



Drives and controls

ABB Micro Drives ACS250 price list

Power and productivity
for a better world™



ACS250 price list

Table of contents

ACS250 IP20

Overview	5
Type code sheet	6
Data sheet	7
List prices	8
Frame options	9
Options	10
Dimensions and weights	11

ACS250 IP66

Overview	13
Type code sheet	14
Data sheet	15
List prices	16
Frame options	17
Options	18
Dimensions and weights	19

ACS250 IP20 & IP66

Braking resistors	20
Resistor technical data	25

Additional resources

QR codes	26
Drive life cycle	27
Glossary of terms	28

ACS250

Drive selection chart

ACS250 IP20	ACS250 IP66 - NEMA 4X
	
Main attributes	Main attributes
Feed-thru wiring, embedded Modbus-RTU, built-in macros for simple machine interface	Wide range of input voltages, high protection class enclosure for harsh environments, Modbus-RTU as standard
HP range	HP range
1~115 V - 0.5 to 1.5 HP 3~600 V - 0.75 - 20 HP	1~115 V - 0.5 to 1.5 HP 1~230 V - 0.5 to 3 HP 3~230 V - 0.5 to 5 HP 3~460 V - 1 to 10 HP 3~600 V - 0.75 - 15 HP
Voltage range	Voltage range
1~120 V In / 3~ 230 V Out 3~600 V In / Out	1~115 V In / 3~230 V Out 1~230 V In / 3~230 V Out 3~230 V In / Out 3~460 V In / Out 3~600 V In / Out
Enclosure type	Enclosure type
UL type 0 (IP20)	UL type 4X (IP66)
Control mode	Control mode
Scalar (V/Hz) variable torque and constant torque V/Hz profiles	Scalar (V/Hz) variable torque and constant torque V/Hz profiles
Communications options	Communications options
Embedded Modbus-RTU	Embedded Modbus-RTU
Operator interface	Operator interface
Integral and/or remote mount keypad	Integral and/or remote mount keypad

ACS250 IP20

Overview

Replacing a motor starter or soft starter with a drive can help your customer improve their overall energy efficiency, reduce mechanical stresses and enhance their process control. With its feed-thru wiring, the ACS250 can easily replace motor starters for general purpose low power applications, such as; augers, mixers, pumps, fans and conveyors. The key features include a integrated keypad for easy configuration, precise process control with an enhanced V/Hz control with variable torque and constant torque V/Hz profiles, and embedded, Modbus-RTU communication interface for real time control and monitoring.



Main features

- Integrated display and keypad
- Feed-thru wiring
- 50°C no de-rate / 60°C max.
- Built-in macros and only the essential parameters make commissioning straightforward
- Enhanced V/Hz control (all models)
- Adjustable current limit
- Power loss ride-through
- DC injection braking
- DC magnetizing start (provides maximum starting torque)
- Internal braking chopper (except frame E1)
- Modbus-RTU fieldbus as standard
- Open loop vector - speed & torque control (600 V only)
- SIL2 Safe torque-off (600 V only)

Applications

- Variable torque, constant torque or constant horsepower applications requiring a compact drive solution for cabinet mounting

Capabilities

- V/Hz control with peak overload capacity of 175%
- Feed-thru wiring DIN rail mountable IP20 enclosure
- Intuitive integrated keypad
- Designed to be easy to program for simple machine interface

ACS250 IP20

Type code sheet

1 - 250 HP, wall mount and floor standing

A	C	S	2	5	0	-				-					-	
---	---	---	---	---	---	---	--	--	--	---	--	--	--	--	---	--

Product code

1...6

A	C	S	2	5	0
---	---	---	---	---	---

Product series

7...10

-			X
---	--	--	---

Phase

Phase: -01 = single phase, -03 = three phase

EMC info (X): -U = no EMC filter, -E = includes EMC filter

11...15

-				
---	--	--	--	--

Nominal current

	Frame size E1	Frame size E2	Frame size P2	Frame size P3
115 V	02A3, 04A3	02A3, 04A3	02A3, 04A3	02A3, 04A3
600 V			02A1, 03A1, 04A1, 06A5, 09A0	12A0, 17A0, 22A0

16...17

-	
---	--

Supply voltage

1 = 115 V 6 = 600 V

ACS250 IP20

Data sheet



0.5 thru 1.5 HP (1~115 V In/ 3~230V Out) 1 thru 20 HP (3~600 V In/Out)

Performance features	Control modes	115 VAC: V/Hz 600 VAC: V/Hz and open loop vector
	Operator interface module	Integral drive mounted
	Display lines	6-character LED display
	Programmable preset speeds	Four
	Analog output: one	One (0-10 VDC)
	Auto restart	Yes – up to 5 attempts
	Frequency avoidance	One band
	Fault history	Last four faults
	Digital inputs: four	Two programmable digital inputs, two user selectable analog/digital inputs
	Digital inputs type	Pull-up
Drive specifications	Analog inputs: two	0-10 VDC, 4 to 20mA
	Relay output: one	Built-in form C relay
	Analog output / digital output	0-10 VDC: one analog usable for meter (freq., current, voltage) or digital output
	Overload capacity	Drive output 150% for one minute and 175% for 2 seconds
	Maximum load	1.5 HP @ 120 V In/230 V Out, 20 HP @ 600 V In/Out
	Input voltage ranges	115 VAC (99-126); 600 VAC (450-660)
	Rated input frequency	50-60 Hz (±5%)
	Carrier frequency	4-32 kHz (8 kHz default)
	Operating temperature	-10° to 50°C
	Snubber (dynamic braking)	Built-in transistor (frames 2 and 3)
	Dynamic braking external	Up to 150% dynamic braking with appropriately sized resistor
	DC injection braking	Included
	Volts/Hz	Linear V/Hz, user defined, energy optimizer & boost function
	Frequency control range	0-500 Hz
	Accel/decel:	Independently adjustable accel. & decel. ramps
	Time range	0.00 to 600.0 Seconds
	Keypad speed control	Yes
	Sink/source inputs	Source, 24 VDC logic
	Electronic overload trip	Electronic motor overload inverse 150% for 1 minute or 175% for 2 seconds
	Communications	Built-in Modbus-RTU (RS-485) communications
	PI control	Built-in
Protective features	Under voltage	Level depends on voltage class (\$408)
	Output short circuit	Phase-to-phase on drive output
	Over temperature	Heat sink monitor
	DC bus overvoltage	DC bus level trip
	Drive overload	Exceed drive rating of 150% for one minute or 175% for 2 seconds
	Over current	Over-current/short-circuit protection
	Output phase	Trips on open output phase
	Loss of reference	Trips on loss of speed command signal
	Communication error	Detects a communication error (fault)
Agency certifications		UL, cUL, CE, C-tick, gost
Service conditions	Altitude	1,000 m (3,300 ft.), derate by 1% per 100M up to 2,000 on maximum
	Ambient temperature	-10°C (14°F) to 50°C (102°F)
	Storage temperature:	-40°C (-40°F) to 60°C (140°F)
	Relative humidity	10% to 95%, non-condensing

ACS250 IP20

List prices

IP20 drive ratings

Type code	Braking chopper (included)	P _N HP	Output current I _{2N} A	Weight (lbs)	Frame size	List price
1-phase supply voltage 110 to 120 V, +/-10%, 3-phase output 200 to 240 V						
ACS250-01U-02A3-1	-	0.5	2.3	2.2	E1	\$408
ACS250-01U-04A3-1	-	1.0	4.3	2.2	E1	\$450
ACS250-01U-05A8-1	X	1.5	5.8	3.75	E2	\$552
3-phase supply voltage 500 to 600 V, +/-10%						
ACS250-03U-02A1-6	X	1.0	2.1	4.0	P2	\$602
ACS250-03U-03A1-6	X	2.0	3.1	4.0	P2	\$782
ACS250-03U-04A1-6	X	3.0	4.1	4.0	P2	\$869
ACS250-03U-06A5-6	X	5.0	6.5	4.0	P2	\$1,043
ACS250-03U-09A0-6	X	7.5	9.0	4.0	P2	\$1,459
ACS250-03U-12A0-6	X	10.0	12.0	7.7	P3	\$1,751
ACS250-03U-17A0-6	X	15.0	17.0	7.7	P3	\$2,291
ACS250-03U-22A0-6	X	20	22	7.7	P3	\$2,917

