

# ABB standard drives

ACS510 - 01, 1.1 kW - 160 kW

Technical catalogue

## ABB Drives Work Smarter

PRODUCTS

APPLICATIONS



**NEW**



# ABB



# Two ways to select your drive

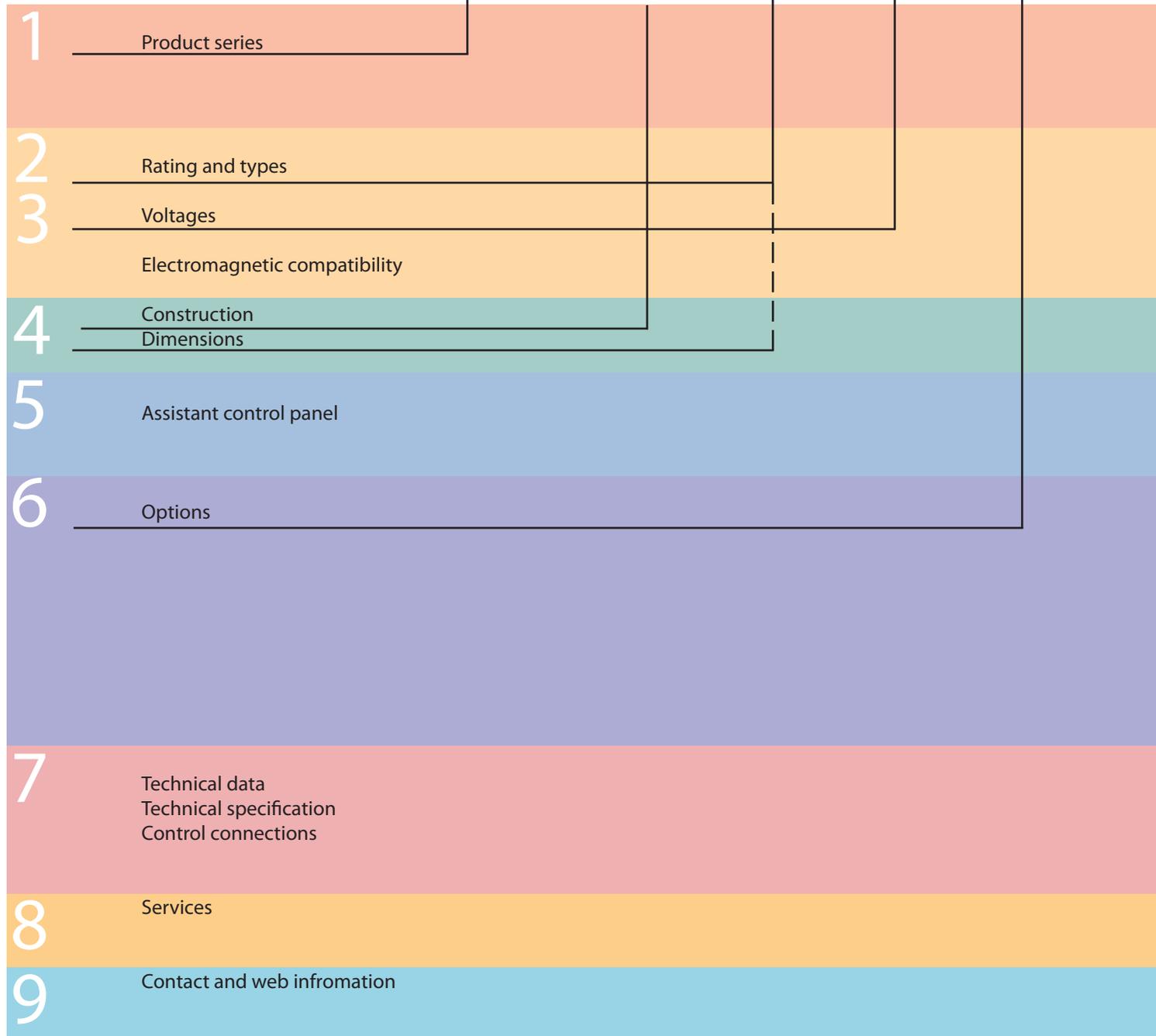
Choice 1: Simply contact your local ABB drives sales office (see page 15) and let them know what you want. Use page 3 as a reference section for more information.

OR

Choice 2: Build up your own ordering code using the simple 6-step approach below. Each step is accompanied by a reference to a page that is filled with useful information.

Type code:

ACS510 - 01 - 03A3 - 4 + B055



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# ABB standard drives

ACS510 - 01 - 03A3 - 4 + B055

## ABB standard drives

ABB standard drives are simple to buy, install, configure and use, saving considerable time. They are widely available through ABB channel partners, hence the use of the term standard. The drives have common user and process interfaces with fieldbuses, common software tools for sizing, commissioning, maintenance and common spare parts.

## Applications

ABB standard drives can be used in a wide range of industries. Typical applications include pump, fan and constant torque use, such as conveyors. ABB standard drives are ideal in those situations where there is a need for simplicity to install, commission and use and where customizing or special product engineering is not required.

## ABB ACS510 drive promises

- Precise delivery
- Quick installation
- Rapid start-up
- Trouble-free use

## Highlights

- Perfect match for industrial pumps and fans
- Advanced control panel providing intuitive operation
- Patent pending swinging choke for superior harmonic reduction
- Cycle soft start
- Multiple U/F curves
- Override mode
- Integral RFI filter for 1st and 2nd environment as standard
- CE approved

What are its main features?

