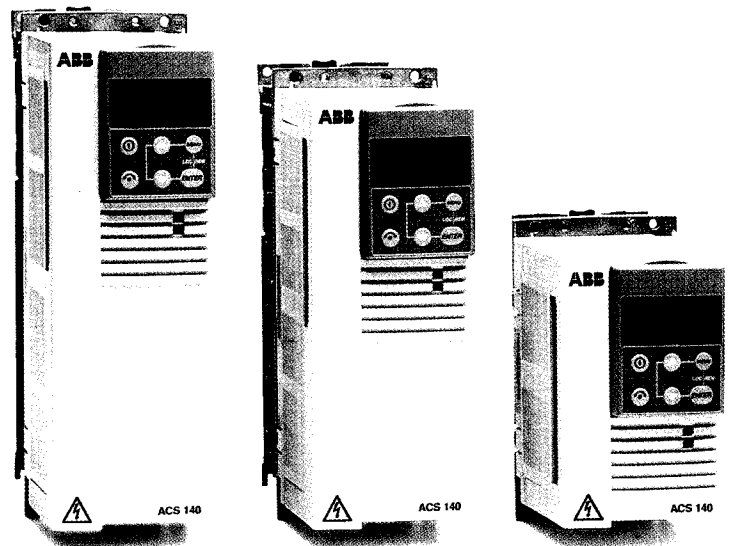


ABB AC Drives

ACS 140
frequency converters
for advanced speed control of
0.37 to 2.2 kW squirrel cage motors



No motor is too small to be controlled.

ABB

Reliable and accurate process control

The ACS 140 frequency converter extends the range of ABB's low power drives. Building on the ACS 100, the ACS 140 raises the voltage range to 480 V and offers additional I/O features for applications which require more sophisticated control. Despite its small size, the ACS 140 offers most of the functions typically associated with high performance drives.

With the ACS 100 and ACS 140, ABB now has an off-the-shelf solution to approximately 80% of the low power drive applications. Well suited for material handling of gaseous, liquid and solid substances, the ACS 140 is typically used in machinery applications such as packaging machines, biscuit machines, laundry machines, as well as mixers, conveyors, fans, pumps, etc.

Reliability a key issue

With the importance of the total life-time cost in mind, the ACS 140 is designed for maximum reliability. The thermal design is based on an optimised natural cooling principle, so no cooling fan is required. In addition, the drive's flange mounting feature allows the heat losses to be dissipated outside the cabinet.

To increase the drive's reliability even further, the parts' count of the drive has been reduced to a minimum.

High reliability is naturally a key issue when aiming for reduced down-time and higher availability. The ACS 140 adds value to your production processes and end-products through savings in service and maintenance costs, increases in production volume and improvements in on-time delivery.