ACS250 IP20

Frame options



ACS250 IP20 - 120 V



ACS250 IP20 - 600 V

ACS250 IP20

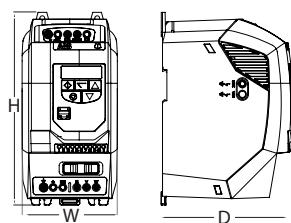
Options

ACS250 IP20 options (these options will be shipped separately from drive shipping package)

Code	Variant	Description	Field kit	Voltage rating	
				120 V	600 V
N/A	RCCS-01 copying tool	Copy stick, which is used to upload and download the parameters through RJ45 connection Parameters can only be copied between drives of the same product range and power rating (size)	RCCS-01	\$234	\$234
N/A	RCRO-01 relay output card	The second relay output module can be used in applications where the analog output from the drive is converted to a relay output. Max relay switching voltage: 250 VAC/220 VDC Max relay switching current: 1A Max input voltage: +/- 50 VDC Environmental: -10°C ... +50°C Conformity: IP00, UL94V-0	RCRO-01	\$140	NA
N/A	RCRP-01 external LED keypad	Remote keypad that can be added through RJ45 connection. Signal interface: standard 6-way RJ45 connector Supply input: 10V ... 36 VDC, 30mA RS485 signal: industry standard 2-wire +5V differential Environmental: operational 0 ... 50 °C Storage: -40°C ... 60°C Relative humidity: < 95% (non condensing) Protection rating: IP54 Max cable length: 20m (unscreened, total length) 100m (screened, twisted pair, total length)	RCRP-01	\$106	\$106
N/A	RCRJ-01 RJ45 Y-cable splitter	The data cable splitter is a 3-way "Y" cable splitter suitable for a RS-485 network of drives. The option is compatible with standard CAT 5 or CAT 6 type cable and can be used for Modbus-RTU or an RS-485 remote keypad network.	RCRJ-01	\$59	\$59
N/A	RCNT-01 RJ45 Y-cable splitter w/ term.	The data cable splitter with terminal block is a 3-way "Y" cable splitter with one terminal block suitable for an RS-485 network of drives. Two of the three connections are compatible with standard CAT 5 or CAT 6 type cable and the third is a terminal block that can be used to connect a PLC or network terminating resistor.	RCNT-01	\$183	\$183
N/A	ACS250 democase	Powered by 115 VAC, the program case does includes an ACS250 drive and IO board with switches, speed potentiometer and LED. Ideal for demonstrating the programability of the ACS250. There is no motor included in this democase	ACS250-DEMOCASE	\$2,000	NA

ACS250 IP20

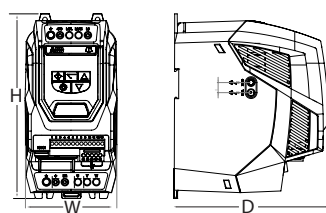
Dimensions and weights



120 V

Frame size	Dimensions and weights								Dimension drawing
	IP20 120 V								
	Height		Width		Depth		Weight		
	in	mm	in	mm	in	mm	lb	kg	
E1	6.81	173	3.23	82	4.84	123	2.20	1	3AXD10000274006
E2	8.70	221	4.29	109	5.91	150	3.75	1.70	3AXD10000274008

H = Height
W = Width
D = Depth



600 V

Frame size	Dimensions and weights								Dimension drawing
	IP20 600 V								
	Height		Width		Depth		Weight		
	in	mm	in	mm	in	mm	lb	kg	
P2	8.70	221	4.41	112	7.28	185	4	1.80	3AXD10000274014
P3	10.28	261	5.16	131	8.07	205	7.70	3.50	3AXD10000274016

H = Height
W = Width
D = Depth

ACS250 IP66

Overview

Augers, mixers, pumps, fans and conveyors are commonly installed in harsh environments containing dust, moisture and chemicals. The IP66/NEMA 4X ACS250 was designed to thrive in these types of conditions. The drive's design and ease of setup benefit a broad range of industries that require machine mounted drives.

Hygienic protection

The drive was designed with materials that meet stringent hygiene standards, preventing the drive from trapping bacteria. The integrated keypad provides straightforward drive commissioning and maintenance in extreme environments. The drive's sealed ABS enclosure and corrosion-resistant heat sink are ideal for wash-down applications.



Main features

- Built-in macros and only the essential parameters make commissioning straightforward
- Can be mounted directly on processing equipment installed in extreme environments
- Conduit cable entry
- Intuitive keypad control
- Optional switch features; speed potentiometer, FWD-OFF-REV and disconnect switches
- IP66/NEMA 4X dust and waterproof design
- Designed for wash-down applications
- Specially coated corrosion-resistant heat sink
- No cooling fans to replace
- Modbus-RTU fieldbus as standard
- Built-in brake chopper (except frame E1)
- Safe torque off function (SIL2) which can be used as emergency stop or to prevent unexpected startup (600 V only)
- Open loop vector speed and vector torque control mode (600 V only)

Applications

- Variable torque, constant torque or constant horsepower applications in harsh environments or requiring on machine mounting

Capabilities

- NEMA 4X IP66 enclosure for indoor use
- V/Hz control with peak overload capacity of 175%
- Embedded Modbus-RTU
- Intuitive integrated keypad
- Designed to be easy to program for simple machine interface local control & disconnect

ACS250 IP66

Type code sheet

1 - 250 HP, wall mount and floor standing

A	C	S	2	5	0	-				-					-		+				
----------	----------	----------	----------	----------	----------	----------	--	--	--	----------	--	--	--	--	----------	--	----------	--	--	--	--

Product code

1...6

A	C	S	2	5	0
----------	----------	----------	----------	----------	----------

 Product series

7...10

-			X
----------	--	--	----------

 Phase

Phase: -01 = single phase, -03 = three phase

EMC info (X): -U = no EMC filter, -E = includes EMC filter

11...15

-				
----------	--	--	--	--

 Nominal current

	Frame size E1	Frame size E2	Frame size E3	Frame size P2	Frame size P3
115 V	02A3, 04A3	05A8			
230 V	02A3, 04A3, 07A0	10A5	18A0		
460 V	02A2, 04A1	05A8, 09A5	14A0, 18A0		
600 V				02A1, 03A1, 04A1, 06A5, 09A0	12A0, 17A0

16...17

-	
----------	--

 Supply voltage

1 = 115 V 2 = 230 V 4 = 460 V 6 = 600 V

18...22

+	B	0	6	3
----------	----------	----------	----------	----------

 NEMA 4X (IP66) enclosure protection class

B063 = NEMA 4X (IP66)

23...27

+	F	2	7	8
----------	----------	----------	----------	----------

 Optional switch



0.5 thru 1.5 HP (1~115 V In/ 3~230V Out) 0.5 thru 3 HP (1~230 V In/ 3~230V Out)
 0.5 thru 5 HP (3~230 V In/Out) 1 thru 10 HP (3~460 V In/Out) 1 thru 15 HP (3~600 V In/Out)

