6.2	4.4
11A0-5	500	9.4	8.9	6.5
014A-5	500	12.0	11.4	9.4
021A-5	500	18.0	17.1	12.0
027A-5	500	23.0	21.9	18.0
034A-5	500	29	28	23
040A-5	500	29	28	23
052A-5	500	37	35	29
065A-5	500	39	37	33
077A-5	500	46	44	39
096A-5	500	58	55	46
124A-5	500	74	70	58
156A-5	500	122	116	74

Drive module type ACS880-01-	Output ratings with selection High speed mode of parameter 95.15 Special HW settings			
	Maximum output frequency			
	f_{max}	Nominal use	Light-duty use	Heavy-duty use
		I_N	I_{Ld}	I_{Hd}
	Hz	A	A	A
180A-5	500	140	133	122
240A-5	500	168	160	140
260A-5	500	182	173	168*
302A-5	500	182	173	168
361A-5	500	206	196	182
414A-5	500	236	224	206**
U_N= 690 V				
07A4-7	500	6.7	6.4	5.4
09A9-7	500	8.9	8.5	6.7
14A3-7	500	12.9	12.3	8.9
019A-7	500	17	16	13
023A-7	500	21	20	17
027A-7	500	24	23	21
07A3-7	500	6.6	6.3	5.3
09A8-7	500	8.8	8.4	6.6
14A2-7	500	12.8	12.2	8.8
018A-7	500	16	15	13
022A-7	500	20	19	16
026A-7	500	23	22	20
035A-7	500	32	30	23
042A-7	500	38	36	32
049A-7	500	44	42	38
061A-7	500	44	42	40
084A-7	500	53	50	44
098A-7	500	68	65	53
119A-7	500	83	79	68
142A-7	500	83	79	72
174A-7	500	96	91	83
210A-7	500	101	96	83
271A-7	500	130	124	101

3AXD00000588487

f	Output frequency
f_{max}	Maximum output frequency with High speed mode
U_N	Nominal voltage of the drive
I_N	Continuous rms output current. No overload capability at 40 °C (104 °F)
P_N	Typical motor power in no-overload use.

I_{Ld}	Continuous rms output current allowing 10% overload for 1 minute every 5 minutes
I_{Hd}	Continuous rms output current allowing 50% overload for 1 minute every 5 minutes * Continuous rms output current allowing 40% overload for 1 minute every 5 minutes ** Continuous rms output current allowing 25% overload for 1 minute every 5 minutes

Fuses (IEC)

gG and 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 to 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.

For frames R7 to R9 ABB recommends ultra-rapid (aR) fuses, see section *Quick guide for selecting between gG and aR fuses* on page *199*.

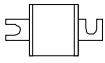
Note 1: See also *Implementing short-circuit and thermal overload protection* on page *90*.

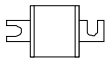
Note 2: Fuses with higher current rating than the recommended ones must not be used. Fuses with lower current rating can be used.

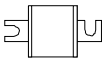
Note 3: Fuses from other manufacturers can be used if they meet the ratings and the melting curve of the fuse does not exceed the melting curve of the fuse mentioned in the table.

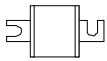
aR fuses DIN 43653 stud-mount (frames R1 to R9)

ABB recommends stud-mount fuses for better cooling but blade style fuses can be used as well.

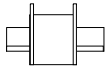
Ultrarapid (aR) fuses stud-mount (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43653** 
U_N = 230 V								
04A6-2	40	4.6	16	48	690	Bussmann	170M1309	000
06A6-2	40	6.6	16	48	690	Bussmann	170M1309	000
07A5-2	40	7.5	16	48	690	Bussmann	170M1309	000
10A6-2	53	10.6	16	48	690	Bussmann	170M1309	000
16A8-2	65	16.8	25	130	690	Bussmann	170M1311	000
24A3-2	120	24.3	40	460	690	Bussmann	170M1313	000

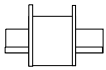
Ultrarapid (aR) fuses stud-mount (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43653** 
031A-2	160	31.0	63	1450	690	Bussmann	170M1315	000
046A-2	280	46	80	2550	690	Bussmann	170M1316	000
061A-2	300	61	125	8500	690	Bussmann	170M1318	000
075A-2	380	75	125	7500	690	Bussmann	170M3013	1
087A-2	500	87	160	8500	690	Bussmann	170M3014	1
115A-2	700	115	200	15000	690	Bussmann	170M3015	1
145A-2	1000	145	250	28500	690	Bussmann	170M3016	1
170A-2	1280	170	315	46500	690	Bussmann	170M3017	1
206A-2	1450	206	350	68500	690	Bussmann	170M3018	1
274A-2	2050	274	400	105000	690	Bussmann	170M3019	1
U_N = 400 V								
02A4-3	65	2.4	25	130	690	Bussmann	170M1311	000
03A3-3	65	3.3	25	130	690	Bussmann	170M1311	000
04A0-3	65	4.0	25	130	690	Bussmann	170M1311	000
05A6-3	65	5.6	25	130	690	Bussmann	170M1311	000
07A2-3	65	8.0	25	130	690	Bussmann	170M1311	000
09A4-3	65	10.0	25	130	690	Bussmann	170M1311	000
12A6-3	65	12.9	25	130	690	Bussmann	170M1311	000
017A-3	120	17	40	460	690	Bussmann	170M1313	000
025A-3	120	25	40	460	690	Bussmann	170M1313	000
032A-3	170	32	63	1450	690	Bussmann	170M1315	000
038A-3	170	38	63	1450	690	Bussmann	170M1315	000
045A-3	280	45	80	2550	690	Bussmann	170M1316	000
061A-3	380	61	100	4650	690	Bussmann	170M1317	000
072A-3	480	72	125	8500	690	Bussmann	170M1318	000
087A-3	700	87	160	16000	690	Bussmann	170M1319	000
105A-3	1280	105	200	15000	690	Bussmann	170M3015	1
145A-3	1280	145	250	28500	690	Bussmann	170M3016	1
169A-3	1800	169	315	46500	690	Bussmann	170M3017	1
206A-3	2210	206	350	68500	690	Bussmann	170M3018	1
246A-3	3010	246	450	105000	690	Bussmann	170M5009	2
293A-3	4000	293	500	145000	690	Bussmann	170M5010	2
363A-3	5550	363	630	275000	690	Bussmann	170M5012	2
430A-3	7800	430	700	405000	690	Bussmann	170M5013	2
U_N = 500 V								
02A1-5	65	2.1	25	130	690	Bussmann	170M1308	000

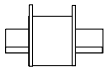
Ultrarapid (aR) fuses stud-mount (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43653** 
03A0-5	65	3.0	25	130	690	Bussmann	170M1308	000
03A4-5	65	3.4	25	130	690	Bussmann	170M1308	000
04A8-5	65	4.8	25	130	690	Bussmann	170M1308	000
05A2-5	65	5.2	25	130	690	Bussmann	170M1308	000
07A6-5	65	7.6	25	130	690	Bussmann	170M1308	000
11A0-5	65	11.0	25	130	690	Bussmann	170M1308	000
014A-5	120	14	40	460	690	Bussmann	170M1313	000
021A-5	120	21	40	460	690	Bussmann	170M1313	000
027A-5	170	27	63	1450	690	Bussmann	170M1315	000
034A-5	170	34	63	1450	690	Bussmann	170M1315	000
040A-5	280	40	80	2550	690	Bussmann	170M1316	000
052A-5	300	52	100	4650	690	Bussmann	170M1317	000
065A-5	480	65	125	8500	690	Bussmann	170M1318	000
077A-5	700	77	160	16000	690	Bussmann	170M1319	000
096A-5	1000	96	200	15000	690	Bussmann	170M3015	1
124A-5	1280	124	250	28500	690	Bussmann	170M3016	1
156A-5	1610	156	315	46500	690	Bussmann	170M3017	1
180A-5	2210	180	315	46500	690	Bussmann	170M3018	1
240A-5	2620	240	400	74000	690	Bussmann	170M5008	2
260A-5	4000	260	450	105000	690	Bussmann	170M5009	2
302A-5	5550	302	550	190000	690	Bussmann	170M5011	2
361A-5	5550	361	630	275000	690	Bussmann	170M5012	2
414A-5	7800	414	700	405000	690	Bussmann	170M5013	2
U_N = 690 V								
07A4-7	40	7.4	16	48	690	Bussmann	170M1309	000
09A9-7	53	9.9	20	78	690	Bussmann	170M1310	000
14A3-7	94	14.3	32	270	690	Bussmann	170M1312	000
019A-7	120	19	40	460	690	Bussmann	170M1313	000
023A-7	160	23	50	770	690	Bussmann	170M1314	000
027A-7	160	27	50	770	690	Bussmann	170M1314	000
07A3-7	40	7.3	16	48	690	Bussmann	170M1309	000
09A8-7	53	9.8	20	78	690	Bussmann	170M1310	000
14A2-7	94	14.2	32	270	690	Bussmann	170M1312	000
018A-7	120	18	40	460	690	Bussmann	170M1313	000
022A-7	160	22	50	770	690	Bussmann	170M1314	000
026A-7	160	26	50	770	690	Bussmann	170M1314	000

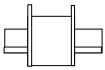
Ultrarapid (aR) fuses stud-mount (one fuse per phase)								
Drive type ACS880-01-	Min. short-circuit current [1] (A)	Input current (A)	Fuse					
			A	A^2s	V	Manufacturer	Type	Type DIN 43653 
035A-7	170	35	63	1450	690	Bussmann	170M1315	000
042A-7	280	42	80	2550	690	Bussmann	170M1316	000
049A-7	280	49	80	2550	690	Bussmann	170M1316	000
061A-7	480	61	125	8500	690	Bussmann	170M1318	000
084A-7	700	84	160	16000	690	Bussmann	170M1319	000
098A-7	1610	98	200	15000	690	Bussmann	170M3015	1
119A-7	1610	119	200	15000	690	Bussmann	170M3015	1
142A-7	2210	142	250	28500	690	Bussmann	170M3016	1
174A-7	2210	174	315	46500	690	Bussmann	170M3017	1
210A-7	3200	210	400	74000	690	Bussmann	170M5008	2
271A-7	3200	271	415	105000	690	Bussmann	170M5009	2
[1] minimum short-circuit current of the installation								

aR fuses DIN 43620 blade style (frames R1 to R9)

Ultrarapid (aR) fuses blade style (one fuse per phase)								
Drive type ACS880-01-	Min. short-circuit current [1] (A)	Input current (A)	Fuse					
			A	A^2s	V	Manufacturer	Type	Type DIN 43620 
U_N = 230 V								
04A6-2	40	4.6	16	48	690	Bussmann	170M1559	000
06A6-2	40	6.6	16	48	690	Bussmann	170M1559	000
07A5-2	40	7.5	16	48	690	Bussmann	170M1559	000
10A6-2	53	10.6	20	78	690	Bussmann	170M1560	000
16A8-2	65	16.8	25	130	690	Bussmann	170M1561	000
24A3-2	120	24.3	40	460	690	Bussmann	170M1563	000
031A-2	160	31.0	63	1450	690	Bussmann	170M1565	000
046A-2	280	46	80	2550	690	Bussmann	170M1566	000
061A-2	300	61	125	8500	690	Bussmann	170M1568	000
075A-2	380	75	200	15000	690	Bussmann	170M3815	1
087A-2	500	87	250	28500	690	Bussmann	170M3816	1
115A-2	700	115	315	46500	690	Bussmann	170M3817	1
145A-2	1000	145	315	46500	690	Bussmann	170M3817	1
170A-2	1280	170	450	105000	690	Bussmann	170M5809	2

Ultrarapid (aR) fuses blade style (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43620** 
206A-2	1450	206	500	155000	690	Bussmann	170M5810	2
274A-2	2050	274	630	220000	690	Bussmann	170M5810	3
U_N = 400 V								
02A4-3	65	2.4	25	130	690	Bussmann	170M1561	000
03A3-3	65	3.3	25	130	690	Bussmann	170M1561	000
04A0-3	65	4.0	25	130	690	Bussmann	170M1561	000
05A6-3	65	5.6	25	130	690	Bussmann	170M1561	000
07A2-3	65	8.0	25	130	690	Bussmann	170M1561	000
09A4-3	65	10.0	25	130	690	Bussmann	170M1561	000
12A6-3	65	12.9	25	130	690	Bussmann	170M1561	000
017A-3	120	17	40	460	690	Bussmann	170M1563	000
025A-3	120	25	40	460	690	Bussmann	170M1563	000
032A-3	170	32	63	1450	690	Bussmann	170M1565	000
038A-3	170	38	63	1450	690	Bussmann	170M1565	000
045A-3	280	45	80	2550	690	Bussmann	170M1566	000
061A-3	380	61	100	4650	690	Bussmann	170M1567	000
072A-3	480	72	125	8500	690	Bussmann	170M1568	000
087A-3	700	87	160	16000	690	Bussmann	170M1569	000
105A-3	1280	105	315	46500	690	Bussmann	170M3817	1
145A-3	1280	145	315	46500	690	Bussmann	170M3817	1
169A-3	1800	169	450	105000	690	Bussmann	170M5809	2
206A-3	2210	206	500	145000	690	Bussmann	170M5810	2
246A-3	3010	246	630	275000	690	Bussmann	170M5812	2
293A-3	4000	293	800	490000	690	Bussmann	170M6812D	3
363A-3	5550	363	1000	985000	690	Bussmann	170M6814D	3
430A-3	7800	430	1250	2150000	690	Bussmann	170M8554D	3
U_N = 500 V								
02A1-5	65	2.1	25	130	690	Bussmann	170M1561	000
03A0-5	65	3.0	25	130	690	Bussmann	170M1561	000
03A4-5	65	3.4	25	130	690	Bussmann	170M1561	000
04A8-5	65	4.8	25	130	690	Bussmann	170M1561	000
05A2-5	65	5.2	25	130	690	Bussmann	170M1561	000
07A6-5	65	7.6	25	130	690	Bussmann	170M1561	000
11A0-5	65	11.0	25	130	690	Bussmann	170M1561	000
014A-5	120	14	40	460	690	Bussmann	170M1563	000

Ultrarapid (aR) fuses blade style (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43620** 
021A-5	120	21	40	460	690	Bussmann	170M1563	000
027A-5	170	27	63	1450	690	Bussmann	170M1565	000
034A-5	170	34	63	1450	690	Bussmann	170M1565	000
040A-5	280	40	80	2550	690	Bussmann	170M1566	000
052A-5	300	52	100	4650	690	Bussmann	170M1567	000
065A-5	480	65	125	8500	690	Bussmann	170M1568	000
077A-5	700	77	160	16000	690	Bussmann	170M1569	000
096A-5	1000	96	250	28500	690	Bussmann	170M3816	1
124A-5	1280	124	315	46500	690	Bussmann	170M3817	1
156A-5	1610	156	400	74000	690	Bussmann	170M5808	2
180A-5	2210	180	500	155000	690	Bussmann	170M5810	2
240A-5	2620	240	550	190000	690	Bussmann	170M5811	2
260A-5	4000	260	800	490000	690	Bussmann	170M6812D	3
302A-5	5550	302	1000	985000	690	Bussmann	170M6814D	3
361A-5	5550	361	1000	985000	690	Bussmann	170M6814D	3
414A-5	7800	414	1250	2150000	690	Bussmann	170M8554D	3
U_N = 690 V								
07A4-7	40	7.4	16	48	690	Bussmann	170M1559	000
09A9-7	53	9.9	20	78	690	Bussmann	170M1560	000
14A3-7	94	14.3	32	270	690	Bussmann	170M1562	000
019A-7	120	19	40	460	690	Bussmann	170M1563	000
023A-7	160	23	50	770	690	Bussmann	170M1564	000
027A-7	160	27	50	770	690	Bussmann	170M1564	000
07A3-7	40	7.3	16	48	690	Bussmann	170M1559	000
09A8-7	53	9.8	20	78	690	Bussmann	170M1560	000
14A2-7	94	14.2	32	270	690	Bussmann	170M1562	000
018A-7	120	18	40	460	690	Bussmann	170M1563	000
022A-7	160	22	50	770	690	Bussmann	170M1564	000
026A-7	160	26	50	770	690	Bussmann	170M1564	000
035A-7	170	35	63	1450	690	Bussmann	170M1565	000
042A-7	280	42	80	2550	690	Bussmann	170M1566	000
049A-7	280	49	80	2550	690	Bussmann	170M1566	000
061A-7	480	61	125	8500	690	Bussmann	170M1568	000
084A-7	700	84	160	16000	690	Bussmann	170M1569	000
098A-7	1610	98	400	74000	690	Bussmann	170M3816	2

Ultrarapid (aR) fuses blade style (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current [1] (A)**	**Input current (A)**	**Fuse**					
			A	**A^2s**	**V**	**Manufacturer**	**Type**	**Type DIN 43620** 
119A-7	1610	119	400	74000	690	Bussmann	170M3816	2
142A-7	2210	142	500	145000	690	Bussmann	170M5810	2
174A-7	2210	174	500	145000	690	Bussmann	170M5810	2
210A-7	3200	210	700	320000	690	Bussmann	170M6811D	3
271A-7	3200	271	700	320000	690	Bussmann	170M6811D	3
[1] minimum short-circuit current of the installation								

gG fuses DIN 43620 blade style (frames R1 to R9)

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

gG fuses (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current[1)]**	**Input current**	**Fuse**					
	A	A	A	A^2s	V	Manufacturer	Type	DIN size
U_N = 230 V								
04A6-2	40	4.6	6	110	500	ABB	OFAF000H6	000
06A6-2	80	6.6	10	360	500	ABB	OFAF000H10	000
07A5-2	120	7.5	16	740	500	ABB	OFAF000H16	000
10A6-2	120	10.6	16	740	500	ABB	OFAF000H16	000
16A8-2	200	16.8	25	2500	500	ABB	OFAF000H25	000
24A3-2	350	24.3	40	7700	500	ABB	OFAF000H40	000
031A-2	400	31.0	50	16000	500	ABB	OFAF000H50	000
046A-2	500	46	63	20100	500	ABB	OFAF000H63	000
061A-2	800	61	80	37500	500	ABB	OFAF000H80	000
075A-2	1000	75	100	65000	500	ABB	OFAF000H100	000
087A-2	1300	87	125	100000	500	ABB	OFAF00H125	00
115A-2	1700	115	160	170000	500	ABB	OFAF00H160	00
145A-2	2300	145	200	300000	500	ABB	OFAF0H200	0
170A-2	3300	170	250	600000	500	ABB	OFAF0H250	0
206A-2	5500	206	315	710000	500	ABB	OFAF1H315	1
274A-2	7000	274	400	1100000	500	ABB	OFAF2H400	2
U_N = 400 V								
02A4-3	17	2.4	4	53	500	ABB	OFAF000H4	000
03A3-3	40	3.3	6	110	500	ABB	OFAF000H6	000
04A0-3	40	4.0	6	110	500	ABB	OFAF000H6	000
05A6-3	80	5.6	10	355	500	ABB	OFAF000H10	000
07A2-3	80	8.0	10	355	500	ABB	OFAF000H10	000
09A4-3	120	10.0	16	700	500	ABB	OFAF000H16	000
12A6-3	120	12.9	16	700	500	ABB	OFAF000H16	000
017A-3	200	17	25	2500	500	ABB	OFAF000H25	000
025A-3	250	25	32	4500	500	ABB	OFAF000H32	000
032A-3	350	32	40	7700	500	ABB	OFAF000H40	000
038A-3	400	38	50	15400	500	ABB	OFAF000H50	000
045A-3	500	45	63	21300	500	ABB	OFAF000H63	000
061A-3	800	61	80	37000	500	ABB	OFAF000H80	000
072A-3	1000	72	100	63600	500	ABB	OFAF000H100	000

gG fuses (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current[1)]**	**Input current**	**Fuse**					
	A	A	A	A^2s	V	Manufacturer	Type	DIN size
087A-3	1000	87	100	63600	500	ABB	OFAF000H100	000
105A-3	1300	105	125	103000	500	ABB	OFAF00H125	00
145A-3	1700	145	160	185000	500	ABB	OFAF00H160	00
169A-3	3300	169	250	600000	500	ABB	OFAF0H250	0
206A-3	5500	206	315	710000	500	ABB	OFAF1H315	1
246A-3	6400	246	355	920000	500	ABB	OFAF1H355	1
293A-3	7800	293	425	1300000	500	ABB	OFAF2H425	2
363A-3	9400	363	500	2000000	500	ABB	OFAF2H500	2
430A-3	10200	430	630	2800000	500	ABB	OFAF3H630	3
U_N = 500 V								
02A1-5	17	2.1	4	53	500	ABB	OFAF000H4	000
03A0-5	40	3.0	6	110	500	ABB	OFAF000H6	000
03A4-5	40	3.4	6	110	500	ABB	OFAF000H6	000
04A8-5	80	4.8	10	355	500	ABB	OFAF000H10	000
05A2-5	80	5.2	10	355	500	ABB	OFAF000H10	000
07A6-5	120	7.6	16	700	500	ABB	OFAF000H16	000
11A0-5	120	11.0	16	700	500	ABB	OFAF000H16	000
014A-5	200	14	25	2500	500	ABB	OFAF000H25	000
021A-5	250	21	32	4500	500	ABB	OFAF000H32	000
027A-5	350	27	40	7700	500	ABB	OFAF000H40	000
034A-5	400	34	50	15400	500	ABB	OFAF000H50	000
040A-5	500	40	63	21300	500	ABB	OFAF000H63	000
052A-5	800	52	80	37000	500	ABB	OFAF000H80	000
065A-5	1000	65	100	63600	500	ABB	OFAF000H100	000
077A-5	1000	77	100	63600	500	ABB	OFAF000H100	000
096A-5	1300	96	125	103000	500	ABB	OFAF00H125	00
124A-5	1700	124	160	185000	500	ABB	OFAF00H160	00
156A-5	3300	156	250	600000	500	ABB	OFAF0H250	0
180A-5	5500	180	315	710000	500	ABB	OFAF1H315	1
240A-5	6400	240	355	920000	500	ABB	OFAF1H355	1
260A-5	7000	260	400	1100000	500	ABB	OFAF2H400	2
302A-5	9400	302	500	2000000	500	ABB	OFAF2H500	2
361A-5	10200	361	630	2800000	500	ABB	OFAF3H630	3
414A-5	10200	414	630	2800000	500	ABB	OFAF3H630	3
U_N = 690 V								
07A4-7	115	7.4	16	1200	690	ABB	OFAA000GG16	000

gG fuses (one fuse per phase)								
Drive type ACS880-01-	**Min. short-circuit current[1)]**	**Input current**	**Fuse**					
	A	A	A	A^2s	V	Manufacturer	Type	DIN size
09A9-7	145	9.9	20	2400	690	ABB	OFAA000GG20	000
14A3-7	190	14.3	25	4000	690	ABB	OFAA000GG25	000
019A-7	280	19	35	12000	690	ABB	OFAA000GG35	000
023A-7	450	23	50	24000	690	ABB	OFAA000GG50	000
027A-7	450	27	50	24000	690	ABB	OFAA000GG50	000
07A3-7	115	7.3	16	1200	690	ABB	OFAA000GG16	000
09A8-7	145	9.8	20	2400	690	ABB	OFAA000GG20	000
14A2-7	190	14.2	25	4000	690	ABB	OFAA000GG25	000
018A-7	280	18	35	12000	690	ABB	OFAA000GG35	000
022A-7	450	22	50	24000	690	ABB	OFAA000GG50	000
026A-7	450	26	50	24000	690	ABB	OFAA000GG50	000
035A-7	520	35	63	30000	690	ABB	OFAA000GG63	000
042A-7	800	42	80	51000	690	ABB	OFAA0GG80	0
049A-7	800	49	80	51000	690	ABB	OFAA0GG80	0
061A-7	1050	61	100	95000	690	ABB	OFAA0GG100	0
084A-7	1700	84	160	240000	690	ABB	OFAA1GG160	1
098A-7	1700	98	160	240000	690	ABB	OFAA1GG160	1
119A-7	2200	119	200	350000	690	ABB	OFAA1GG200	1
142A-7	3200	142	250	700000	690	ABB	OFAA1GG250	1
174A-7	5500	174	315	850000	690	ABB	OFAA2GG315	2
210A-7	7000	210	400	1300000	690	ABB	OFAA3GG400	3
271A-7	7000	271	400	1300000	690	ABB	OFAA3GG400	3

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

Quick guide for selecting between gG and aR fuses

The combinations (cable size, cable length, transformer size and fuse type) in this table fulfill the minimum requirements for the proper operation of the fuse. Use this table to select between gG and aR fuses or calculate the short-circuit current of the installation as described under *Calculating the short-circuit current of the installation* on page *202*).

