# Quick installation and start-up guide ACS480 Drive







### Safety instructions

Read the safety instructions in the ACS480 Hardware manual (3AXD50000047392



WARNING! Obey these safety instructions to prevent physical injury or death, or damage to the equipment. If you are not a qualified electrician, do not do electrical installation or maintenance work.

- When you install the drive, make sure that dust does not go into the drive.
- When the drive or connected equipment is energized, do not do work on the drive, motor cable, motor, control cables or control circuits
- After you disconnect the input power, wait for 5 minutes to let the intermediate circuit capacitors discharge.
- Make sure that the equipment is not energized:
- Use a multimeter with an impedance of at least 1 Mohm.
- Make sure that the voltage between the drive output terminals (U, V, W) and the ground (PE) is 0 V.
- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the ground (PE) is 0 V.
- Make sure that the voltage between the DC and brake resistor terminals (UDC+, UDC- and R-) and the ground (PE) is 0 V.
- If you use a permanent magnet synchronous motor, do not do work on the drive when the motor rotates. A permanent magnet motor that rotates energizes the drive and the input power terminals.



**WARNING!** The installation, start-up and operation of this equipment requires detailed instructions. Refer to the detailed instructions in the ACS480 Hardware manual (3AXD50000047392 [EN]) and ACS480 Firmware manual (3AXD50000047399 [EN]). You can download these manuals from the ABB website or order hard copies of the manuals with the delivery. Keep this guide near the unit at all times

# 1. Examine the installation area

The drive is intended for cabinet installation and has an ingress protection rating of

Make sure that in the installation area:

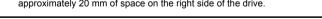
- There is sufficient cooling and hot air does not recirculate.
- The ambient conditions are suitable. Refer to Free space requirements.
- The mounting surface is non-flammable and can hold the weight of the drive. Refer to Dimensions and weights.
- Materials near the drive are non-flammable.
- There is sufficient space above and below the drive maintenance work. Refer to

# 2. Install the drive

You can install the drive with screws or to a DIN rail.

Installation requirements:

- Make sure that there is a minimum of 75 mm of free space at the top and bottom of the drive for cooling air.
- You can install the R1, R2, R3 and R4 drives tilted by up to 90 degrees, from vertical to fully horizontal orientation.
- You can install several drives side by side. Side-mounted options require approximately 20 mm of space on the right side of the drive.

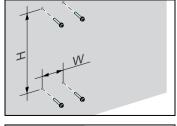


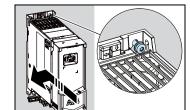


WARNING! Do not install the drive upside down. Make sure that the cooling air exhaust (at the top) is always above the cooling air inlet (at the bottom)

### To install the drive with screws

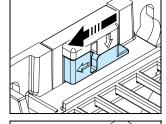
- Make marks onto the surface for the mounting holes. Refer to ons and weights. The R3 and R4 drives come with a mounting template.
- Make the holes for the mounting screws and install suitable plugs or
- Start to tighten the screws into the mounting holes
- Install the drive onto the mounting screws
- Tighten the mounting screws 5.



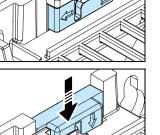


#### To install the drive to a DIN rail

- Move the locking part to the left.
- 2. Push and hold the locking button down.
- Put the top tabs of the drive onto the top edge of the DIN installation rail.
- Put the drive against the bottom edge of the DIN installation rail.



- Release the locking button.
- Move the locking part to the right.
- Make sure that the drive is correctly
- To remove the drive, use a flat-head screwdriver to open the locking part.



### 3. Measure the insulation resistance

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

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

#### Motor and motor cable:

- Make sure that the motor cable is connected to the motor and disconnected from the drive output terminals T1/U, T2/V and T3/W.
- Use a voltage of 500 V DC to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of an ABB motor must be more than 100 Mohm (at 25 °C/77 °F). For the insulation resistance of other motors, refer to the manufacturer's documentation.



Moisture in the motor decreases the insulation resistance. If you think that there is moisture in the motor, dry the motor and do the measurement again.