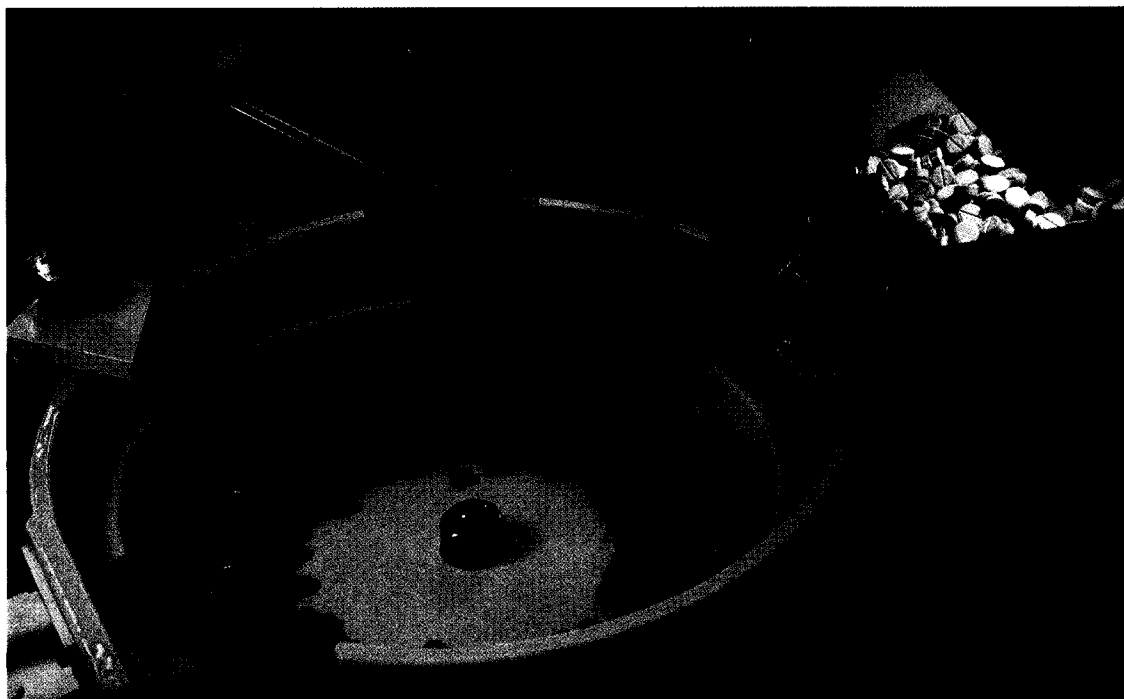
Accurate and fast control

The ACS 140 is highly accurate with reference to the input signal. On the average the accuracy is better than 1%, making tuning easy.

The ACS 140 also has a very short response time. The average delay is less than 9 ms, making the ACS 140 easily adaptable to many positioning applications where high accuracy is critical.

High repeatability for constant product quality

In order to ensure constant end-product quality in various applications, high repeatability has been one of the cornerstones in the design of



the ACS 140. The ACS 140 shows very low variance in response time and accuracy. This feature of the ACS 140 makes it possible to control processes within narrow tolerances. Low variance ensures highly predictable behaviour of machinery and constant product quality. In addition, the serial communication feature along with the digital control interface maintain constant high repeatability.

ACS 140
– Summary of main features

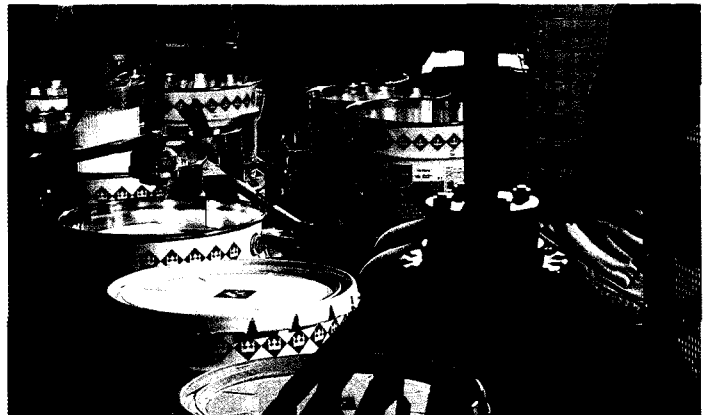
- 2 Analogue Inputs
- 5 Digital Inputs
- 1 Analogue Output
- 2 Relay Outputs
- Flying Start
- Pre-magnetising Macro
- 7 Pre-set Speeds
- DC Hold
- Serial Communication for Panel or External Control

- Compact Size
- Power-Loss Ride-Through
- No Cooling Fan
- PID-Control
- No Need for Control Panel

ACS 140 Options:

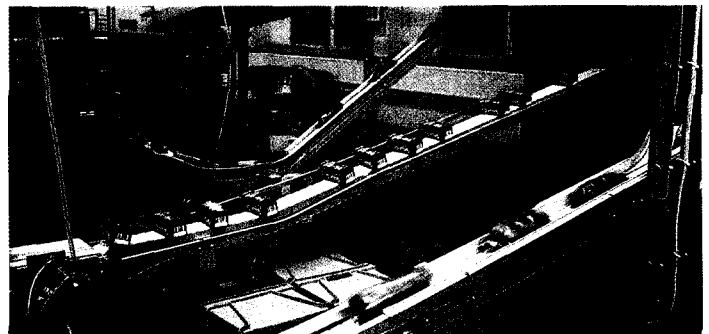
- Control Panel
- Extension Cable
- RFI Input Filters
- Braking Units
- RS 485/232 Adapter

Continuous processes, such as those involving pumps and mixers, require a very reliable drive. For these applications the ACS 140 is a safe choice. To operate the ACS 140 in harsh industrial environments ABB has designed a special IP 54 enclosure. The design and drawings of the enclosure are available on request.