Drive type ACS880-01-	Cable type		Supply transformer minimum apparent power S_N (kVA)					
	Copper	Aluminum	Maximum cable length with gG fuses			Maximum cable length with aR fuses		
	mm^2	mm^2	10 m	50 m	100 m	10 m	100 m	200 m
U_N = 230 V								
04A6-2	3×1.5	-	1.1	1.1	-	1.1	1.2	-
06A6-2	3×1.5	-	2.2	2.4	-	1.1	1.2	-
07A5-2	3×1.5	-	3.3	4.3	-	1.1	1.2	-
10A6-2	3×1.5	-	3.3	4.3	-	1.5	1.8	-
16A8-2	3×6	-	5.5	5.8	-	1.8	1.8	-
24A3-2	3×6	-	9.7	11	-	3.3	3.5	-
031A-2	3×10	-	11	12	-	4.4	4.6	-
046A-2	3×16	3×35	14	15	-	7.7	8.2	-
061A-2	3×25	3×35	22	24	-	8.3	8.6	-
075A-2	3×35	3×50	28	29	-	11	11	-
087A-2	3×35	3×70	36	39	-	14	15	-
115A-2	3×50	3×70	48	52	-	19	21	-
145A-2	3×95	3×120	64	70	-	28	30	-
170A-2	3×120	3×150	93	104	-	36	39	-
206A-2	3×150	3×240	158	194	-	40	45	-
274A-2	2×(3×95)	2×(3×120)	198	229	-	57	62	-
U_N = 400 V								
02A4-3	3×1.5	-	0.82	0.82	0.82	3.1	3.4	5.0
03A3-3	3×1.5	-	1.9	1.9	2.0	3.1	3.4	5.0
04A0-3	3×1.5	-	1.9	1.9	2.0	3.1	3.4	5.0
05A6-3	3×1.5	-	3.8	4.0	4.4	3.1	3.4	5.0
07A2-3	3×1.5	-	3.8	4.0	4.4	3.1	3.4	5.0
09A4-3	3×1.5	-	5.8	6.2	8.4	3.1	3.4	5.0
12A6-3	3×1.5	-	5.8	6.2	8.4	3.1	3.4	5.0
017A-3	3×6	-	9.6	9.8	10	5.8	5.9	6.2
025A-3	3×6	-	12	12	13	5.8	5.9	6.2
032A-3	3×10	-	17	17	18	8.2	8.3	8.7
038A-3	3×10	-	19	20	21	8.2	8.3	8.7
045A-3	3×16	3×25	24	24	26	13	14	15
061A-3	3×25	3×25	39	39	42	18	19	20

Drive type ACS880-01-	Cable type		Supply transformer minimum apparent power S_N (kVA)					
	Copper	Aluminum	Maximum cable length with gG fuses			Maximum cable length with aR fuses		
	mm^2	mm^2	10 m	50 m	100 m	10 m	100 m	200 m
072A-3	3×35	3×35	48	49	52	23	24	25
087A-3	3×35	3×50	48	49	52	34	35	38
105A-3	3×50	3×70	63	65	68	62	67	80
145A-3	3×95	3×95	82	85	88	62	65	70
169A-3	3×120	3×150	160	170	187	87	93	104
206A-3	3×150	3×185	269	298	357	107	116	132
246A-3	2×(3×70)	2×(3×95)	311	335	393	145	157	180
293A-3	2×(3×95)	2×(3×120)	380	411	478	193	211	248
363A-3	2×(3×120)	2×(3×185)	459	502	591	269	304	378
430A-3	2×(3×150)	2×(3×240)	499	547	641	380	452	634
U_N = 500 V								
02A1-5	3×1.5	-	1.0	1.0	1.0	3.9	4.1	5.0
03A0-5	3×1.5	-	2.4	2.4	2.4	3.9	4.1	5.0
03A4-5	3×1.5	-	2.4	2.4	2.4	3.9	4.1	5.0
04A8-5	3×1.5	-	4.8	4.9	5.2	3.9	4.1	5.0
05A2-5	3×1.5	-	4.8	4.9	5.2	3.9	4.1	5.0
07A6-5	3×1.5	-	7.2	7.5	8.9	3.9	4.1	5.0
11A0-5	3×1.5	-	7.2	7.5	8.9	3.9	4.1	5.0
014A-5	3×6	-	12	12	12	7.2	7.3	7.6
021A-5	3×6	-	15	15	16	7.2	7.3	7.6
027A-5	3×10	-	21	21	22	10	10	11
034A-5	3×10	-	24	24	25	10	10	11
040A-5	3×16	3×35	30	30	31	17	17	18
052A-5	3×25	3×35	48	49	51	18	18	19
065A-5	3×35	3×50	60	61	63	29	29	30
077A-5	3×35	3×70	60	61	63	42	43	46
096A-5	3×50	3×70	78	80	83	60	63	67
124A-5	3×95	3×120	103	105	108	77	80	85
156A-5	3×120	3×150	200	209	224	97	102	109
180A-5	3×150	3×240	335	362	411	133	143	156
240A-5	2×(3×70)	2×(3×95)	388	410	456	158	165	179
260A-5	2×(3×70)	2×(3×95)	425	452	512	242	262	307
302A-5	2x(3x95)	2×(3×120)	572	617	711	336	372	450
361A-5	2×(3×120)	2×(3×185)	621	669	763	336	368	427
414A-5	2×(3×150)	2×(3×240)	621	666	747	473	539	674
U_N = 690 V								
07A4-7	3×1.5	-	9.5	9.5	9.5	3.3	3.3	3.3

Drive type ACS880-01-	Cable type		Supply transformer minimum apparent power S_N (kVA)					
	Copper	Aluminum	Maximum cable length with gG fuses			Maximum cable length with aR fuses		
	mm^2	mm^2	10 m	50 m	100 m	10 m	100 m	200 m
09A9-7	3×1.5	-	12	12	12	4.4	4.4	4.4
14A3-7	3×2.5	-	16	16	16	7.8	7.8	7.8
019A-7	3×4	-	23	23	23	9.9	10	10
023A-7	3×6	-	37	37	38	13	13	13
027A-7	3×10	-	37	37	38	13	13	13
07A3-7	3×1.5	-	9.5	9.5	9.5	3.3	3.3	3.3
09A8-7	3×1.5	-	12	12	12	4.4	4.4	4.4
14A2-7	3×2.5	-	16	16	16	7.8	7.8	7.8
018A-7	3×4	-	23	23	23	9.9	10	10
022A-7	3×6	-	37	37	38	13	13	13
026A-7	3×10	3×25	37	37	38	13	13	13
035A-7	3×10	3×25	43	43	44	14	14	14
042A-7	3×16	3×25	66	67	68	23	23	24
049A-7	3×16	3×25	66	67	68	23	23	24
061A-7	3×25	3×35	87	88	90	40	40	41
084A-7	3×35	3×50	141	144	149	58	59	61
098A-7	3×50	3×70	141	143	146	134	138	145
119A-7	3×70	3×95	183	187	192	134	138	145
142A-7	3×95	3×120	267	275	286	184	192	205
174A-7	3×120	3×185	452	476	515	184	192	205
210A-7	3×185	2×(3×95)	584	608	654	266	277	295
271A-7	3×240	2×(3×120)	584	605	640	266	275	289

Calculating the short-circuit current of the installation

Check that the short-circuit current of the installation is at least the value given in the fuse table.

The short-circuit current of the installation can be calculated as follows:

$$I_{k2\text{-}ph} = \frac{U}{2 \cdot \sqrt{R_c^2 + (Z_k + X_c)^2}}$$

where

$I_{k2\text{-}ph}$ = short-circuit current in symmetrical two-phase short-circuit

U = network line-to-line voltage (V)

R_c = cable resistance (ohm)

$Z_k = z_k \cdot U_N^2/S_N$ = transformer impedance (ohm)

z_k = transformer impedance (%)

U_N = transformer rated voltage (V)

S_N = nominal apparent power of the transformer (kVA)

X_c = cable reactance (ohm).

Calculation example

Drive:

- ACS880-01-145A-3
- supply voltage = 410 V

Transformer:

- rated power S_N = 600 kVA
- rated voltage (drive supply voltage) U_N = 430 V
- transformer impedance z_k = 7.2%.

Supply cable:

- length = 170 m
- resistance/length = 0.398 ohm/km
- reactance/length = 0.082 ohm/km.

$$Z_k = z_k \cdot \frac{U_N^2}{S_N} = 0.072 \cdot \frac{(430\ \text{V})^2}{600\ \text{kVA}} = 22.19\ \text{mohm}$$

$$R_c = 170\ \text{m} \cdot 0.398\ \frac{\text{ohm}}{\text{km}} = 67.66\ \text{mohm}$$

$$X_c = 170\ \text{m} \cdot 0.082\ \frac{\text{ohm}}{\text{km}} = 13.94\ \text{mohm}$$

$$I_{k2\text{-}ph} = \frac{410\ \text{V}}{2 \cdot \sqrt{(67.66\ \text{mohm})^2 + (22.19\ \text{mohm} + 13.94\ \text{mohm})^2}} = 2.7\ \text{kA}$$

The calculated short-circuit current 2.7 kA is higher than the minimum short-circuit current of the drive gG fuse type OFAF00H160 (1700 A). -> The 500 V gG fuse (ABB Control OFAF00H160) can be used.

Fuses (UL)

UL class T fuses for branch circuit protection per NEC are listed below. Fast acting class T or faster fuses are recommended in the USA. **Check on the fuse time-current curve to ensure the operating time of the fuse is below 0.5 seconds for units of frame sizes R1 to R6 and below 0.1 seconds for units of frame sizes R7 to R9. Obey local regulations.**

Note 1: See also *Implementing short-circuit and thermal overload protection* on page *90*.

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

Drive type ACS880-01-	Input current	UL (one fuse per phase)				
	A	A	V	Manufacturer	Type	UL class
U_N = 230 V						
04A6-2	4.4	15	600	Bussmann	JJS-15	T
06A6-2	6.3	15	600	Bussmann	JJS-15	T
07A5-2	7.1	15	600	Bussmann	JJS-15	T
10A6-2	10.1	20	600	Bussmann	JJS-20	T
16A8-2	16.0	25	600	Bussmann	JJS-25	T
24A3-2	23.1	40	600	Bussmann	JJS-40	T
031A-2	29.3	50	600	Bussmann	JJS-50	T
046A-2	44	80	600	Bussmann	JJS-80	T
061A-2	58	100	600	Bussmann	JJS-100	T
075A-2	71	125	600	Bussmann	JJS-125	T
087A-2	83	125	600	Bussmann	JJS-125	T
115A-2	109	150	600	Bussmann	JJS-150	T
145A-2	138	200	600	Bussmann	JJS-200	T
170A-2	162	250	600	Bussmann	JJS-250	T
206A-2	196	300	600	Bussmann	JJS-300	T
274A-2	260	400	600	Bussmann	JJS-400	T
U_N = 460 V						
02A1-5	2.1	3	600	Bussmann	JJS-3	T
03A0-5	3.0	6	600	Bussmann	JJS-6	T
03A4-5	3.4	6	600	Bussmann	JJS-6	T
04A8-5	4.8	10	600	Bussmann	JJS-10	T
05A2-5	5.2	10	600	Bussmann	JJS-10	T
07A6-5	7.6	15	600	Bussmann	JJS-15	T
11A0-5	11	20	600	Bussmann	JJS-20	T
014A-5	14	25	600	Bussmann	JJS-25	T
021A-5	21	35	600	Bussmann	JJS-35	T
027A-5	27	40	600	Bussmann	JJS-40	T
034A-5	34	50	600	Bussmann	JJS-50	T
040A-5	40	60	600	Bussmann	JJS-60	T
052A-5	52	80	600	Bussmann	JJS-80	T
065A-5	65	90	600	Bussmann	JJS-90	T
077A-5	77	110	600	Bussmann	JJS-110	T
096A-5	96	150	600	Bussmann	JJS-150	T
124A-5	124	200	600	Bussmann	JJS-200	T
156A-5	156	225	600	Bussmann	JJS-225	T
180A-5	180	300	600	Bussmann	JJS-300	T
240A-5	240	350	600	Bussmann	JJS-350	T
260A-5	260	400	600	Bussmann	JJS-400	T

Drive type ACS880-01-	**Input current**	**UL (one fuse per phase)**				
	A	A	V	Manufacturer	Type	UL class
302A-5	302	400	600	Bussmann	JJS-400	T
361A-5	361	500	600	Bussmann	JJS-500	T
414A-5	414	600	600	Bussmann	JJS-600	T
U_N = 575 V						
07A4-7	7.0	15	600	Bussmann	JJS-15	T
09A9-7	9.4	20	600	Bussmann	JJS-20	T
14A3-7	13.6	30	600	Bussmann	JJS-30	T
019A-7	18	40	600	Bussmann	JJS-40	T
023A-7	22	50	600	Bussmann	JJS-50	T
027A-7	27	50	600	Bussmann	JJS-50	T
07A3-7	9.0	15	600	Bussmann	JJS-15	T
09A8-7	11	20	600	Bussmann	JJS-20	T
14A2-7	17	30	600	Bussmann	JJS-30	T
018A-7	22	40	600	Bussmann	JJS-40	T
022A-7	27	50	600	Bussmann	JJS-50	T
026A-7	32	50	600	Bussmann	JJS-50	T
035A-7	41	60	600	Bussmann	JJS-60	T
042A-7	52	80	600	Bussmann	JJS-80	T
049A-7	52	80	600	Bussmann	JJS-80	T
061A-7	62	110	600	Bussmann	JJS-110	T
084A-7	77	150	600	Bussmann	JJS-150	T
098A-7	99	150	600	Bussmann	JJS-150	T
119A-7	125	200	600	Bussmann	JJS-200	T
142A-7	144	250	600	Bussmann	JJS-250	T
174A-7	180	300	600	Bussmann	JJS-300	T
210A-7	242	400	600	Bussmann	JJS-400	T
271A-7	271	400	600	Bussmann	JJS-400	T

Circuit breakers

The table below lists MCB and MCCB circuit breakers that can be used with the drive.

Note: Fuses must be used with circuit breakers in the USA.

Drive type ACS880-01-	Frame size	ABB miniature circuit breaker		ABB moulded case circuit breaker (Tmax)	
		Type	kA [1)]	Type	kA [1)]
U_N = 230 V					
04A6-2	R1	S 203 M/P-B/C 10	5	-	-
06A6-2	R1	S 203 M/P-B/C 10	5	-	-
07A5-2	R1	S 203 M/P-B/C 16	5	-	-
10A6-2	R1	S 203 M/P-B/C 16	5	-	-
16A8-2	R2	S 203 M/P-B/C 20	5	-	-
24A3-2	R2	S 203 M/P-B/C 32	5	-	-
031A-2	R3	S 203 M/P-B/C 50	5	-	-
046A-2	R4	S 803 S-B/C 75	10	-	-
061A-2	R4	S 803 S-B/C 80	10	-	-
075A-2	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
087A-2	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
115A-2	R6	-	-	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
145A-2	R6	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
170A-2	R7	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
206A-2	R7	-	-	(T4 L 320 PR221DS-LS/I In=320 3p F F)	65
274A-2	R8	-	-	(T4 L 320 PR221DS-LS/I In=320 3p F F)	65
U_N = 400 V					
02A4-3	R1	S 203 M/P-B/C 6	5	-	-
03A3-3	R1	S 203 M/P-B/C 6	5	-	-
04A0-3	R1	S 203 M/P-B/C 6	5	-	-
05A6-3	R1	S 203 M/P-B/C 10	5	-	-
07A2-3	R1	S 203 M/P-B/C 13	5	-	-
09A4-3	R1	S 203 M/P-B/C 13	5	-	-
12A6-3	R1	S 203 M/P-B/C 20	5	-	-
017A-3	R2	S 203 M/P-B/C 25	5	-	-
025A-3	R2	S 203 M/P-B/C 32	5	-	-
032A-3	R3	S 203 M/P-B/C 50	5	-	-
038A-3	R3	S 203 M/P-B/C 63	5	-	-

Drive type ACS880-01-	Frame size	ABB miniature circuit breaker		ABB moulded case circuit breaker (Tmax)	
		Type	kA [1)]	Type	kA [1)]
045A-3	R4	S 803 S-B/C 63	10	-	-
061A-3	R4	S 803 S-B/C 75	10	-	-
072A-3	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
087A-3	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
105A-3	R6	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
145A-3	R6	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
169A-3	R7	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
206A-3	R7	-	-	(T4 L 320 PR221DS-LS/I In=320 3p F F)	65
246A-3	R8	-	-	(T5 L 400 PR221DS-LS/I In=400 3p F F)	65
293A-3	R8	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
363A-3	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
430A-3	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
U_N = 500 V					
02A1-5	R1	S 803 S-B/C 6	10	-	-
03A0-5	R1	S 803 S-B/C 6	10	-	-
03A4-5	R1	S 803 S-B/C 6	10	-	-
04A8-5	R1	S 803 S-B/C 10	10	-	-
05A2-5	R1	S 803 S-B/C 13	10	-	-
07A6-5	R1	S 803 S-B/C 13	10	-	-
11A0-5	R1	S 803 S-B/C 20	10	-	-
014A-5	R2	S 803 S-B/C 25	10	-	-
021A-5	R2	S 803 S-B/C 32	10	-	-
027A-5	R3	S 803 S-B/C 50	10	-	-
034A-5	R3	S 803 S-B/C 63	10	-	-
040A-5	R4	S 803 S-B/C 63	10	-	-
052A-5	R4	S 803 S-B/C 75	10	-	-
065A-5	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65
077A-5	R5	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	65

Drive type ACS880-01-	Frame size	ABB miniature circuit breaker		ABB moulded case circuit breaker (Tmax)	
		Type	kA [1)]	Type	kA [1)]
096A-5	R6	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
124A-5	R6	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
156A-5	R7	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	65
180A-5	R7	-	-	(T4 L 320 PR221DS-LS/I In=320 3p F F)	65
240A-5	R8	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
260A-5	R8	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
302A-5	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
361A-5	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
414A-5	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	65
U_N = 690 V					
07A4-7	R3	S 803 S-B/C 13	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
09A9-7	R3	S 803 S-B/C 20	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
14A3-7	R3	S 803 S-B/C 25	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
019A-7	R3	S 803 S-B/C 32	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
023A-7	R3	S 803 S-B/C 50	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
027A-7	R3	S 803 S-B/C 63	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
07A3-7	R5	S 803 S-B/C 13	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
09A8-7	R5	S 803 S-B/C 20	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
14A2-7	R5	S 803 S-B/C 25	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	18
018A-7	R5	S 803 S-B/C 32	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
022A-7	R5	S 803 S-B/C 50	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
026A-7	R5	S 803 S-B/C 63	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18

Drive type ACS880-01-	Frame size	ABB miniature circuit breaker		ABB moulded case circuit breaker (Tmax)	
		Type	kA [1)]	Type	kA [1)]
035A-7	R5	S 803 S-B/C 63	10	(XT2 L 160 Ekip LS/I In=63 3p F F)	18
042A-7	R5	S 803 S-B/C 80	10	(XT2 L 160 Ekip LS/I In=100 3p F F)	18
049A-7	R5	S 803 S-B/C 80	10	(XT2 L 160 Ekip LS/I In=100 3p F F)	18
061A-7	R6	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	20
084A-7	R6	S 803 S-B/C 125	10	(XT2 L 160 Ekip LS/I In=160 3p F F)	20
098A-7	R7	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	20
119A-7	R7	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	20
142A-7	R8	-	-	(XT4 L 250 Ekip LS/I In=250 3p F F)	20
174A-7	R8	-	-	(T4 L 320 PR221DS-LS/I In=320 3p F F)	35
210A-7	R9	-	-	(T5 L 400 PR221DS-LS/I In=400 3p F F)	35
271A-7	R9	-	-	(T5 L 630 PR221DS-LS/I In=630 3p F F)	35

3AXD00000588487, 3AXD10000114581

[1)] Maximum allowed rated conditional short-circuit current (IEC 61800-5-1) of the electrical power network

Dimensions, weights and free space requirements

Frame	IP21					UL type 1				
	H1	H2	W	D	Weight	H1	H2	W	D	Weight
	mm	mm	mm	mm	kg	in.	in.	in.	in.	lb
R1	409	370	155	226	7.0	16.11	14.57	6.10	8.89	15
R2	409	370	155	249	8.4	16.11	14.57	6.10	9.80	19
R3	475	420	172	261	10.8	18.71	16.54	6.77	10.28	24
R4	580	490	203	274	18.6	22.85	19.29	7.99	10.79	41
R5	732	596	203	274	22.8	28.80	23.46	7.99	10.77	50
R6	727	569	252	357	42.2	28.60	22.40	9.92	14.10	93
R7	880	621	284	365	53.0	34.66	24.45	11.18	14.35	117
R8	965	700	300	386	68.0	38.01	27.56	11.81	15.21	150
R9	955	700	380	413	95.0	37.59	27.56	14.96	16.27	209
Frame	**IP55**					**UL type 12**				
	H1	**H2**	**W**	**D**	**Weight**	**H1 ***	**H2**	**W ****	**D**	**Weight**
	mm	mm	mm	mm	kg	in.	in.	in.	in.	lb
R1	450	-	162	292	8.1	17.72	-	6.38	11.50	18
R2	450	-	162	315	9.5	17.72	-	6.38	12.40	21
R3	525	-	180	327	12.0	20.70	-	7.09	12.87	26
R4	580	-	203	344	19.1	22.85	-	7.99	13.53	42
R5	732	-	203	344	23.4	28.80	-	7.99	13.53	52
R6	727	-	252	421	42.9	28.60	-	9.92	16.59	95
R7	880	-	284	423	54.0	34.66	-	11.18	16.65	119
R8	966	-	300	452	74.0	38.01	-	11.81	17.78	163
R9	955	-	380	477	102.0	37.59	-	14.96	18.78	225

H1 Height with cable entry box.

H2 Height without cable entry box (option +P940)

H3 Height with hood

W Width with cable entry box

D Depth with cable entry box

* Hood increases height with 155 mm (6.10 in) in frames R4 to R8 and with 230 mm (9.06 in) in frame R9.

** Hood increases width with 23 mm (0.91 in) in frames R4 and R5, 40 mm (1.57 in) in frames R6 and R7 and 50 mm (1.97 in) in frames R8 and R9.

Note 1: For more information on dimensions, see chapter *Dimension drawings*.

Note 2: For dimensions and weights of option +P940 and +P944, see *ACS880 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement* (3AUA0000145446 [English]).

Note 3: For dimensions of option +C135, see *ACS880-01…+C135 drives with flange mounting kit supplement* (3AXD50000349814 [English]). For the additional weight of the flange mounting kit, see the table below.

Frame	Weight of flange mounting kit (option +C135)	
	kg	**lb**
R1	2.9	6
R2	3.1	7
R3	4.5	10
R4	4.7	10
R5	4.7	10
R6	4.5	10
R7	5	11
R8	6	13
R9	7	15

Free space requirements

200 mm (7.87 in.) free space is required at top of the drive.

300 mm (11.81 in.) free space (when measured from the drive base without the cable entry box) is required at bottom of the drive.