### 4. Select the cables

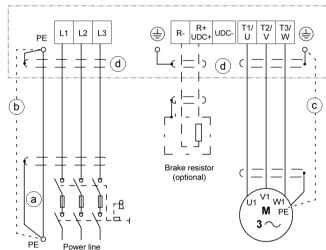
**Input power cable:** For the best EMC perfomance, use a symmetrical shielded cable and two grounding conductors

Motor cable: Use a symmetrical shielded cable

 $\label{localize} \textbf{Control cable:} \ Use a double-shielded twisted-pair cable for the analog signals. \ Use a double- or single-shielded cable for the digital, relay and I/O signals. \ Do not mix 24 V and 115/230 V signals in the same cable.$ 

#### 5. Connect the power cables

### **Connection diagram**



- Two grounding conductors. Use two conductors, if the cross-section of the grounding conductor is less than 10 mm<sup>2</sup> Cu or 16 mm<sup>2</sup> Al (IEC/EN 61800-5-1). For example, use the cable shield in addition to the fourth conductor.
- Separate grounding cable (line side). Use it if the conductivity of the fourth conductor or shield is not sufficient for the protective grounding.
- Separate grounding cable (motor side). Use it if the conductivity of the shield is not sufficient for the protective grounding, or there is no symmetrically constructed grounding conductor in the cable.
- 360-degree grounding of the cable shield. This is required for the motor cable and brake resistor cable, and recommended for the input power cable.

# **Connection procedure**

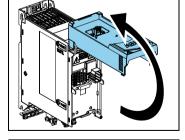


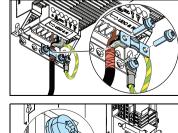
WARNING! Obey the safety instructions in the ACS480 Hardware manual (3AXD50000047392 [EN]). If you ignore them, injury or death, or damage to the equipment can occur.

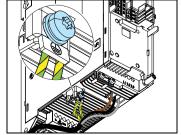
WARNING! If the drive is connected to an IT (non-grounded) system or to a corner-grounded TN system, disconnect the EMC filter grounding screw.

Note! If you power up the drive before you install the I/O or fieldbus module, the drive

- Open the front cover. To open the front cover, loosen the locking screw and lift the front cover up.
- Strip the motor cable.
- Ground the motor cable sh the grounding clamp.
- Twist the motor cable shield into a bundle, mark it accordingly and connect it to the grounding terminal
- Connect the phase conductors of the motor cable to the T1/U, T2/V and T3/W motor terminals. Torque the terminals to 0.8 N·m (7 lbf·in).
- If it is applicable, connect the brake resistor cable to the R- and UDC+ terminals. Torque the terminals to 0.8 N·m (7 lbf·in). Use a shielded cable and ground the shield under the grounding clamp
- Strip the input power cable.
- If the input power cable has a shield, twist it into a bundle, mark it and connect it to the grounding terminal.
- Connect the PE conductor of the input power cable to the grounding terminal. If it is necessary, use a second PE conductor.
- Connect the phase conductors of the input power cable to the L1, L2 and L3 input terminals. Torque the terminals to 0.8 N·m (7 lbf·in)
- Mechanically attach the cables on



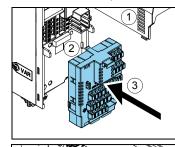




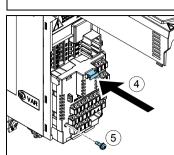
#### 6. Install the communication module

To install the communication module (I/O module or fieldbus module):

- Open the front cover.
- Align the communication module contacts with the contacts on the
- Carefully push the communication module into position.







### 7. Connect the control cables

#### Connection procedure

Do the connections according to the default control connections of the application macro that you select. For the connections of the factory default macro (ABB standard macro), refer to *Default I/O connections (ABB standard macro)*. For the other macros, refer to the *ACS480 Firmware manual* (3AXD50000047399 [EN]).

Note! If you do not use the I/O module, select the ABB limited macro.