Feature	Advantage	Benefit	
Perfect match for industrial fans and pumps	PFC application	Up to 7 (1+ 6) pumps	More pumps can be switched on and off
	SPFC	Cycle soft start	Each pump can be regulated in turn
	Multiple U/F curve	Freely defined 5 point U/F curve	More wide and flexible application
	Override mode	Emergency application in ventilator	More safe and reliable application
Economical	PID	2 built-up PID controllers Two groups of parameter setting for PID1	Flexible tension control by trimming PID
	Intuitive features	Noise optimization: Increases switching frequency when temperature is reduced Controlled cooling fan: Drive is cooled only when necessary	Considerable motor noise reduction Reduce inverter noise and improve energy efficiency
	Flux optimization	Disable or Enable by user Energy efficiency	Reduce the energy consumption and noise
	Connectivity	Simple to install: Side by side installation Easy connection of cables Easy connection to external fieldbus systems through multiple I/Os and plug-in options	Reduce installation time Reduce installation space Secure cable connections
Environmental friendly as standard	EMC	1st and 2nd environment RFI filters as standard	No need for additional external filtering
	Chokes	Swinging chokes - matches the right inductance to the right load, thereby suppressing and reducing harmonics emissions up to 25%	Reduce Total Harmonic Distortion (THD)
Other	Advanced control pane	Two soft-keys, function of which changes according to the panel state Built-in help button Changed parameters menu	Easy commissioning Fast set-up Quick access to recent parameter changes
	Fieldbus	Built-in Modbus using RS 485	Rapid fault diagnosis Reduce cost



# Ratings, types and voltages

ACS510 - 01 - 03A3 - 4 + B055

## Type code

This is the unique reference number (shown above and in column 4, right) that clearly identifies your drive by power rating and frame size. Once you have selected the type code, the frame size (column 5) can be used to determine the drives dimensions, shown on the next page.

## Voltages

ACS510 -01 is available in the following voltage range:  
4 = 380 - 480 V

### Normal use

For the majority of pump, fan and conveyor applications, select "Normal use" figures. If in doubt contact your local ABB sales office or your drives distributor - see page 15.

$S_N$  kVA = Typical motor apparent output power in 400 V at normal use  
 $P_N$  kW = Typical motor power in 400 V at normal use

3-phase supply voltage 380-480 V  
Wall mounted units

Ratings			Type code	Frame size
$S_N$ kVA	$P_N$ kW	$I_{2N}$ A		
2.3	1.1	3.3	ACS510-01-03A3-4	R1
3	1.5	4.1	ACS510-01-04A1-4	R1
4	2.2	5.6	ACS510-01-05A6-4	R1
5	3	7.2	ACS510-01-07A2-4	R1
6	4	9.4	ACS510-01-09A4-4	R1
9	5.5	11.9	ACS510-01-012A-4	R1
11	7.5	17	ACS510-01-017A-4	R2
16	11	25	ACS510-01-025A-4	R2
20	15	31	ACS510-01-031A-4	R3
25	18.5	38	ACS510-01-038A-4	R3
30	22	46	ACS510-01-046A-4	R3
41	30	60	ACS510-01-060A-4	R4
50	37	72	ACS510-01-072A-4	R4
60	45	88	ACS510-01-088A-4	R4
70	55	125	ACS510-01-125A-4	R5
100	75	157	ACS510-01-157A-4	R6
120	90	180	ACS510-01-180A-4	R6
140	110	205	ACS510-01-195A-4	R6
170	132	245	ACS510-01-246A-4	R6
200	160	290	ACS510-01-290A-4	R6

# Electromagnetic compatibility

## EMC according to EN61800-3

1<sup>st</sup> environment restricted distribution for frame sizes R3, R4 with 75 m motor cables and for frame sizes R1, R2, R5, R6 with 100 m motor cables as standard.

2<sup>nd</sup> environment unrestricted distribution for frame sizes R1 to R4 with 300 m motor cables and for frame sizes R5 to R8 with 100 m motor cables as standard.

These cable lengths are for EMC purposes only. Operational cable lengths are available in the output choke selection table on page 11. For longer motor cable lengths, external EMC filters are available on request.

## EMC standards in general

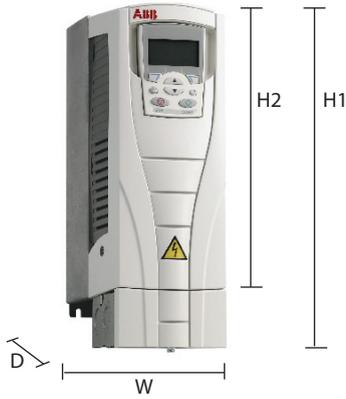
EN 61800-3/A11 (2000), product standard	EN 61800-3 (2004), product standard	EN 55011, product family standard for industrial, scientific and medical (ISM) equipment
1 <sup>st</sup> environment, unrestricted distribution	Category C1	Group 1 Class B
1 <sup>st</sup> environment, restricted distribution	Category C2	Group 1 Class A
2 <sup>nd</sup> environment, unrestricted distribution	Category C3	Group 2 Class A
2 <sup>nd</sup> environment, restricted distribution	Category C4	Not applicable



# Dimensions

ACS510 - 01 - 03A3 - 4 + B055

## Wall-mounted drives



H1 = Height with cable connection box  
 H2 = Height without cable connection box  
 W = Width  
 D = Depth

## Wall mounted units

Frame size	Dimensions and weights								
	IP21 / UL type 1					IP54 / UL type 12			
	H1 mm	H2 mm	W mm	D mm	Weight kg	H mm	W mm	D mm	Weight kg
R1	369	330	125	212	6.5	449	213	234	8.2
R2	469	430	125	222	9	549	213	245	11.2
R3	583	490	203	231	16	611	257	253	18.5
R4	689	596	203	262	24	742	257	284	26.5
R5	739	602	265	286	34	776	369	309	38.5
R6	880	700	300	400	69	924	410	423	80
R6 <sup>1)</sup>	986	700	302	400	73	1119	410	423	84

<sup>1)</sup>The dimensions and weights apply to ACS510-01-246A-4 and ACS510-01-290A-4.