Losses, cooling data and noise

Drive type ACS880-01-	Frame	Air flow		Heat dissipation	Noise
		m^3/h	ft^3/min	W	dB(A)
U_N = 230 V					
04A6-2	R1	44	26	73	46
06A6-2	R1	44	26	94	46
07A5-2	R1	44	26	122	46
10A6-2	R1	44	26	172	46
16A8-2	R2	88	52	232	51
24A3-2	R2	88	52	337	51
031A-2	R3	134	79	457	57
046A-2	R4	134	79	500	62
061A-2	R4	280	165	630	62
075A-2	R5	280	165	680	62
087A-2	R5	280	165	730	62
115A-2	R6	435	256	840	67
145A-2	R6	435	256	940	67
170A-2	R7	450	265	1260	67
206A-2	R7	450	265	1500	67
274A-2	R8	550	324	2100	65
U_N = 400 V					
02A4-3	R1	44	26	30	46
03A3-3	R1	44	26	40	46
04A0-3	R1	44	26	52	46
05A6-3	R1	44	26	73	46
07A2-3	R1	44	26	94	46
09A4-3	R1	44	26	122	46
12A6-3	R1	44	26	172	46
017A-3	R2	88	52	232	51
025A-3	R2	88	52	337	51
032A-3	R3	134	79	457	57
038A-3	R3	134	79	562	57
045A-3	R4	134	79	667	62
061A-3	R4	280	165	907	62
072A-3	R5	280	165	1117	62
087A-3	R5	280	165	1120	62
105A-3	R6	435	256	1295	67
145A-3	R6	435	256	1440	67
169A-3	R7	450	265	1940	67
206A-3	R7	450	265	2310	67
246A-3	R8	550	324	3300	65

Drive type ACS880-01-	Frame	Air flow		Heat dissipation	Noise
		m^3/h	ft^3/min	W	dB(A)
293A-3	R8	550	324	3900	65
363A-3	R9	1150	677	4800	68
430A-3	R9	1150	677	6000	68
U_N = 500 V					
02A1-5	R1	44	26	30	46
03A0-5	R1	44	26	40	46
03A4-5	R1	44	26	52	46
04A8-5	R1	44	26	73	46
05A2-5	R1	44	26	94	46
07A6-5	R1	44	26	122	46
11A0-5	R1	44	26	172	46
014A-5	R2	88	52	232	51
021A-5	R2	88	52	337	51
027A-5	R3	134	79	457	57
034A-5	R3	134	79	562	57
040A-5	R4	134	79	667	62
052A-5	R4	280	165	907	62
065A-5	R5	280	165	1117	62
077A-5	R5	280	165	1120	62
096A-5	R6	435	256	1295	67
124A-5	R6	435	256	1440	67
156A-5	R7	450	265	1940	67
180A-5	R7	450	265	2310	67
240A-5	R8	550	324	3300	65
260A-5	R8	550	324	3900	65
302A-5	R9	1150	677	4200	68
361A-5	R9	1150	677	4800	68
414A-5	R9	1150	677	6000	68
U_N = 690 V					
07A4-7	R3	134	79	114	57
09A9-7	R3	134	79	143	57
14A3-7	R3	134	79	207	57
019A-7	R3	134	79	274	57
023A-7	R3	134	79	329	57
027A-7	R3	134	79	405	57
07A3-7	R5	280	165	217	62
09A8-7	R5	280	165	284	62
14A2-7	R5	280	165	399	62
018A-7	R5	280	165	490	62

Drive type ACS880-01-	Frame	Air flow		Heat dissipation	Noise
		m^3/h	ft^3/min	W	dB(A)
022A-7	R5	280	165	578	62
026A-7	R5	280	165	660	62
035A-7	R5	280	165	864	62
042A-7	R5	280	165	998	62
049A-7	R5	280	165	1120	62
061A-7	R6	435	256	1295	67
084A-7	R6	435	256	1440	67
098A-7	R7	450	265	1940	67
119A-7	R7	450	265	2310	67
142A-7	R8	550	324	3300	65
174A-7	R8	550	324	3900	65
210A-7	R9	1150	677	4200	68
271A-7	R9	1150	677	4800	68

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

Drive type ACS880-01-	Frame	Air flow (option +C135)		Heat dissipation (option +C135)	
		Heatsink	Front	Heatsink	Front
		m^3/h	m^3/h	W	W
U_N = 230 V					
04A6-2	R1	44	9	57	16
06A6-2	R1	44	9	76	18
07A5-2	R1	44	9	101	21
10A6-2	R1	44	9	146	26
16A8-2	R2	88	16	195	37
24A3-2	R2	88	16	290	47
031A-2	R3	134	22	393	64
046A-2	R4	134	32	423	77
061A-2	R4	280	32	540	90
075A-2	R5	280	42	567	113
087A-2	R5	280	42	612	118
115A-2	R6	435	52	711	129
145A-2	R6	435	52	801	139
170A-2	R7	450	75	1089	171
206A-2	R7	450	75	1305	195
274A-2	R8	550	120	1845	255
U_N = 400 V					
02A4-3	R1	44	9	18	12

Drive type ACS880-01-	Frame	Air flow (option +C135)		Heat dissipation (option +C135)	
		Heatsink	Front	Heatsink	Front
		m^3/h	m^3/h	W	W
03A3-3	R1	44	9	27	13
04A0-3	R1	44	9	38	14
05A6-3	R1	44	9	57	16
07A2-3	R1	44	9	76	18
09A4-3	R1	44	9	101	21
12A6-3	R1	44	9	146	26
017A-3	R2	88	16	195	37
025A-3	R2	88	16	290	47
032A-3	R3	134	22	393	64
038A-3	R3	134	22	488	74
045A-3	R4	134	32	573	94
061A-3	R4	280	32	789	118
072A-3	R5	280	42	960	157
087A-3	R5	280	42	963	157
105A-3	R6	435	52	1121	175
145A-3	R6	435	52	1251	189
169A-3	R7	450	75	1701	239
206A-3	R7	450	75	2034	276
246A-3	R8	550	120	2925	375
293A-3	R8	550	120	3465	435
363A-3	R9	1150	170	4275	525
430A-3	R9	1150	170	5355	645
U_N = 500 V					
02A1-5	R1	44	9	18	12
03A0-5	R1	44	9	27	13
03A4-5	R1	44	9	38	14
04A8-5	R1	44	9	57	16
05A2-5	R1	44	9	76	18
07A6-5	R1	44	9	101	21
11A0-5	R1	44	9	146	26
014A-5	R2	88	16	195	37
021A-5	R2	88	16	290	47
027A-5	R3	134	22	393	64
034A-5	R3	134	22	488	74
040A-5	R4	134	32	573	94
052A-5	R4	280	32	789	118
065A-5	R5	280	42	960	157
077A-5	R5	280	42	963	157

Drive type ACS880-01-	Frame	Air flow (option +C135)		Heat dissipation (option +C135)	
		Heatsink	Front	Heatsink	Front
		m^3/h	m^3/h	W	W
096A-5	R6	435	52	1121	175
124A-5	R6	435	52	1251	189
156A-5	R7	450	75	1701	239
180A-5	R7	450	75	2034	276
240A-5	R8	550	120	2925	375
260A-5	R8	550	120	3465	435
302A-5	R9	1150	170	3735	465
361A-5	R9	1150	170	4275	525
414A-5	R9	1150	170	5355	645
U_N = 690 V					
07A4-7	R3	134	22	68	46
09A9-7	R3	134	22	92	51
14A3-7	R3	134	22	140	67
019A-7	R3	134	22	186	88
023A-7	R3	134	22	238	91
027A-7	R3	134	22	293	112
07A3-7	R5	280	42	150	67
09A8-7	R5	280	42	211	73
14A2-7	R5	280	42	314	85
018A-7	R5	280	42	396	94
022A-7	R5	280	42	475	103
026A-7	R5	280	42	549	111
035A-7	R5	280	42	733	131
042A-7	R5	280	42	854	145
049A-7	R5	280	42	963	157
061A-7	R6	435	52	1121	175
084A-7	R6	435	52	1251	189
098A-7	R7	450	75	1701	239
119A-7	R7	450	75	2034	276
142A-7	R8	550	120	2925	375
174A-7	R8	550	120	3465	435
210A-7	R9	1150	170	3735	465
271A-7	R9	1150	170	4275	525

Terminal and entry data for the power cables

IEC

Input, motor, resistor and DC cable terminal screw sizes, accepted wire sizes (per phase) and tightening torques (*T*) are given below. *l* denotes stripping length inside the terminal.

Frame	Cable entries		L1, L2, L3, T1/U, T2/V, T3/W				Grounding terminals	
		Ø *	Wire size	*T* (Wire screw)		*l*	Max. wire size	*T*
	pcs	mm	mm^2	M…	N·m	mm	mm^2	N·m
R1	2	17	0.75…6	-	0.6	8	25	1.8
R2	2	17	0.75…6	-	0.6	8	25	1.8
R3	2	21	0.5…16	-	1.7	10	25	1.8
R4	2	24	0.5…35	-	3.3	18	25	2.9
R5	2	32	6…70	M8	15	18	35	2.9
R6	2	45	25…150	M10	30	30	185	9.8
R7	2	54	95…240 (25…150**)	M10	40 (30**)	30	185	9.8
R8	4	45	2 × (50…150)	M10	40	30	2×185	9.8
R9	4	54	2 × (95…240)	M12	70	30	2×185	9.8

Frame	Cable entries		R-, R+/UDC+ and UDC- terminals			
		Ø *	Wire size	*T* (Wire screw)		*l*
	pcs	mm	mm^2	M…	N·m	mm
R1	1	17	0.75…6	-	0.6	8
R2	1	17	0.75…6	-	0.6	8
R3	1	21	0.5…16	-	1.7	10
R4	1	24	0.5…35	-	3.3	18
R5	1	32	6…70	M8	15	18
R6	1	35	25…95	M8	20	30
R7	1	43	25…150	M10	30	30
R8	2	45	2 × (50…150)	M10	40	30
R9	2	54	2 × (95…240)	M12	70	30

* maximum cable diameter accepted. For the entry plate hole diameters, see chapter *Dimension drawings*.

** 525…690 V drives

Note: When you use a cable size smaller than what is accepted by the terminal, remove the terminal and use suitable cable lugs for connecting the cable directly under the head of the bolt.

UL

Input, motor, resistor and DC cable terminal screw sizes, accepted wire sizes (per phase) and tightening torques (*T*) in US units are given below. *l* denotes stripping length inside the terminal.

Frame	Cable entries		L1, L2, L3, T1/U, T2/V, T3/W				Grounding terminals	
		Ø *	Wire size	*T* (Wire screw)		*l*	Max. wire size	
	pcs	in.	kcmil/AWG	M…	lbf·ft	in.	AWG	lbf·ft
R1	2	0.67	18…10	-	0.44	0.31	4	1.3
R2	2	0.67	18…10	-	0.44	0.31	4	1.3
R3	2	0.83	20…6	-	1.25	0.39	4	1.3
R4	2	0.94	20…2	-	2.4	0.70	4	2.1
R5	2	1.26	10…2/0	M8	11	0.70	2	2.1
R6	2	1.77	4…300 MCM	M10	22.1	1.18	350 MCM	7.2
R7	2	2.13	3/0…400 MCM (4…300 MCM)	M10	29.5 (22.1**)	1.18	350 MCM	7.2
R8	4	1.77	2 × (1/0…300 MCM)	M10	29.5	1.18	2× 350 MCM	7.2
R9	4	2.13	2 × (3/0…400 MCM)	M12	51.6	1.18	2× 350 MCM	7.2

Frame	Cable entries		R-, R+/UDC+ and UDC- terminals			
		Ø *	Wire size	*T* (Wire screw)		*l*
	pcs	in.	kcmil/AWG	M…	lbf·ft	mm
R1	1	0.67	18…10	-	0.44	0.31
R2	1	0.67	18…10	-	0.44	0.31
R3	1	0.83	20…6	-	1.25	0.39
R4	1	0.94	20…2	-	2.4	0.70
R5	1	1.26	10…2/0	M8	11	1.18
R6	1	1.38	4…3/0	M8	14.8	1.18
R7	1	1.69	4…300 MCM	M10	22,1	1.18
R8	2	1.77	2 × (1/0…300 MCM)	M10	29.5	1.18
R9	2	2.13	2 × (3/0…400 MCM)	M12	51.6	1.18

* maximum cable diameter accepted. Cable connector inside diameter: 3/4” (frames R1 and R2), 1” (R3). For the entry plate hole diameters, see chapter *Dimension drawings*.

** 525…690 V drives

UL listed cable lugs and tools

Wire size	**Compression lug**		**Crimping tool**		
kcmil/AWG	Manufacturer	Type	Manufacturer	Type	No. of crimps
6	Thomas & Betts	E10731 54136	Thomas & Betts	TBM4S TBM45S	1
	Burndy	YAV6C-L2	Burndy	MY29-3	1
	Ilsco	CCL-6-38	Ilsco	ILC-10	2
4	Thomas & Betts	54140	Thomas & Betts	TBM4S	1
	Burndy	YA4C-L4BOX	Burndy	MY29-3	1
	Ilsco	CCL-4-38	Ilsco	MT-25	1
2	Thomas & Betts	54143TB 54142TB	Thomas & Betts	TBM4S TBM4S	1
	Burndy	YA2C-L4BOX	Burndy	MY29-3	2
	Ilsco	CRC-2	Ilsco	IDT-12	1
	Ilsco	CCL-2-38	Ilsco	MT-25	1
1	Thomas & Betts	54148	Thomas & Betts	TBM-8	3
	Burndy	YA1C-L4BOX	Burndy	MY29-3	2
	Ilsco	CRA-1-38	Ilsco	IDT-12	1
	Ilsco	CCL-1-38	Ilsco	MT-25	1
1/0	Thomas & Betts	54109	Thomas & Betts	TBM-8	3
	Burndy	YA25-L4BOX	Burndy	MY29-3	2
	Ilsco	CRB-0	Ilsco	IDT-12	1
	Ilsco	CCL-1/0-38	Ilsco	MT-25	1
2/0	Thomas & Betts	54110	Thomas & Betts	TBM-8	3
	Burndy	YAL26T38	Burndy	MY29-3	2
	Ilsco	CRA-2/0	Ilsco	IDT-12	1
	Ilsco	CCL-2/0-38	Ilsco	MT-25	1

Terminal data for the control cables

See *Control unit (ZCU-12) connection data* below.

Electrical power network specification

Voltage (U_1)	ACS880-01-xxxx-2 drives: 208 … 240 V AC 3-phase +10%…-15%. This is indicated in the type designation label as typical input voltage level 3 ~ 230 V AC. ACS880-01-xxxx-3 drives: 380 … 415 V AC 3-phase +10%…-15%. This is indicated in the type designation label as typical input voltage level 3 ~ 400 V AC. ACS880-01-xxxx-5 drives: 380 … 500 V AC 3-phase +10%…-15%. This is indicated in the type designation label as typical input voltage levels 3 ~ 400/480/500 V AC. ACS880-01-xxxx-7 drives: 525 … 690 V AC 3-phase +10%…-15%. This is indicated in the type designation label as typical input voltage levels 3 ~ 525/600/690 V AC.
Network type	TN (grounded) and IT (ungrounded) systems. However, 690 V drives must not be installed on corner-grounded TN systems or corner-grounded IT systems.
Rated conditional short-circuit current (IEC 61439-1)	65 kA when protected by fuses given in the fuse tables
Short-circuit current protection (UL 508C, CSA C22.2 No. 14-05)	US and Canada: The drive is suitable for use on a circuit capable of delivering not more than 100 kA symmetrical amperes (rms) at 600 V maximum when protected by fuses given in the fuse table, see page *203*.
Frequency	50/60 Hz, variation ± 5%, maximum rate of change 17%/s
Imbalance	Max. ± 3% of nominal phase to phase input voltage
Fundamental power factor (cos phi$_1$)	0.98 (at nominal load)

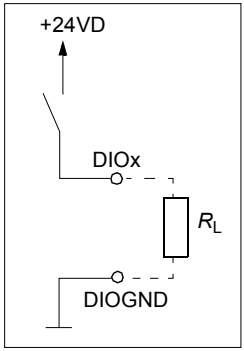
Motor connection data

Motor types	Asynchronous AC induction motors, permanent magnet synchronous motors, AC induction servomotors and ABB synchronous reluctance motors (SynRM motors)
Voltage (U_2)	0 to U_1, 3-phase symmetrical, U_{max} at the field weakening point
Frequency	0…500 Hz For drives with du/dt filter: 120 Hz For drives with sine filter: 120 Hz
Current	See section *Ratings*.
Switching frequency	2.7 kHz (typically)

Maximum recommended motor cable length	For ACS880-01-xxxx-2, ACS880-01-xxxx-3 and ACS880-01-xxxx-5 frames R1 to R3 and for types ACS880-01-07A3-7, ACS880-01-09A8-7, ACS880-01-14A2-7 and ACS880-01-018A-7: 150 m (492 ft) For ACS880-01-xxxx-2, ACS880-01-xxxx-3 and ACS880-01-xxxx-5 frames R4 to R9 and for types from ACS880-01-022A-7 to ACS880-01-271A-7: 300 m (984 ft). **Note 1:** With motor cables longer than 150 m (492 ft) or switching frequencies higher than default, the EMC Directive requirements may not be fulfilled. **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 ABB for more information. Note that a sine filter (optional) at the drive output also causes a voltage decrease.

Control unit (ZCU-12) connection data

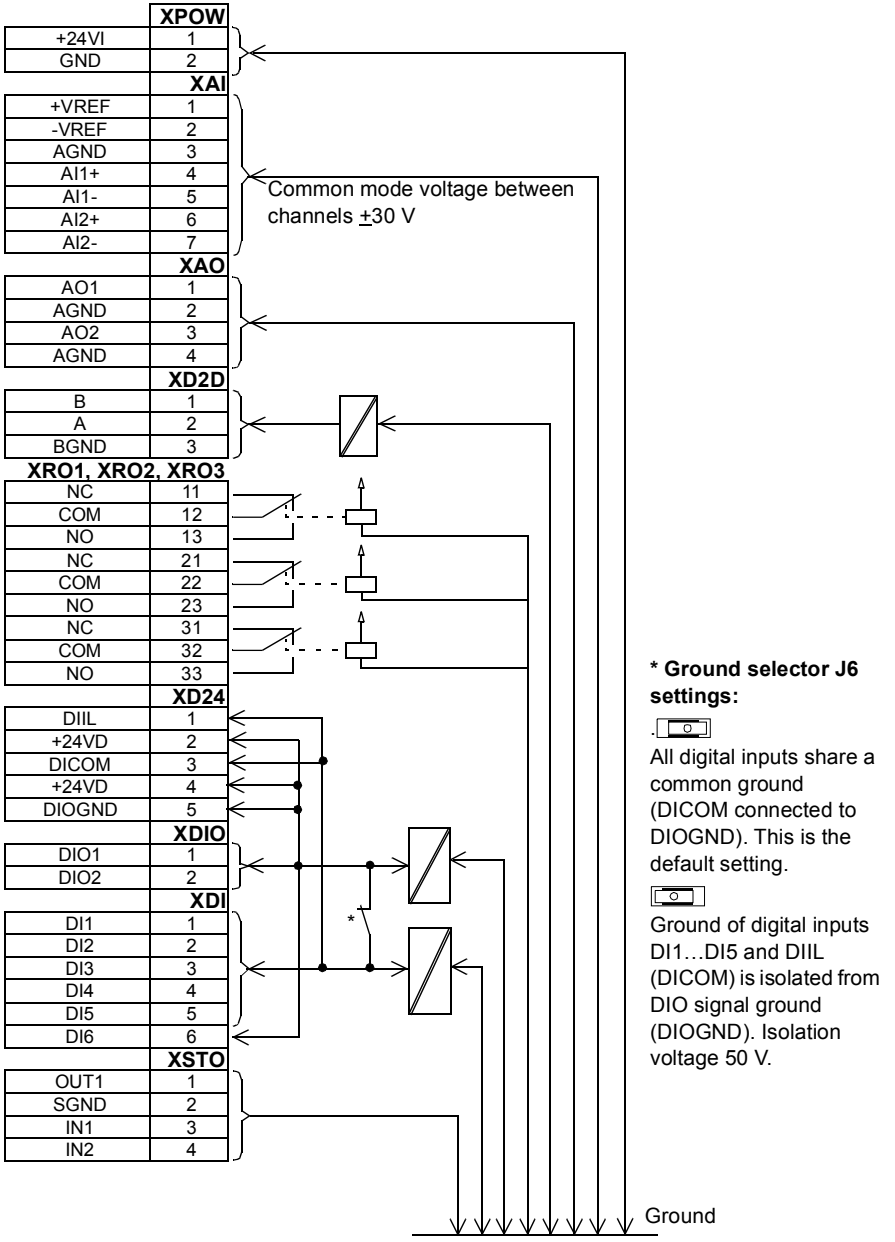
Power supply (XPOW)	24 V (±10%) DC, 2 A Supplied from the power unit of the drive, or from an external power supply through connector XPOW (pitch 5 mm, wire size 2.5 mm^2).
Relay outputs RO1…RO3 (XRO1 … XRO3)	Connector pitch 5 mm, wire size 2.5 mm^2 250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:2 and XD24:4)	Connector pitch 5 mm, wire size 2.5 mm^2 Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1…DI6 (XDI:1 … XDI:6)	Connector pitch 5 mm, wire size 2.5 mm^2 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP (DI1…DI5), NPN (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms DI6 (XDI:6) can alternatively be used as an input for PTC sensors. “0” > 4 kohm, “1” < 1.5 kohm I_{max}: 15 mA (for DI6 5 mA)
Start interlock input DIIL (XD24:1)	Connector pitch 5 mm, wire size 2.5 mm^2 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms

Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0…16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual, parameter group 11.	Connector pitch 5 mm, wire size 2.5 mm^2 As inputs: 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Filtering: 0.25 ms As outputs: Total output current from +24VD is limited to 200 mA. 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	Connector pitch 5 mm, wire size 2.5 mm^2 10 V ±1% and –10 V ±1%, R_{load} 1…10 kohm
Analog inputs AI1 and AI2 (XAI:4 … XAI:7). Current/voltage input mode selection by jumpers. See page 127.	Connector pitch 5 mm, wire size 2.5 mm^2 Current input: –20…20 mA, R_{in}: 100 ohm Voltage input: –10…10 V, R_{in}: > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range Inaccuracy for Pt100 sensors: 10 °C (50 °F)
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 2.5 mm^2 0…20 mA, R_{load} < 500 ohm Frequency range: 0…300 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
Drive to drive link (XD2D)	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485 Termination by switch

Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 2.5 mm^2 Input voltage range: -3…30 V DC Logic levels: “0” < 5 V, “1” > 17 V Current consumption of frames R1 to R7: 30 mA (24 V DC, continuous) per STO channel Current consumption of frames R8 and R9: 12 mA (24 V DC, continuous) per STO channel Maximum output current from OUT1: 200 mA (24 V DC, continuous) For the drive to start, both connections must be closed (OUT1 to IN1 and IN2). EMC (immunity) according to IEC 61326-3-1
Control panel - drive connection	EIA-485, male RJ-45 connector, max. cable length 100 m
Control panel - PC connection	USB Type Mini-B, max. cable length 2 m

The terminals on the board fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.

Ground isolation diagram



*** Ground selector J6 settings:**

All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.

Ground of digital inputs DI1…DI5 and DIIL (DICOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.

Efficiency

	Approximately 98% at nominal power level

Degree of protection

Degree of protection (IEC/EN 60529)	IP21, IP55. Option +P940 and +P944: IP20
Enclosure types (UL508C)	UL Type 1, UL Type 12. Option +P940: UL Open Type. For indoor use only.
Overvoltage category (IEC 60664-1)	III
Protective class (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.

	Operation installed for stationary use	**Storage** in the protective package	**Transportation** in the protective package
Installation site altitude	• 0 to 4000 m (13123 ft) above sea level [1)] • 0 to 2000 m (6561 ft) above sea level [2)] Output derated above 1000 m [3281 ft]), see page *177*.	-	-
Surrounding air temperature	-15 to +55 °C (5 to 131 °F). [3)] No frost allowed. See section *Ratings*.	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	5 to 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		

<table>
<tr><td rowspan="2">Contamination levels
(IEC 60721-3-3, IEC 60721-3-2, IEC 60721-3-1)</td><td colspan="3">No conductive dust allowed.</td></tr>
<tr><td>Chemical gases: Class 3C2. For circuit boards in IP55 drives Class 3C3 and ANSI/ISA S71.04-1985 GX
Solid particles: Class 3S2</td><td>Chemical gases: Class 1C2
Solid particles: Class 1S3</td><td>Chemical gases: Class 2C2
Solid particles: Class 2S2</td></tr>
<tr><td>Pollution degree
(IEC/EN 61800-5-1)</td><td>Pollution degree 2</td><td>-</td><td>-</td></tr>
<tr><td>Atmospheric pressure</td><td>70 to 106 kPa
0.7 to 1.05 atmospheres</td><td>70 to 106 kPa
0.7 to 1.05 atmospheres</td><td>60 to 106 kPa
0.6 to 1.05 atmospheres</td></tr>
<tr><td>Vibration (IEC 60068-2)</td><td>Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal</td><td>Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal</td><td>Max. 3.5 mm (0.14 in.) (2 to 9 Hz), max. 15 m/s^2 (49 ft/s^2) (9 to 200 Hz) sinusoidal</td></tr>
<tr><td>Vibration (ISTA)</td><td>-</td><td colspan="2">R1…R5 (ISTA 1A): Displacement, 25 mm peak to peak, 14200 vibratory impacts
R6…R9 (ISTA 3E): Random, overall Grms level of 0.54</td></tr>
<tr><td>Shock/Drop (ISTA)</td><td>Not allowed</td><td colspan="2">R1…R5 (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>
R6…R9 (ISTA 3E): Shock, incline impact: 1.2 m/s (3.94 ft/s)
Shock, rotational edge drop: 230 mm (7.9 in)</td></tr>
</table>

1. For neutral-grounded TN and TT systems and non-corner grounded IT systems
2. For corner-grounded TN, TT and IT systems
3. For IP55 (UL Type 12) type -210A-7: -15 to +45 °C (5 to 113 °F). For IP55 (UL Type 12) types -0430A-3, -0414A-5 and -0271A-7: -15 to +35 °C (5 to 95 °F).