Keep the signal wire pairs twisted as near to the terminals as possible to prevent inductive coupling

- Strip a part of the outer shield of the control cable for grounding.
- Use a cable tie to ground the outer shield to the grounding tab.
- Strip the control cable conductors
- Connect the conductors to the correct control terminals. Torque the terminals to 0.5 N·m (4.4 lbf·in).
- Connect the shields of the twisted pairs and grounding wires to the SCR terminal. Torque the terminals to 0.5 N·m (4 lbf·in).
- Mechanically attach the control cables on the outside of the drive.
- Close the front cover and tighten the

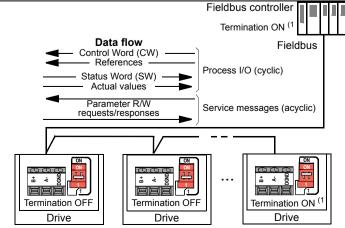
### Default I/O connections (ABB standard macro)

For the standard drive with the I/O module. The fixed terminals in the base module are marked in the table:

Termina	ıl	Description						
		Reference voltage and analog I/O						
	SCR	Signal cable shield (screen)						
	Al1	Output fre	equency/speed reference: 010 V					
	AGND		put circuit common					
	+10 V	Referenc	e voltage 10 V DC					
110 kohm	Al2	Not configured						
_ []]	AGND		put circuit common					
	A01	,	equency: 020 mA					
	AO2		ırrent: 020 mA					
$\sqrt{}$	AGND		Analog output circuit common					
max. 500 ohm		Aux. voltage output and programmable digital inputs						
	+24 V		age output +24 V DC, max. 250 mA	Х				
	DGND		age output common	X				
	DCOM	out common for all	X					
	DI1	Stop (0)/S		X				
	DI2		(0)/Reverse (1)	X				
	DI3		frequency/speed selection	_^				
	DI4		frequency/speed selection					
		DI5 Ramp set 1 (0)/Ramp set 2 (1)						
	DI6	Not configured						
	DI0	Relay outputs						
	RO1C	Ready						
	RO1A		250 V AC/30 V DC	X				
	RO1B		250 V AC/30 V DC	X				
	RO2C	_	Running	^				
			250 V AC/30 V DC					
	RO2A RO2B	$\neg$	250 V AC/30 V DC					
			=::					
	RO3C		Fault (-1)					
l á —	RO3A	$\neg$	250 V AC/30 V DC					
	RO3B		2 A					
	5.		A-485 Modbus RTU					
	B+	∟mbedde	d Modbus RTU (EIA-485)					
,	A-							
	DGND							
	TERM&BIAS		a link termination switch					
			Safe torque off					
	SGND		ue off. Factory connection. Both	Х				
	IN1	circuits m	ust be closed for the drive to start.	Х				
H.	IN2			Х				
	OUT1			Х				
	+24V		voltage output. The alternative terminals					
	DGND	have the	same supply as the base unit.					
	DCOM							

# Connecting EIA-485 Modbus RTU terminal to the drive

Connect the fieldbus to the EIA-485 Modbus RTU terminal on the BMIO-01 module which is attached on the control unit of the drive. The connection diagram is shown



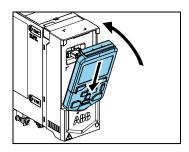
1) The device at both ends on the fieldbus must have termination set to ON

### 8. Install the control panel

To install the control panel:

it locks into position.

- Close the front cover and tighten the locking screw.
- Put the bottom edge of the control panel into position
- Push the top of the control panel until



#### 9. Start up the drive

For information on the start-up and drive parameters, refer to the ACS480 Firmware manual (3AXD5000047399 [EN]).



WARNING! Before you start up the drive, make sure that the installation is complete. Make sure that the cover of the drive and the cable box, if included, are in place

Make sure that the motor does not cause danger when it starts. Disconnect the motor from other machinery, if there is a risk of damage or injury.

For information on the user interface, refer to the ACS-AP-x Assistant control panel user's manual (3AUA0000085685 [EN]).