Performance features	Control modes	115-460 VAC: V/Hz 600 VAC: V/Hz and open loop vector
	Operator interface module	Integral drive mounted
	Display lines	6-character LED display
	Programmable preset speeds	Four
	Analog output: one	One (0-10 VDC)
	Auto restart	Yes- Up to 5 attempts
	Frequency avoidance	One band
	Fault history	Last four faults
	Digital Inputs: four	Three configurable inputs
	Digital inputs type	Pull-up
Drive specifications	Analog inputs: two	0-10 VDC, 4 to 20mA
	Relay output: one	One built-in form C relay
	Analog output / digital output	0-10 VDC: one analog usable for meter (freq., current, voltage) or digital output
	Maximum load	5 HP @ 230 VAC, 10 HP @ 460 VAC, 15 HP @ 600 VAC
	Overload capacity	Drive output 150% for one minute and 175% for 2 seconds
	Input voltage ranges	115 VAC (99-126); 230 VAC (198-264); 460 VAC (342-528); 600 VAC (450-660)
	Rated input frequency	50-60 Hz (±5%)
	Carrier frequency	4-32 kHz (8 kHz default)
	Operating temperature	-10° to 40°C
	Snubber (dynamic braking)	Built-in transistor (frames 2 and 3)
	Dynamic braking external	Up to 150% dynamic braking with appropriately sized resistor
	DC injection braking	Included
	Volts/Hz	Linear V/Hz, user defined, energy optimizer & boost function
	Frequency control range	0-500 Hz
	Accel/decel:	Independently adjustable accel. & decel. ramps
	Time range	0.00 to 600.0 seconds
	Keypad speed control	Yes
	Sink/source inputs	Source, 24 VDC logic
Protective features	Electronic overload trip	Electronic motor overload inverse 150% for 1 minute or 175% for 2 seconds
	Communications	Built-in Modbus-RTU (RS-485) communications
	PI control	Built-in
	Under voltage	Level depends on voltage class (120, 240, 480, or 575)
	Output short circuit	Phase-to-phase on drive output
	Over temperature	Heat sink monitor
	DC bus overvoltage	DC Bus level trip
	Drive overload	Exceed drive rating of 150% for one minute or 175% for 2 seconds
	Over current	Over-current/short-circuit protection
Agency certifications	Output phase	Trips on open output phase
	Loss of reference	Trips on loss of speed command signal
Service conditions	Communication error	Detects a communication error (fault)
	Altitude	1,000 m (3,300 ft.), derate by 1% per 100M up to 2,000m maximum
	Ambient temperature	-10°C (14°F) to 40°C (122°F)
	Storage temperature:	-40°C (-40°F) to 60°C (140°F)
	Relative humidity	10% to 95%, non-condensing
	Intermittent overload	150% overload capacity for up to 1 minute, 175% overload capacity for up to 2 seconds

ACS250 IP66

List prices

IP66 drive ratings

Type code	Braking chopper (included)	P _N HP	Output current I _{2N} A	Weight (lbs)	Frame size	List price	Optional switch (+F278)
1-phase supply voltage 110 to 120V, +/-10%, 3-phase output 200 to 240 V							
ACS250-01U-02A3-1+B063	-	0.5	2.3	6.5	E1	\$757	\$936
ACS250-01U-04A3-1+B063	-	1.0	4.3	6.5	E1	\$836	\$1,010
ACS250-01U-05A8-1+B063	X	1.5	5.8	9.3	E2	\$1,018	\$1,151
1-phase supply voltage 200 to 240V, +/-10%, 3-phase output 200 to 240 V							
ACS250-01U-02A3-2+B063	-	0.5	2.3	6.5	E1	\$723	\$832
ACS250-01U-04A3-2+B063	-	1.0	4.3	6.5	E1	\$795	\$893
ACS250-01U-07A0-2+B063	-	2.0	7.0	6.5	E1	\$853	\$1,004
ACS250-01U-10A5-2+B063	X	3.0	10.5	9.3	E2	\$982	\$1,122
3-phase supply voltage 200 to 240 V, +/-10%							
ACS250-03U-02A3-2+B063	-	0.5	2.3	6.5	E1	\$660	\$780
ACS250-03U-04A3-2+B063	-	1	4.3	6.5	E1	\$717	\$813
ACS250-03U-07A0-2+B063	X	2.0	7.0	9.3	E2	\$824	\$974
ACS250-03U-10A5-2+B063	X	3.0	10.5	9.3	E2	\$950	\$1,122
ACS250-03U-18A0-2+B063	X	5.0	18.0	17.0	E3	\$1,353	\$1,500
3-phase supply voltage 380 to 480 V, +/-10%							
ACS250-03U-02A1-4+B063	-	1.0	2.2	6.5	E1	\$777	\$896
ACS250-03U-04A1-4+B063	-	2.0	4.1	6.5	E1	\$911	\$1,040
ACS250-03U-05A8-4+B063	X	3.0	5.8	9.3	E2	\$1,027	\$1,175
ACS250-03U-09A5-4+B063	X	5.0	9.5	9.3	E2	\$1,275	\$1,411
ACS250-03U-14A0-4+B063	X	7.5	14.0	17.0	E3	\$1,646	\$1,765
ACS250-03U-18A0-4+B063	X	10.0	18.0	17.0	E3	\$1,952	\$2,118
3-phase supply voltage 500 to 600 V, +/-10%							
ACS250-03U-02A1-6+B063	X	1.0	2.1	10.6	P2	\$1,285	\$1,462
ACS250-03U-03A1-6+B063	X	2.0	3.1	10.6	P2	\$1,484	\$1,649
ACS250-03U-04A1-6+B063	X	3.0	4.1	10.6	P2	\$1,697	\$1,849
ACS250-03U-06A5-6+B063	X	5.0	6.5	10.6	P2	\$1,946	\$2,082
ACS250-03U-09A0-6+B063	X	7.5	9.0	10.6	P2	\$2,455	\$2,559
ACS250-03U-12A0-6+B063	X	10.0	12.0	16.1	P3	\$2,925	\$3,096
ACS250-03U-17A0-6+B063	X	15.0	17.0	16.1	P3	\$4,297	\$4,424

ACS250 IP66
Frame options



ACS250+B063+F278



ACS250+B063

ACS250 IP66

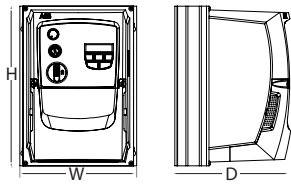
Options

ACS250 IP66 options (these options will be shipped separately from drive shipping package)

Code	Variant	Description	Field kit	Voltage rating	
				120 V	600 V
N/A	RCCS-01 copying tool	Copy stick, which is used to upload and download the parameters through RJ45 connection Parameters can only be copied between drives of the same product range and power rating (size)	RCCS-01	\$234	\$234
N/A	RCRO-01 relay output card	The second relay output module can be used in applications where the analog output from the drive is converted to a relay output. Max relay switching voltage: 250 VAC/220 VDC Max relay switching current: 1A Max input voltage: +/- 50 VDC Environmental: -10°C ... +50°C Conformity: IP00, UL94V-0	RCRO-01	\$140	N/A
N/A	RCRP-01 external LED keypad	Remote panel that can be added through RJ45 connection. Signal interface: standard 6-way RJ45 connector Supply input: 10V ... 36 VDC, 30mA RS485 signal: industry standard 2-wire +5V differential Environmental: operational 0 ... 50°C Storage: -40°C ... 60°C Relative humidity: < 95% (non condensing) Protection rating: IP54 Max cable length: 20m (unscreened, total length) 100m (screened, twisted pair, total length)	RCRP-01	\$106	\$106
N/A	RCRJ-01 RJ45 Y-cable splitter	The data cable splitter is a 3-way "Y" cable splitter suitable for a RS-485 network of drives. The option is compatible with standard CAT 5 or CAT 6 type cable and can be used for Modbus-RTU or an RS-485 remote keypad network.	RCRJ-01	\$59	\$59
N/A	RCNT-01 RJ45 Y-cable splitter w/ term.	The data cable splitter with terminal block is a 3-way "Y" cable splitter with one terminal block suitable for an RS-485 network of drives. Two of the three connections are compatible with standard CAT 5 or CAT 6 type cable and the third is a terminal block that can be used to connect a PLC or network terminating resistor.	RCNT-01	\$183	\$183

ACS250 IP66

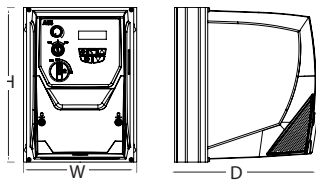
Dimensions and weights



120, 240 & 480 V

Frame size	Dimensions and weights IP66 120, 240 & 480 V								Dimension drawing
	Height		Width		Depth		Weight		
	in	mm	in	mm	in	mm	lb	kg	
E1	9.13	232	6.34	161	7.05	179	6.50	2.95	3AXD10000274009
E2	10.12	257	7.40	188	7.34	186	9.26	4.20	3AXD10000274011
E3	12.20	310	8.29	210	9.00	229	16.97	7.70	3AXD10000274012