Materials

Drive enclosure

- PC/ABS 3 mm, color NCS 1502-Y (RAL 9002 / PMS 1C Cool Grey) and RAL 9017
- PC+10% GF 3.0 mm, Color RAL 9017 (in frames R1 to R3 only)
- Plastic parts are made of UV resistant f1 classified plastics
- hot-dip zinc coated steel sheet 1.5 to 2.5 mm, thickness of coating 100 micrometers, color NCS 1502-Y

Package

Plywood and cardboard. Foam cushions PP-E, bands PP.

Frame	Package		
	Length (mm)	Width (mm)	Height (mm)
R1	574	256	281
R1 (IP55)	574	256	364
R2	574	256	304
R2 (IP55)	574	256	386
R3	624	256	316
R3 (+P940)	624	256	316
R3 IP55	624	256	399
R4 IP21	691	290	329
R4 (+P940)	691	290	329
R4 (IP55)	691	290	415
R5 IP21	896	293	329
R5 (+P940)	896	293	329
R6	870	325	580
R7	992	400	568
R8	1145	485	655
R9	1145	485	655

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 60204-1:2006 + A1 2009	*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/EN 60529:1991 + A1 2000	*Degrees of protection provided by enclosures (IP code)*
IEC 60664-1:2007	*Insulation coordination for equipment within low-voltage systems. Part 1: Principles, requirements and tests.*
EN 61800-3:2004	*Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods*
EN 61800-5-1:2007	*Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy*
EN 61800-5-2:2007	*Adjustable speed electrical power drive systems. Part 5-2: Safety requirements – Functional*
UL 508C:2002	*UL Standard for Safety, Power Conversion Equipment, third edition*
NEMA 250:2008	*Enclosures for Electrical Equipment (1000 Volts Maximum)*
CSA C22.2 No. 14-10	*Industrial control equipment*
GOST R 51321-1:2007	*Low-voltage switchgear and control gear assemblies. Part 1 - Requirements for type-tested and partially type-tested assemblies - General technical requirements and methods of tests*

Markings

These markings are attached to the drive:

Mark	Description
CE	CE mark Product complies with the applicable European Union legislation. For fulfilling the EMC requirements, see section *CE marking* on page *230*.
TÜV NORD Safety Approved	TÜV Nord Safety Approved mark (functional safety) Product contains Safe Torque Off and possibly other (optional) safety functions which are certified by TÛV Nord according to the relevant functional safety standards.
c UL us LISTED	UL Listed mark for USA and Canada Product has been tested and evaluated against the relevant North American standards by Underwriters Laboratories.

	CSA certification mark for USA and Canada Product has been tested and evaluated against the relevant North American standards by CSA Group.
	RCM mark Product complies with Australian and New Zealand requirements specific to EMC, telecommunications and electrical safety.
	Eurasian Conformity mark Product complies with technical regulations of the Eurasian Customs Union. EAC marking is required in Russia, Belarus and Kazakhstan.
	The KC (Korea Certification) certification Product complies with Korea's product safety requirements for electrical and electronic equipment and components that utilize power from 50…1000 V AC.
	EIP (Electronic Information Products) mark Product 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. 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.
	WEEE mark At the end of life the product should enter the recycling system at an appropriate collection point and not placed in the normal waste stream. See *Disposal* on page *228*.

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 standards EN 60204-1 and EN 61800-5-1.

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 (EN 61800-

3:2004 + A1:2012) covers requirements stated for drives. See section *Compliance with the EN 61800-3:2004 + A1:2012* below.

Compliance with the European RoHS II Directive

The RoHS II Directive defines the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

The drive is an electronic product which is covered by the European Low Voltage Directive. However, the drive includes the Safe torque off function and can be equipped with other safety functions for machinery which, as safety components, are in the scope of the Machinery Directive. These functions of the drive comply with European harmonized standards such as EN 61800-5-2.

Declaration 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 products:

Frequency converters

ACS880-01/-11/-31

ACS880-04/-04F/-M04/-14/-34

with regard to the built-in safety function:

Safe torque off;

and with regard to the following optional safety functions with FSO-12 module (option code +Q973, encoderless):

Safe stop 1; Safe stop emergency; Safely-limited speed; Safe maximum speed; Safe brake control; Prevention of Unexpected Start-up;

and with regard to the following optional safety functions with FSO-21 and FSE-31 modules (option codes +Q972 and +L521):

Safe stop 1; **Safe stop emergency**; **Safely-limited speed**; **Safe maximum speed; Safe brake control**; **Safe speed monitor; Safe direction; Prevention of Unexpected Start-up;**

and with regard to the following optional safety function with FPTC-01 thermistor protection module (option code +L536):

Safe Motor Temperature;

are in conformity with all the relevant safety component requirements of EU Machinery Directive 2006/42/EC, when the listed safety functions are 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: 2006 + A1:2009 + AC:2010	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

The following other standards have been applied:

IEC 61508:2010	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 products referred in this Declaration of conformity fulfil the relevant provisions of other European Union Directives which are notified in Single EU Declaration of conformity 3AXD10000497831.

Person authorized to compile the technical file:

Name and address: Ari Korpela, Hiomotie 13, 00380 Helsinki, Finland.

Helsinki, 29 Jan 2018

Manufacturer representative:

Vesa Kandell
Vice President, ABB Oy

Compliance with the EN 61800-3:2004 + A1:2012

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 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.

Drive of category C4: drive of rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment.

Category C2

The emission limits are complied with the following provisions:

1. The drive is equipped with EMC filter +E202.
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. For the maximum motor cable length, see page *221*.

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 internal EMC filter connected on IT (ungrounded) systems. The supply network becomes connected to ground potential through the internal EMC filter capacitors which may cause danger or damage to the drive. For disconnecting the EMC filter see page *106*.

Note: Do not install a drive with the internal EMC filter connected on corner-grounded TN systems; otherwise the drive will be damaged. For disconnecting the internal EMC filter see page *106*.

Category C3

The drive complies with the standard with the following provisions:

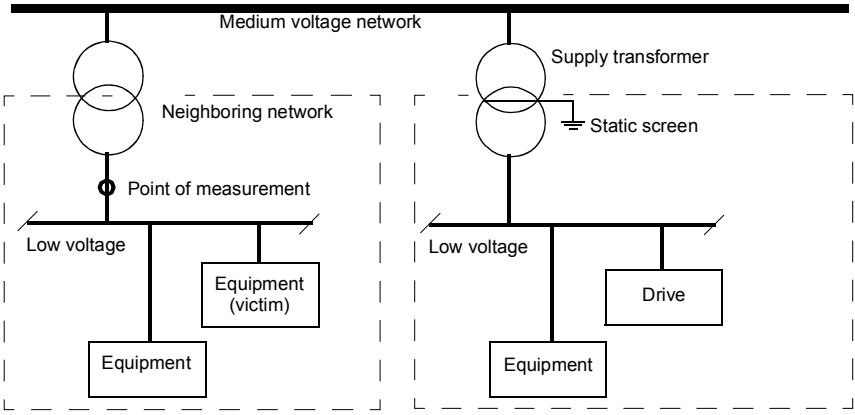
1. The drive is equipped with EMC filter +E200.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.
4. For the maximum motor cable length, see page *221*.

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.



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 checklist

WARNING! Operation of this drive requires detailed installation and operation instructions provided in the hardware and software manuals. The manuals are provided in electric format in the drive package or on the Internet. Retain the manuals with the drive at all times. Hard copies of the manuals can be ordered through the manufacturer.

- Make sure that the drive type designation label includes the cULus Listed marking.
- **DANGER - 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. UL Type 12 (IP55) enclosure provides protection from airborne dust and light sprays or splashing water from all directions.
- The maximum surrounding air temperature is +40 °C (104 °F) at rated current. The current is derated for 40 to 55 °C (104 to 131 °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 on page *203*. The ampere rating is based on tests done according to the appropriate UL standard.
- 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. The fuses must provide branch circuit protection in accordance with the national regulations (National Electrical Code (NEC) or Canadian Electrical Code). Obey also any other applicable local or provincial codes.

  Note: Circuit breakers must not be used without fuses in the USA. Consult ABB for suitable circuit breakers.

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 device 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 *225*. For pollution degree, see page *226*.

Approvals

The drive is marine type approved. For more information, see *ACS880-01/04 +C132 marine type-approved drives supplement* (3AXD50000010521 [English]).

Disclaimers

General 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.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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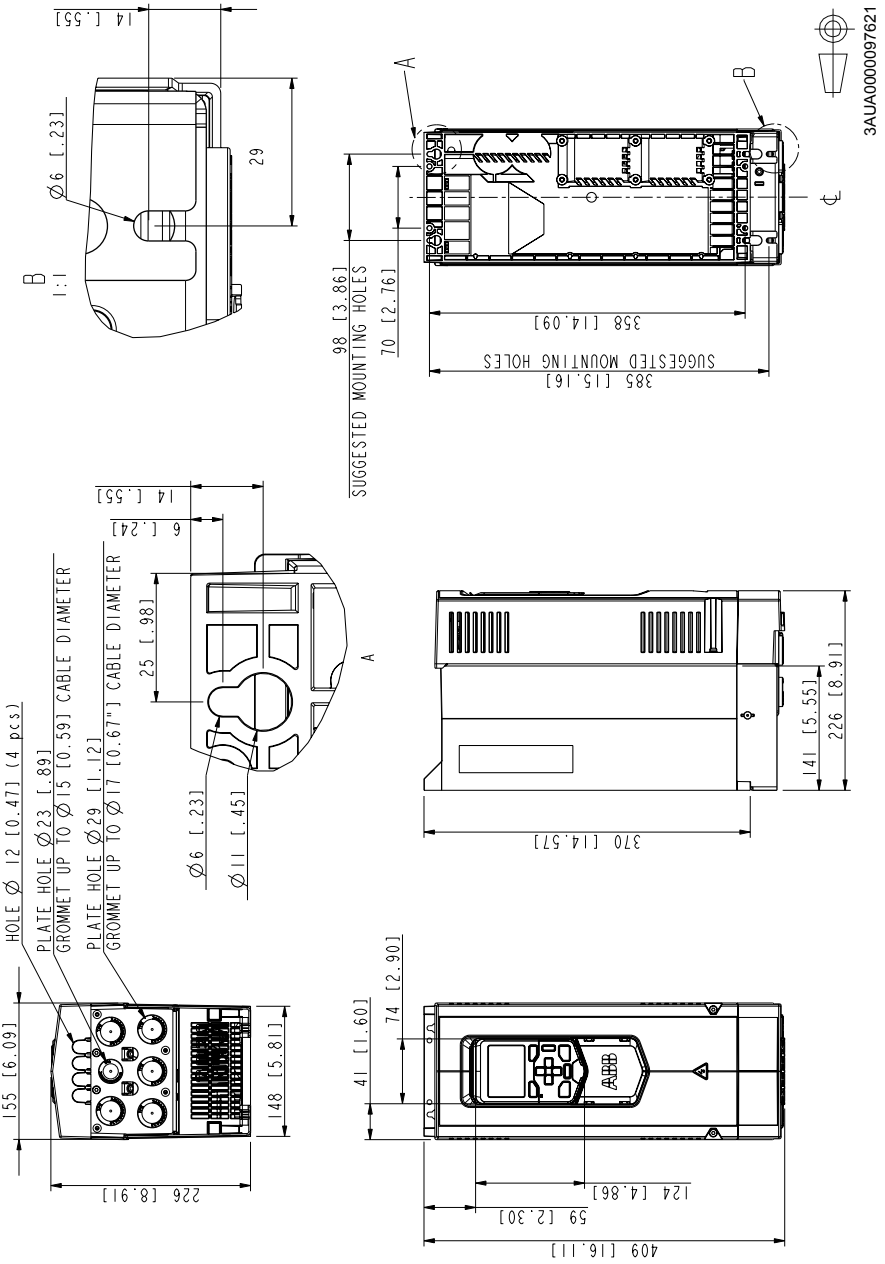
Dimension drawings

Contents of this chapter

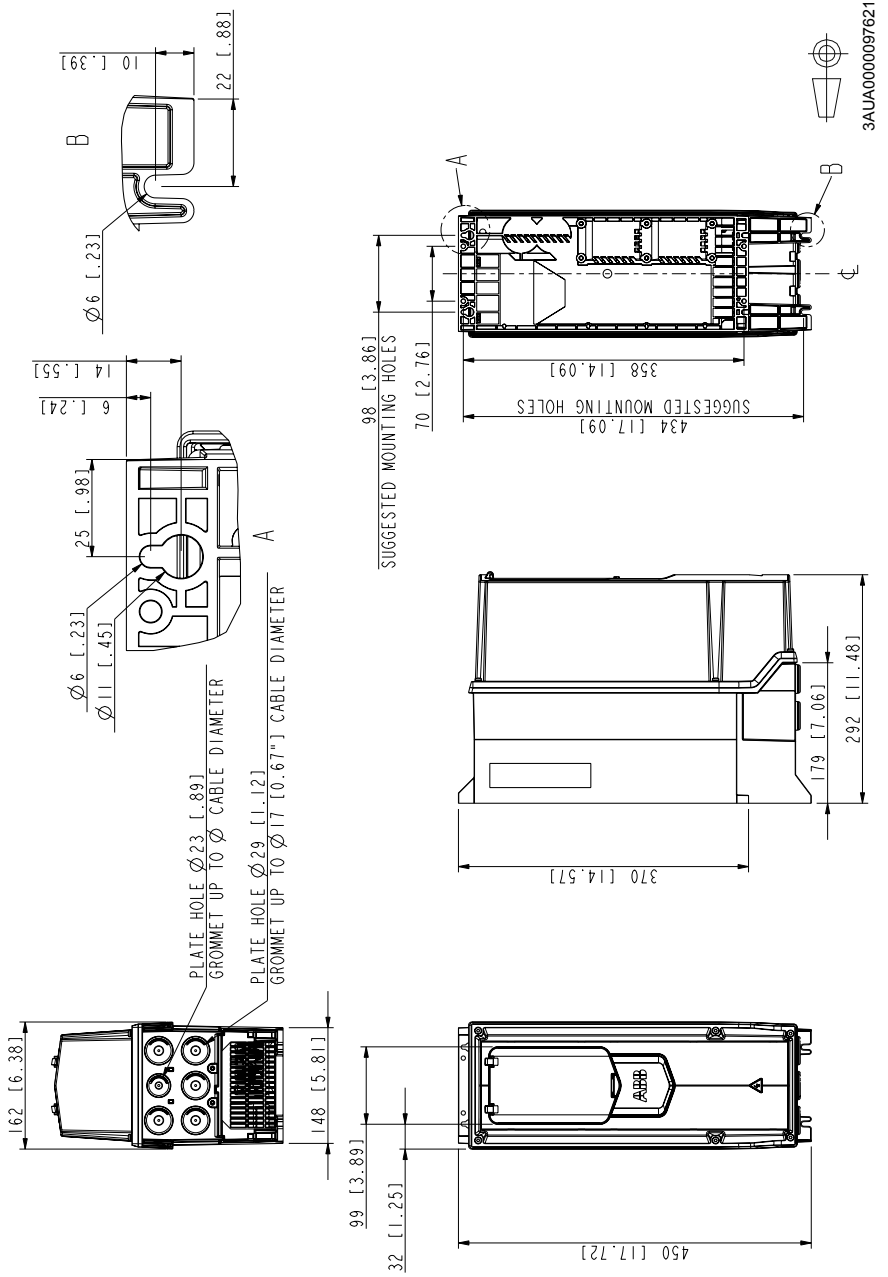
This chapter contains dimension drawings of the standard drive (IP21, UL Type 1) and drive with option +B056 (IP55, UL Type 12).

For dimension drawings of options +P940 and +P944 (IP20, UL Open Type), see *ACS880 drive module frames R1 to R9 for cabinet installation (options +P940 and +P944) supplement* (3AUA0000145446 [English]).

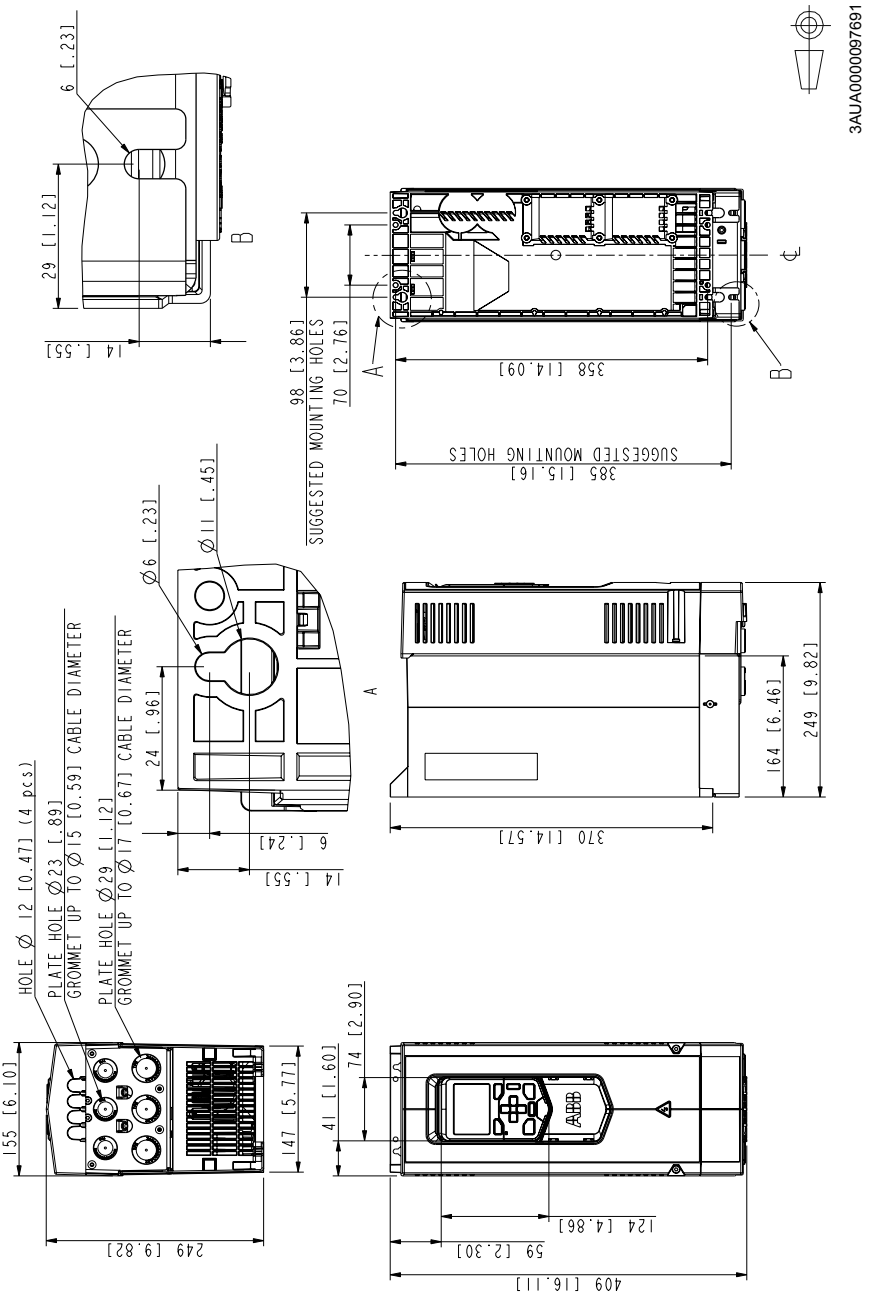
Frame R1 (IP21, UL Type 1)



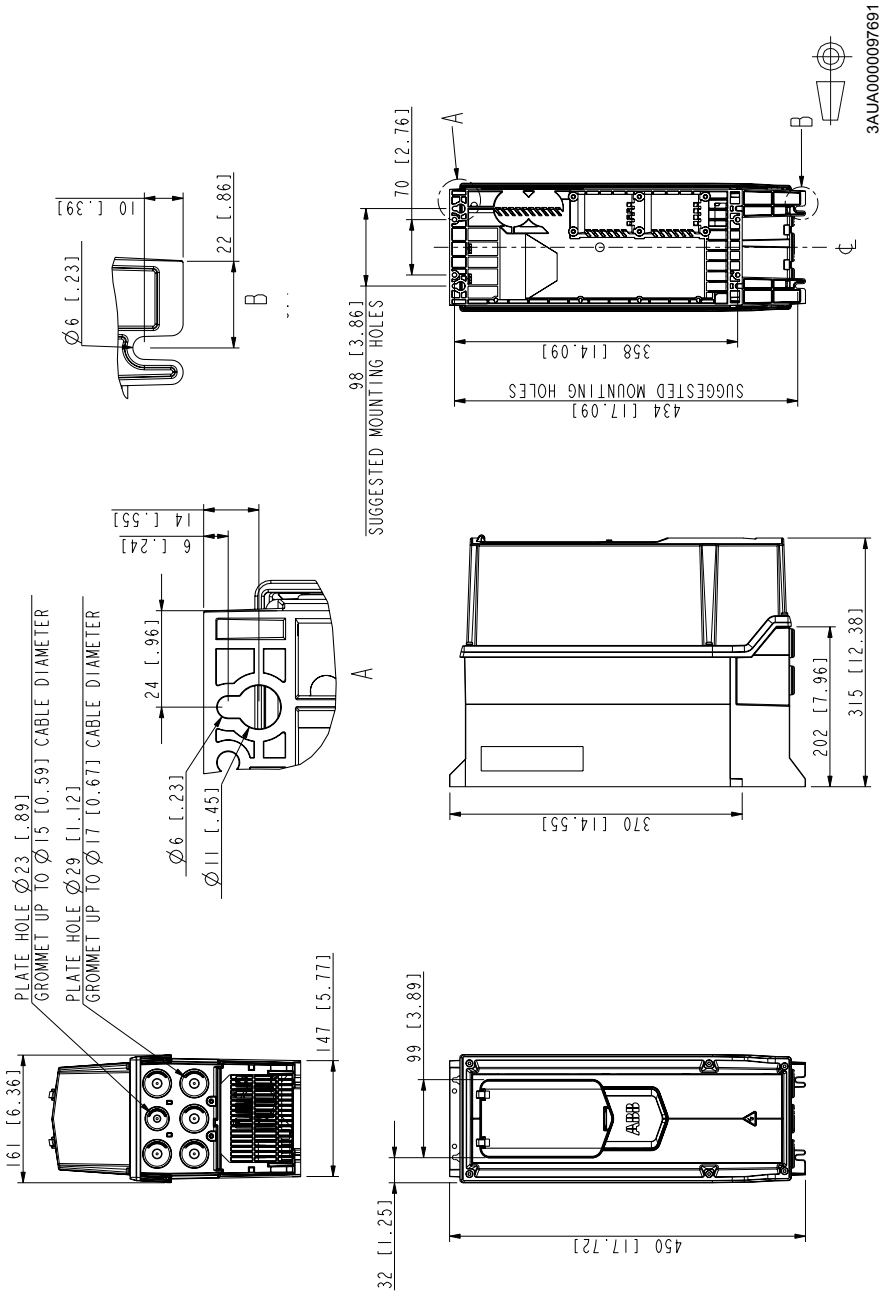
Frame R1 (IP55, UL Type 12)