# Construction

ACS510 - 01 - 03A3 - 4 + B055

“01” within the type code (shown above) varies depending on the drive mounting arrangement and power rating. Choose the correct one for your needs from the table below:

01	For IP54 units
<ul style="list-style-type: none"> <li>■ Wall mounted, frame size R1-R6</li> <li>■ 1.1 to 160 kW</li> <li>■ IP21</li> <li>■ Built-in EMC filter</li> <li>■ Coated board</li> <li>■ Standard software</li> <li>■ Built-in Modbus interface</li> <li>■ Cable connection box</li> <li>■ Brake chopper in frame sizes R1-R2</li> <li>■ Assistant control panel</li> </ul>	<ul style="list-style-type: none"> <li>■ If IP 54 is required, simply select “01” and then see page 8 to find the correct “Option” code.</li> </ul>



# Assistant control panel

The assistant control panel, which is delivered as standard, features a multilingual alphanumeric display, (EN, DA, DE, ES, FI, FR, IT, NL, PT, SE, US) or alternatively with code J416 (EN, DE, CZ, HU, PT, RU, TR) for easy drive programming. The control panel has various assistants and an inbuilt help function to guide the user. It includes a real time clock, which can be used during fault logging. The control panel can be used for copying parameters for back up or for downloading them to another drive. A large graphical display and soft keys make it extremely easy to navigate.

Name	
	Start-up Drive start
	Stop Drive stop
	Up Alter parametre/Increase reference
	Down Alter parametre/Decrease reference
	Local/ Remote Switch between Local (control panel)and Remote (I/O or other control source).
	Help Built-in help button
	Soft key1 Fuction of which changes according to the panel state
	Soft key2 Fuction of which changes according to the panel state

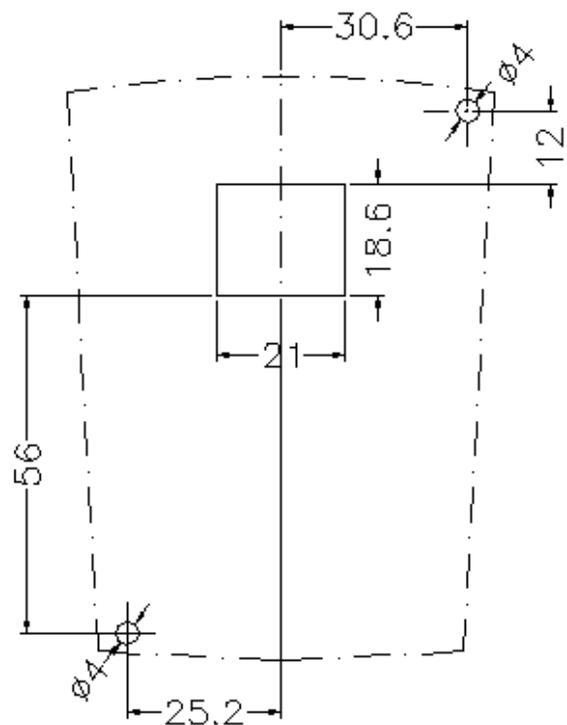


## Basic control panel

The basic control panel features a single line numeric display. The panel can be used to control the drive, set the parameter values or copy them from one drive to another.



## Control panel frame size





# Options

ACS510 - 01 - 03A3 - 4 + B055

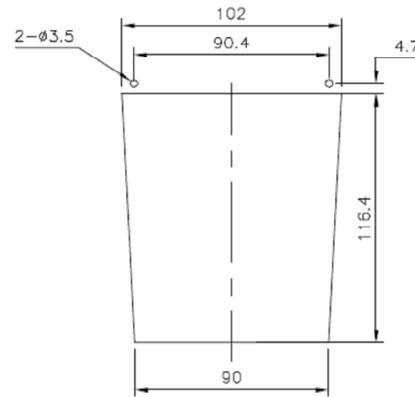
## Panel mounting kit

Two optional mounting kits for control panel:

- ACS-CP-EXT
- OPMP-01

To attach the control panel to the outside of a larger enclosure, two panel mounting kits are available. A simple and cost-efficient installation is possible with the ACS/H-CP-EXT kit, while the OPMP-01 kit provides a more user-friendly solution, including a panel platform that enables the panel to be removed in the same way as a drive-mounted panel. The panel mounting kits include all hardware required, including 3 m extension cables and installation instructions.

## OPMP-01 kit and mounting hole dimensions



## How to select options

The options shown in the table are available within the ACS510 range. Most of them have an associated 4-figure option code, which is shown in the table. It is this code that replaces B055 in the type code above. External options require a separate order line and material or type code number.