H = Height
W = Width
D = Depth



600 V

Frame size	Dimensions and weights								Dimension drawing
	IP66 600 V								
	Height		Width		Depth		Weight		
	in	mm	in	mm	in	mm	lb	kg	
P2	10.12	257	7.40	188	9.41	239	10.60	4.80	3AXD10000274017
P3	12.20	310	8.29	211	9.88	251	16.10	7.30	3AXD10000274018

H = Height
W = Width
D = Depth

ACS250 IP20 & IP66

Braking resistors

Single-phase 100-120 V applications, stopping duty only
Type CR resistors (available for the small HP drives as listed below)

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-01U-05A8-1	1.5	P14494-CR-06	50	100	\$87	P14494-CR-18	50	200	\$104
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-01U-05A8-1	1.5	P14494-CR-24	50	300	\$139	P14494-CR-32	50	400	\$174

Standard enclosed resistor packages

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-01U-05A8-1	1.5	P14494-24	45	300	\$223	P14494-24	45	300	\$223
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-01U-05A8-1	1.5	P14494-24	45	300	\$223	P14494-24	45	300	\$223

Notes: To determine resistor type, dimensions and weights refer to Resistor Technical Data Tables

ACS250 IP66

Braking resistors

Single-phase 200-240 V applications, stopping duty only

Type CR resistors (available for the small HP drives as listed below)

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-01U-10A5-2	3	P14494-CR-12	50	150	\$104	P14494-CR-24	50	300	\$139
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-01U-10A5-2	3	P14494-CR-32	50	400	\$174				

Standard enclosed resistor packages

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-01U-10A5-2	3	P14494-31	35	300	\$223	P14494-31	35	300	\$223
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-01U-10A5-2	3	P14494-32	35	820	\$337	P14494-32	35	820	\$337

Notes: To determine resistor type, dimensions and weights refer to Resistor Technical Data Tables

ACS250 IP66

Braking resistors

Three-phase 200-240 V applications, stopping duty only

Type CR resistors (available for the small HP drives as listed below)

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-07A0-2	2	P14494-CR-06	50	100	\$87	P14494-CR-18	50	200	\$122
ACS250-03U-10A5-2	3	P14494-CR-12	50	150	\$104	P14494-CR-24	50	300	\$139
ACS250-03U-18A0-2	5	P14494-CR-26	40	300	\$139	P14494-CR-34	40	400	\$174
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-07A0-2	2	P14494-CR-24	50	300	\$140	P14494-CR-32	50	400	\$174
ACS250-03U-10A5-2	3	P14494-CR-32	50	400	\$174				

Standard enclosed resistor packages

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-03U-07A0-2	2	P14494-31	35	300	\$223	P14494-31	35	300	\$223
ACS250-03U-10A5-2	3	P14494-31	35	300	\$223	P14494-31	35	300	\$223
ACS250-03U-18A0-2	5	P14494-31	35	300	\$223	P14494-32	35	820	\$337
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-01U-07A0-2	2	P14494-31	35	300	\$223	P14494-32	35	820	\$337
ACS250-01U-10A5-2	3	P14494-32	35	820	\$337	P14494-32	35	820	\$337
ACS250-03U-18A0-2	5	P14494-32	35	820	\$337	P14494-32	35	820	\$337

Notes: To determine resistor type, dimensions and weights refer to Resistor Technical Data Tables

ACS250 IP66

Braking resistors

Three-phase 380-480 V applications, stopping duty only

Type CR resistors (available for the small HP drives as listed below)

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-04A1-4	2	P14494-CR-03	150	100	\$87	P14494-CR-15	150	200	\$122
ACS250-03U-05A8-4	3	P14494-CR-11	100	150	\$104	P14494-CR-22	100	300	\$139
ACS250-03U-09A5-4	5	P14494-CR-22	100	300	\$139	P14494-CR-30	100	400	\$174
ACS250-03U-14A0-4	7.5	P14494-CR-32	50	400	\$174				
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-04A1-4	2	P14494-CR-21	150	300	\$139	P14494-CR-29	150	400	\$174
ACS250-03U-05A8-4	3	P14494-CR-30	100	400	\$174				

Standard enclosed resistor packages

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-03U-04A1-4	2	P14494-15	150	300	\$223	P14494-15	150	300	\$223
ACS250-03U-05A8-4	3	P14494-15	150	300	\$223	P14494-15	150	300	\$223
ACS250-03U-09A5-4	5	P14494-19	75	300	\$223	P14494-20	75	600	\$337
ACS250-03U-14A0-4	7.5	P14494-25	45	800	\$337	P14494-25	45	800	\$337
ACS250-03U-18A0-4	10	P14494-25	45	800	\$337	P14494-26	45	1260	\$433
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-03U-04A1-4	2	P14494-15	150	300	\$223	P14494-16	150	600	\$337
ACS250-03U-05A8-4	3	P14494-16	150	600	\$337	P14494-16	150	600	\$337
ACS250-03U-09A5-4	5	P14494-20	75	600	\$337	P14494-21	75	1000	\$433
ACS250-03U-14A0-4	7.5	P14494-26	45	1260	\$433	P14494-27	45	1920	\$626

Notes: To determine resistor type, dimensions and weights refer to Resistor Technical Data Tables

ACS250 IP20 & IP66

Braking resistors

Three-phase 575-600 V applications, stopping duty only

Type CR resistors (available for the small HP drives as listed below)

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-02A1-6	1.5	P14494-CR-02	200	100	\$87	P14494-CR-13	250	200	\$122
ACS250-03U-03A1-6	2	P14494-CR-08	250	150	\$104	P14494-CR-19	250	300	\$139
ACS250-03U-04A1-6	3	P14494-CR-22	100	300	\$139	P14494-CR-30	100	400	\$174
ACS250-03U-06A5-6	5	P14494-CR-22	100	300	\$139				
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	CR part no.	Ohms	Watts	List price	CR part no.	Ohms	Watts	List price
ACS250-03U-02A1-6	1.5	P14494-CR-19	250	300	\$139	P14494-CR-27	250	400	\$174
ACS250-03U-03A1-6	2	P14494-CR-19	250	300	\$139	P14494-CR-27	250	400	\$174
ACS250-03U-04A1-6	3	P14494-CR-27	250	400	\$174				

Standard enclosed resistor packages

		DutyCycle=3sec on/27sec off				DutyCycle=10sec on/50sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-03U-02A1-6	1.5	P14494-11	250	300	\$223	P14494-11	250	300	\$223
ACS250-03U-03A1-6	2	P14494-11	250	300	\$223	P14494-11	250	300	\$223
ACS250-03U-04A1-6	3	P14494-11	250	300	\$223	P14494-11	250	300	\$223
ACS250-03U-06A5-6	5	P14494-13	200	300	\$223	P14494-14	200	600	\$337
		DutyCycle=30sec on/180sec off				DutyCycle=60sec on/180sec off			
Drive type code	HP	Resistor part no.	Ohms	Watts	List price	Resistor part no.	Ohms	Watts	List price
ACS250-03U-02A1-6	1.5	P14494-11	250	300	\$223	P14494-11	250	300	\$223
ACS250-03U-03A1-6	2	P14494-11	250	300	\$223	P14494-11	250	300	\$223
ACS250-03U-04A1-6	3	P14494-12	250	600	\$337	P14494-12	250	600	\$337
ACS250-03U-06A5-6	5	P14494-14	200	600	\$337	P14494-18	150	1200	\$529
ACS250-03U-09A0-6	7.5	ABB-48431-052	80	800	\$337	P14494-63	80	1050	\$433
ACS250-03U-12A0-6	10	P14494-62	63	800	\$337	ABB-48431-140	63	1200	\$433
ACS250-03U-17A0-6	15	ABB-41163	35	900	\$433	P14494-34	35	1600	\$529
ACS250-03U-22A0-6	20	P14494-33	35	1200	\$433	ABB-44534	40	2010	\$626

Notes: To determine resistor type, dimensions and weights refer to Resistor Technical Data Tables