The control panel has softkeys below the display to access the corresponding commands, and arrow keys to navigate the menu and change parameter values. Push the "?" button to open the help function.

First start-up:

Make sure that you have the motor data (from the name plate) available.

1. Set the main power to on.



Select the user interface language with the arrow keys and set it with the right softkey (OK).



Select Start set-up and push the right softkey (Next).



- Select the localization and push the right softkey (Next).
- To complete the start-up procedure, enter the settings and values when you are prompted by the set-up assistant.

To set up fieldbus communications for a fieldbus adapter, refer to the applicable fieldbus adapter manual and to the *ACS480 Firmware manual* (3AXD50000047399 [EN]).

You can also use *Primary settings* in the Main menu to configure the unit.

	15:02	Next
Local♦	C ACS480	\$0.0 Hz
Localizat	ion	
Unit defau		
Internatio		
US standa	ard (Imperial)	
Back	08:27	Next
Local♦	C ACS480	<b>\$</b> 0.2 Hz
Main mer	nu	
🌣 Pri	mary settings	٠
<b>₽®</b> 1/0	)	•
<b>∕</b> ✓ Dia	gnostics	•
Exit	09:30	Select

# Fieldbus communications

You can connect the drive to a serial communication link via a fieldbus adapter module or the embedded fieldbus interface. The embedded fieldbus interface is included in the I/O module, and it supports the Modbus RTU protocol. The table shows the minimum set of parameters for embedded Modbus communication. For the fieldbus adapter module settings, refer to the appropriate documentation.

Note! Embedded Modbus is valid with the I/O module.

To configure embedded Modbus communications:

- Connect the fieldbus cable and the required I/O signals. Refer to Default I/O connections (ABB standard macro)
- 2. If it is necessary, set the termination switch to ON
- 3. Power up the drive.
- Select the ABB limited 2-wire macro from Primary settings or with parameter
- 5. Configure fieldbus communications from the parameter list. The minimum parameters that apply to embedded Modbus RTU:

Parameter	Setting
20.01 Ext1 commands	Embedded fieldbus
20.03 Ext1 in 1 source	Selected
28.11 Ext1 frequency ref1 (scalar)	EFB ref1
31.11 Fault reset selection	DI1
58.01 Protocol enable	Modbus RTU
58.03 Node address	1 (default)
58.04 Baud rate	19,2 kbps (default)
58.05 Parity	8 EVEN 1 (default)

If you need to change other parameters, you can set them manually. Refer to the 6. ACS480 Firmware manual (3AXD50000047399 [EN]) and the applicable fieldbus adapter documentation.

### Warnings and faults generated by the drive

Warning	Fault	Description
A2A1	2281	Warning: Current calibration is done at the next start. Fault: Output phase current measurement fault.
A2B1	2310	Overcurrent. The output current is more than the internal limit. This can be caused by an earth fault or phase loss.
A2B3	2330	Earth leakage. A load unbalance that is typically caused by an earth fault in the motor or the motor cable.
A2B4	2340	Short circuit. There is a short circuit in the motor or the motor cable.
	3130	Input phase loss. The intermediate DC circuit voltage oscillates.
	3181	Cross connection. The input and motor cable connections are incorrect.
A3A1	3210	DC link overvoltage. There is an overvoltage in the intermediate DC circuit.
A3A2	3220	DC link undervoltage. There is an undervoltage in the intermediate DC circuit.
	3381	Output phase loss. All three phases are not connected to the motor.
A5A0	5091	Safe torque off. The Safe torque off (STO) function is on.
	6681	EFB communication loss. Break in embedded fieldbus communication.
	7510	FBA A communication. Communication lost between drive and fieldbus adapter.
A7AB		Extension I/O configuration failure. I/O module is not installed into drive or ABB limited macro is not selected.
AFF6		Identification run. The motor ID run occurs at the next start.
FA81		Safe torque off 1. The Safe torque off circuit 1 is broken.
FA82		Safe torque off 2. The Safe torque off circuit 2 is broken.