- <sup>1)</sup> Ordering with a separate material code number.
- <sup>2)</sup> One slot available for relay or encoder.
- <sup>3)</sup> One slot available for fieldbus adapter. Modbus inbuilt as standard.

## Available options

Protection class		
B055	IP54	
Control panel		
OJ400	If no control panel is required	
J404	Basic control panel	ACS-CP-C
-1)	Panel mounting kit	ACS/H-CP-EXT ACS-CP-cabinet
I/O options <sup>2)</sup>		
L511	Relay output extension	OREL-01
Fieldbus <sup>3)</sup>		
K451	DeviceNet	RDNA-01
K452	LonWorks	RLON-01
K454	Profibus-DP	RPBA-01
-1)	CANOpen	RCAN-01
-1)	ControlNet	RCNA-01
-1)	Ethernet	RETA-01



# Options

## Control interfaces

ACS510 - 01 - 03A3 - 4 + B055

### Output chokes

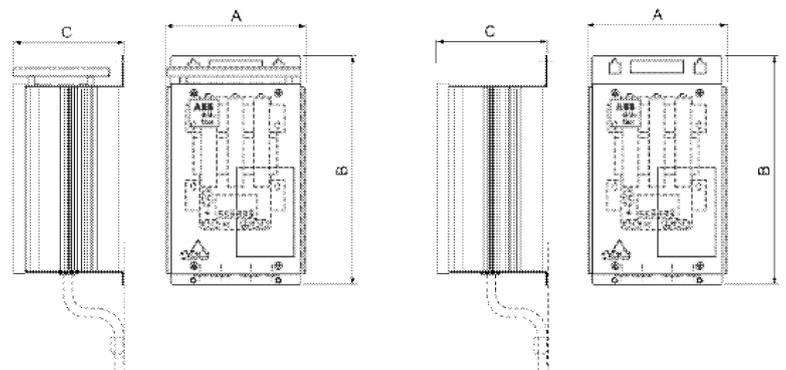
Output chokes are used when motor cables above normal length are required. Cable can be roughly 1.5 times standard cable length, see below.

Type code	Frame size	Nominal current $I_{2N}$ A	Output choke type code <sup>1)</sup>	Choke thermal current I A	Max. cable length without choke <sup>2)</sup> m	Max. cable length with choke <sup>3)</sup> m
$U_N = 380 - 480 \text{ V} (380, 400, 415, 440, 460, 480 \text{ V})$						
ACS510-01-03A3-4	R1	3.3	NOCH-0016-6X	19	100	150
ACS510-01-04A1-4	R1	4.1	NOCH-0016-6X	19	100	150
ACS510-01-05A6-4	R1	5.6	NOCH-0016-6X	19	100	150
ACS510-01-07A2-4	R1	7.2	NOCH-0016-6X	19	100	150
ACS510-01-09A4-4	R1	9.4	NOCH-0016-6X	19	100	150
ACS510-01-012A-4	R1	11.9	NOCH-0016-6X	19	100	150
ACS510-01-017A-4	R2	17	NOCH-0016-6X	19	200	250
ACS510-01-025A-4	R2	25	NOCH-0030-6X	41	200	250
ACS510-01-031A-4	R3	31	NOCH-0030-6X	41	200	250
ACS510-01-038A-4	R3	38	NOCH-0030-6X	41	200	250
ACS510-01-046A-4	R3	46	NOCH-0070-6X	112	200	300
ACS510-01-060A-4	R4	60	NOCH-0070-6X	112	200	300
ACS510-01-072A-4	R4	72	NOCH-0070-6X	112	200	300
ACS510-01-088A-4	R4	88	NOCH-0070-6X	112	200	300
ACS510-01-125A-4	R5	125	NOCH-0120-6X	157	300	300
ACS510-01-157A-4	R6	157	FOCH-0260-70	289	300	300
ACS510-01-180A-4	R6	180	FOCH-0260-70	289	300	300
ACS510-01-195A-4	R6	205	FOCH-0260-70	289	300	300
ACS510-01-246A-4	R6	245	FOCH-0260-70	289	300	300
ACS510-01-290A-4	R6	290	FOCH-0320-50	445	300	300

- <sup>1)</sup> The last digit of the output choke type defines the degree of protection; X stands for 2 = IP22 or 5 = IP54, 0 = IP00
- <sup>2)</sup> Cable lengths according to 4 kHz switching frequency
- <sup>3)</sup> Maximum switching frequency to be used with du/dt filter is 4 kHz

### Dimensions

Type code	A mm	B mm	C mm	Weight kg
NOCH-0016-62/65	199	323	154	6
NOCH-0030-62/65	249	348	172	9
NOCH-0070-62/65	279	433	202	15.5
NOCH-0120-62/65	308	765	256	45



### Note

An output choke does not improve the EMC performance of the drive. To fulfil local EMC requirements use sufficient RFI filtering. For more information refer to the ACS510 Technical reference. Please consult local ABB to get FOCH information.



