

ACS 140

User's Guide

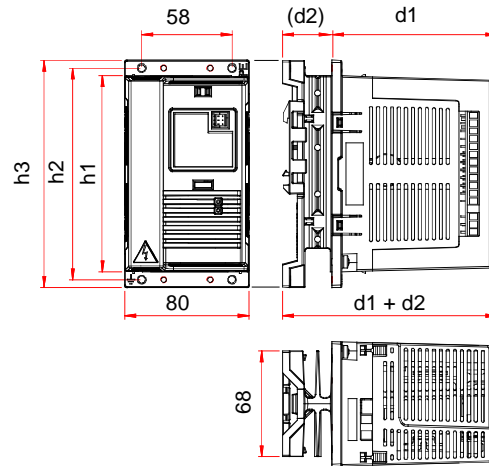


Installation

Study this guide carefully before proceeding. Failure to observe the warnings and instructions given may cause a malfunction or personal hazard.

- 1 CHECK the environment. See **P**
- 2 INSTALL the ACS 140. See **A, B**
- 3 REMOVE the cover. See **C**
- 4 USE a warning sticker in the language of your choice. See **E**
- 5 IDENTIFY power and control terminals. See **D, E, G**
- 6 CHECK voltage supply. See **F**
- 7 CHECK the motor. See **H**
- 8 CHECK the U/I Jumper Socket S1. See **G**
- 9 CONNECT power terminals. See **D, E**
- 10 CONNECT control wires. See **E, G, I**
- 11 REPLACE the cover. See **J**
- 12 TURN the power on. See **K**

A Dimensions (mm)



Frame Size IP 20	200 V Series						Weight (kg)		
	h1	h2	h3	d1	(d2)	d1+d2	1~	3~	
A	126	136	146	106	32	138	0.9	0.8	
B	126	136	146	106	69	175	1.2	1.1	
C	198	208	218	106	104	210	2.2	2.0	
D	225	235	245	113	115	228	2.7	2.5	
	400 V Series								
B	126	136	146	106	69	175		1.1	
C	198	208	218	106	104	210		2.0	
D	225	235	245	113	115	228		2.5	

B Installing the ACS 140

Install the ACS 140 vertically. Leave 25 mm free space above and below the unit. Ensure that there is sufficient cool air in the cabinet to compensate for the power losses listed at the end of section P, Technical Data.

Wall mounting

Use M4 screws.

DIN rail (35 mm)

Press the lever on top of the unit while installing on / removing from DIN rail.

Flange mounting

The ACS 140 can be installed so that the heat sink is in an air duct. The power circuit losses will then be dissipated outside leaving only the control circuit losses to be dissipated inside (see P).


C Removing the Cover

Press the four snap-on buttons in the top and bottom corners of the unit simultaneously.



Warning! Turn power off and wait at least 5 minutes. Measure the voltage before removing cover.