ACS250 IP20 & IP66

Resistor technical data

Part number	Ohms	Watts	Encl	Dimensions W x D x H (inches)	Weight (lbs)	List price
P14494-11	250	300	GCE1	12W x 5D x 5H	7	\$223
P14494-12	250	600	GCE2	12W x 7D x 5H	10	\$337
P14494-13	200	300	GCE1	12W x 5D x 5H	7	\$223
P14494-14	200	600	GCE2	12W x 7D x 5H	10	\$337
P14494-15	150	300	GCE1	12W x 5D x 5H	7	\$223
P14494-16	150	600	GCE2	12W x 7D x 5H	10	\$337
P14494-18	150	1200	GCE4	12W x 13D x 5H	16	\$529
P14494-19	75	300	GCE1	12W x 5D x 5H	7	\$223
P14494-20	75	600	GCE2	12W x 7D x 5H	10	\$337
P14494-21	75	1000	GCE3	12W x 10D x 5H	13	\$433
P14494-25	45	800	GCE2	12W x 7D x 5H	10	\$337
P14494-26	45	1260	GCE3	12W x 10D x 5H	13	\$433
P14494-27	45	1920	GCE5	12W x 16D x 5H	18	\$626
P14494-31	35	300	GCE1	12W x 5D x 5H	7	\$223
P14494-32	35	820	GCE2	12W x 7D x 5H	10	\$337
P14494-34	35	1600	GCE4	12W x 13D x 5H	16	\$529
P14494-CR-02	200	100	CR100	6W x 1.5D x 0.75H	1	\$87
P14494-CR-03	150	100	CR100	6W x 1.5D x 0.75H	1	\$87
P14494-CR-06	50	100	CR100	6W x 1.5D x 0.75H	1	\$87
P14494-CR-08	250	150	CR150	9W x 1.5D x 0.75H	1	\$104
P14494-CR-11	100	150	CR150	9W x 1.5D x 0.75H	1	\$104
P14494-CR-12	50	150	CR150	9W x 1.5D x 0.75H	1	\$104
P14494-CR-13	250	200	CR200	6W x 3D x 1.5H	2	\$122
P14494-CR-15	150	200	CR200	6W x 3D x 1.5H	2	\$122
P14494-CR-18	50	200	CR200	6W x 3D x 1.5H	2	\$122
P14494-CR-19	250	300	CR300	9W x 3D x 1.5H	3	\$139
P14494-CR-21	150	300	CR300	9W x 3D x 1.5H	3	\$139
P14494-CR-22	100	300	CR300	9W x 3D x 1.5H	3	\$139
P14494-CR-24	50	300	CR300	9W x 3D x 1.5H	3	\$139
P14494-CR-26	40	300	CR300	9W x 3D x 1.5H	3	\$139
P14494-CR-27	250	400	CR400	12W x 3D x 1.5H	4	\$174
P14494-CR-29	150	400	CR400	12W x 3D x 1.5H	4	\$174
P14494-CR-30	100	400	CR400	12W x 3D x 1.5H	4	\$174
P14494-CR-31	75	400	CR400	12W x 3D x 1.5H	4	\$174
P14494-CR-32	50	400	CR400	12W x 3D x 1.5H	4	\$174
P14494-CR-34	40	400	CR400	12W x 3D x 1.5H	4	\$174
ABB-48431-052	80	800	GCE2	12W x 7D x 5H	10	337
P14494-63	80	1050	GCE3	12W x 10D x 5H	13	433
P14494-62	63	800	GCE2	12W x 7D x 5H	10	337
ABB-48431-140	63	1200	GCE3	12W x 10D x 5H	13	433
ABB-41163	35	900	GCE3	12W x 10D x 5H	13	433
P14494-34	35	1600	GCE4	12W x 13D x 5H	16	529
P14494-33	35	1200	GCE3	12W x 10D x 5H	13	433
ABB-44534	40	2010	GCE5	12W x 16D x 5H	18	626

ACS250

Additional resources

QR codes

Scan or click the QR code to the left to access the described resources

ABB drives website



The ABB drives web portal.
Access all ABB drive information
from here.

Secure uptime throughout the drive life cycle

ABB follows a four-phase model for managing the life cycles of its drives. The life cycle phases are active, classic, limited and obsolete. Within each phase, every drive series has a defined set of services.

Examples of individual services are drive selection and dimensioning, installation and commissioning, preventive and corrective maintenance, remote monitoring and intelligent diagnostics, technical support, upgrade and retrofit, replacement and recycling plus training and learning.

In the active phase the drive is in serial production. The drive, with complete life cycle services, is available for purchase.

In the classic phase, the serial production of the drive has ended. The drive, with complete life cycle services, is available for plant extensions.

In the limited phase, the drive is no longer available. The life cycle services are limited. Spare parts as well as maintenance and repair services are available as long as materials can be obtained.

In the obsolete phase, the drive is not available. ABB cannot guarantee availability of services for technical reasons or within reasonable cost.

To ensure the availability of complete life cycle services, ABB recommends that a drive is kept in the active or classic phase by upgrading, retrofitting or replacing.

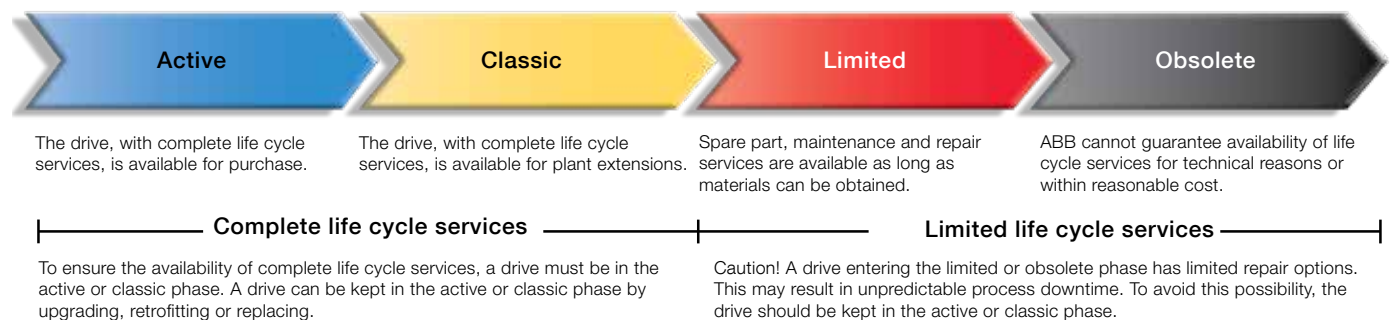
In the classic phase ABB carries out an annual review for each drive life cycle plan. Should any changes to the availability or duration of the services be necessary, ABB gives a life cycle announcement indicating eventual change of life cycle phase and/or any change in the duration of services.

In the limited phase, ABB issues a life cycle phase change announcement, half a year prior to shifting the product into the obsolete phase.

Maximizing return on investment

The four-phase life cycle management model provides customers with a transparent method for managing their investment in drives. In each phase, customers clearly see what life cycle services are available, and more importantly, what services are not available. Decisions on upgrading, retrofitting or replacing drives can be made with confidence.

ABB drive life cycle management model



ACS250

Glossary of terms

AC (Alternating Current) – The commonly available electric power supplied by an AC generator and is distributed in single- or three-phase forms. AC current changes its flow (current).

AC motor – A motor operating on AC current that flows in either direction. There are two types: induction and synchronous.

Accelerating torque – An increase in torque (force) generated by a motor in order to achieve running speed.

Adjustable speed – The concept of varying the speed of a motor, either manually or automatically. The desired operating speed (set speed) is relatively constant regardless of load.

Adjustable speed drive (electrical) – The adjustable speed drive is comprised of the motor, drive controller, and operator's controls (either manual or automatic). See also Inverter.

Altitude – The atmospheric altitude (height above sea level) at which the motor or drive will be operating.

Ambient temperature – The temperature of the surrounding cooling medium, such as gas or liquid, which comes into contact with the heated parts of the motor or drive.

Ampere – The rate of flow of charge in a conductor of one coulomb per second.