Offering the advantages of dynamic braking and flying start, the ACS 140 is a practical choice for many building automation applications such as air handling. The built-in PID-control keeps variables such as temperature, pressure, or humidity under control. *Being a silent drive, the ACS 140 is also well suited for office and residential environments.*

In material handling and packaging applications, where precise positioning of goods is essential, the ACS 140's high repeatability is a clear advantage. Also the seven pre-set speeds allow for easy speed changes, when switching to a different size, weight or type of material. In addition, the ACS 140 can be easily integrated with any existing control logic, since the drive is compatible with both negative and positive control logic.



Designed for optimum usability

The ACS 140 has several features which speed up installation and commissioning.

The control panel of the ACS 140 has a para-meter copy function which lets the user easily copy parameters from drive to drive. The panel's clear menu structure has both short and long menus for easy configuration. In many applications the control panel is not needed at all.

Easy integration

The ACS 140 is one of the smallest naturally cooled AC drives on the market. This together with its multiple mounting possibilities makes it very easy to build the ACS 140 into existing machinery.

The added functionality of the drive's design also means that there is no need for positive/negative conversion logic. Together with the built-in galvanic isolation of digital and analogue inputs, the installation cost can be reduced.

Accurate serial communication

In addition to local control through the panel, the ACS 140 can also be remotely controlled by

an external device. The serial communication capability and Modbus fieldbus control make the ACS 140 also adaptable to applications where centralised control is required.

Multiple mounting possibilities

Besides the traditional wall mounting, the ACS 140 offers time and space saving DIN-rail mounting as well as flange mounting, where heat sink can be placed outside the cabinet. The converters can also be mounted without any space between the units.

Flexible application macros

To ensure fast commissioning the ACS 140 has several pre-set application macros. With a change of just a single variable, all macro-specific parameters are automatically set and all the control terminals are automatically configured.

Factory application macro is intended for applications where there is no control panel available. It provides a general purpose I/O configuration. Different macros are available for 50 Hz and 60 Hz power supply.

The ABB Standard (typical in Europe) and

Low power AC drive selection guide

0.37 - 2.2 kW (240 V) and 0.75 - 2.2 kW (380 - 480 V)

PID-control	ACS 141		ACS 143	
More than 1 analogue input	ACS 141		ACS 143	
Analogue output	ACS 141		ACS 143	
More than 3 digital inputs	ACS 141		ACS 143	
More than 1 relay output	ACS 141		ACS 143	
None of the above	ACS 101	ACS 103		
	240 V 1 phase	240 V 3 phase	380 V 3 phase	480 V 3 phase

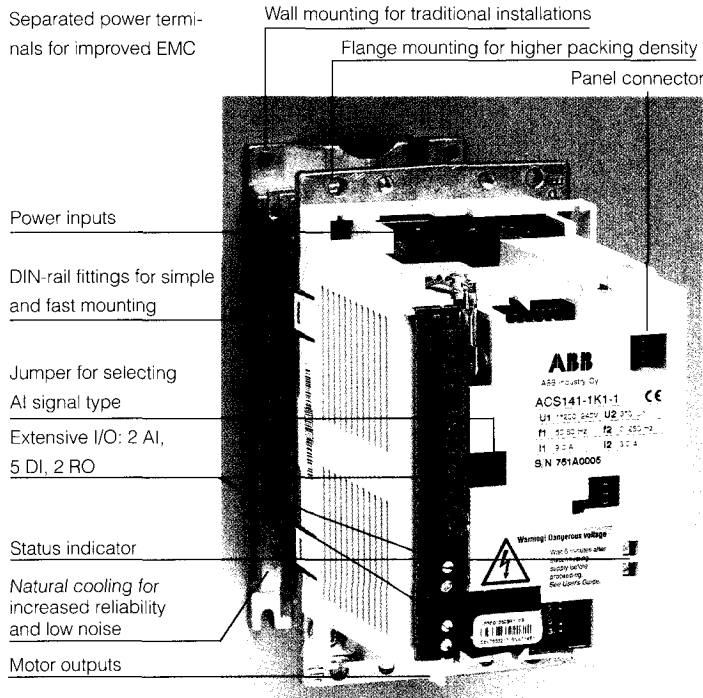
See the ratings table for the specific product codes for each nominal motor power.

the 3-wire (typical in U.S.) application macros are for general purpose, and offer two additional pre-set speeds compared to Factory macro.

Alternate application macro has an I/O-configuration that is adopted to a sequence of DI-control signals used when alternating the direction of the drive.