D Cable Connections

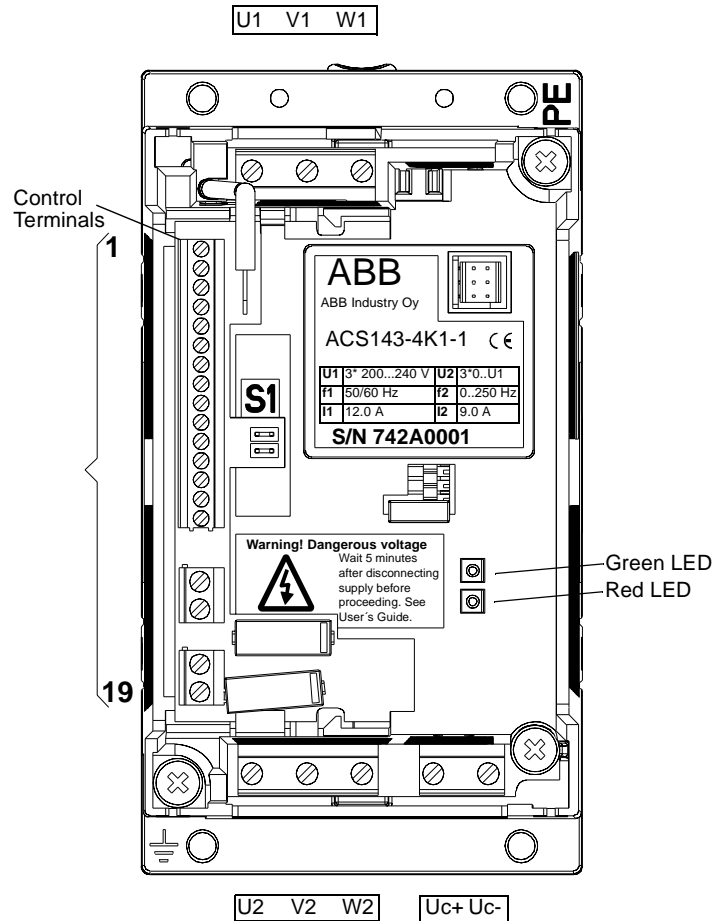
Terminal	Description	Note
L, N	1~ power supply input	In figure below (see E), a 3~ unit is shown.
U1, V1, W1	3~ power supply input	Do not use in 1~ supply!
PE	Protective Earth	Min. 4 mm ² Cu wire.
U2, V2, W2	Power output to motor	Max. cable length 75 m without output choke.
Uc+, Uc-	DC bus	For optional ACS 140 braking unit.
	Motor cable shield	

Follow local rules for cable cross-sections. Use shielded motor cable. Route the motor cable away from control wires and the power supply cable to avoid electromagnetic interference.



Note! See ACS 140 EMC instructions.

E Terminal Interface



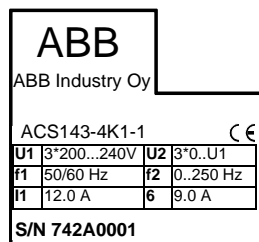
F Type Designation Label and Code Key

Supply:

ACS 141 = 1 ~
ACS 143 = 3 ~

ACS 141-xxx-1 = 200 V
ACS 141-xxx-3 = 400 V

Power:
4K1 = 4.1 kVA



Serial number:

S/N 742A0001
7 = Year
42 = Week
A0001=Internal
number

G Control Terminals

The analogue input signal is selected with U/I jumper S1.

S1 open = U and S1 connected = I.

No.	Identification	Description
1	SCR	Terminal for signal cable screen. (Connected internally to frame earth.)
2	AI 1	Analogue input channel 1, programmable. Default: 0 - 10 V ($R_i = 190 \text{ k}\Omega$) (S1:1:U) \Leftrightarrow 0 - f_{nom} output frequency 0(4) - 20 mA ($R_i = 500 \Omega$) (S1:1:I) \Leftrightarrow 0 - f_{nom} output frequency Resolution 0.1 % accuracy ± 1 %.
3	AGND	Analogue input circuit common. (Connected internally to frame earth through 1 M Ω .)
4	10 V	10 V/10 mA reference voltage output for analogue input potentiometer, accuracy ± 2 %.
5	AI 2	Analogue input channel 2, programmable. Default: 0 - 10 V ($R_i = 190 \text{ k}\Omega$) (S1:2:U) 0 - 20 mA ($R_i = 500 \Omega$) (S1:2:I) Resolution 0.1 % accuracy ± 1 %.
6	AGND	Analogue input circuit common. (Connected internally to frame earth through 1 M Ω .)
7	AO	Analogue output, programmable. Default: 0-20 mA (load < 500 Ω) \Leftrightarrow 0- f_{nom}
8	AGND	Common for DI return signals.
9	12 V	Aux. voltage output 12 V DC / 100 mA (reference to AGND). Short circuit protected.
10	DCOM	Digital input common. To activate a digital input, there must be +12 V (or -12 V) between that input and DCOM. The 12 V may be provided by the ACS 140 (X1:9) as in the connection examples (see J) or by an external 12-24 V (max 28 V) source of either polarity .
DI Configuration		Factory (0) ($f_{nom} = 50 \text{ Hz}$)
11	DI 1	Start. Activate to start. Motor will ramp up to frequency reference. Disconnect to stop. Motor will coast to stop.
12	DI 2	Reverse. Activate to reverse rotation direction.
13	DI 3	Jog. Activate to set output frequency to jogging frequency (default: 5 Hz).
14	DI 4	Has to be deactivated.
15	DI 5	Acceleration/deceleration ramp time selection (5 s/ 60 s). Activate to select 60 s ramp times.
16	DO 1A	Relay output 1, programmable (default: fault relay). Fault: DO 1A and DO 1B not connected. 12 - 250 V AC / 30 V DC, 10 mA - 2 A
17	DO 1B	
18	DO 2A	Relay output 2, programmable (default: running). Running: DO 1A and DO 1B connected. 12 - 250 V AC / 30 V DC, 10 mA - 2 A
19	DO 2B	