# Options

ACS510 - 01 - 03A3 - 4 + B055

## Relay output extension option module

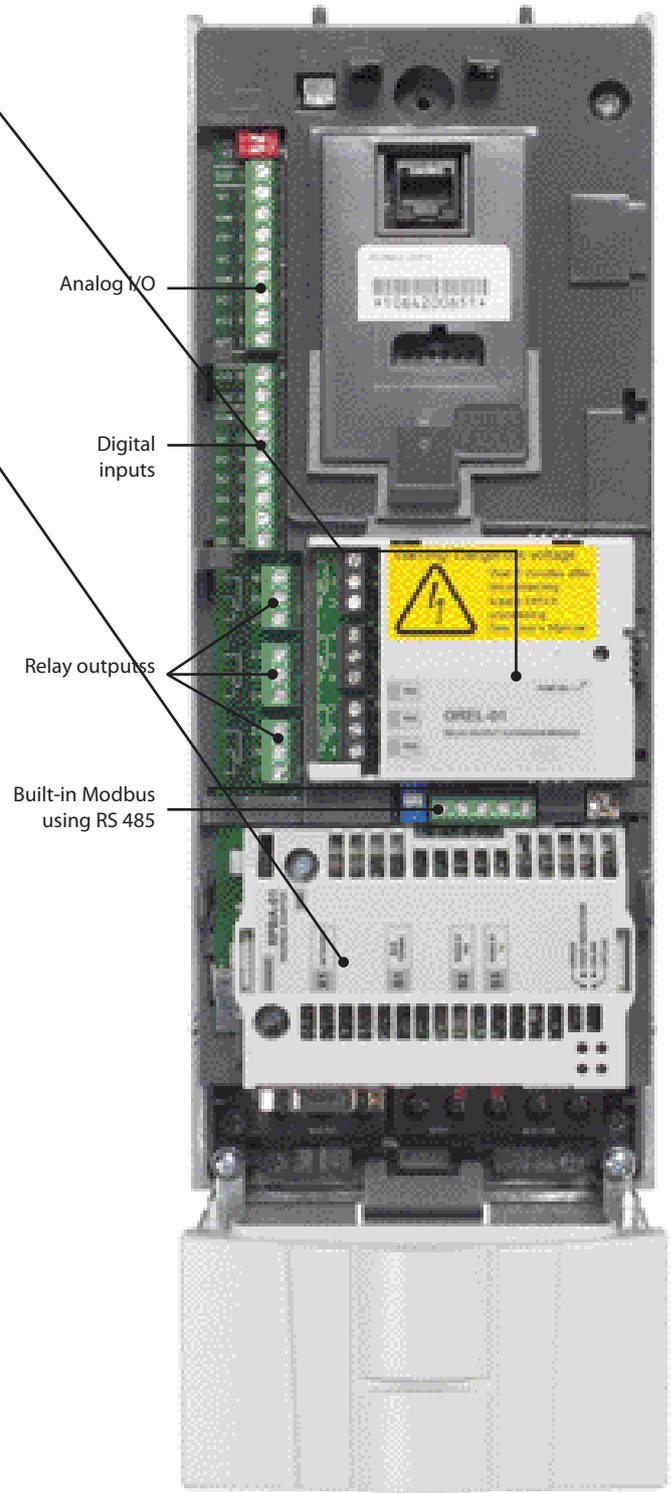
This plug-in option offers three additional relay outputs. They can be used, for example, in pump and fan control or many supervisory functions. All the relays can be programmed to on/off by using the assistant control panel's clock. Alternatively, fieldbus can be used to control any external components in the system.

## Plug-in fieldbus module

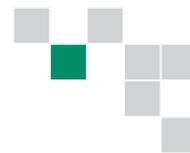
The plug-in fieldbus options bring connectivity to major automation systems. A single twisted pair avoids large amounts of conventional cabling, thereby reducing cost and increasing system reliability.

ACS510 supports the following fieldbus options:

- DeviceNet
- LONWORKS
- PROFIBUS DP
- CANopen
- ControlNet
- Ethernet

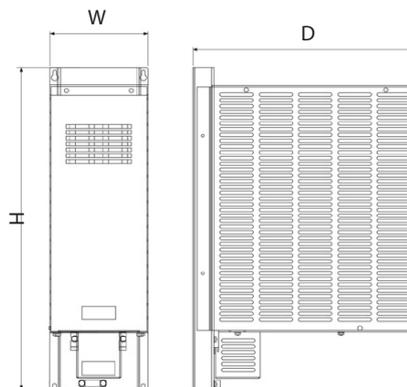


For type codes see page 8



## Brake units and choppers

Frame sizes R1 to R2 are delivered with integrated brake choppers as standard. Other units can use the compact-sized brake units which include brake chopper and resistor. For more information please refer to the ACS-BRK Brake Units Installation and Start-up Guide.

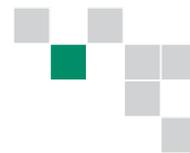


### Dimensions

Width (W) mm	Height (H) mm	Depth (D) mm	Weight kg	Brake unit type code
150	500	347	7.5	ACS-BRK-C
270	600	450	20.5	ACS-BRK-D