Armature – The moving part of a magnetic circuit, such as the rotating part of a motor or generator.

Base frequency – The motor nameplate frequency rating.

Base speed – The manufacturer's nameplate rating at which point the motor will develop rated horsepower at rated load and voltage. With DC drives, it is commonly the point where full armature voltage is applied with full-rated field excitation. With AC drives, it is commonly the point where 60 Hz is applied to the induction motor.

BAUD – A unit of signaling speed, equal to the number of discrete conditions or signal events per second. Where one bit is encoded on each signaling event, the number of baud is the same as the number of bits.

Braking – A method of stopping or reducing the time required to stop an AC or DC motor, accomplished in several ways:

DC-injection braking (AC drives) – A method which produces electromagnetic braking forces in the motor by removing two AC motors (stator) phases and injecting DC current. The result is a linear braking characteristic (ramp) that does not diminish with motor speed. Application is normally limited to 10 - 20% of rated motor speed due to increased heating in the rotor.

Dynamic Braking (AC drives) - DB – A method which produces electromagnetic braking forces in the motor by

dissipating generated power into the DC bus through a resistive load. Braking force remains constant and is only limited by the thermal capacity of the resistors. The result is a linear braking characteristic (ramp) that does not diminish with motor speed.

Dynamic Braking (DC drives) - DB – A method which produces electromagnetic braking forces in the motor by dissipating generated power from armature / shunt field reaction into a resistive load. Braking force is determined by the field strength, armature voltage, and thermal capacity of the resistors. The result is a logarithmic braking characteristic (curve) that diminishes with motor speed.

Regenerative Braking – The technique of slowing or stopping a drive by regeneration.

Braking torque – The torque required to bring a motor down to a standstill. The term is also used to describe the torque developed by a motor during dynamic braking conditions.

Breakaway torque – The torque required to start a machine from standstill. It is always greater than the torque needed to maintain motion.

Cascade drive system – Two or more drives connected to a master speed setting potentiometer.

Capacitor – A device which, when connected in an alternating-current circuit, causes the current to lead the voltage in time phase. The peak of the current wave is reached ahead of the peak of the voltage wave.

CE – This designation shows that a product such as a drive or motor meets European Standards for safety and environmental protection. A CE mark is required for products used in most European countries.

Chassis – A hardware assembly that houses devices such as I/O modules, adapter modules, processor modules, and power supplies.

Configurable – Input parameter whose values can only be modified while the drive is stopped (not running or jogging).

Current – The time rate of flow of electrical charge. Current is measured in amps (amperes).

Current feedback – A current signal used by the regulator to control the operating current of the drive.

AC (Alternating Current) – A type of electrical current where the current repeatedly changes direction. It may be continuous or discontinuous and it may be constant or varying.

DC bus – A drive's power structure that transmits rectified AC line power from the bridge rectifier to the output transistors.

ACS250

Glossary of terms

Decelerating torque – The torque (force) generated by the decrease in motor and load kinetic energy which the motor and load requires to reach its final (slower) speed condition.

Default value – Parameter values that are stored in the drive's read-only memory (ROM).

Device – A module or product.

Diode – A solid-state, unidirectional conductor.

Drive controller – An electronic device that can control the speed, torque horsepower, and direction of an AC or DC motor. Also called Variable Speed Drive.

Dynamic braking – See Braking.

Efficiency – The ratio of mechanical output to electrical input. It represents the effectiveness with which the motor converts electrical energy to mechanical energy.

EIA – Electronics Industries Association. An American agency that sets electrical / electronic standards.

Electrostatic discharge (ESD) – A static-electricity discharge that may damage drive components. Follow appropriate precautions to guard against damage to drive components.

EMF – Electromotive Force, another term for voltage or potential difference. In DC adjustable speed drives, voltage applied to the motor armature from a power supply is the emf and the voltage generated by the motor is the counter-emf or cemf.

EMI – Electromagnetic Interference. Any electromagnetic disturbance that interrupts, obstructs, or otherwise impairs the performance of electronic equipment.

Enclosure – The housing or frame of the drive.

Fault – Any malfunction that interferes with normal system operation.

Firmware – Logic stored in read-only memory.

Flash update – The process of updating firmware in a device.

Flux – The magnetic field which is established around an energized conductor or permanent magnet. The field is represented by flux lines creating a flux pattern between opposite poles. The density of the flux lines is a measure of the strength of the magnetic field.

Force – The tendency to change the motion of an object with an exertion of energy from a separate source. Force is measured in pound-feet, ounce-inches, Newton-meters, or gram-centimeters.

Frame – The supporting structure of the drive. The frame also determines mounting dimensions.

Frequency – The rate at which alternating current makes a complete cycle of reversals. It is expressed in cycles per second. In the U.S., 60 cycles (Hz) is the standard while in other countries 50 Hz (cycles) is common. The frequency of the AC current will affect the speed of a motor.

Frequency setpoint – The frequency value stored in memory (either by local or remote means) within a given frequency range of the drive's output voltage. This sets the speed of the motor.

Gain – The ratio of the magnitude of the output signal with respect to that of the input signal.

Ground fault sense – A current transducer that detects an unequal or imbalanced current in the three-phase AC line or DC bus of the drive. The imbalance indicates an output ground fault condition.

Hertz (Hz) – One cycle per second (as in 60 Hz which is 60 cycles per second).

Horsepower – The measure of the rate of work. One horsepower is equivalent to lifting 33,000 pounds to a height of one foot in one minute. The horsepower (HP) of a motor is expressed as a function of torque (T, measured in lb-ft) and RPM (revolutions per minute). For motors, you can approximate horsepower using this formula: $HP = T \times (RPM/5250)$.

Host –

1. A central controlling computer in a network system.
2. Any device on a network system that provides a controlling function to another device on the network.
3. Any intelligent device for which another device is providing a communication interface to a network.

Host interface – The communication interface to the host computer.

Inductance – The characteristic of an electric circuit by which varying current in it produces a varying magnetic field which causes voltages in the same circuit or in a nearby circuit.

Inertia – A measure of a body's resistance to changes in velocity, whether the body is at rest or moving at a constant velocity. The velocity can be either linear or rotational.

Inertial load – A load (such as a flywheel or fan) that tends to cause the motor shaft to continue to rotate after power has been removed (stored kinetic energy). If this continued rotation cannot be tolerated, some mechanical or electrical braking means must be applied. This application might require a special motor due to the energy required to accelerate the inertia.

ACS250

Glossary of terms

Ingress protection (IP) rating – The IP designation is a numeric rating used to specify the degree of environmental protection provided by an enclosure based on specific tests. The IP rating consists of two numbers, although a third number describing the degree of protection from mechanical impact can also be included but is commonly omitted.

For example, IP 56. A higher number represents better protection.

First number – The first number describes the degree of protection from solid objects and with respect to human access to hazardous parts.

- 0 - No protection.
- 1 - Protection against solid objects 50 mm in diameter or greater
- 2 - Protection against solid objects 12.5 mm in diameter or greater
- 3 - Protection against solid objects 2.5 mm in diameter or greater
- 4 - Protection against solid objects 1.0 mm in diameter or greater
- 5 - Dust protected (quantities of dust will not accumulate)
 - Dust tight

Second number – The second number describes the degree of protection from liquids.

- 0 - No protection.
- 1 - Protection against vertically falling drops of water
- 2 - Protection against vertically falling drops of water when enclosure is tilted up to 15 degrees
- 3 - Protection against spraying water when the enclosure is tilted up to 60 degrees on the vertical
- 4 - Protection against splashing water from all directions
- 5 - Protection against water jets from all directions
- 6 - Protection against powerful water jets or heavy seas
- 7 - Protection against the effects of temporary immersion in water
- 8 - Protection against the effects of continuous submersion in water

Instantaneous electronic trip (IET) – A fault condition that occurs while the drive is running resulting in a motor coast-to-rest stop. The drive senses a condition that could result in equipment damage.

Input parameter – A parameter whose value can be changed.

Input power factor – The ratio of the input inverter AC effective power to the input AC apparent power.