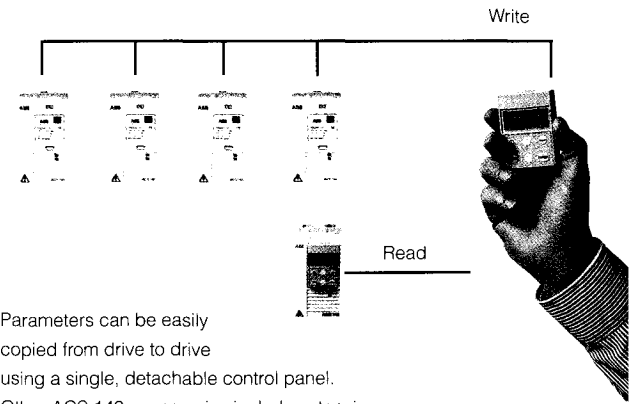
Potentiometer application macro provides a cost-effective interface for PLCs that vary the speed of the drive using only digital signals.

Hand/Auto application macro offers I/O-configuration typically used in HVAC applications.



Factory parameter values:

9905 Motor nom volt	230/400 V	1105 Ext ref1 max	50 Hz
9907 Motor nom freq	50 Hz	1106 Ext ref2 select	0 (keypad)
9908 Motor nom speed	1440 rpm	1201 Const speed sel	3 (DI3)
1001 Ext 1 commands	2 (DI1,2)	1503 AO content max	50 Hz
1002 Ext 2 commands	0 (not sel)	1601 Run enable	0 (not sel)
1003 Direction	3 (request)	2008 Maximum freq	50 Hz
1101 Keypad ref sel	1 (ref 1)	2105 Pregmagn sel	0 (not sel)
1102 Ext1/Ext2 sel	6 (ext1)	2201 Acc/Dec 1/2 sel	5 (DI5)
1103 Ext1 ref1 select	1 (AI1)		



Parameters can be easily copied from drive to drive using a single, detachable control panel. Other ACS 140 accessories include extension cable kit, RFI filters and braking units.

PID-control application macro is intended for use with different closed loop control systems such as pressure and flow control.

Premagnetise application macro enables the drive to start very quickly by eliminating the delay needed for building up the flux in the motor.

An example macro: Factory application

This macro is intended for applications where control panel is not required. For more information, please see the ACS 140 Programming Guide.

Input signals

- Start, stop and direction (DI1,2)
- Analogue reference (AI1)
- Constant speed 1 (DI3)
- Ramp pair 1/2 selection (DI5)

Output signals

- Analogue output AO: Frequency
- Relay output 1: Fault
- Relay output 2: Running

Control Terminals	Function
1 SCR	
2 AI 1	External reference 1; 0 – 10 V \leftrightarrow 0 – 50 Hz
3 AGND	
4 10 V	Reference voltage 10 VDC
5 AI 2	Not used
6 AGND	
7 AO	Output frequency 0 – 20 mA \leftrightarrow 0 – 50 Hz
8 AGND	
9 +12 V	+12 VDC
10 DCOM	
11 DI 1	Start/Stop. Activate to start ACS 140.
12 DI 2	Fwd/Rev. Activate to reverse rotation direction.
13 DI 3	Constant speed 1. Default: 5Hz
14 DI 4	Leave connected!*
15 DI 5	Ramp pair selection. Activate to select ramp pair 2. Defaults: 5 s (ramp pair 1), 60 s (ramp pair 2)
16 DO 1A	Relay output 1
17 DO 1B	Fault: open
18 DO 2A	Relay output 2
19 DO 2B	Running: closed

ACS 140 technical data

Mains connection

Voltage:

- 1 phase and 3 phase, 200 to 240 V ± 10 %
- 3 phase, 380 to 480 V ± 10 %

Frequency: 50 or 60 Hz

Fundamental power factor: approximately 0.98

Motor connection

Voltage: 3 phase, from 0 to U_{mains} ;

U_{max} at field weakening point

Frequency: 0 to 250 Hz*

Continuous load capacity (constant torque at maximum ambient temperature of 40 °C):

ACS 140 rated current I_2

Overload capacity at maximum ambient temperature of 40 °C:

- constant torque: $1.5 \cdot I_2$
for one minute every ten minutes
- constant torque: $1.25 \cdot I_2$
for two minutes every ten minutes

Ratings for short-time, intermittent and periodic duty cycle are available upon request.