### Brake choppers

Type code	Frame size	Chopper	Rsel [Ohm]	Ppeak [kW]	Prated (cont.) [kW]	Rtype	W x H x D
R1	ACS510-01-03A3-4	Internal	200	3.1	0.36	CBR-V 210 DT 281 200R	130 x 345 x 120
R1	ACS510-01-04A1-4	Internal	200	3.1	0.36	CBR-V 210 DT 281 200R	130 x 345 x 120
R1	ACS510-01-05A6-4	Internal	200	3.1	0.36	CBR-V 210 DT 281 200R	130 x 345 x 120
R1	ACS510-01-07A2-4	Internal	80	7.8	0.79	CBR-V 460 DT 281 80R	130 x 595 x 120
R1	ACS510-01-09A4-4	Internal	80	7.8	0.79	CBR-V 460 DT 281 80R	130 x 595 x 120
R1	ACS510-01-012A-4	Internal	80	7.8	0.79	CBR-V 460 DT 281 80R	130 x 595 x 120
R2	ACS510-01-017A-4	Internal	80	7.8	0.79	CBR-V 460 DT 281 80R	130 x 595 x 120
R2	ACS510-01-025A-4	Internal	80	7.8	0.79	CBR-V 460 DT 281 80R	130 x 595 x 120
R3	ACS510-01-031A-4	BRK-C	32	12	2	Built-In	150 x 500 x 347
R3	ACS510-01-038A-4	BRK-D	10.5	42	7	Built-In	270 x 600 x 450
R3	ACS510-01-046A-4	BRK-D	10.5	42	7	Built-In	270 x 600 x 450
R4	ACS510-01-060A-4	BRK-D	10.5	42	7	Built-In	270 x 600 x 450
R4	ACS510-01-072A-4	BRK-D	10.5	42	7	Built-In	270 x 600 x 450
R4	ACS510-01-088A-4	BRK-D	10.5	42	7	Built-In	270 x 600 x 450
R5	ACS510-01-125A-4	NBRA-656C	4	83	9	SAFUR125F500	Consult ABB
R6	ACS510-01-157A-4	NBRA-656C	4	113	9	SAFUR125F500	Consult ABB
R6	ACS510-01-180A-4	NBRA-657C	4	135	9	SAFUR125F500	Consult ABB
R6	ACS510-01-195A-4	NBRA-657C	2.7	165	13.5	SAFUR200F500	Consult ABB
R6	ACS510-01-246A-4	NBRA-658C	2.7	198	13.5	SAFUR200F500	Consult ABB
R6	ACS510-01-290A-4	NBRA-658C	1.7	229	21	2xSAFUR210F575	Consult ABB



## Cooling

ACS510 is fitted with cooling air fans. The cooling air must be free from corrosive materials and not above the maximum ambient temperature of 40°C (50°C with derating). For more specific environmental limits see page 5.

### Cooling air flow 380 - 480 V units

Type code	Frame size	Heat dissipation		Air flow	
		W	BTU/hr	m <sup>3</sup> /h	ft <sup>3</sup> /min
ACS510-01-03A3-4	R1	40	137	44	26
ACS510-01-04A1-4	R1	52	178	44	26
ACS510-01-05A6-4	R1	73	249	44	26
ACS510-01-07A2-4	R1	97	331	44	26
ACS510-01-09A4-4	R1	127	434	44	26
ACS510-01-012A-4	R1	172	587	44	26
ACS510-01-017A-4	R2	232	792	88	52
ACS510-01-025A-4	R2	337	1151	88	52
ACS510-01-031A-4	R3	457	1561	134	79
ACS510-01-038A-4	R3	562	1919	134	79
ACS510-01-046A-4	R3	667	2278	134	79
ACS510-01-060A-4	R4	907	3098	280	165
ACS510-01-072A-4	R4	1120	3825	280	165
ACS510-01-088A-4	R4	1440	4918	280	165
ACS510-01-125A-4	R5	1940	6625	350	205
ACS510-01-157A-4	R6	2310	7889	405	238
ACS510-01-180A-4	R6	2810	9597	405	238
ACS510-01-195A-4	R6	3050	10416	405	238
ACS510-01-246A-4	R6	3850	13148	540	318
ACS510-01-290A-4	R6	4550	15539	540	318

## Fuse connections

Standard fuses can be used with ABB standard drives. For input fuse connections see tables below.

Recommended input protection fuses for 380 - 480 V units

Type code	Frame size	IEC fuses		UL fuses	
		A	Fuse type <sup>*)</sup>	A	Fuse type
ACS510-01-03A3-4	R1	10	gG	10	UL Class T
ACS510-01-04A1-4	R1	10	gG	10	UL Class T
ACS510-01-05A6-4	R1	10	gG	10	UL Class T
ACS510-01-07A2-4	R1	10	gG	10	UL Class T
ACS510-01-09A4-4	R1	10	gG	15	UL Class T
ACS510-01-012A-4	R1	16	gG	15	UL Class T
ACS510-01-017A-4	R2	16	gG	20	UL Class T
ACS510-01-025A-4	R2	25	gG	30	UL Class T
ACS510-01-031A-4	R3	35	gG	40	UL Class T
ACS510-01-038A-4	R3	50	gG	50	UL Class T
ACS510-01-046A-4	R3	50	gG	60	UL Class T
ACS510-01-060A-4	R4	63	gG	80	UL Class T
ACS510-01-072A-4	R4	80	gG	90	UL Class T
ACS510-01-088A-4	R4	125	gG	125	UL Class T
ACS510-01-125A-4	R5	160	gG	175	UL Class T
ACS510-01-157A-4	R6	200	gG	200	UL Class T
ACS510-01-180A-4	R6	250	gG	250	UL Class T
ACS510-01-195A-4	R6	250	gG	250	UL Class T
ACS510-01-246A-4	R6	250	gG	350	UL Class T
ACS510-01-290A-4	R6	315	gG	315	UL Class T

### Free space requirements

Enclosure type	Space above mm	Space below mm	Space on left/right mm
Wall mounted	200	200	0

<sup>\*)</sup> According to IEC-60269 standard.