- Inverter** –
- 1 - An AC adjustable-frequency drive
 - 2 - A particular section of an AC drive. This section uses the DC voltage from a previous circuit stage (intermediate DC circuit) to produce a pulse-width modulated or stepped AC current or voltage waveform that has characteristics similar to the desired sine-wave frequency.
 - 3 - A circuit whose output signal is the inverse of its input.

I/O – Input(s) and/or Output(s)

I/O block – An assembly containing a chassis, a power supply, an adapter, and I/O in a single integral package.

I/O channel – A channel of a data transmission link between a processor scanner module and an I/O adapter module.

I/O chassis – A chassis for I/O modules and either a processor to control the I/O modules, or an adapter to interface a scanner to the I/O modules.

IR compensation – A way to compensate for the voltage drop across resistance of the AC or DC motor circuit and the resultant reduction in speed. This compensation also provides a way to improve the speed regulation characteristics of the motor, especially at low speeds. Drives that use a tachometer generator for speed feedback generally do not require an IR compensation circuit because the tachometer will inherently compensate for the loss in speed.

- Jogging** –
- 1 - In a numerical control system, an operator manually generating motion (continuous or incrementally) by closing a switch.
 - 2 - An operator generating motion incrementally by closing a switch.

- Joule** –
- 1. The work done by the force of 1 Newton acting through a distance of 1 meter.
 - 2. The energy required to transport 1 coulomb between two points having a potential difference of 1 volt.

k – An abbreviation used as a multiple for bits, bytes, or words denoting size of a block of data or memory. 1 k = 1024.

Kilowatt (kW) – Equals 1,000 watts and is used where larger units of power measurement are desired because the watt is a relatively small unit of power.

Kinetic energy – The energy of motion of a moving body.

Ladder diagram – An industry standard for representing relay control logic.

LED – Light Emitting Diode.

LEM – A hall-effect current transducer that senses drive output current and generates a signal for the control logic.

Line dip – A short duration, low input voltage condition.

Liquid crystal display (LCD) – A reflective, visual readout device often used in digital watches and laptop computers.

Load – The burden imposed on a motor by the driven machine. It is often stated as the torque required to overcome the resistance of the machine it drives. "Load" is sometimes synonymous with "required power."

ACS250

Glossary of terms

Load torque – The motor torque required to keep the load rotating at nearly constant speed.

Local I/O – I/O connected to a processor across a backplane or a parallel link, thus limiting its distance from the processor.

Logic diagram – A diagram that represents logic elements and their interconnections.

Master – A device used to control secondary devices.

Modulated LED control – A photoelectric control that operates on light pulses, rather than on constant light intensity.

Module – A device that provides an interface between a product and a network. It is often referred to as a peripheral.

Module addressing – The method of identifying the I/O modules installed in chassis.

Motor – A device that converts electrical energy to mechanical energy to turn a shaft.

Motor Identification:

- Frame designation (actual frame size in which the motor is built)
- Horsepower, speed, design and enclosure
Voltage, frequency and number of phases of power supply
- Class of insulation and time rating
- Application

Motor Nameplate – The plate on the outside of a motor that describes the motor, horsepower, voltage, revolutions per minute, efficiency, design, enclosure, etc.

NEMA (National Electrical Manufacturer's Association) – A non-profit organization organized and supported by manufacturers of electric equipment and supplies. NEMA has set standards for: horsepower ratings, speeds, frame sizes and dimensions, standard voltages and frequencies with allowable variations, service factors, torque, starting current, and enclosures.

Network – A series of stations (nodes) connected by some type of communication medium. A network may be made up of a single link or multiple links.

Node – The connection point at which media access is provided.

Non-Retentive – Changes to the parameter value are not saved when power is removed.

Non-Volatile storage (NVS) – NVS is the permanent memory of a device. Devices such as the converter store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called EEPROM.

Output parameter – Provides output information. Value cannot be changed through the OIM.

Overcurrent – A current greater than a specified maximum current value.

Overload capacity – The ability of the drive to withstand currents beyond the system's continuous rating. It is normally specified as a percentage of full load current for a specified time period.

Peripheral equipment – In a programmable controller system, units that communicate with the programmable controller, but are not part of the programmable controller. For example, a programmable device or printer.

Phase – Indicates changing values of the recurring cycles of AC voltages and currents. The most common power supplies are either single- or three-phase (with 120 electrical degrees between three-phases).

Potentiometer – A resistor with one or more adjustable sliding contacts that function as an adjustable voltage divider.

Power – Work done per unit time. Measured in horsepower or watts: 1 HP = 33,000 ft-lb/min = 746 watts.

Power factor – A measurement of the time phase difference between the voltage and current in an AC circuit. Power factor is the ratio of real power (kW) to total KVA or the ratio of actual power (W) to apparent power (volt-amperes).

Preset speed – Describes one or more fixed speeds at which a drive operates.

Program – A set of instructions used to control a machine or process.

Programmable controller – A solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory.

Programmable controller communications command (PCCC)

– The protocol used by some controllers to communicate with devices on a network. Some software products also use PCCC to communicate.

Pulse – A momentary, sharp change in voltage, current, or light from its quiescent condition.

Pulse-width-modulation (PWM) – A technique used to eliminate or reduce unwanted harmonic frequencies when inverting DC voltage to sine wave AC.

Queue – A logical structure that keeps track of items waiting for processing whenever the system is unable to process each item immediately. It controls the order in which the waiting items are ultimately processed.

ACS250

Glossary of terms

Rated input voltage – The specified AC line voltage connected to the drive.

Rated output current – The total maximum current delivered from a drive or to a motor under full load conditions.

Rated output voltage – The total maximum output voltage while delivering rated current under full load conditions.

Rectifier – A device that conducts current in only one direction, thereby transforming alternating current to direct current.

Regeneration – 1. For DC drives, the characteristic of a motor to act as a generator when the counter emf is larger than the drive's applied voltage.

2. For AC drives, the point at which rotor synchronous frequency is greater than the applied frequency.

Regenerative braking – See Braking.

Regenerative control – A regenerative drive contains the inherent capability and/or power semiconductors to control the flow of power to and from the motor.

Remote I/O – I/O connected to a processor across a serial link. With a serial link, remote I/O can be located long distance from the processor.

Revolutions per minute (RPM) – The number of times per minute the shaft of the motor (machine) rotates.

Service factor (SF) – When used on a motor nameplate, a number that indicates how much above the nameplate rating a motor can be loaded without causing serious degradation. For example, a 1.15 SF can produce 15% greater torque than a 1.0 SF rating of the same motor.

Slave – In a communication link, a station that cannot initiate communication. Only a master can initiate communication.

Speed range – The speed minimum and maximum at which a motor must operate under constant or variable torque load conditions.

Stall – A motor state in which the motor remains motionless although the motor is generating torque.

Stator – The part of an AC induction motor's magnetic structure which does not rotate.

Status – The condition at a particular time of any of numerous entities within a system.

Status indicators – LEDs that are used to report the status of a device.

Surge suppressor – Circuit protection that suppresses the peak value of any unusual input voltage to the drive. It is sometimes used to lighten the leading edge of voltage.

Tachometer – Normally used as a rotation sensing device. Tachometers are typically attached to the output shaft of a motor requiring close speed regulation. The tachometer feeds its signal to a control loop, which adjusts its input to the motor accordingly.

Throughput – The rate at which equipment processes or transmits data.

Top speed – The highest speed a drive can achieve. Top speed equals base speed when there is no field weakening.

Torque – Turning force delivered by a motor or gearmotor shaft, usually expressed in pounds-feet or newton-meters:

$$\text{lb-ft} = \text{HP} \times (5250/\text{RPM}) = \text{Full Load Torque};$$

$$\text{Nm} = \text{P(kW)} \times (9550/\text{RPM}) = \text{Full Load Torque};$$

Torque compensation – The increase of the volts/frequency ratio of the drive in the low frequency area to compensate for the reduced torque of the motor at low speeds. Reduced torque at low speeds is due to the resistance of the motor stator windings.

Transducer – A device that converts one energy form to another. When a transducer is actuated by signals from one system or medium, it can supply a related signal to the other system or medium.