Nominal motor frequency: 50 to 250 Hz*

Nominal motor voltage:

- 200 to 240 V
- 380 to 480 V

Switching frequency:*

- standard 4 kHz
- low noise 8 kHz

Acceleration time: 0.1 to 1800 s

Deceleration time: 0.1 to 1800 s

Control connections

Two programmable analogue inputs:

- voltage signal: 0 (2) to 10 V, 190 k Ω single ended
- current signal: 0 (4) to 20 mA, 500 Ω single ended
- potentiometer reference: 10 V ± 2 % max. 10 mA, 1 k $\Omega \leq R \leq 10$ k Ω
- response time: ≤ 60 ms
- resolution: 0.1 %
- accuracy: ± 1 %

One programmable analogue output:

- 0 (4) to 20 mA, load $< 500 \Omega$

Auxiliary voltage: 12 V DC, max 100 mA

Five programmable digital inputs:

- 12 V DC, PNP and NPN logic (using internal supply)
- 24 V DC, PNP and NPN logic (using external supply)
- input impedance: 1.5 k Ω
- response time: ≤ 9 ms

Two programmable relay outputs:

- switching voltage: 12 to 250 V AC / 30 V DC
- continuous current: 10 mA to 2 A

Serial communication for panel

or external control: Modbus protocol

Programmable features*

Seven application macros for easy configuration:

- Factory
- ABB Standard
- 3-Wire
- Alternate
- Motor Potentiometer
- Hand-Auto

- PID-Control

- Pre-magnetising

Output current and frequency limit

Two acceleration ramps

Two deceleration ramps

PID-control

Flying start

Seven pre-set speeds

Two skip frequencies

IR compensation

Protection

Overcurrent

Current regulation limit: 0.5 to $1.5 \cdot I_2$

Current I²t protection*

Overvoltage

Undervoltage

Overtemperature: limit 90 / 95 °C, heatsink

I/O terminal: short circuit protection

Auxiliary voltage: short circuit protection

Earth-fault protection: protects the ACS 140 in case of earth-fault at motor output

Output short circuit protection

Input phase loss (3-phase units only)

Power-loss ride-through

Motor overload protection

Stall protection

Serial communication error

Loss of AI signal

Environmental limits

Ambient operating temperature:

- output current = I_2 , $f_{\text{switch}} = 4$ k Hz: 0 to 40 °C
- output current = $0.8 \cdot I_2$, $f_{\text{switch}} = 4$ k Hz: 0 to 50 °C
- output current = $0.9 \cdot I_2$, $f_{\text{switch}} = 8$ k Hz: 0 to 40 °C
- output current = I_2 , $f_{\text{switch}} = 8$ k Hz: 0 to 30 °C

Installation altitude:

- output current = I_2 : 0 to 1000 m
- output current derated 1% for every 100 m above 1000 m: 0 to 2000 m

Relative humidity: less than 95 % (non-condensing)

Enclosure

Protection degree: IP 20

Colour: NCS 1502-Y, RAL 9002, PMS 420 C

Product conformity

- Low Voltage Directive 73/23/EEC with amendments
- EMC Directive 89/336/EEC with amendments (Note: With ACS 140 no filter is needed in Second Environment)
- Quality system ISO 9001

Accessories

- Control panel ACS 100-PAN
- Extension cable ACS 100-EXT
- RFI input filters
- Braking units
- RS 485/232 Adapter

ABB Drive Tools

- ACS 140 is supported by PC software packages such as Drives Window

* Programmable using the optional control panel

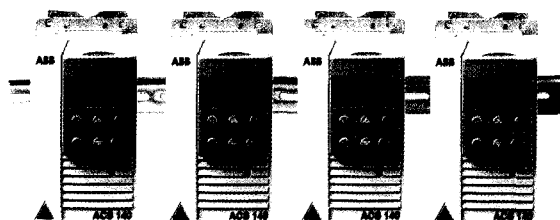
ACS 140 installation choices and frame sizes