# Technical specification



ACS510 - 01 - 03A3 - 4 + B055

## Mains connection

Voltage and power range	3-phase, 380 to 480 V, +10/-15%, 1.1 - 160 kW Auto-identification of input line
Frequency	48 to 63 Hz
Power factor	0.98

## Motor connection

Voltage	3-phase, from 0 to U <sub>SUPPLY</sub>
Frequency	0 to 500 Hz (0 to 50HZ for N688, 0 to 55HZ for N689)
Continuous loading capability (constant torque at a max ambient temperature of 400C)	Rated output current I <sub>2</sub>
Overload capacity (at a max. ambient temperature of 400C)	At normal use 1.1 x I <sub>2N</sub> for 1 minute every 10 minutes
Switching frequency Standard	Default 4 kHz
Selectable	1 kHz, 4 kHz, 8 kHz, 12 kHz
Acceleration time	0.1 to 1800 s
Deceleration time	0.1 to 1800 s

## Environmental limits

Ambient temperature	-15 to 40°C 40 to 50°C	No frost allowed Switch frequency 4 kHz, derating please contact supplier
Altitude	Rated current available at 0 to 1000 m Output current reduced by 1% per 100 m over 1000 m to 2000 m	
Relative humidity	lower than 95% (without condensation)	
Protection class	IP21 or IP54	
Enclosure colour	NCS 1502-Y, RAL 9002, PMS 420 C	
Contamination levels	IEC 721-3-3 No conductive dust allowed	
Transportation	Class 1C2 (chemical gases), Class 1S2 (solid particles)	
Storage	Class 2C2 (chemical gases), Class 2S2 (solid particles))	
Operation	Class 3C2 (chemical gases), Class 3S2 (solid particles)	

## Programmable control connections

Two analog inputs	
Voltage signal	0 (2) to 10 V, R <sub>in</sub> > 312 k $\Omega$ , single-ended
Current signal	0 (4) to 20 mA, R <sub>in</sub> = 100 $\Omega$ , single-ended 10 V
Potentiometer reference value	$\pm$ 2% max. 10 mA, R < 10 k $\Omega$
Maximum delay	12 to 32 ms
Resolution	0.1%
Accuracy	$\pm$ 1%
Two analog outputs	0 (4) to 20 mA, load < 500 $\Omega$ ,
Accuracy	$\pm$ 3%
Auxiliary voltage	24 V DC $\pm$ 10%, max 250 mA
Six digital inputs	12 V... 24 V DC with internal or external supply,
Input impedance	PNP and NPN
Maximum delay	2.4 k $\Omega$ 5 ms $\pm$ 1 ms
Three relay outputs	
Maximum switching voltage	250 V AC/30 V DC
Maximum switching current	6 A/30 V DC; 1500 V A/230 V AC
Maximum continuous current	2 A rms
Serial communication	
RS 485	Modbus protocol

## Protection limits

Overvoltage trip limits	
Running V DC	842 (corr. to 595 V input)
Start inhibit V DC	661 (corr. to 380 - 415 V input),
Undervoltage trip	
Running V DC	333 (corr.to 247 V input)
Start inhibit V DC	436 (corr.to 380 - 415 V input),

## EMC (according to EN61800-3)

1st environment restricted distribution for frame sizes R3, R4 with 75 m motor cables and for frame sizes R1, R2, R5, R6 with 100 m motor cables.

2nd environment unrestricted distribution with 300 m motor cables for frame sizes R1 to R4 and 100 m motor cables for frame sizes R5 to R6 as standard.

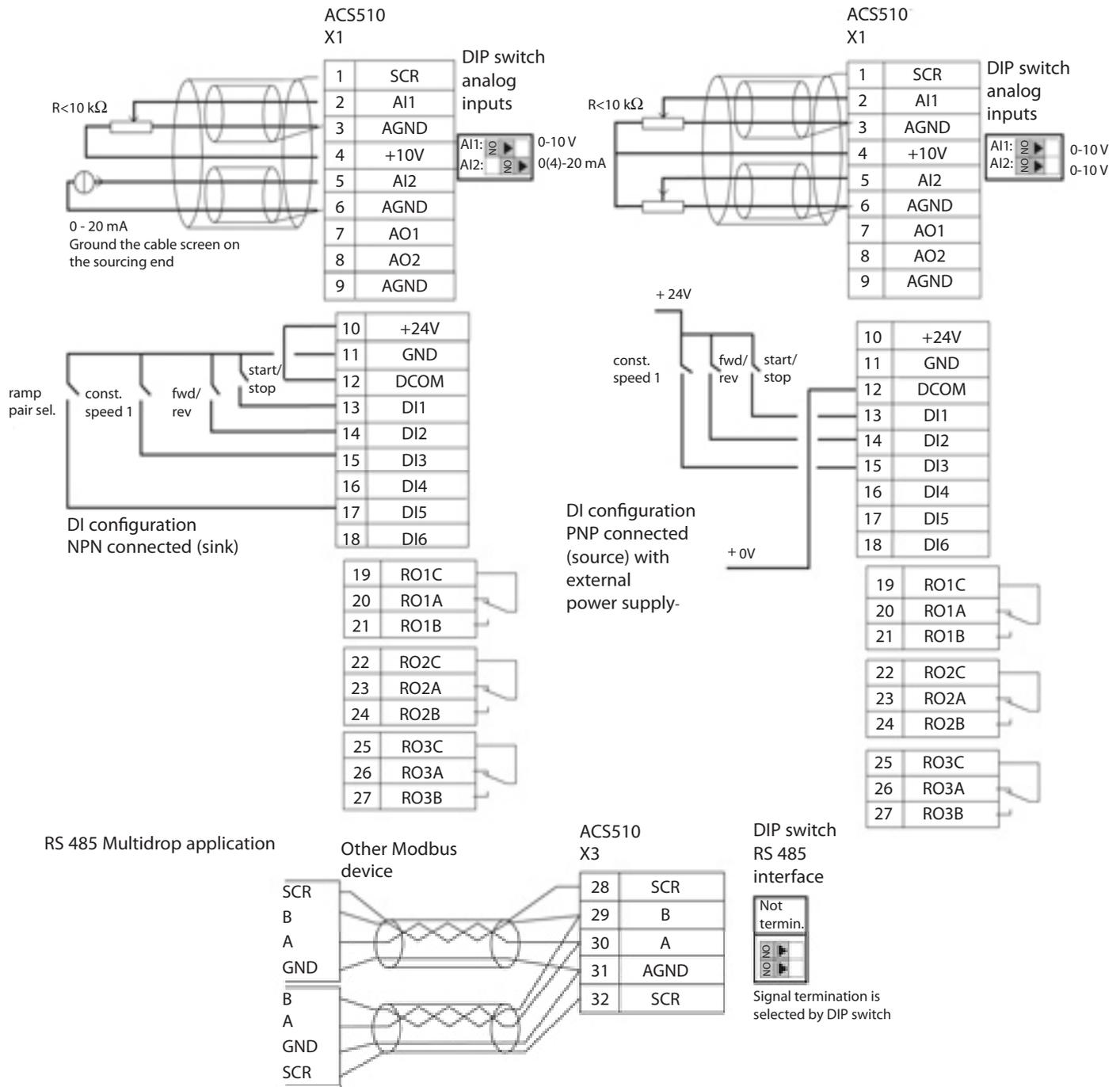
For longer motor cable lengths, external EMC filters are available on request.