Tunable – Input parameter whose value can be modified at any time (when the drive is stopped, running, or jogging).

U.L. (underwriter's laboratory) – An independent testing organization, which examines and tests devices, systems and materials with particular reference to life, fire and casualty hazards.

Variable torque – A multi-speed motor used on loads with torque requirements, which vary with speed as with some centrifugal pumps and blowers. The horsepower varies as the square of the speed.

Voltage – The force that causes a current to flow in an electrical circuit. Analogous to pressure in hydraulics, voltage is often referred to as electrical pressure. The voltage of a motor is usually determined by the supply to which it is attached. NEMA requires that the motor be able to carry its rated horsepower at nameplate voltage plus or minus 10% although not necessarily at the rated temperature rise.

Voltage feedback – A voltage signal which the regulator uses to control the operation of the drive.

Volts per hertz (V/Hz) – The ratio of output voltage (in volts) to output frequency (in hertz) in the output frequency range of the drive to achieve constant torque in the motor.

Watt (W) – The amount of power required to maintain a current of one ampere at a pressure of one volt. One horsepower is equal to 756 watts.

Word – A grouping or a number of bits in a sequence that is treated as a unit.

Work – A force moving an object over a distance. $\text{Work} = \text{Force} \times \text{Distance}$.

General terms and conditions of sale

1. General.

The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, the term "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided, however, that Paragraph 13(a) shall apply exclusively to the initial end user.

2. Prices.

- (a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.
- (b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.
- (c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.
- (d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

3. Payment.

- (a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.
- (b) If in the judgment of ABB the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.
- (c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

4. Changes.

- (a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.
- (b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

5. Delivery.

- (a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.
- (b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.
- (c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.
- (d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier.

6. Title & Risk of Loss.

Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

7. Inspection, Testing and Acceptance.

- (a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.
- (b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.
- (c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.

- (a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.
- (b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.
- (c) Exceptions. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment 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 ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.
- (d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".
- (e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Patent Indemnity.

- (a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.
- (b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.
- (c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.
- (d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision.

General terms and conditions of sale

10. Limitation of Liability.

(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the equipment or part thereof or Services which gives rise to the claim.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services. 11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State Courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA.

ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

13. Software License.

(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine readable Software from all of Purchaser's storage media.

14. Inventions and Information.

Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure.

ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation.

Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination.

No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

18. Export Control.

(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.

(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

19. Assignment.

Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity.

For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale.

If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement.

This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.

US district sales offices

© Copyright 2013 All specifications and pricing subject to change without notice.

ARIZONA

PHOENIX

4211 S. 43RD PLACE
PHOENIX, AZ 85040
PHONE: 602-470-0407
FAX: 602-470-0464

ARKANSAS

CLARKSVILLE

706 WEST MAIN STREET
CLARKSVILLE, AR 72830
PHONE: 479-754-9108
FAX: 479-754-9205

CALIFORNIA

LOS ANGELES

6480 FLOTILLA STREET
COMMERCE, CA 90040
PHONE: 323-724-6771
FAX: 323-721-5859

HAYWARD

21056 FORBES STREET
HAYWARD, CA 94545
PHONE: 510-785-9900
FAX: 510-785-9910

COLORADO

DENVER

3855 FOREST STREET
DENVER, CO 80207
PHONE: 303-623-0127
FAX: 303-595-3772

CONNECTICUT

WALLINGFORD

65 SOUTH TURNPIKE ROAD
WALLINGFORD, CT 06492
PHONE: 203-269-1354
FAX: 203-269-5465

FLORIDA

TAMPA / PUERTO RICO / VIRGIN ISLANDS

3906 EAST 11TH AVENUE
TAMPA, FL 33605
PHONE: 813-248-5078
FAX: 813-241-9514

GEORGIA

ATLANTA

62 TECHNOLOGY DRIVE
ALPHARETTA, GA 30005
PHONE: 770-772-7000
FAX: 770-772-7200

ILLINOIS

CHICAGO

340 REMINGTON BOULEVARD
BOLINGBROOK, IL 60440
PHONE: 630-296-1400
FAX: 630-226-9420

INDIANA

INDIANAPOLIS

5525 W. MINNESOTA STREET
INDIANAPOLIS, IN 46241
PHONE: 317-246-5100
FAX: 317-246-5110

IOWA

DES MOINES

1943 HULL AVENUE
DES MOINES, IA 50313
PHONE: 515-263-6929
FAX: 515-263-6515

MARYLAND

BALTIMORE

7071A DORSEY RUN ROAD
ELKBRIDGE, MD 20175
PHONE: 410-579-2135
FAX: 410-579-2677

MASSACHUSETTS

BOSTON

6 PULLMAN STREET
WORCESTER, MA 01606
PHONE: 508-854-0708
FAX: 508-854-0291

MICHIGAN

DETROIT

5993 PROGRESS DRIVE
STERLING HEIGHTS, MI 48312
PHONE: 586-978-9800
FAX: 586-978-9969

MINNESOTA

MINNEAPOLIS

21080 134TH AVE NORTH
ROGERS, MN 55374
PHONE: 763-426-3633
FAX: 763-428-4551

MISSOURI

ST. LOUIS

13678 LAKEFRONT DRIVE
EARTH CITY, MO 63045
PHONE: 314-373-3032
FAX: 314-373-3038

KANSAS CITY

9810 INDUSTRIAL BLVD.
LENEXA, KS 66215
PHONE: 816-587-0272
FAX: 816-587-3735

NEW YORK

AUBURN

ONE ELLIS DRIVE
AUBURN, NY 13021
PHONE: 315-255-3403
FAX: 315-253-9923

NORTH CAROLINA

GREENSBORO

1220 ROTHERWOOD ROAD
GREENSBORO, NC 27406
PHONE: 336-272-6104
FAX: 336-273-6628

OHIO

CINCINNATI

2929 CRESCENTVILLE ROAD
WEST CHESTER, OH 45069
PHONE: 513-771-2600
FAX: 513-772-2219

OHIO (continued)

CLEVELAND

8929 FREEWAY DRIVE
MACEDONIA, OH 44056
PHONE: 330-468-4777
FAX: 330-468-4778

OKLAHOMA

TULSA

5555 E. 71ST STREET SUITE 9100
TULSA, OK 74136
PHONE: 918-366-9320
FAX: 918-366-9338

OREGON

PORTLAND

12651 SE CAPPS ROAD
CLACKAMAS, OR 97015
PHONE: 503-691-9010
FAX: 503-691-9012

PENNSYLVANIA

PHILADELPHIA

1035 THOMAS BUSCH
MEMORIAL HIGHWAY
PENNSAUKEN, NJ 08110
PHONE: 856-661-1442
FAX: 856-663-6363

PITTSBURGH

159 PROMINENCE DRIVE
NEW KENSINGTON, PA 15068
PHONE: 724-889-0092
FAX: 724-889-0094

TENNESSEE

MEMPHIS

4000 WINCHESTER ROAD
MEMPHIS, TN 38118
PHONE: 901-365-2020
FAX: 901-365-3914

TEXAS

DALLAS

2920 114TH STREET SUITE 100
GRAND PRAIRIE, TX 75050
PHONE: 214-634-7271
FAX: 214-634-8874

HOUSTON

10355 W. UTILE YORK ROAD SUITE 300
HOUSTON, TX 77041
PHONE: 281-977-6500
FAX: 281-977-6510

UTAH

SALT LAKE CITY

2230 SOUTH MAIN STREET
SALT LAKE CITY, UT 84115
PHONE: 801-832-0127
FAX: 801-832-8911

WISCONSIN

MILWAUKEE

1960 SOUTH CALHOUN ROAD
NEW BERLIN, WI 53151
PHONE: 262-784-5940
FAX: 262-784-1215

Contact us

ABB Inc.

Automation Technologies

Drives & Motors

16250 West Glendale Drive

New Berlin, WI 53151

USA

Telephone +1 262 785-3200

+1 800 752-0696, opt 1

E-mail DrivesSupportLine@us.abb.com

Fax +1 262 780-5135

Website www.abb.com/drives

ACS250-PNPL01U-EN REV A Effective 10/01/2013