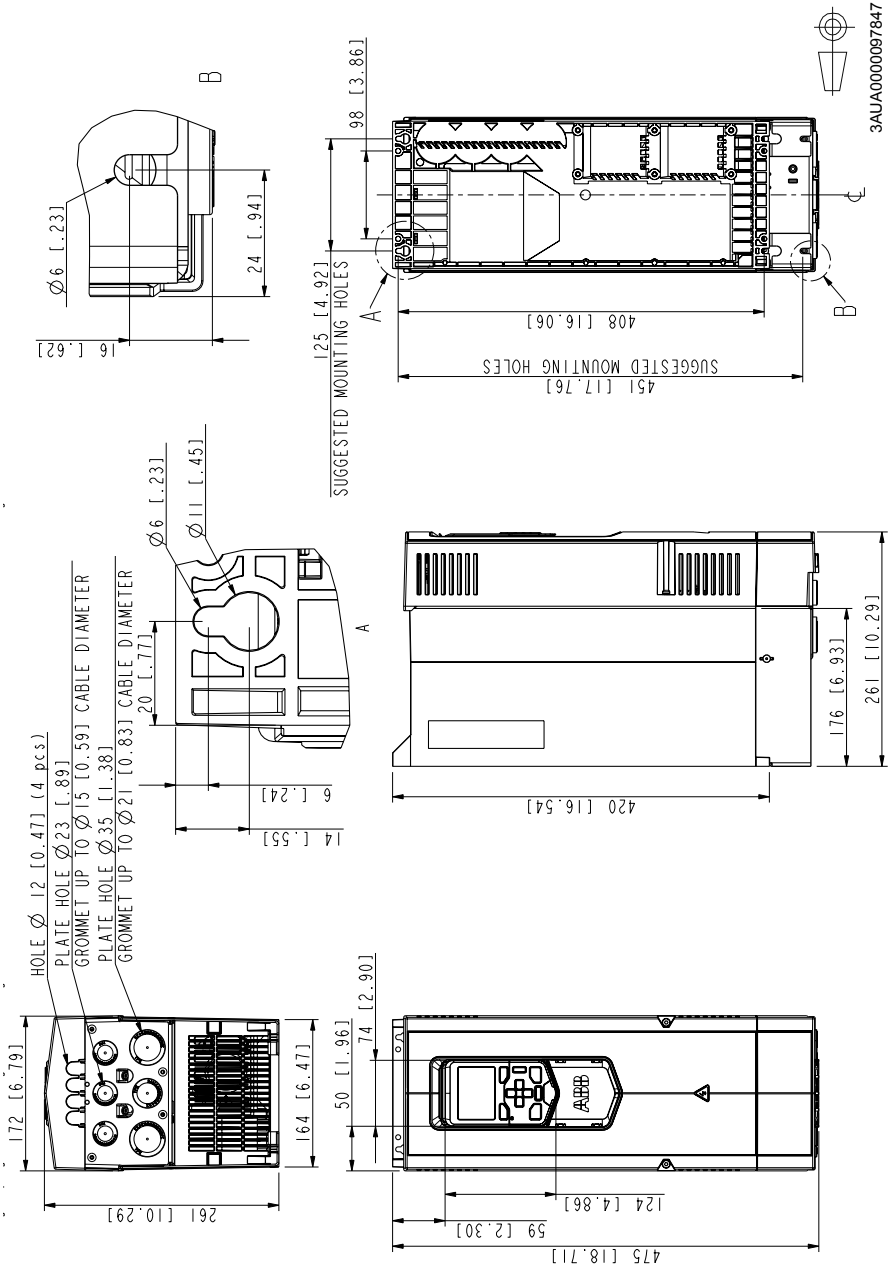
Frame R2 (IP21, UL Type 1)



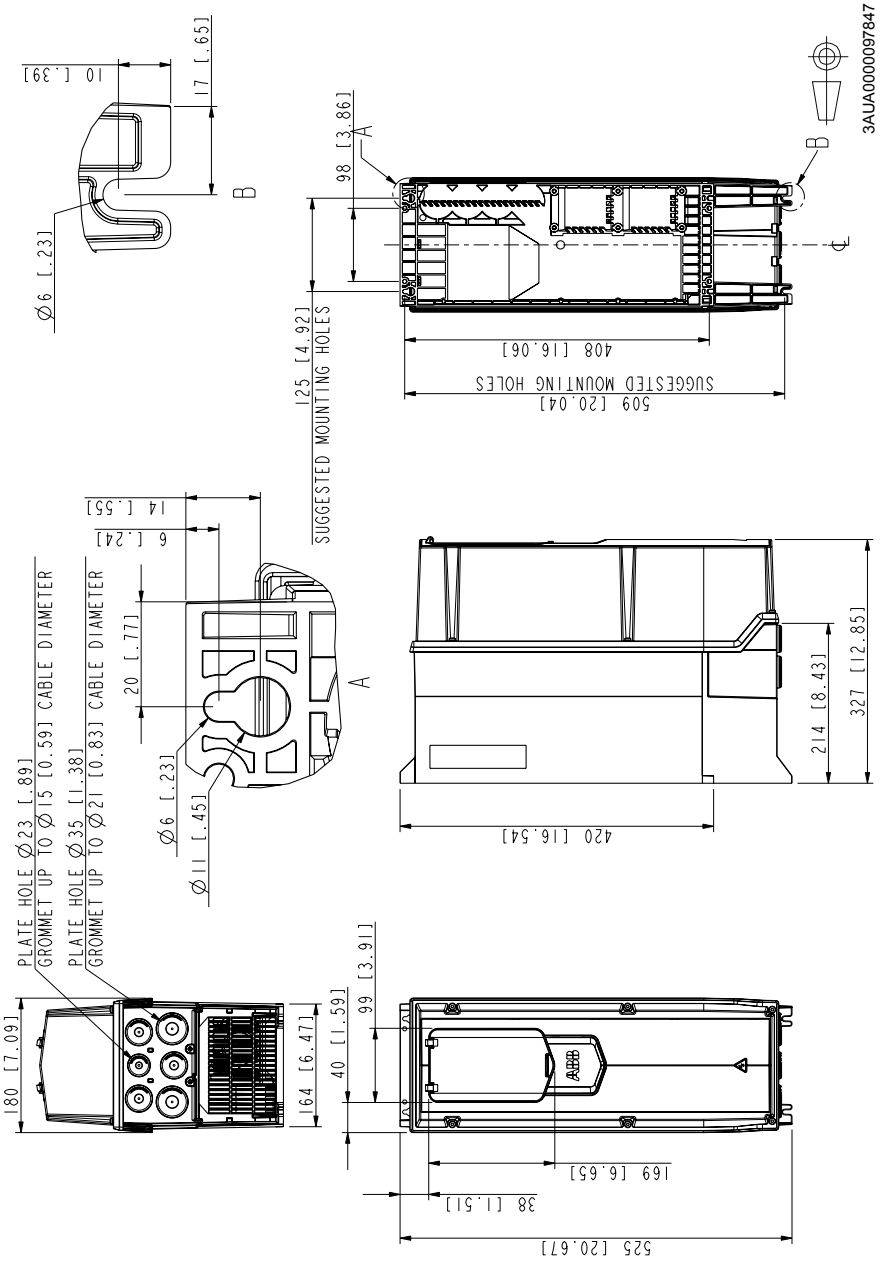
Frame R2 (IP55, UL Type 12)



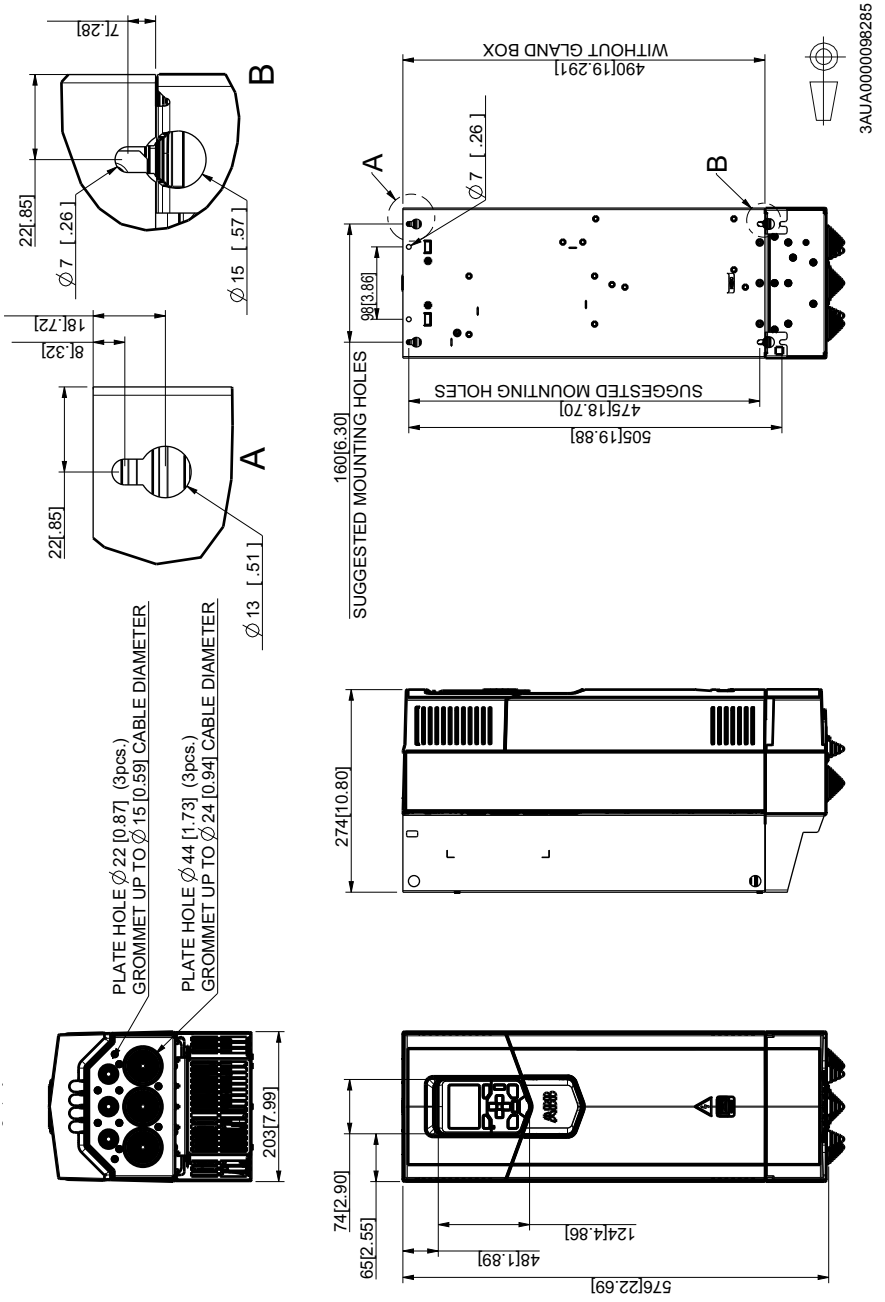
Frame R3 (IP21, UL Type 1)



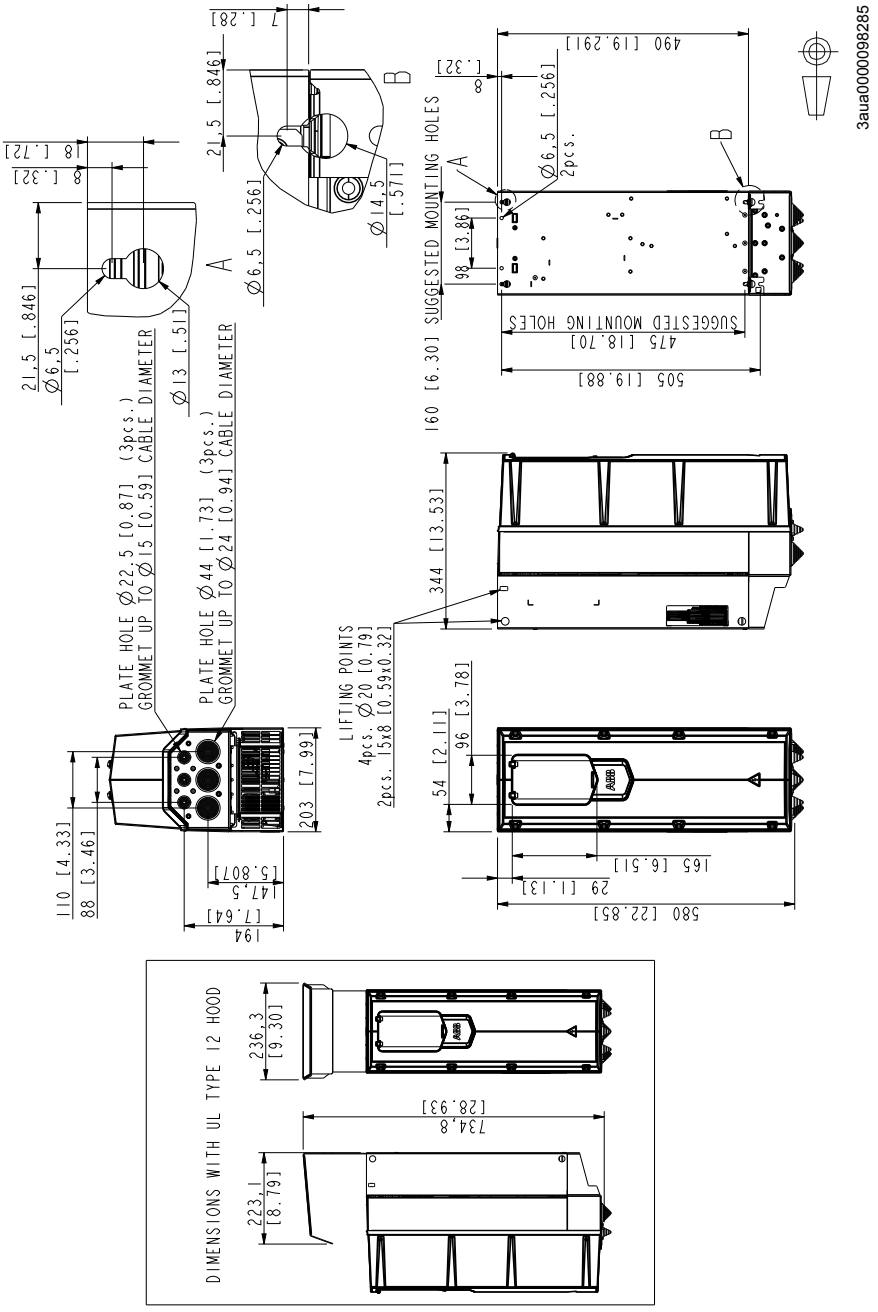
Frame R3 (IP55, UL Type 12)



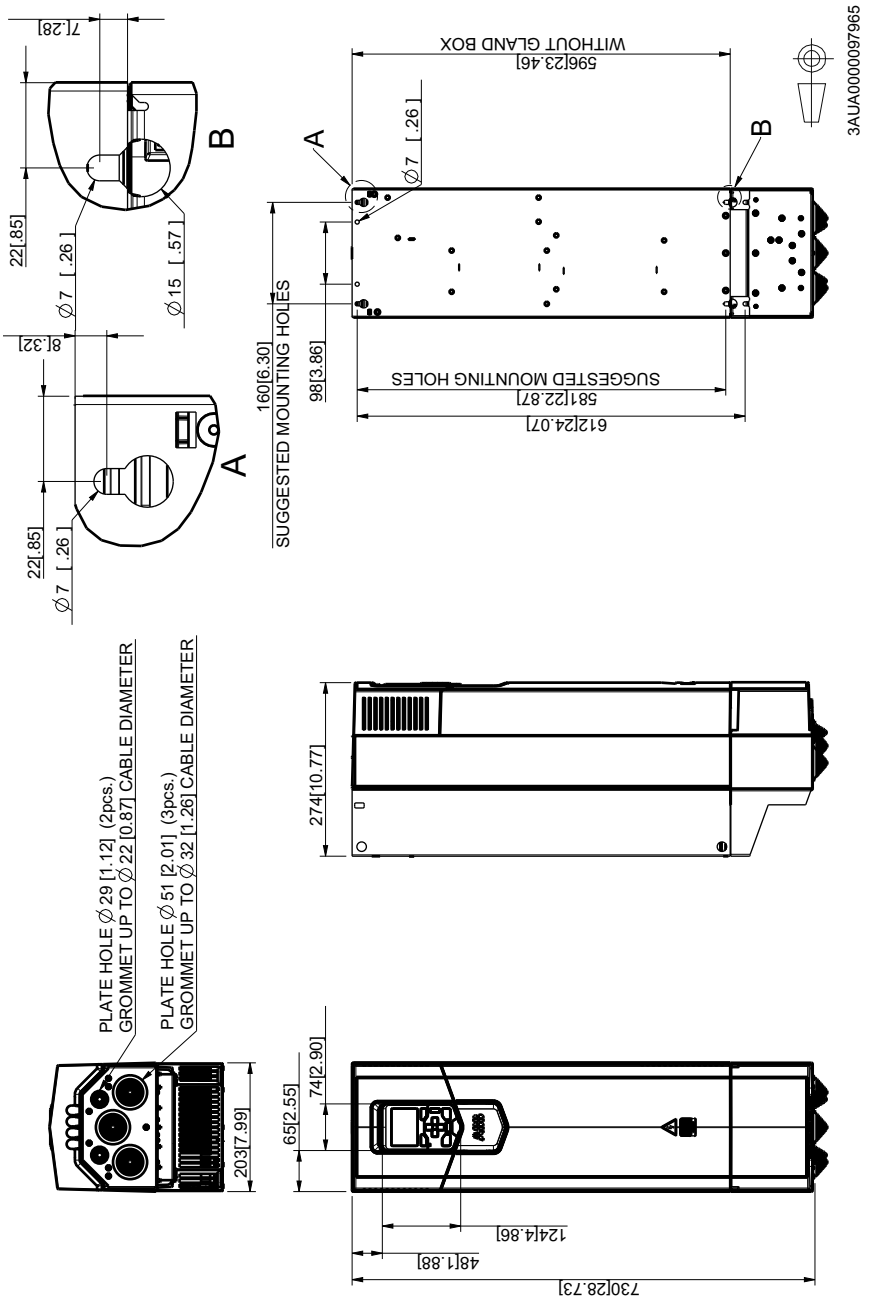
Frame R4 (IP21, UL Type 1)



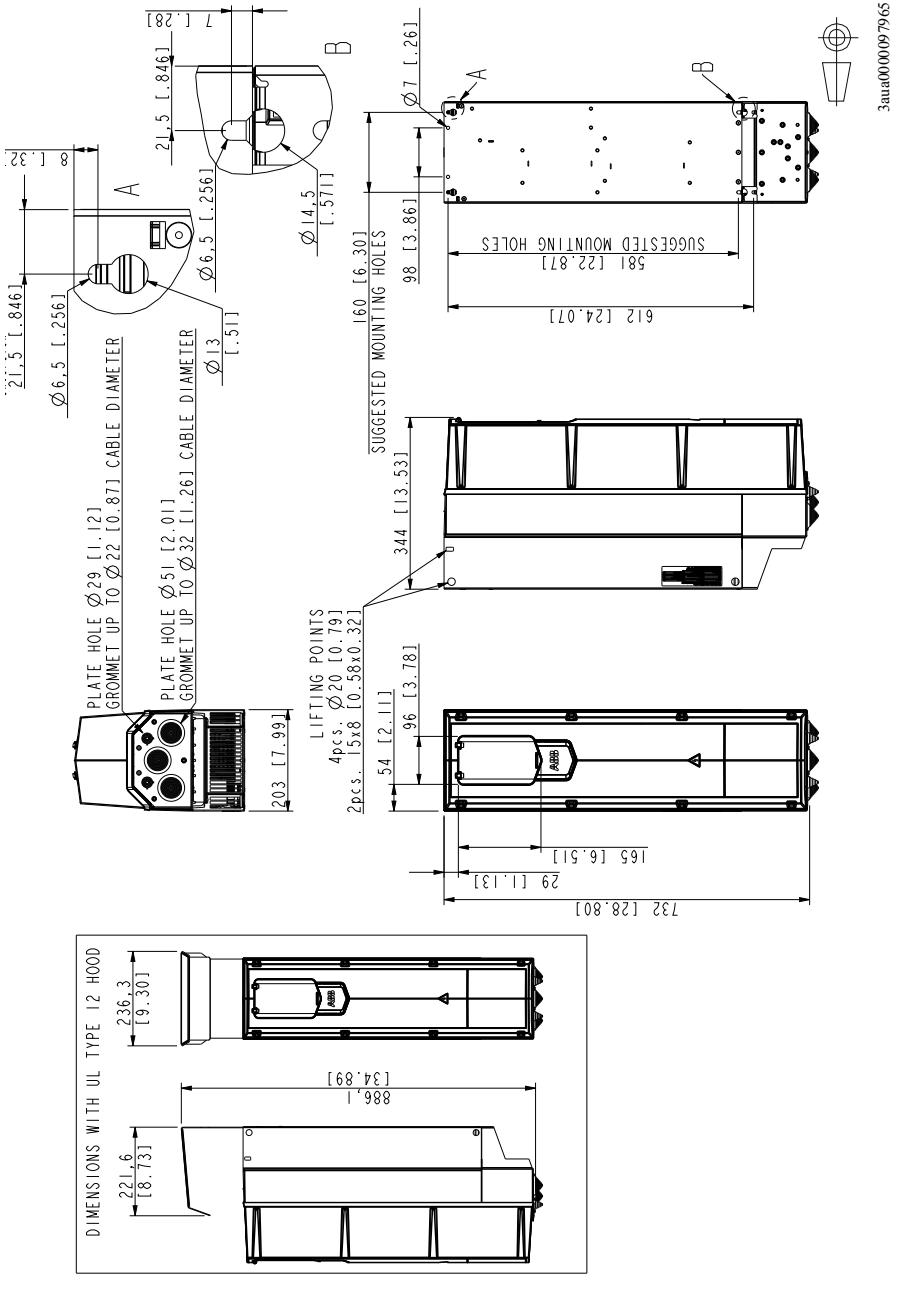
Frame R4 (IP55, UL Type 12)



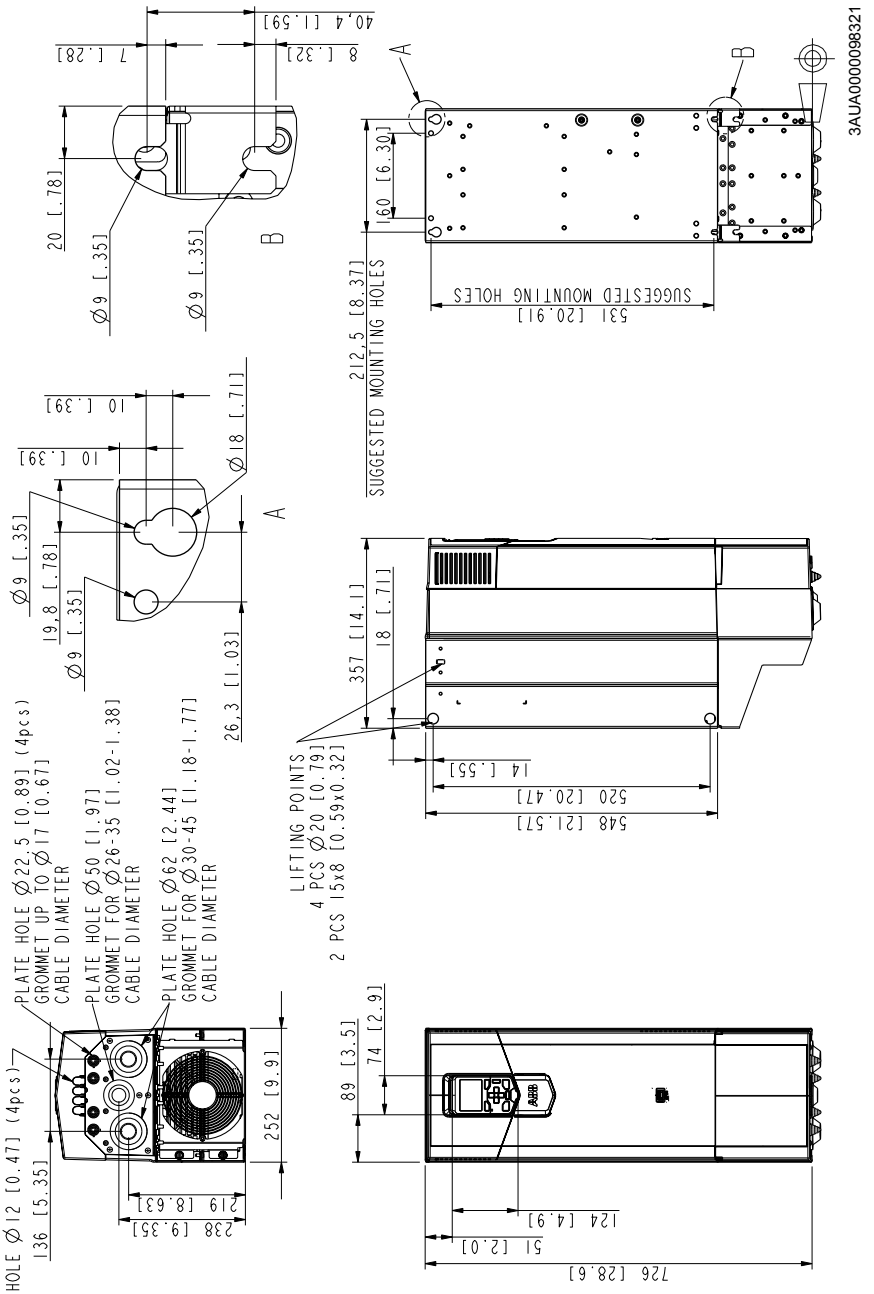
Frame R5 (IP21, UL Type 1)