# Control connections

ACS510 - 01 - 03A3 - 4 + B055

These connections are shown as examples only.  
Please refer to the ACS510 User's Manual, chapter  
Installations, for more detailed information.





# Services

## SupportLine services

ABB has created a lifecycle management model for ABB drives products and systems to provide customers with maximum profit for purchased assets by maintaining high availability, eliminating unplanned repair costs and extending system lifetime. The lifecycle management model comprises a palette of dedicated services for the entire lifecycle of the ABB drive, ACS510.

The services begin with drive dimensioning, professional commissioning and training, continue with spare part services, proactive scheduled maintenance programs and support services and end with smooth transition to new technology and recycling at the end of the product lifecycle.

## Installation and commissioning

ABB's professional start-up service uses certified engineers to install and adjust ABB drives according to the application requirements as well as to instruct the user on how to operate the drive.

## Training services

ABB offers dedicated training on ABB drives for your service and operating personnel. Upon successful completion of the training course your personnel will have acquired the skills to use ABB drives correctly and safely, and also to get the best results from their application. The training courses are broken down into modules that allow for customization of the contents depending on the objectives and skill levels of the participants.

For more information on our training services, please contact your local ABB representative or visit the ABB University web pages at <http://www.abb.com/abbuniversity>.

## ABB Beijing 24x 365 hotline service

The ABB Beijing Service Hot Line provides fast, easy, reliable access to our power electronics support engineers. This service is available 24 hours per day, 365 days per year.

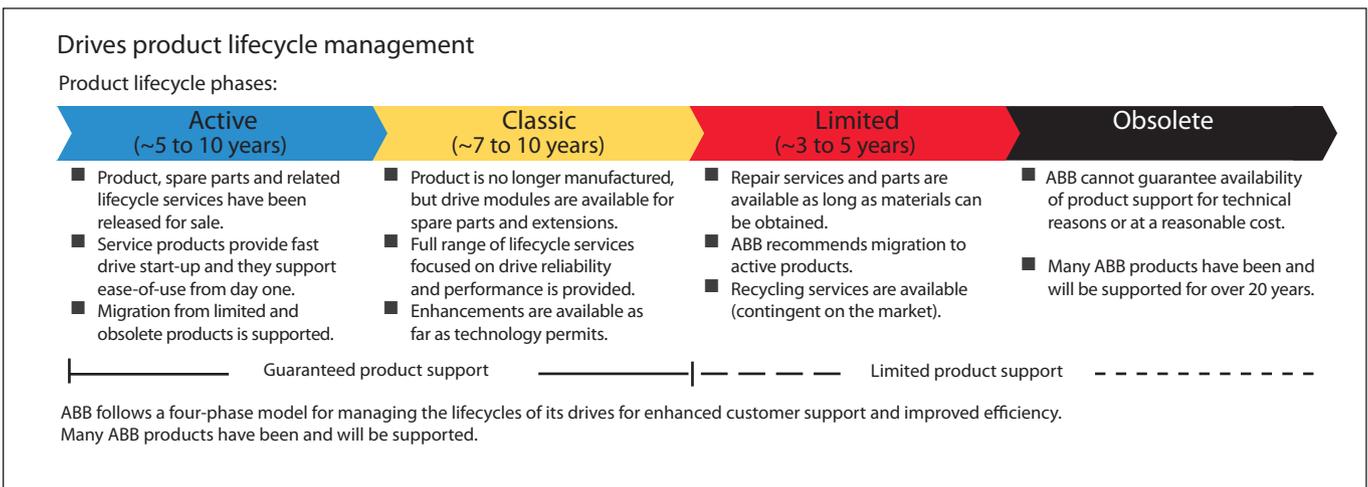




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