For the complete list of warnings and faults, refer to the ACS480 Firmware manual (3AXD50000047399 [EN]).

#### **Ratings**

For detailed technical information, refer to the ACS480 Hardware manual (3AXD50000047392 [EN]).

#### IEC ratings

Туре	Input	Input	Max.			Output	ratings		ı					
ACS480- 04-	rating	with choke			uty use	Heavy-c	size							
	I <sub>1N</sub>	<i>I</i> <sub>1N</sub>	I <sub>max</sub>	I <sub>N</sub>	P <sub>N</sub>	I <sub>Ld</sub>	P <sub>Ld</sub>	I <sub>Hd</sub>	P <sub>Hd</sub>					
	Α	Α	Α	Α	kW	Α	kW	Α	kW					
3-phase U <sub>N</sub> = 380440 V														
02A7-4	4.2	2.6	3.2	2.6	0.75	2.5	0.75	1.8	0.55	R1				
03A4-4	5.3	3.3	4.7	3.3	1.1	3.1	1.1	2.6	0.75	R1				
04A1-4	6.4	4.0	5.9	4.0	1.5	3.8	1.5	3.3	1.1	R1				
05A7-4	9.0	5.6	7.2	5.6	2.2	5.3	2.2	4.0	1.5	R1				
07A3-4	11.5	7.2	10.1	7.2	3.0	6.8	3.0	5.6	2.2	R1				
09A5-4	15.0	9.4	13.0	9.4	4.0	8.9	4.0	7.2	3.0	R1				
12A7-4	20.2	12.6	16.9	12.6	5.5	12.0	5.5	9.4	4.0	R2				
018A-4	27.2	17.0	22.7	17.0	7.5	16.2	7.5	12.6	5.5	R3				
026A-4	40.0	25.0	30.6	25.0	11.0	23.8	11.0	17.0	7.5	R3				
033A-4	45.0	32.0	45.0	32.0	15.0	30.5	15.0	25.0	11.0	R4				
039A-4	50.0	38.0	57.6	38.0	18.5	36.0	18.5	32.0	15.0	R4				
046A-4	56.0	45.0	68.4	45.0	22.0	42.8	22.0	38.0	18.5	R4				
050A-4	60.0	50.0	81.0	50.0	22.0	48.0	22.0	45.0	22.0	R4				

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#### **NEMA** ratings

Туре	Input	Input		Output	ratings		Frame
ACS480-04-	rating	with choke			al use Heavy-c		size
	I <sub>1N</sub>	I <sub>1N</sub>	/ <sub>Ld</sub>	$P_{Ld}$	/ <sub>Hd</sub>	$P_{Hd}$	•
	Α	Α	Α	hp	Α	hp	
3-phase <i>U</i> <sub>N</sub> = 460 V (44)	0480 V)						
02A7-4	3.4	2.1	2.1	1.0	1.6	0.75	R1
03A4-4	4.8	3.0	3.0	1.5	2.1	1.0	R1
04A1-4	5.4	3.4	3.4	2.0	3.0	1.5	R1
05A7-4	7.7	4.8	4.8	2.0	3.4	2.0	R1
07A3-4	9.6	6.0	6.0	3.0	4.0	2.0	R1
09A5-4	12.2	7.6	7.6	5.0	4.8	3.0	R1
12A7-4	17.6	11.0	11.0	7.5	7.6	5.0	R2
018A-4	22.4	14.0	14.0	10.0	11.0	7.5	R3
026A-4	33.6	21.0	21.0	15.0	14.0	10.0	R3
033A-4	37.9	27.0	27.0	20.0	12.0	15.0	R4
039A-4	44.7	34.0	34.0	25.0	27.0	20.0	R4
046A-4	49.8	40.0	40.0	30.0	34.0	25.0	R4
050A-4	50.4	42.0	42.0	30.0	40.0	30.0	R4

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# **Fuses**

For more information on fuses, circuit breakers and manual motor protectors, refer to the ACS480 Hardware manual (3AXD50000047392 [EN]).