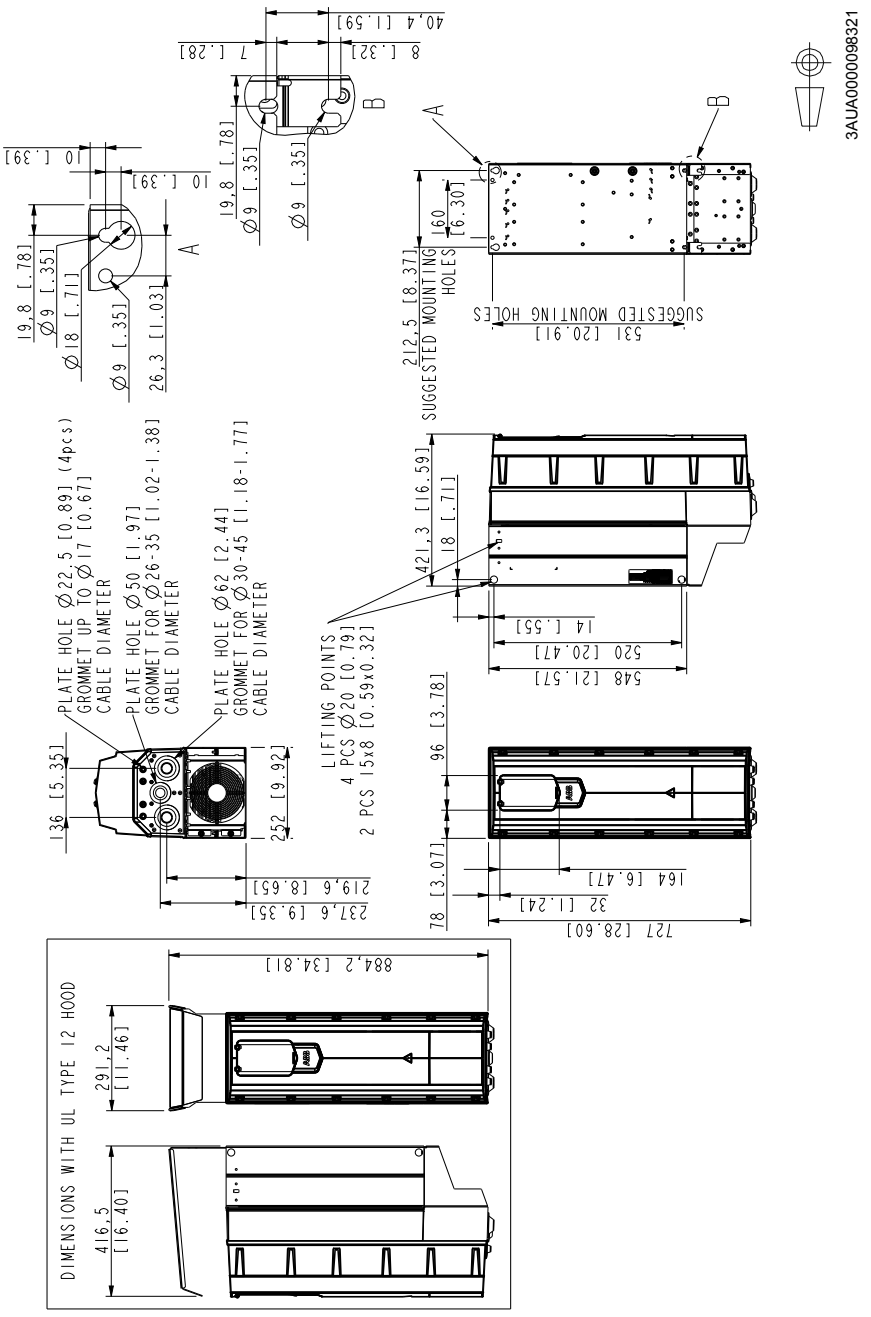
Frame R5 (IP55, UL Type 12)



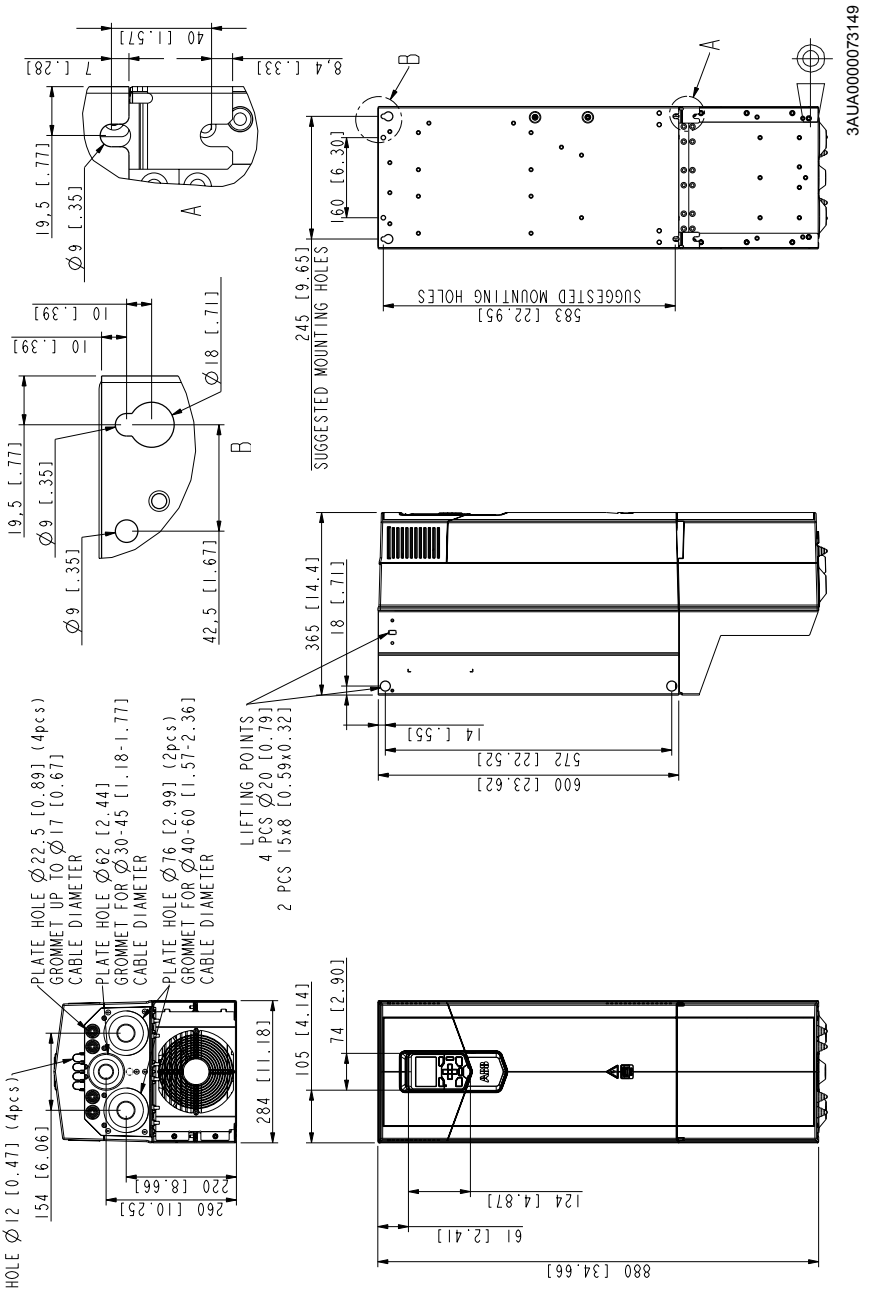
Frame R6 (IP21, UL Type 1)



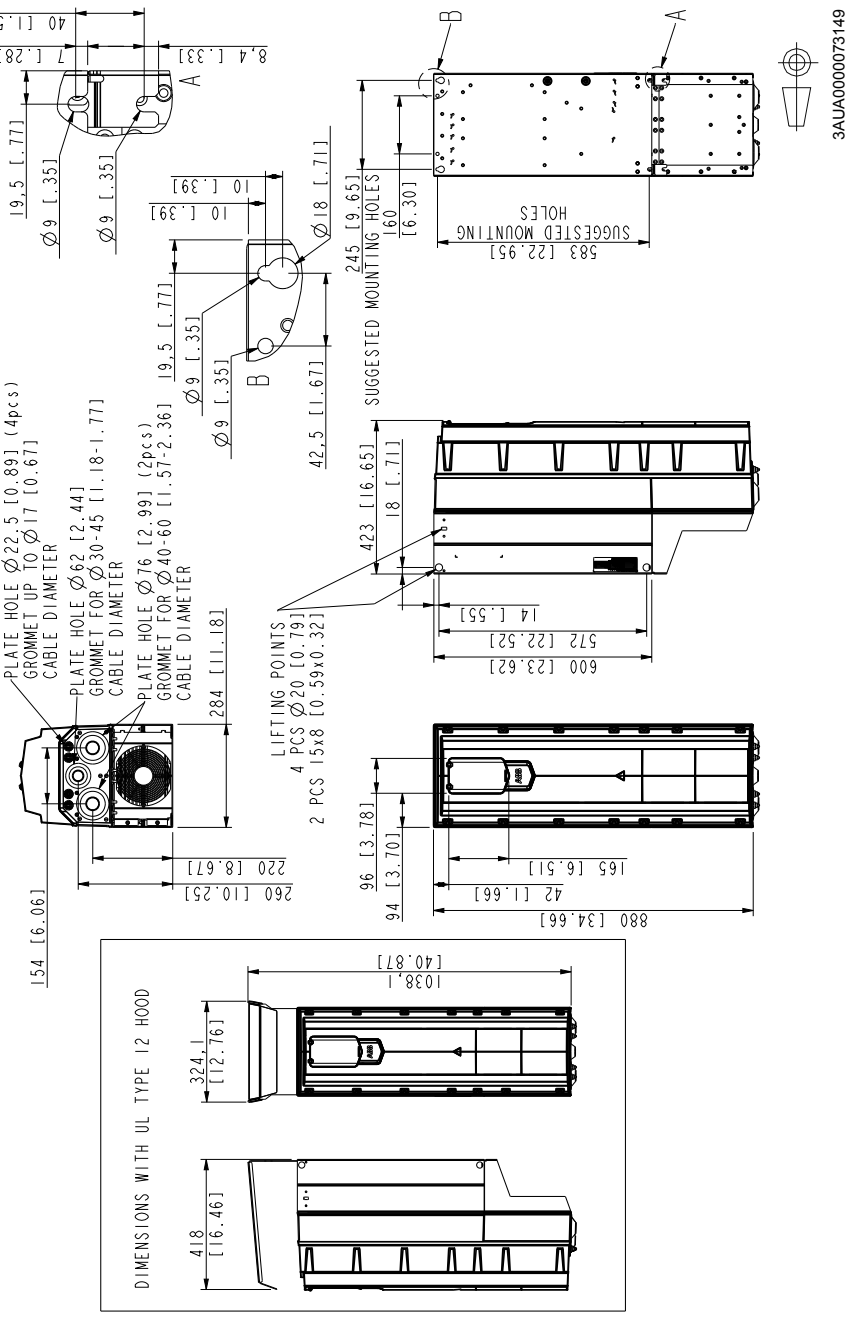
Frame R6 (IP55, UL Type 12)



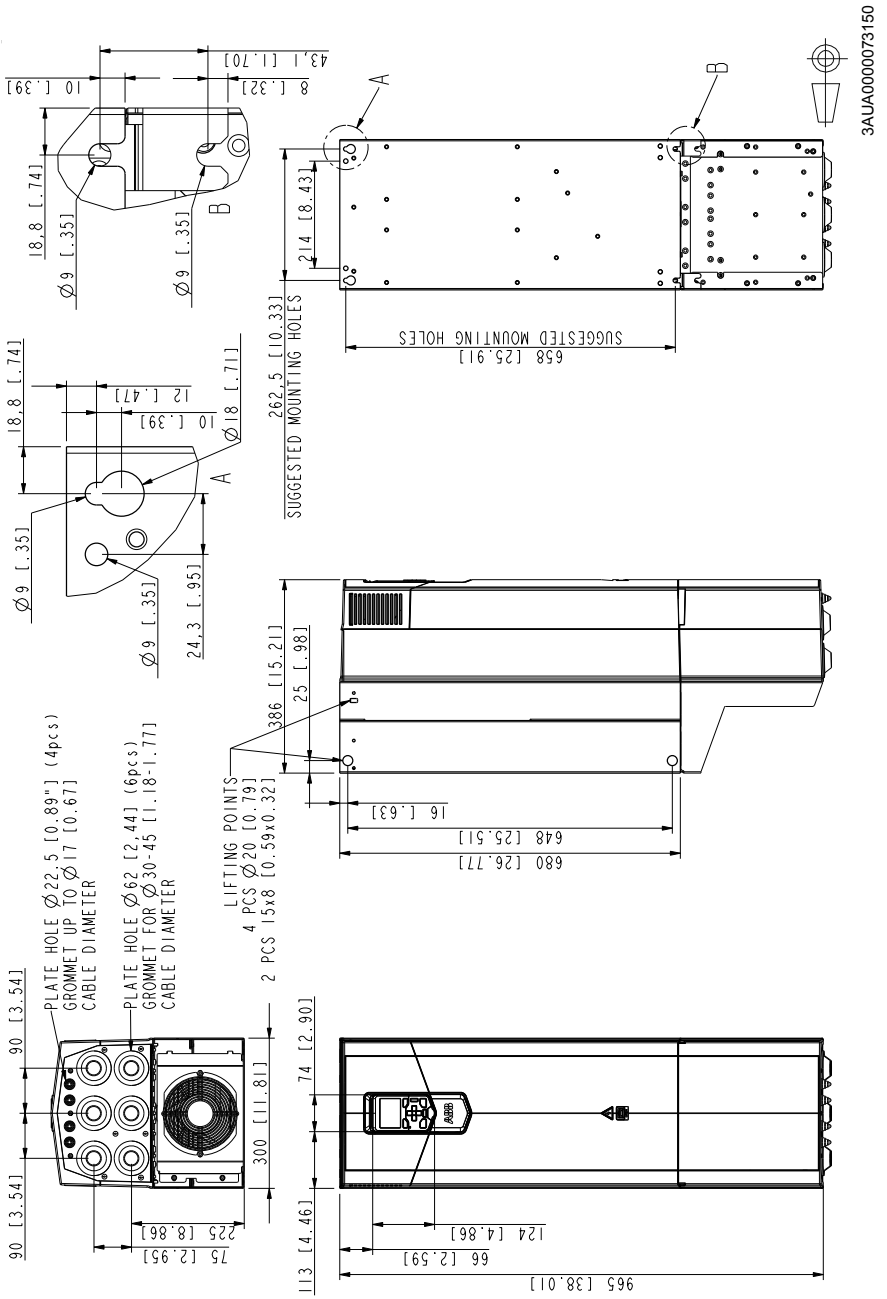
Frame R7 (IP21, UL Type 1)



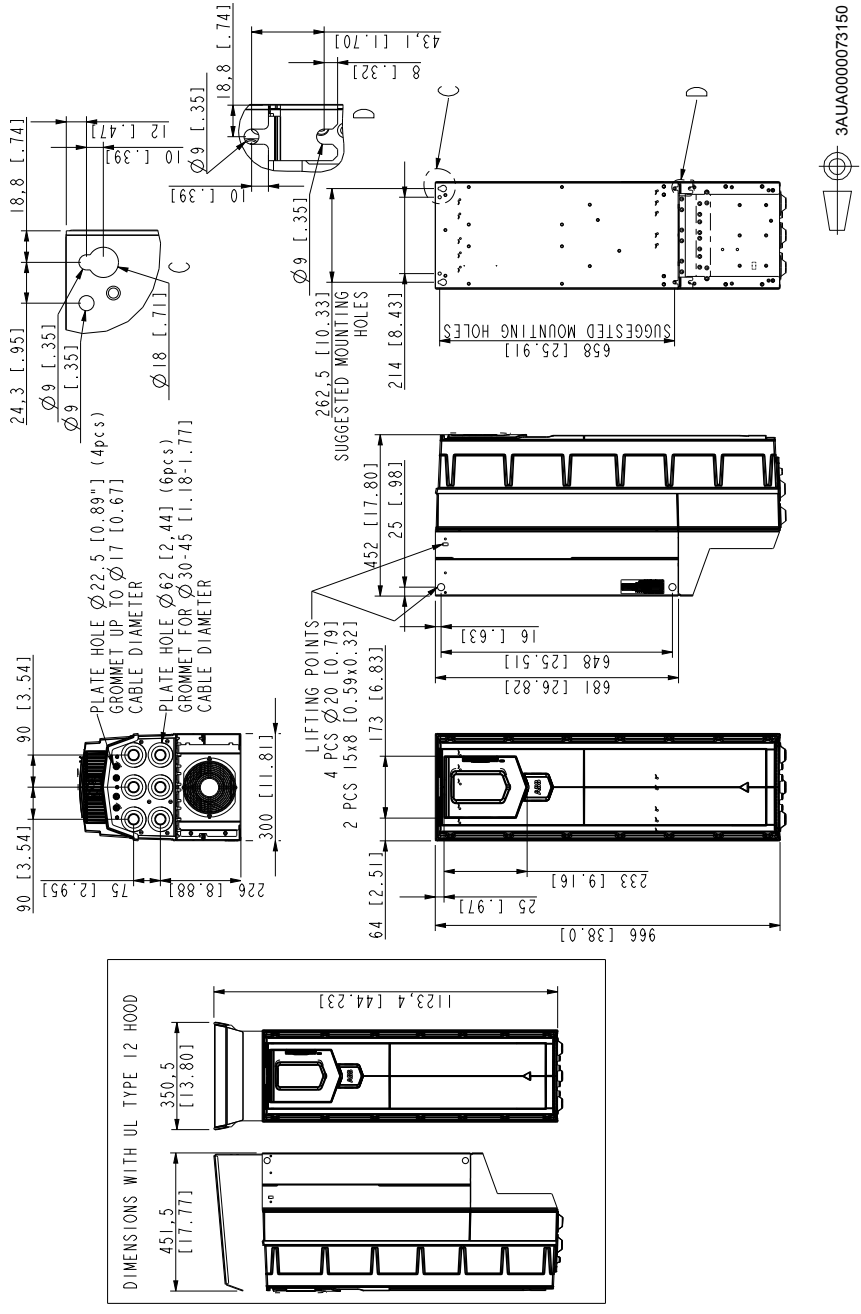
Frame R7 (IP55, UL Type 12)



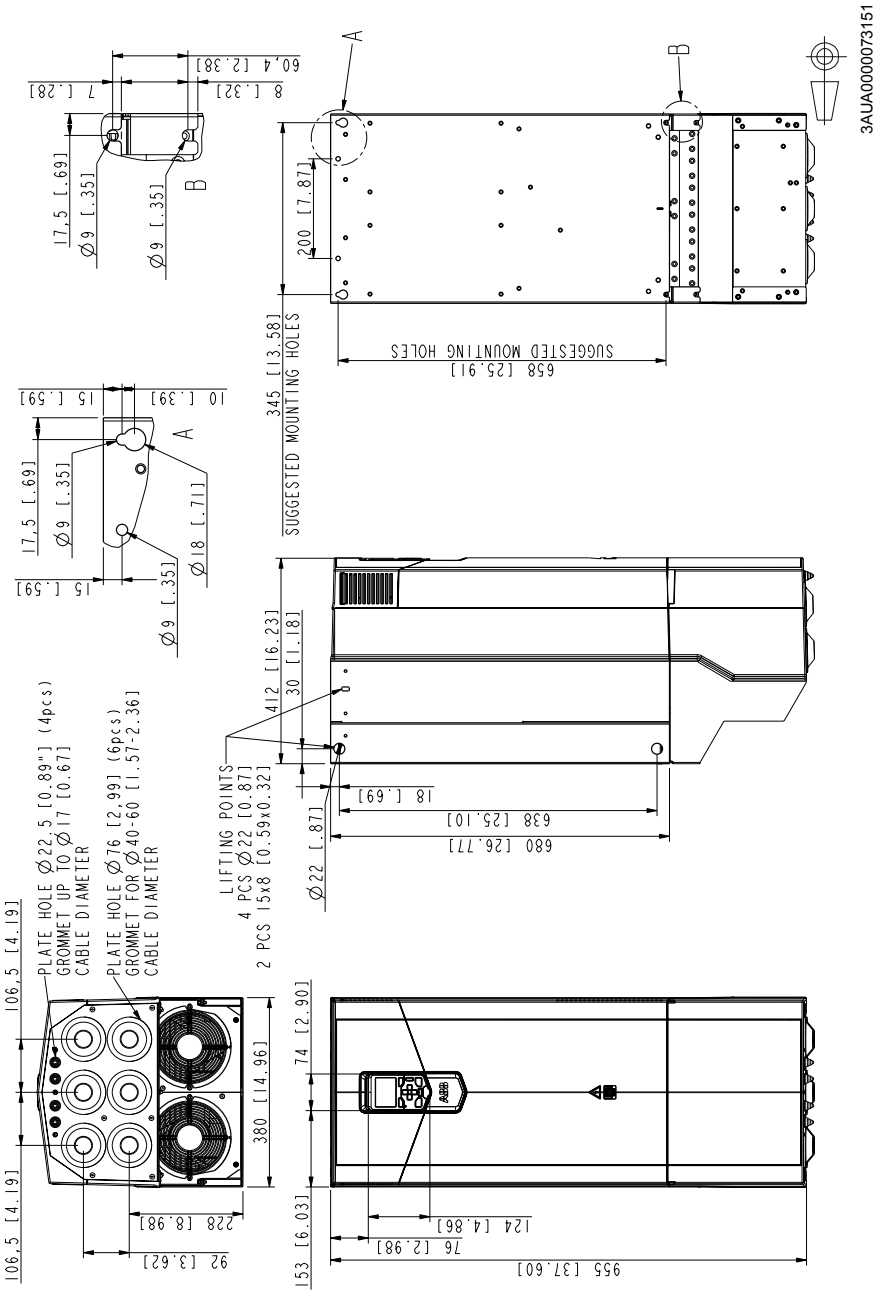
Frame R8 (IP21, UL Type 1)



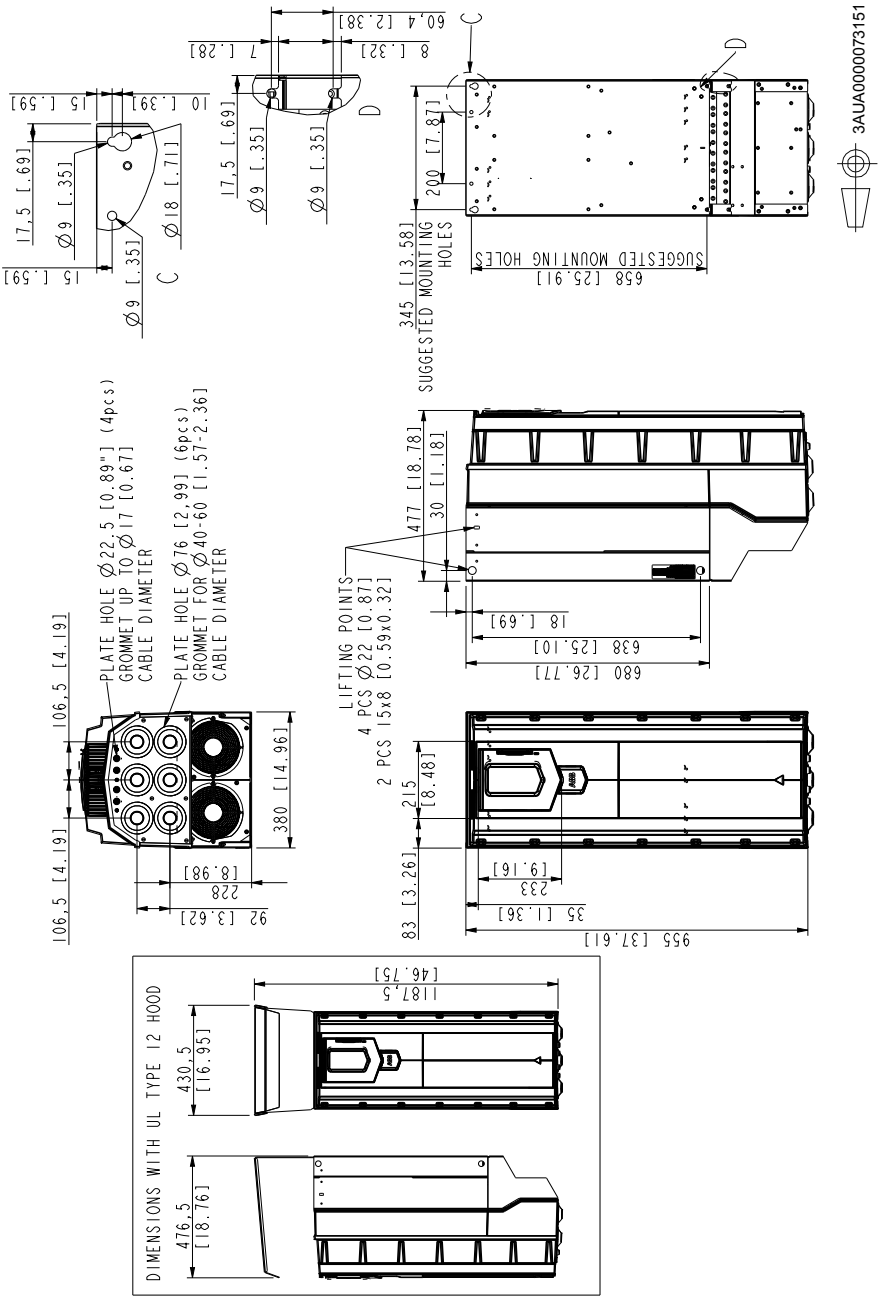
Frame R8 (IP55, UL Type 12)



Frame R9 (IP21, UL Type 1)



Frame R9 (IP55, UL Type 12)



13

The 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 below), 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 complies with these standards:

Standard	Name
IEC 60204-1:2016 EN 60204-1:2006 + A1:2009 + AC:2010	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

Standard	Name
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 61326-3-1:2008	*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 61511-1:2016	*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 principles for design*
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 1037:1995 + A1:2008 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* on page *231*.