Digital input impedance 1.5 k Ω .

Use multi-strand 0.5-1.5 mm² wire.

Note! DI 4 is read only when powered-up (Factory macro 0 and 1).

Note! For fail safe reasons the fault relay signals a "fault", when the ACS 140 is powered down.

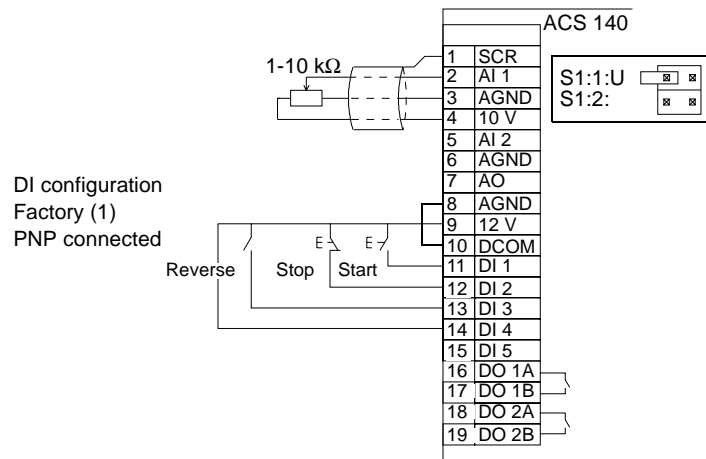
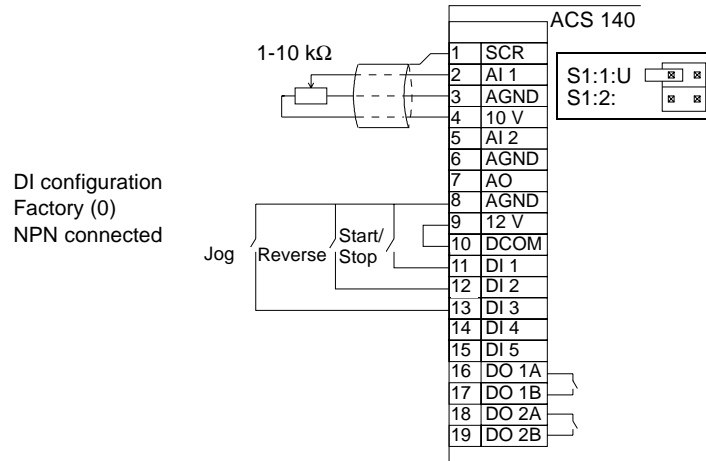
Note! Terminals 3, 6 and 8 are at the same potential.

H Motor

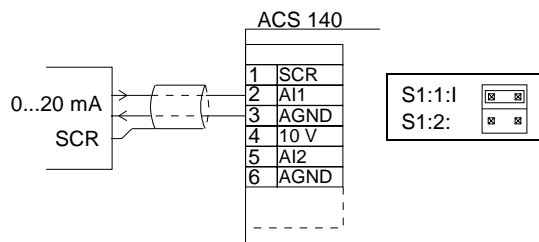
Check that the motor is compatible. The motor must be a three-phase induction motor, with U_N from 200 to 240 V or from 380 to 480 V and f_N either 50 Hz or 60 Hz.

The motor nominal current, I_N , must be less than the nominal output current of the ACS 140, I_2 (See F and P).

I Connection Examples



Frequency Reference from a Current Source



J Replace the Cover

Do not turn the power on before snapping the cover back on.

K Power On

When power is supplied to the ACS 140, the green LED comes on.

L Protection Features

The ACS 140 has a number of protective features:

- Overcurrent
- Overvoltage
- Undervoltage
- Overtemperature
- Output earth fault
- Output short circuit
- Input phase loss (3~)
- Power loss ride through (500 ms)
- I/O terminal short circuit protection
- Long-term overcurrent limit trip 110 %
- Short-term current limit 150 %
- Motor overload protection (see **N**)
- Stall protection

The ACS 140 has the following LED alarm and fault indicators:

Red LED: off Green LED: blinking	ABNORMAL CONDITION
ABNORMAL CONDITION: <ul style="list-style-type: none"> • ACS 140 cannot fully follow control commands. • Blinking lasts 15 seconds. 	POSSIBLE CAUSES: <ul style="list-style-type: none"> • Acceleration or deceleration ramp is too fast in relation to load torque requirement • A short voltage interruption

Red LED: on Green LED: on	FAULT
ACTION: <ul style="list-style-type: none"> • Give a stop signal to reset fault. • Give a start signal to restart the drive. NOTE: If the drive fails to start, check that the input voltage is within the tolerance range.	POSSIBLE CAUSES: <ul style="list-style-type: none"> • Transient overcurrent • Over-/undervoltage • Overtemperature CHECK: <ul style="list-style-type: none"> • the supply line for phase loss or disturbances. • the drive for mechanical problems that might cause overcurrent. • that heat sink is clean.

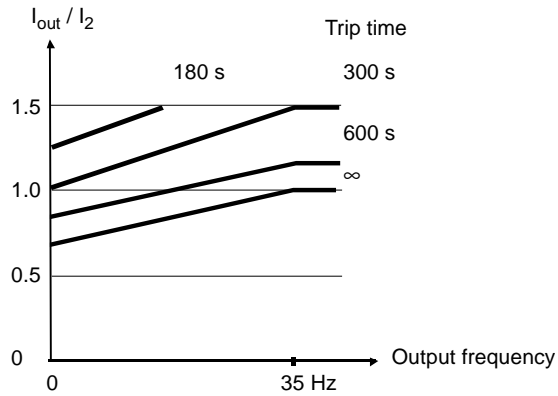
Red LED: blinking Green LED: on	FAULT
ACTION: <ul style="list-style-type: none"> • Turn the power off. • Wait for the LEDs to turn off. • Turn the power back on. Caution! This action may start the drive.	POSSIBLE CAUSE: <ul style="list-style-type: none"> • Output earth fault • Short circuit CHECK: <ul style="list-style-type: none"> • the isolations in the motor circuit.

Note! Whenever the ACS 140 detects a fault condition, the fault relay activates. The motor stops and the ACS 140 will wait to be reset. If the fault still persists and no external cause has been identified, contact your ACS 140 supplier.

M Motor Overload Protection

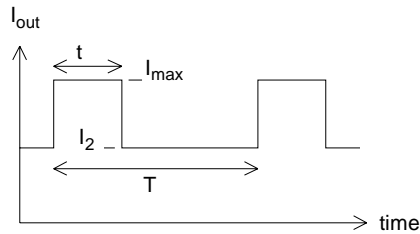
If the motor current I_{out} exceeds I_2 of the ACS 140 for a prolonged period, the ACS 140 automatically protects the motor from overheating by tripping.