Standard ratings, ambient temperature 40 °C

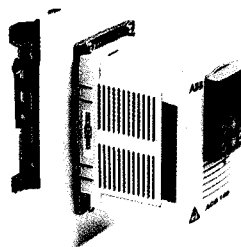
Rated motor power P_N (kW)	Rated output current I_2		Type designation	Rated input current I_1		Frame size/ Weight [kg]	
	Rated current 3~ I_2 (A)	Maximum current* ¹⁾ 3~ I_{max} (A)		1 phase I_1 , 1~ (A)	3 phase I_1 , 3~ (A)		
200 to 240 V, 1 phase input 50/60 Hz	0.37	2.2	3.3	ACS 141-K75-1	6.9	-	A/0.9
	0.55	3.0	4.5	ACS 141-1K1-1	9.0	-	B/1.2
	0.75	4.3	6.5	ACS 141-1K6-1	10.8	-	B/1.2
	1.1	5.9	8.9	ACS 141-2K1-1	14.8	-	C/2.2
	1.5	7.0	10.5	ACS 141-2K7-1	18.2	-	C/2.2
	2.2	9.0	13.5	ACS 141-4K1-1	24.5	-	D/2.7
200 to 240 V, 3 phase input 50/60 Hz	0.37	2.2	3.3	ACS 143-K75-1	-	3.2	A/0.8
	0.55	3.0	4.5	ACS 143-1K1-1	-	4.2	B/1.1
	0.75	4.3	6.5	ACS 143-1K6-1	-	5.3	B/1.1
	1.1	5.9	8.9	ACS 143-2K1-1	-	7.2	C/2.0
	1.5	7.0	10.5	ACS 143-2K7-1	-	8.9	C/2.0
	2.2	9.0	13.5	ACS 143-4K1-1	-	12.0	D/2.5
380 to 480 V, 3 phase input 50/60 Hz	0.75	2.0	3.0	ACS 143-1K6-3	-	2.5	B/1.1
	1.1	2.8	4.2	ACS 143-2K1-3	-	3.4	C/2.0
	1.5	3.6	5.4	ACS 143-2K7-3	-	4.6	C/2.0
	2.2	4.9	7.4	ACS 143-4K1-3	-	6.5	D/2.5

Ratings for short-time, intermittent and periodic duty cycle are available upon request. ¹⁾ 1 min/10 min

Mounting configurations



DIN-rail mounting



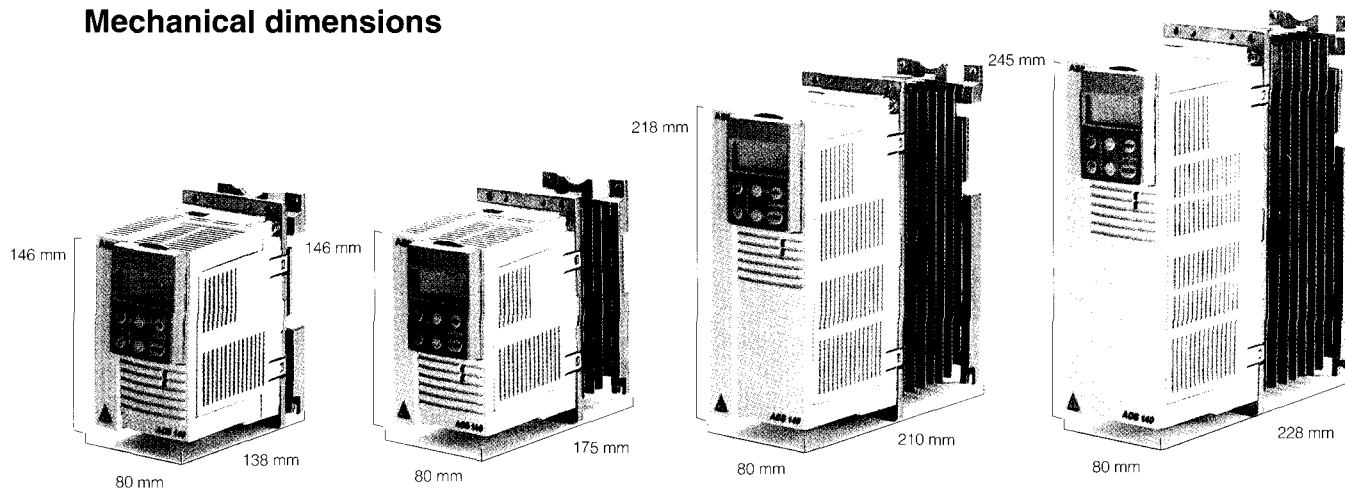
Flange mounting



Wall mounting

In addition to traditional wall mounting and space saving DIN-rail mounting, the ACS 100 offers the added feature of flange mounting. This way the heat sink can be placed outside the cabinet and little heat will be dissipated inside. The natural cooling system increases the drive's reliability and allows high packing density.

Mechanical dimensions



Frame A

Frame B

Frame C

Frame D



ABB Industry Oy

Drives
P.O. Box 184
FIN-00381 Helsinki
FINLAND
Telephone +358 (0)10 222 000
Telefax +358 (0)10 222 2681

www.abb.com/vsd