Wiring

The following diagrams present examples of Safe torque off wiring for

- a single drive (page *262*)
- multiple drives (page *264*)
- multiple drives when an external 24 V DC power supply is used (page *265*).

For information on the specifications of the STO input, see section *Control unit (ZCU-12) connection data* on page *221*.

Activation switch

In the wiring diagrams below, 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.
- An FSO-xx safety functions module or an FPTC-0x 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

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.

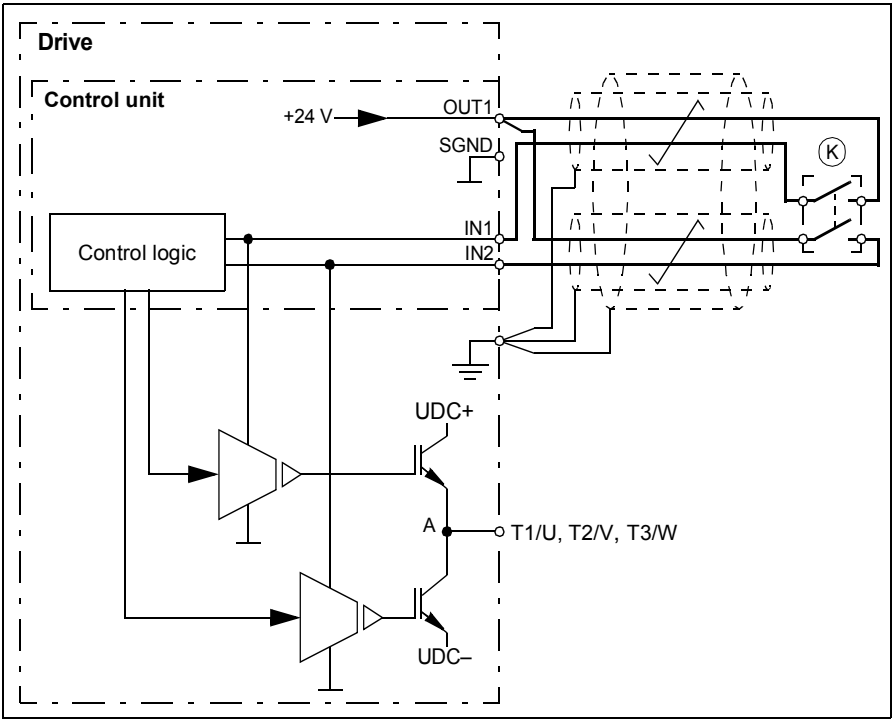
Note: The voltage at the STO input terminals of the drive control unit must be at least 17 V DC to be interpreted as “1”. The pulse tolerance of the input channels is 1 ms.

Grounding of protective shields

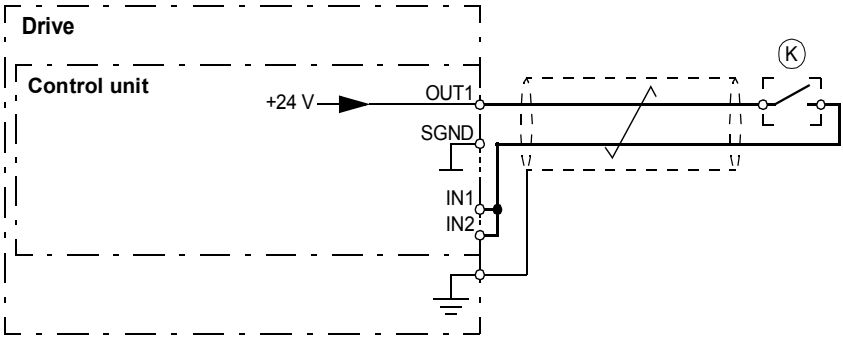
- Ground the shield in the cabling between the activation switch and the control unit at the control unit.
- Ground the shield in the cabling between two control units at one control unit only.

Single drive unit (internal power supply)

Dual-channel connection



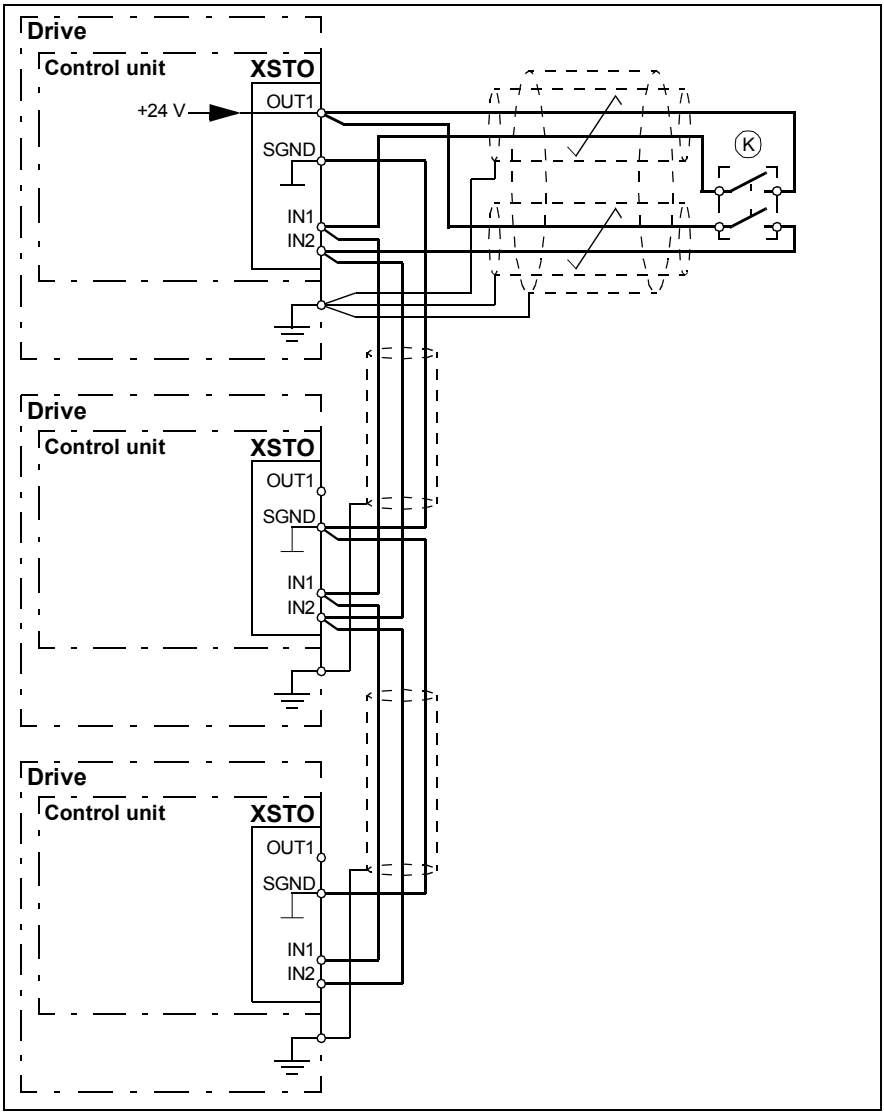
Single-channel connection



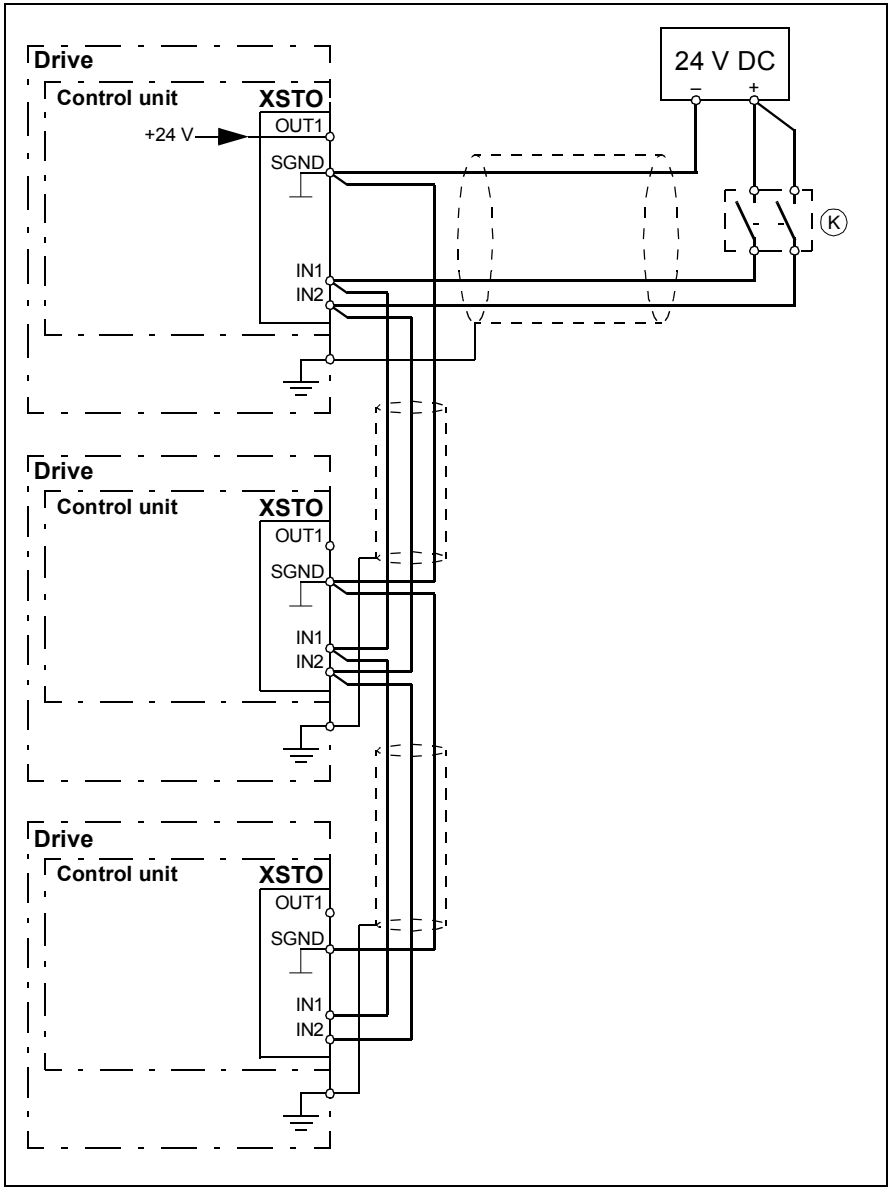
Notes:

- 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.

Multiple drives (internal power supply)



Multiple drives (external power supply)



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* (refer to 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 acceptance 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 an acceptance test.

The acceptance 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.

Competence

The acceptance test 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. The test procedures and report must be documented and signed by this person.

Acceptance test reports

Signed acceptance 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 acceptance tests performed due to changes or maintenance shall be logged into the logbook.

Acceptance test procedure

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

Note: If the drive is equipped with safety option +Q972, +Q973 or +Q982, do the procedure shown in the FSO module documentation.

Action	☑
WARNING! Obey the safety instructions given in *Safety instructions*, page *13*. If you ignore them, injury or death, or damage to the equipment can occur.	☐
Ensure 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 by a disconnector.	☐
Check the Safe torque off 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. Ensure 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 ensure 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. • Ensure that the motor stays at 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 acceptance 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* (refer to 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 AC supply.

WARNING! (With permanent magnet 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.
- 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 *270*). It is assumed that all dangerous failures of the STO circuit are detected by the proof test. To perform the proof test, do the *Acceptance test procedure* (page *267*).

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, follow the test given in section *Acceptance test procedure* on page *267*.

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 indications can be read via fieldbus. The indications are not safety-classified signals.

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 drive firmware manual 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/ SIL CL	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	2.84E-09	2.37E-05	5.91E-05	10530	≥90	3	3	1	80	20
R2	3	e	>99	2.84E-09	2.37E-05	5.91E-05	10529	≥90	3	3	1	80	20
R3	3	e	>99	2.84E-09	2.37E-05	5.91E-05	10489	≥90	3	3	1	80	20
R4	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10442	≥90	3	3	1	80	20
R5	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10240	≥90	3	3	1	80	20
R6... R8	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10340	≥90	3	3	1	80	20

Frame size	SIL/ SIL CL	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 = 400 V, U_N = 500 V													
R1	3	e	>99	2.84E-09	2.37E-05	5.91E-05	10530	≥90	3	3	1	80	20
R2	3	e	>99	2.84E-09	2.37E-05	5.91E-05	10529	≥90	3	3	1	80	20
R3	3	e	>99	2.84E-09	2.37E-05	5.91E-05	10489	≥90	3	3	1	80	20
R4	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10442	≥90	3	3	1	80	20
R5	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10240	≥90	3	3	1	80	20
R6, R7	3	e	>99	2.89E-09	2.41E-05	6.02E-05	10340	≥90	3	3	1	80	20
R8, R9	3	e	99.0	3.23E-09	2.69E-05	6.72E-05	6882	≥90	3	3	1	80	20
U_N = 690 V													
R3	3	e	99.3	2.94E-09	2.42E-05	6.05E-05	9295	≥90	3	3	1	80	20
R5	3	e	98.5	3.23E-09	2.67E-05	6.68E-05	5823	≥90	3	3	1	80	20
R6... R9	3	e	99.1	3.20E-09	2.66E-05	6.65E-05	10333	≥90	3	3	1	80	20

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- 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 reaction time (shortest detectable break): 1 ms
- STO response time: 2 ms (typical), 5 ms (maximum)
- Fault detection time: Channels in different states for longer than 200 ms
- Fault reaction time: Fault detection time + 10 ms
- STO fault indication (parameter *31.22*) delay: < 500 ms
- STO warning indication (parameter *31.22*) delay: < 1000 ms

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

Abbr.	Reference	Description
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 *269*.
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.

14

Resistor braking

Contents of this chapter

This chapter describes how to select, protect and wire brake choppers and resistors. The chapter also contains technical data.

Operation principle and hardware description

Frames R1 to R4 have a built-in brake chopper as standard. Frames R5 and up can be equipped with optional built-in brake chopper (+D150). Brake resistors are available as add-on kits.

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.

Planning the braking system

Selecting the brake circuit components

1. Calculate the maximum power generated by the motor during braking (P_{max}).
2. Select a suitable drive, brake chopper and brake resistor combination for the application from the rating table on page *281*. The braking power of the chopper must be greater or equal than the maximum power generated by the motor during the braking.
3. Check the resistor selection. The energy generated by the motor during a 400-second period must not exceed the resistor heat dissipation capacity E_R.

Note: If the E_R value is not sufficient, it is possible to use a four-resistor assembly in which two standard resistors are connected in parallel, two in series. The E_R value of the four-resistor assembly is four times the value specified for the standard resistor.

Selecting a custom resistor

If you use a resistor other than the default resistor, make sure that:

1. The resistance of the custom resistor is greater or equal than the resistance of the default resistor in the rating table on page *281*:

   $$R \geq R_{min}$$

   where

   R Resistance of the custom resistor.

   WARNING! Never use a brake resistor with a resistance smaller than R_{min}. The drive and the chopper are not able to handle the overcurrent caused by the low resistance.

   R_{min} Resistance of the default resistor

2. The load capacity of the custom resistor is higher than the instantaneous maximum power consumption of the resistor when it is connected to the drive DC link voltage by the chopper:

   $$P_r < \frac{U_{DC}^2}{R}$$

   where

   P_r Load capacity of the custom resistor

   U_{DC} Drive DC link voltage.
   1.35 · 1.25 · 415 V DC (when supply voltage is 380 to 415 V AC)
   1.35 · 1.25 · 500 V DC (when supply voltage is 440 to 500 V AC) or
   1.35 · 1.25 · 690 V DC (when supply voltage is 525 to 690 AC)

   R Resistance of the custom resistor

Selecting and routing the brake resistor cables

Use the same cable type for the resistor cabling as for the drive input cabling to ensure that the input fuses also protect the resistor cable. Alternatively, a two conductor shielded cable with the same cross-sectional area can be used.

Minimizing electromagnetic interference

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

- Shield the braking power line completely, either by using shielded cable or a metallic enclosure. Unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses the radiated emissions.
- 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 resistors

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, ensure that the material withstands high temperatures. Protect the resistor against contact.

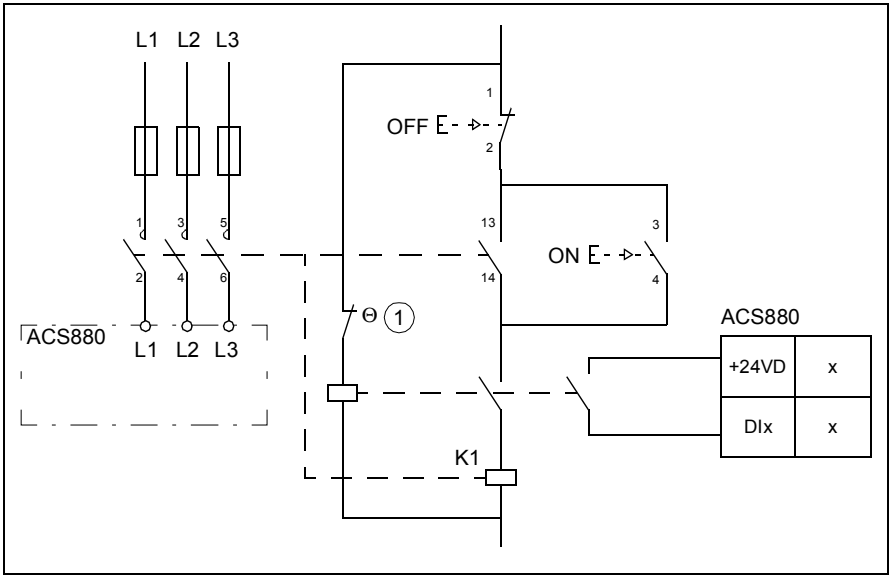
Protecting the system against thermal overload

The brake chopper protects itself and the resistor cables against thermal overload when the cables are dimensioned according to the nominal current of the drive. The drive control program includes a resistor and resistor cable thermal protection function which can be tuned by the user. See the firmware manual.

Frames R1 to R4

Equipping the drive with a main contactor is highly recommended for safety reasons. 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 resistors are equipped with a thermal switch (1) inside the resistor assembly as standard. The switch indicates overtemperature and overload.

ABB recommends that you also wire the thermal switch to a digital input of the drive.

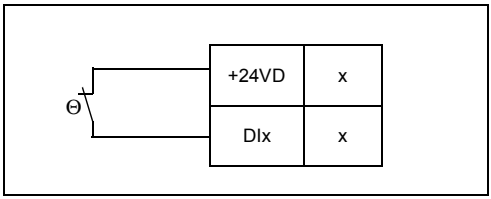


Frames R5 to R9

A main contactor is not required for protecting against resistor overheating when the resistor is dimensioned according to the instructions and the internal brake chopper is in use. The drive will disable power flow through the input bridge if the chopper remains conductive in a fault situation but the charging resistor may fail.

Note: If an external brake chopper (outside the drive module) is used, a main contactor is always required.

A thermal switch (standard in ABB resistors) is required for safety reasons. The thermal switch cable must be shielded and may not be longer than the resistor cable. Wire the switch to a digital input on the drive control unit as shown in the figure below.



Protecting the resistor cable against short-circuits

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

Mechanical installation

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

Electrical installation

Checking the insulation of the assembly

Follow the instructions given under *Brake resistor assembly* on page *104*.

Connection diagram

See section *Connection diagram* on page *109*.

Connection procedure

- Connect the resistor cables to the R+ and R- terminals in the same way as the other power cables. If a shielded three-conductor cable is used, cut the third conductor, insulate it, and ground the twisted shield of the cable (protective earth conductor of the resistor assembly) at both ends.
- Connect the thermal switch of the brake resistor as described above in section *Frames R1 to R4* or *Frames R5 to R9*.

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 (ACS880 primary control program):

- Disable the overvoltage control of the drive by parameter **30.30 Overvoltage control**.
- Set parameter **31.01 External event 1 source** to point to the digital input where the thermal switch of the brake resistor is wired.
- Set parameter **31.02 External event 1 type** to **Fault**.
- 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.
- For frames R5 to R9: Set parameter **43.07 Brake chopper runtime enable** to **Other [bit]** and select from parameter **10.01 DI status** the digital input where the thermal switch of the brake resistor is wired.
- Check the resistance value of parameter **43.10 Brake resistance**.

With these parameter settings, the drive stops by coasting 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.

For settings of other control programs, see the appropriate firmware manual.

Technical data

Ratings

Drive type	Internal brake chopper		Example brake resistor(s)			
	P_{brcont}	R_{min}	Type	R	E_R	P_{Rcont}
	kW	ohm		ohm	kJ	kW
U_N = 230 V						
ACS880-01-04A6-2	0.75	65	JBR-03	80	40	0.14
ACS880-01-06A6-2	1.1	65	JBR-03	80	40	0.14
ACS880-01-07A5-2	1.5	65	JBR-03	80	40	0.14
ACS880-01-10A6-2	2.2	65	JBR-03	80	40	0.14
ACS880-01-16A8-2	4.0	18	SACE15RE22	22	420	2
ACS880-01-24A3-2	5.5	18	SACE15RE22	22	420	2
ACS880-01-031A-2	7.5	13	SACE15RE13	13	435	2
ACS880-01-046A-2	11	12	SACE15RE13	13	435	2
ACS880-01-061A-2	11	12	SACE15RE13	13	435	2
ACS880-01-075A-2	18.5	6	SAFUR90F575	8	1800	4.5
ACS880-01-087A-2	22	6	SAFUR90F575	8	1800	4.5
ACS880-01-115A-2	30	3.5	SAFUR125F500	4	3600	9
ACS880-01-145A-2	37	3.5	SAFUR125F500	4	3600	9
ACS880-01-170A-2	45	2.4	SAFUR200F500	2.7	5400	13.5
ACS880-01-206A-2	55	2.4	SAFUR200F500	2.7	5400	13.5
ACS880-01-274A-2	75	1.8	SAFUR200F500	2.7	5400	13.5
U_N = 400 V						
ACS880-01-02A4-3	0.75	78	JBR-03	80	40	0.14
ACS880-01-03A3-3	1.1	78	JBR-03	80	40	0.14
ACS880-01-04A0-3	1.5	78	JBR-03	80	40	0.14
ACS880-01-05A6-3	2.2	78	JBR-03	80	40	0.14
ACS880-01-07A2-3	3.0	78	JBR-03	80	40	0.14
ACS880-01-09A4-3	4.0	78	JBR-03	80	40	0.14
ACS880-01-12A6-3	5.5	78	JBR-03	80	40	0.14
ACS880-01-017A-3	7.5	39	SACE08RE44	44	210	1
ACS880-01-025A-3	11	39	SACE08RE44	44	210	1
ACS880-01-032A-3	15	19	SACE15RE22	22	420	2
ACS880-01-038A-3	18.5	19	SACE15RE22	22	420	2
ACS880-01-045A-3	22	13	SACE15RE13	13	435	2
ACS880-01-061A-3	22	13	SACE15RE13	13	435	2
ACS880-01-072A-3	37	8	SAFUR90F575	8	1800	4.5
ACS880-01-087A-3	45	8	SAFUR90F575	8	1800	4.5
ACS880-01-105A-3	55	5.4	SAFUR80F500	6	2400	6
ACS880-01-145A-3	75	5.4	SAFUR80F500	6	2400	6

Drive type	Internal brake chopper		Example brake resistor(s)			
	P_{brcont}	R_{min}	Type	R	E_R	P_{Rcont}
	kW	ohm		ohm	kJ	kW
ACS880-01-169A-3	90	3.3	SAFUR125F500	4	3600	9
ACS880-01-206A-3	110	3.3	SAFUR125F500	4	3600	9
ACS880-01-246A-3	132	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-293A-3	132	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-363A-3	160	2.0	SAFUR200F500	2.7	5400	13.5
ACS880-01-430A-3	160	2.0	SAFUR200F500	2.7	5400	13.5
U_N = 500 V						
ACS880-01-02A1-5	0.75	78	JBR-03	80	40	0.14
ACS880-01-03A0-5	1.1	78	JBR-03	80	40	0.14
ACS880-01-03A4-5	1.5	78	JBR-03	80	40	0.14
ACS880-01-04A8-5	2.2	78	JBR-03	80	40	0.14
ACS880-01-05A2-5	3.0	78	JBR-03	80	40	0.14
ACS880-01-07A6-5	4.0	78	JBR-03	80	40	0.14
ACS880-01-11A0-5	5.5	78	JBR-03	80	40	0.14
ACS880-01-014A-5	7.5	39	SACE08RE44	44	210	1
ACS880-01-021A-5	11	39	SACE08RE44	44	210	1
ACS880-01-027A-5	15	19	SACE15RE22	22	420	2
ACS880-01-034A-5	18.5	19	SACE15RE22	22	420	2
ACS880-01-040A-5	22	13	SACE15RE13	13	435	2
ACS880-01-052A-5	22	13	SACE15RE13	13	435	2
ACS880-01-065A-5	37	8	SAFUR90F575	8	1800	4.5
ACS880-01-077A-5	45	8	SAFUR90F575	8	1800	4.5
ACS880-01-096A-5	55	5.4	SAFUR80F500	6	2400	6
ACS880-01-124A-5	75	5.4	SAFUR80F500	6	2400	6
ACS880-01-156A-5	90	3.3	SAFUR125F500	4	3600	9
ACS880-01-180A-5	110	3.3	SAFUR125F500	4	3600	9
ACS880-01-240A-5	132	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-260A-5	132	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-302A-5	160	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-361A-5	160	2.3	SAFUR200F500	2.7	5400	13.5
ACS880-01-414A-5	160	2.3	SAFUR200F500	2.7	5400	13.5
U_N = 690 V						
ACS880-01-07A4-7	5.5	44	SACE08RE44	44	210	1
ACS880-01-09A9-7	7.5	44	SACE08RE44	44	210	1
ACS880-01-14A3-7	11.0	44	SACE08RE44	44	210	1
ACS880-01-019A-7	15.0	44	SACE08RE44	44	210	1
ACS880-01-023A-7	18.5	44	SACE08RE44	44	210	1
ACS880-01-027A-7	22.0	44	SACE08RE44	44	210	1

Drive type	Internal brake chopper		Example brake resistor(s)			
	P_{brcont}	R_{min}	Type	R	E_R	P_{Rcont}
	kW	ohm		ohm	kJ	kW
ACS880-01-07A3-7	6	18	SACE08RE44	44	210	1
ACS880-01-09A8-7	8	18	SACE08RE44	44	210	1
ACS880-01-14A2-7	11	18	SACE08RE44	44	210	1
ACS880-01-018A-7	17	18	SACE15RE22	22	420	2
ACS880-01-022A-7	23	18	SACE15RE22	22	420	2
ACS880-01-026A-7	28	18	SACE15RE22	22	420	2
ACS880-01-035A-7	33	18	SACE15RE22	22	420	2
ACS880-01-042A-7	45	18	SACE15RE22	22	420	2
ACS880-01-049A-7	45	18	SACE15RE22	22	420	2
ACS880-01-061A-7	55	13	SACE15RE13	13	435	2
ACS880-01-084A-7	65	13	SACE15RE13	13	435	2
ACS880-01-098A-7	90	8	SAFUR90F575	8	1800	4.5
ACS880-01-119A-7	110	8	SAFUR90F575	8	1800	4.5
ACS880-01-142A-7	132	6	SAFUR80F500	6	2400	6
ACS880-01-174A-7	160	6	SAFUR80F500	6	2400	6
ACS880-01-210A-7	200	4	SAFUR125F500	4	3600	9
ACS880-01-271A-7	250	4	SAFUR125F500	4	3600	9

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P_{brcont} Maximum continuous braking power. The braking is considered continuous if the braking time exceeds 30 seconds.

R_{min} The minimum allowed resistance value of the brake resistor

R Resistance value for the listed resistor assembly

E_R Short energy pulse that the resistor assembly withstands every 400 seconds

P_{Rcont} Continuous power (heat) dissipation of the resistor when placed correctly

The rating apply at an ambient temperature of 40 °C (104 °F)

Degree of protection and thermal constant of the resistors

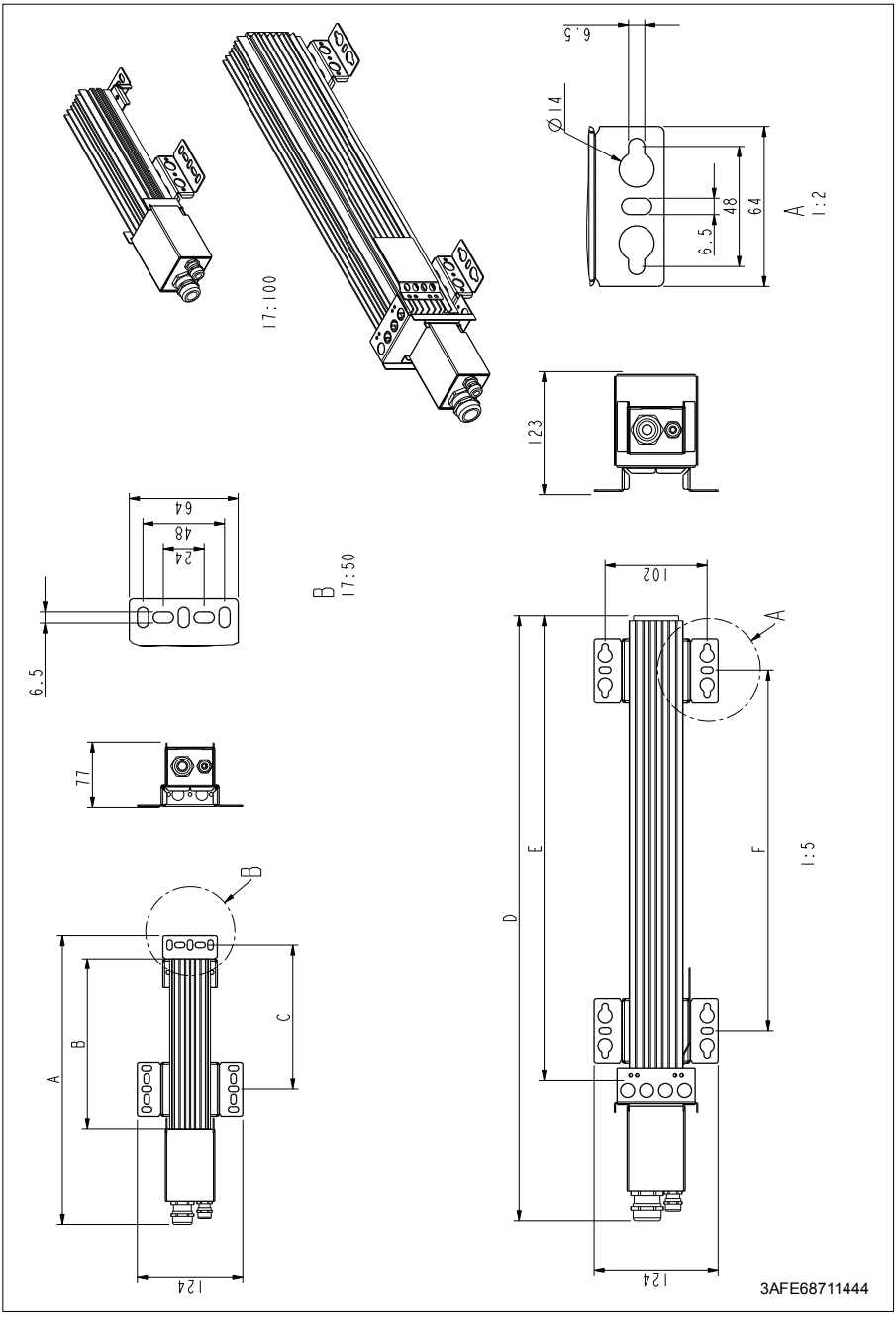
Resistor type	Degree of protection	Thermal constant (s)
JBR-03	IP20	
SACE	IP21	200
SAFUR	IP00	555

Terminals and cable entry data

See section *Terminal and entry data for the power cables* on page *217*.

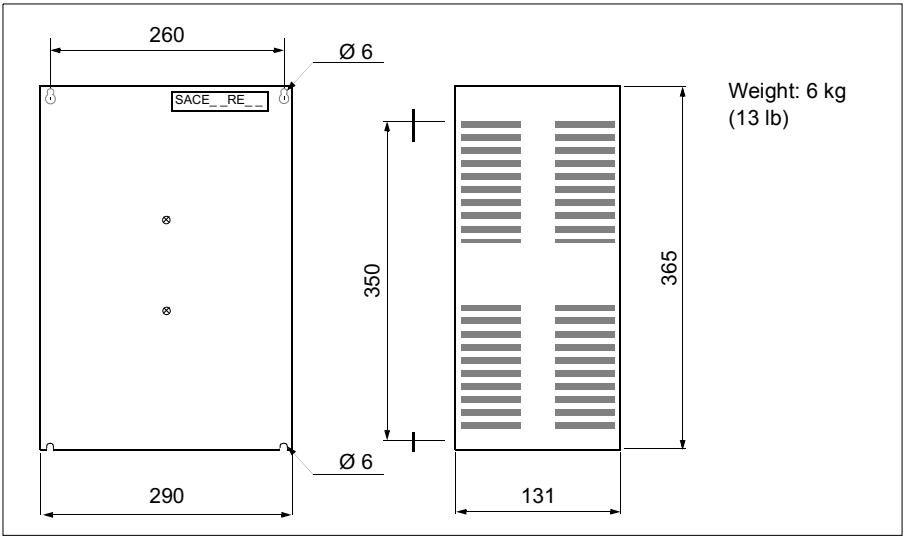
Dimensions and weights of external resistors

JBR-03

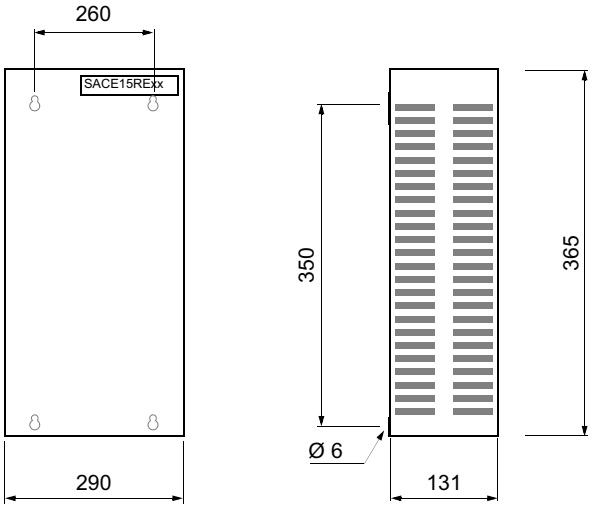

17:100
B
17:50
A
1:2
1:5
64
48
24
6.5
77
123
102
D
E
F
A
B
C
124
3AFE68711444

JBR-03 brake resistor	
Dimension A	340 mm (13.39 in)
Dimension B	200 mm (7.87 in)
Dimension C	170 mm (6.69 in)
Weight	0.8 kg (1.8 lb)
Maximum wire size of main terminals	10 mm^2 (AWG6)
Tightening torque of main terminals	1.5 … 1.8 N·m (13 … 16 lbf·in)
Wire size of thermal switch terminals	4 mm^2 (AWG12)
Tightening torque of thermal switch terminals	0.6 … 0.8 N·m (5.3 … 7.1 lbf·in)

SACE08RE44

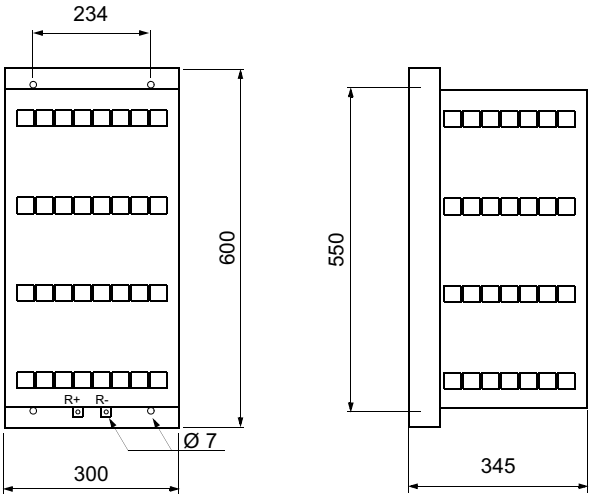


SACE15RE13 and SACE15RE22



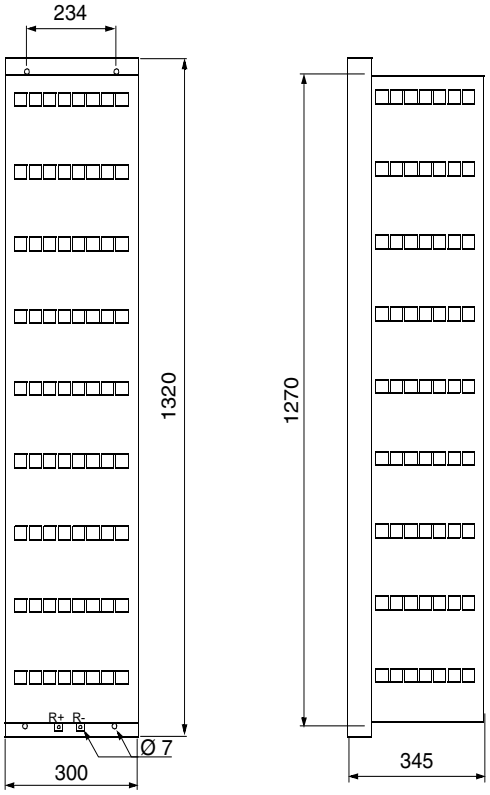
Weight: 6 kg
(13 lb)

SAFUR80F500 and SAFUR90F575



Brake resistor type	Weight
SAFUR80F500	14 kg (31 lb)
SAFUR90F500	12 kg (26 lb)

SAFUR125F500 and SAFUR200F500



Brake resistor type	Weight
SAFUR125F500	25 kg (55 lb)
SAFUR200F500	30 kg (66 lb)

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Common mode, du/dt and sine filters

Contents 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 *Checking the compatibility of the motor and drive*, page *68*. A common mode filter kit is available from ABB with order number is 64315811 for the drive. The kit includes three wound cores. For installation instructions of the cores, see the instruction included in the core package.

du/dt filters

When is a du/dt filter needed?

See section *Checking the compatibility of the motor and drive*, page *68*.

du/dt filter types

Drive type ACS880-01-	du/dt filter type	Drive type ACS880-01-	du/dt filter type	Drive type ACS880-01-	du/dt filter type
U_N = 400 V		U_N = 500 V		U_N = 690 V	
02A4-3	NOCH0016-6X	02A1-5	NOCH0016-6X	07A4-7	NOCH0016-6X
03A3-3	NOCH0016-6X	03A0-5	NOCH0016-6X	09A9-7	NOCH0016-6X
04A0-3	NOCH0016-6X	03A4-5	NOCH0016-6X	14A3-7	NOCH0016-6X
05A6-3	NOCH0016-6X	04A8-5	NOCH0016-6X	019A-7	NOCH0030-6X
07A2-3	NOCH0016-6X	05A2-5	NOCH0016-6X	023A-7	NOCH0030-6X
09A4-3	NOCH0016-6X	07A6-5	NOCH0016-6X	027A-7	NOCH0030-6X
12A6-3	NOCH0016-6X	11A0-5	NOCH0016-6X	07A3-7	NOCH0016-6X
017A-3	NOCH0030-6X	014A-5	NOCH0030-6X	09A8-7	NOCH0016-6X
025A-3	NOCH0030-6X	021A-5	NOCH0030-6X	14A2-7	NOCH0016-6X
032A-3	NOCH0070-6X	027A-5	NOCH0070-6X	018A-7	NOCH0030-6X
038A-3	NOCH0070-6X	034A-5	NOCH0070-6X	022A-7	NOCH0030-6X
045A-3	NOCH0070-6X	040A-5	NOCH0070-6X	026A-7	NOCH0030-6X
061A-3	NOCH0070-6X	052A-5	NOCH0070-6X	035A-7	NOCH0070-6X
072A-3	NOCH0120-6X	065A-5	NOCH0120-6X	042A-7	NOCH0070-6X
087A-3	NOCH0120-6X	077A-5	NOCH0120-6X	049A-7	NOCH0070-6X
105A-3	NOCH0120-6X	096A-5	NOCH0120-6X	061A-7	NOCH0120-6X
145A-3	FOCH0260-7X	124A-5	FOCH0260-7X	084A-7	NOCH0120-6X
169A-3	FOCH0260-7X	156A-5	FOCH0260-7X	098A-7	NOCH0120-6X
206A-3	FOCH0260-7X	180A-5	FOCH0260-7X	119A-7	FOCH0260-7X
246A-3	FOCH0260-7X	240A-5	FOCH0260-7X	142A-7	FOCH0260-7X
293A-3	FOCH0260-7X	260A-5	FOCH0260-7X	174A-7	FOCH0260-7X
363A-3	FOCH0320-5X	302A-5	FOCH0320-5X	210A-7	FOCH0260-7X
430A-3	FOCH0320-5X	361A-5	FOCH0320-5X	271A-7	FOCH0260-7X
		414A-5	FOCH0320-5X		

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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 a drive

Check housing of sine filters from the manufacturer's internet pages. Go to https://en.tdk.eu.

Drive type ACS880-01-...	Sine filter type	$I_{cont.\ max}$	$P_{cont.\ max}$	Heat dissipation			Noise
				Drive	Filter	Total	
		A	kW	W	W	W	dB (A)
U_N = 400 V							
02A4-3	B84143V0004R229*	2.3	1.7	30	60	90	72
03A3-3	B84143V0004R229*	3.1	2.3	40	60	100	72
04A0-3	B84143V0004R229*	3.8	2.9	52	60	112	72
05A6-3	B84143V0006R229*	5.3	4.0	73	100	173	72
07A2-3	B84143V0011R229*	7.2	5.4	94	90	184	72
09A4-3	B84143V0011R229*	9.2	6.9	122	90	212	72
12A6-3	B84143V0016R229*	12.1	9.1	172	80	252	72
017A-3	B84143V0025R229*	16	12.1	232	140	372	75
025A-3	B84143V0025R229*	24	17.7	337	140	477	75
032A-3	B84143V0033R229*	31	23.4	457	160	617	75
038A-3	B84143V0050R229*	37	27.5	562	220	782	78
045A-3	B84143V0050R229*	43	32.4	667	220	887	78
061A-3	B84143V0066R229*	58	43.7	907	250	1157	78
072A-3	B84143V0075R229*	64	48.2	1117	310	1427	79
087A-3	B84143V0095R229*	77	58.0	1120	400	1520	79
105A-3	B84143V0130R230**	91	68.6	1295	600	1895	80
145A-3	B84143V0162R229**	126	94.6	1440	550	1990	80
169A-3	B84143V0162R229**	153	115.0	1940	550	2490	80
206A-3	B84143V0230R229**	187	140.6	2310	900	3210	80
246A-3	B84143V0230R229**	209	157.6	3300	900	4200	80
293A-3	B84143V0390R229**	249	187.8	3900	1570	5470	80
363A-3	B84143V0390R229**	297	223.6	4800	1570	6370	80
430A-3	B84143V0390R229**	352	265.2	6000	1570	7570	80
U_N = 500 V							
02A1-5	B84143V0004R229*	1.9	1.4	30	60	90	72
03A0-5	B84143V0004R229*	2.8	2.1	40	60	100	72
03A4-5	B84143V0004R229*	3.1	2.3	52	60	112	72

Drive type ACS880-01-...	Sine filter type	$I_{cont.\ max}$	$P_{cont.\ max}$	Heat dissipation			Noise
				Drive	Filter	Total	
		A	kW	W	W	W	dB (A)
04A8-5	B84143V0006R229*	4.4	3.3	73	100	173	72
05A2-5	B84143V0006R229*	4.8	3.6	94	100	194	72
07A6-5	B84143V0011R229*	7.0	5.3	122	90	212	72
11A0-5	B84143V0011R229*	10.2	7.7	172	90	262	72
014A-5	B84143V0016R229*	13	9.8	232	80	312	70
021A-5	B84143V0025R229*	20	14.7	337	140	477	75
027A-5	B84143V0033R229*	25	18.8	457	160	617	75
034A-5	B84143V0050R229*	32	23.7	562	220	782	78
040A-5	B84143V0050R229*	35	26.0	667	220	887	78
052A-5	B84143V0066R229*	44	33.2	907	250	1157	78
065A-5	B84143V0066R229*	52	39.2	1117	250	1367	78
077A-5	B84143V0075R229*	61	46.0	1120	310	1430	78
096A-5	B84143V0130R230**	80	60.6	1295	630	1925	80
124A-5	B84143V0130R230**	104	78.7	1440	630	2070	80
156A-5	B84143V0162R229**	140	105.8	1940	550	2490	80
180A-5	B84143V0162R229**	161	121.3	2310	550	2860	80
240A-5	B84143V0230R229**	205	154.3	3300	900	4200	80
260A-5	B84143V0230R229**	221	166.7	3900	900	4800	80
361A-5	B84143V0390R229**	289	217.9	4800	1570	6370	80
414A-5	B84143V0390R229**	332	250.1	6000	1570	7570	80
U_N = 690 V							
07A4-7	B84143V0010R230*	7.3	5.5	114	90	204	72
09A9-7	B84143V0010R230*	9.3	7.0	143	90	233	72
14A3-7	B84143V0018R230*	13.5	10.2	207	130	337	72
019A-7	B84143V0018R230*	17.1	12.9	274	130	404	72
023A-7	B84143V0026R230*	21	15.7	329	160	489	72
027A-7	B84143V0026R230*	25	18.6	405	160	565	72
07A3-7	B84143V0010R230*	7.3	5.5	217	90	307	72
09A8-7	B84143V0010R230*	9.3	7.0	284	90	374	72
14A2-7	B84143V0018R230*	13.5	10.2	399	130	529	72
018A-7	B84143V0018R230*	17.1	12.9	490	130	620	72
022A-7	B84143V0026R230*	21	15.7	578	160	738	72
026A-7	B84143V0026R230*	25	18.6	660	160	820	72

Drive type ACS880-01-...	Sine filter type	$I_{cont.\ max}$	$P_{cont.\ max}$	Heat dissipation			Noise
				Drive	Filter	Total	
		A	kW	W	W	W	dB (A)
035A-7	B84143V0040R230*	33	25.1	864	250	1114	75
042A-7	B84143V0040R230*	40	30.1	998	250	1248	75
049A-7	B84143V0056R230**	48	36.2	1120	290	1410	78
061A-7	B84143V0056R230**	56	42.5	1295	290	1585	78
084A-7	B84143V0092R230**	78	58.6	1440	610	2050	79
098A-7	B84143V0092R230**	92	69.3	1940	610	2550	79
119A-7	B84143V0130R230**	112	84.2	2310	630	2940	80
142A-7	B84143V0130R230**	112	84.7	3300	630	3930	80
174A-7	B84143V0207R230**	138	103.7	3900	930	4830	80
210A-7	B84143V0207R230**	161	121.3	4200	930	5130	80
271A-7	B84143V0207R230**	208	156.4	4800	930	5730	80
* minimum switching frequency 3.0 kHz							
** minimum switching frequency 2.4 kHz							

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Definitions

$P_{cont.\ max}$	Maximum continuous output power of the drive
$I_{cont.\ max}$	Maximum continuous output current of the drive
Noise	Noise level of the sine filters

Derating

See section *Deratings for special settings in the drive control program* on page *178*.

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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