The trip time depends on the extent of the overload (I_{out} / I_2), the output frequency and f_{nom} . Times given apply to a "cold start".

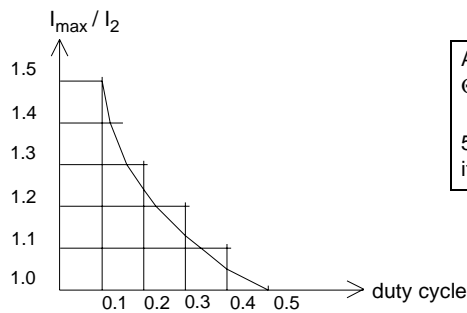


N Loadability of ACS 140

In the event of an output overload, the ACS 140 will trip.



duty cycle = t/T
 $T < 10 \text{ min}$



Ambient temperature, Θ_{amb} max. is 40 °C.
 50 °C is permissible, if I_2 is derated to 80 %.

O Type Series and Technical Data

200 V series							
Nominal motor P _N	kW	0.37	0.55	0.75	1.1	1.5	2.2
1~ Input	ACS141-	K75-1	1K1-1	1K6-1	2K1-1	2K7-1	4K1-1
3~ Input	ACS143-	K75-1	1K1-1	1K6-1	2K1-1	2K7-1	4K1-1
Frame size		A	B	C		D	
Nominal ratings (See F, M)	Unit						
Input voltage U ₁	V	200 V-240 V ±10 % 50/60 Hz (ACS 141: 1~, ACS 143: 3~)					
Output current I ₂	A	2.2	3.0	4.3	5.9	7.0	9.0
Max. output current	A	3.3	4.5	6.5	8.9	10.5	13.5
Output voltage U ₂	V	0 - U ₁ 3~					
Input current I ₁ 1~	A	6.9	9.0	10.8	14.8	18.2	22.0
Input current I ₁ 3~	A	3.2	4.2	5.3	7.2	8.9	12.0
Switching frequency	kHz	4 (Standard) 8 (Low noise *)					
Protection limits	(See M)						
Overcurrent (peak)	A	7.1	9.7	13.8	19.0	23.5	34.5
Overvoltage: Running Start inhibit	V DC V DC	420 (corresponds to 295 V input) 390 (corresponds to 276 V input)					
Undervoltage: Running Start inhibit	V DC V DC	200 (corresponds to 142 V input) 230 (corresponds to 162 V input)					
Overtemperature	°C	90 (heat sink)			95 (heat sink)		
Max. wire sizes							
Power terminals	mm ²	4 single core / torque 0.8 Nm					
Control terminals	mm ²	0.5 - 1.5 (AWG22...AWG16) / torque 0.4 Nm					
Line fuse 1~ ** ACS141-	A	10	10	16	16	20	25
Line fuse 3~ ** ACS143-	A	6	6	6	10	10	16
Power losses							
Power circuit	W	13	19	27	39	48	70
Control circuit	W	14	16	17	18	19	20

* Low noise setting only available with optional control panel.

Derate ambient temperature to 30°C or derate P_N and I₂ to 90 %.

** Fuse type: UL class CC or T. For non-UL installations IEC269 gG.

Use 60°C rated power cable (75°C if T_{amb} above 45°C).

400 V series					
Nominal motor P _N	kW	0.75	1.1	1.5	2.2
3- Input	ACS143-	1K6-3	2K1-3	2K7-3	4K1-3
Frame size		B		C	D
Nominal ratings (See F, M)	Unit				
Input voltage U ₁	V	380V - 480V ±10 % 50/60 Hz (ACS 143: 3-)			
Output current I ₂	A	2.0	2.8	3.6	4.9
Output voltage U ₂	V	0 - U ₁			
Input current I ₁ 3-	A	2.7	4.0	5.1	6.4
Switching frequency	kHz	4 (Standard) 8 (Low noise *)			
Protection limits	(See M)				
Overcurrent (peak)	A	6.6	9.2	11.9	16.3
Overvoltage: Running Start inhibit	V DC V DC	842 (corresponds to 595 V input) 661 (corresponds to 380-415 V input) 765 (corresponds to 440-480 V input)			
Undervoltage: Running Start inhibit	V DC V DC	333 (corresponds to 247 V input) 436 (corresponds to 380-415 V input) 505 (corresponds to 440-480 V input)			
Overtemperature	°C	90 (heat sink)	95 (heat sink)		
Max. wire sizes					
Power terminals	mm ²	4 single core / torque 0.8 Nm			
Control terminals	mm ²	0.5 - 1.5 (AWG22...AWG16) / torque 0.4 Nm			
Line fuse 3- ** ACS143-	A	6.0	6.0	10.0	10.0
Power losses					
Power circuit	W	27	39	48	70
Control circuit	W	17	18	19	20

* Low noise setting only available with optional control panel.

Derate ambient temperature to 30°C or derate P_N and I₂ to 90 %.

** Fuse type: UL class CC or T. For non-UL installations IEC269 gG.

Use 60°C rated power cable (75°C if T_{amb} above 45°C).

P Environmental Limits

- Ambient operating temperature 0 - 40 °C
- Max. ambient temperature 50 °C if P_N and I_2 derated to 80 %
- Installation altitude 0 - 1000 m if P_N and I_2 100 %.
- Installation altitude 0 - 2000 m if P_N and I_2 derated 1 % every 100 m above 1000 m.
- Relative humidity less than 95 % (non-condensing)
- Storage temperature - 40 °C - 70 °C
- Transport temperature -40 °C - 70 °C

The ACS 140 should be installed in clean and dry air, free from dripping water. The installation room must be locked or tool-openable.

Q Product Conformity

The ACS 140 complies with the requirements of the European

- Low Voltage Directive 73/23/EEC with amendments
- EMC Directive 89/336/EEC with amendments

Corresponding declarations and a list of main standards are available on request.




Note! See ACS 140 EMC instructions.


R Environmental Information


The package is made of corrugated board and can be recycled.


A product to be disposed of contains valuable raw material that should be recycled, thus preserving energy and natural resources. Instructions for disposal are available from ABB sales and service companies.


S Safety


 **Warning!** Only a competent electrician may install the ACS 140.


 **Warning!** Dangerous voltages are present when mains supply is connected. Wait at least 5 minutes after disconnecting the supply before removing the cover. Measure the voltage at DC terminals (U_{c+} , U_{c-}) before servicing the unit. See **E**.


 **Warning!** Even when the motor is stopped there are dangerous voltages present at Power Circuit terminals U1, V1, W1 (L,N) and U2, V2, W2 and U_{c+} , U_{c-} .

 **Warning!** Even when the ACS 140 is powered down, there may be dangerous external voltages at relay terminals DO1A, DO1B, DO2A, DO2B.

 **Warning!** The ACS 140 is not a field repairable unit. Never attempt to repair a broken unit; contact the supplier for replacement of the unit.

 **Warning!** The ACS 140 will start up automatically after an input voltage interruption if the external run command is on.

 **Warning!** When the control terminals of two or more ACS100/140 units are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the units or an external supply.

 **Warning!** The heat sink may reach a high temperature (see **P**).

Note! For more technical information, contact the supplier.

Accessories



ACS 100-PAN

Control panel for use with the ACS 100 / ACS 140.

ACS 100-EXT

Extension cable kit for use with the control panel.

ACS 100-FLT-

ACS 140-FLT-

RFI input filter.

ACS 100-CHK-

Input/output chokes.

ACS-BRK-

Braking units.

RS485/232 Adapter

ACS 140 is supported by Drives

Tools

Contact your supplier.



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