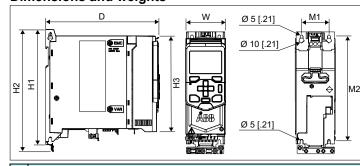
### **Ambient conditions**

Requirement	During operation (installed for stationary use)
Installation altitude	<b>230 V units</b> : 02000 m above sea level (with derating above 1000 m) <b>400 V units</b> : 04000 m above sea level (with derating above 1000 m) $^{(1)}$
Air temperature	-10+50 °C (14122 °F). Up to +60 °C with derating. No frost allowed.
Relative humidity	Up to 95% without condensation
Contamination levels	Class 3C2
(IEC 60721-3-3)	Class 3S2
Shock (IEC 60068-2-27, ISTA 1A)	Not allowed
Free fall	Not allowed

1) Up to 4000 m is possible for 400 V units, if the maximum switching voltage for the integrated Relay Output 1 is 30 V at 4000 m (e.g. do not connect 250 V to Relay Output 1). Up to 250 V is permitted up to 2000 m.

For a 3-phase 400 V drive at 2000...4000 m, only the following power systems are permitted: TN-S, TN-c, TN-CS, TT (not corner earthed).

#### **Dimensions and weights**



		Dimensions and weights														
	Н	H1 H2 H3 W D		N	M1		M2		Weight							
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb
R1	205	8.07	223	8.78	176	6.93	73	2.87	207	8.15	50	1.97	191	7.52	1.77	3.90
R2	205	8.07	223	8.78	176	6.93	97	3.80	207	8.15	75	2.95	191	7.52	2.35	5.19
R3	205	8.07	220	8.66	176	6.93	172	6.76	207	8.15	148	5.83	191	7.52	3.52	7.76
R4	205	8.07	240	9.45	176	6.93	260	10.24	212	8.35	238	9.37	191	7.52	6.02	13.3

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### Free space requirements

Frame size	Free space required							
	Ab	ove	Bel	ow	Sides			
	mm	in	mm	in	mm	in		
R1R4	75	2.95	75	2.95	0	0		

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#### Certifications

The applicable certifications are shown on the product's type label.











# **Declaration of conformity**

# **EU Declaration of Conformity**

Machinery Directive 2006/42/EC

Manufacturer

Hiomotie 13, 00380 Helsinki, Finland. Address:

+358 10 22 11

declare under our sole responsibility that the following product

Frequency converter AC\$480-04

functionality

with regard to the safety function

Safe torque off

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

The following harmonized standards have been applied:

EN 62061:2005 + AC:2010 + A1:2013 + A2:2015

Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

Safety of machinery - Safety-related parts of control systems. Part EN ISO 13849-1:2015 Safety of machinery – Safety-related parts of the control systems EN ISO 13849-2:2012

Part 2: Validation EN 60204-1: 2006 + A1:2009 + 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
Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional IEC 61800-5-2:2016

The product[s] referred in this Declaration of conformity fulfil[s] the relevant provisions of other European Union Directives which are notified in Single EU Declaration of conformity 3AXD10000594967.

Person authorized to compile the technical file:

Name and address: Risto Mynttinen, Hiomotie 13, 00380 Helsinki, Finland.

Helsinki, 9 Feb 2018

Manufacturer representative:

cherren -Vesa Kandell

### Related documents

Document	Code (English)
ACS480 Hardware manual	3AXD50000047392
ACS480 Firmware manual	3AXD50000047399
ACS480 Quick installation and start-up guide	3AXD50000047400
FDNA-01 DeviceNet adapter module quick guide	3AXD50000158515
FENA-01/-11/-21 Ethernet adapter module user's manual	3AUA0000093568
FMBT-21 Modbus/TCP adapter module quick guide	3AXD50000158560
FPBA-01 PROFIBUS DP adapter module user's manual	3AFE68573271
FPNO-21 PROFINET adapter module quick guide	3AXD50000158577



https://www.voutube.com/watch?v=L-rGHZ8I1zg https://www.youtube.com/watch?v=nICGj9ntzA0



Online installation videos:



