



**EMERSON**<sup>TM</sup>  
Industrial Automation



## Commander SK General Purpose AC Drive

0.33 - 200hp (0.25 - 132kW)  
115V / 208V - 240V / 380V - 480V / 575V / 690V



## Commander SK, the Best-in-Class General Purpose AC Drive

The Commander SK's robust design and ease of use provides OEMs and end-users added value to their machines and minimizes the installed cost. These valued advantages are achieved through a simple-to-install, easy-to-use, high-performance drive design with integrated features that allow advanced functions to be performed. The Commander SK is ideal for a wide range of industrial automation and process control applications.



# Simplicity with Functionality

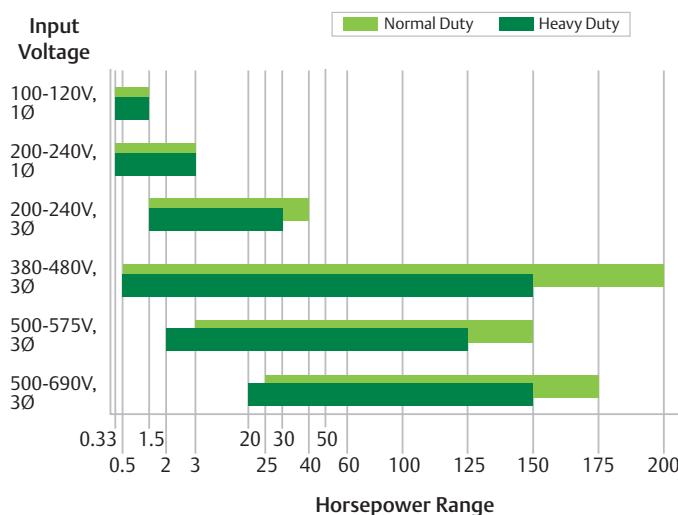
The Commander SK is designed to be a simple, compact, cost-effective open-loop AC motor speed controller that delivers dynamic performance. With the key parameters you need for 90% of applications printed right on the front of the drive, the Commander SK's design ensures straightforward installation and commissioning.

For more demanding applications, the Commander SK delivers benchmark functionality through a variety of optional features including snap-in option modules, PLC functionality and others. When faced with more complex applications, this design ensures that you can still rely on the Commander SK to deliver. Commander SK's robust design offers you more than the average general purpose drive through lower cost solutions and better productivity in your motor control applications.

## Fast and Easy Support

- Commander SK is supported through a global engineering network of over 50 Control Techniques Drive Centers in over 30 countries as well as authorized resellers located in more than 30 additional countries
- Warranty is honored worldwide regardless of where your drive was purchased

## Ratings



## Performance Advantage

### One Drive for All Open-loop Applications

- Precise open-loop vector control algorithm provides full torque down to 1Hz for exceptional performance
- Speed or torque control from one drive
- Standard V/Hz control for single- and multi-motor operation
- Dynamic V/Hz control for energy savings

### Static Auto-Tune

This feature allows fast motor / drive optimization without having to uncouple the load.

### Dual Duty Ratings—Normal and Heavy

One drive provides cost-effective sizing choices for all applications.

### Configurable Analog and Digital I/O

These customize the drive to the specific application without the need to re-wire existing controls.

### S-Ramp Acceleration and Deceleration Profiling

These features provide smooth speed transitions, minimizing machine "jerk" and prolonging equipment life.

### Built-in Independent PID Control

The need for an external PID controller is eliminated while providing "outer loop" control of a process variable such as water pressure or web tension.

### Real-Time Clock Option

The SM-I/O Timer option module allows for scheduling and timing operations.

### Wide Range of Industry Standard Fieldbus Devices

Modbus RTU (Standard), Profibus-DP, INTERBUS, DeviceNet, CANopen, EtherNet/IP and EtherCAT are all options.

### Comprehensive Standard Application Functions

Functions include motorized potentiometer, comparators, 8 preset speeds, programmable logic, S-ramp, energy metering, PID process and more.

### PLC Functionality

Plug in the optional LogicStick and program custom functions using FREE Ladder Logic software, SyPTLite.

### Energy Metering

Built-in power, energy and running cost meters.

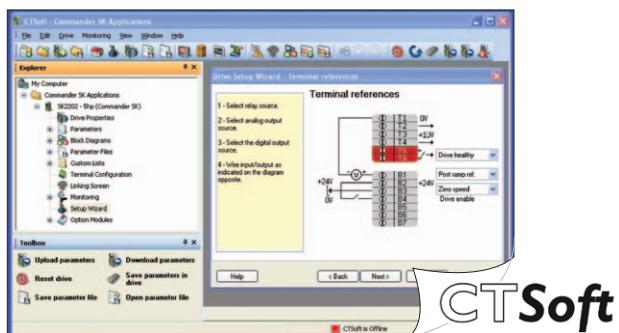
## Software and SmartStick Tools for Rapid Project Implementation

Control Techniques' free software suite makes it easier to access the drive's full feature set. It allows you to optimize the drive tuning, back up the configuration and set up communications networks. The software tools can connect using Ethernet, serial ports, USB or CTNet. For most applications, drive commissioning can be done right from the keypad on the front of the drive.

### CTSoft Drive Configuration

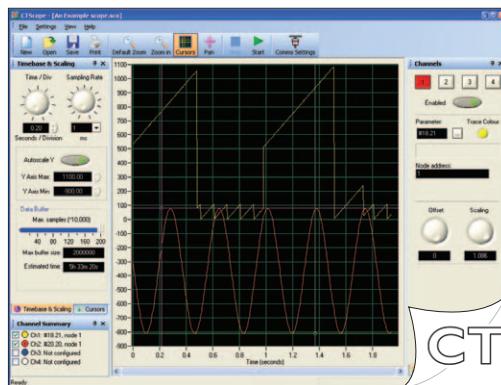
CTSoft is a drive configuration tool for commissioning, optimizing and monitoring Control Techniques drives. It allows you to:

- Use the configuration wizards to commission your drive
- Read, save and load drive configuration settings
- Remotely control the drive with simulated run, stop, reverse and jog push buttons
- Visualize and modify the configuration with live animated diagrams



### CTScope Digital Oscilloscope

CTScope is a full-featured software oscilloscope for viewing and analyzing changing values within the drive. The time base can be set to give high-speed capture for tuning or for longer term trends. The user interface is based on a traditional oscilloscope, making it familiar and friendly to all engineers worldwide.



**CTScope**

*Try it!* Download CTSoft and  
CTScope software from  
[www.controltechniques.com](http://www.controltechniques.com)



### SmartStick Memory Device

The SmartStick can be used to upload drive parameters for storage or for easy set-up of identical drives.

The SmartStick cloning module provides fast and cost-effective drive-to-drive parameter transfer and storage without a PC. A drive can be set to boot from the SmartStick on every power cycle.



# PLC Programming and Options

## LogicStick Memory Device

Insert the LogicStick into the front of the drive to provide the additional memory required to allow the Commander SK to execute a Ladder Logic PLC program. The PLC program is able to access the drive parameters, option module I/O and Real-Time Clock (RTC).

The user can replace nano and micro PLCs using a LogicStick and IEC61131-3 Ladder Logic and Function Block programming.

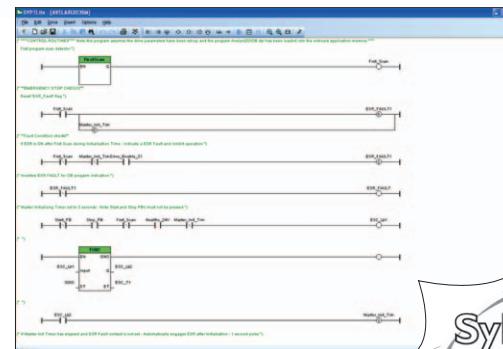


## Options

Option	Description	Order Code
Keypad Interconnect Cables	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, 5ft	SP-LCD-485-005
	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, 10ft	SP-LCD-485-010
	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, 15ft	SP-LCD-485-015
	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, 25ft	SP-LCD-485-025
	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, 50ft	SP-LCD-485-050
	SM-Keypad Plus & SK Remote Keypad to drive interconnect cable, xxx is cable length in 5ft increments (max length 100ft)	SP-LCD-485-xxx
NEMA 1 Covers & Conduit Boxes	NEMA 1 cover and conduit box, size A	SK-NEMA1-KIT-A
	NEMA 1 cover and conduit box, size B	SK-NEMA1-KIT-B
	NEMA 1 cover and conduit box, size C	SK-NEMA1-KIT-C
	NEMA 1 cover and conduit box, size D	SK-NEMA1-KIT-D
	NEMA 1 cover, size A	SK-COVER-A
	NEMA 1 cover, size B	SK-COVER-B
	NEMA 1 cover, size C	SK-COVER-C
	Conduit box, size 2	C-BOX-S2
	Conduit box, size 3 bottom (incoming and output)	C-BOX-S3B
	Conduit box, size 3 top (DC Bus, DB Resistors)	C-BOX-S3T
	Conduit box, size 4 top (incoming) and bottom (output)	C-BOX-S4
	Conduit box, size 5 top (incoming) and bottom (output)	C-BOX-S5
	Conduit box, size 6 top (incoming) and bottom (output)	C-BOX-S6

## SyPTLite Automation Programming

Custom automation solutions are programmed using SyPTLite, an easy-to-use Ladder Logic program editor suitable for replacing relay logic or a micro PLC for simple drive control applications.



Option	Description	Order Code
Shipping Brackets	Shipping brackets for size 5, size 6 and SPMA products (qty 4 per set), required when the drive is panel mounted and subject to rough handling (eg. overseas container shipment)	S5-6-BRACKETS
Fan Kits	Size 2 IP54 fan kit to replace existing IP20 fan	3251-3024-00
	Size 2 IP55 fan to replace existing IP20 fan	3251-3824
	Size 3 IP54 fan kit to replace existing IP20 fan	3251-4024-00
	Size 3 IP55 fan to replace existing IP20 fan	3251-1224
	Size 4 IP54 fan kit to replace existing IP20 fan (2 Rqd)	3251-7824-01
	Size 6 fan power supply	MLP-005-00

Additional order codes are shown on pages 6-7.

## Accessories

### Power

- Line reactors
- EMC filters
- DC motors
- Dynamic braking resistors
- Field supply buck / boost transformers



See Options & Accessories brochure for details.

# Commander SK, Fast and Easy Integration Flexibility



## PC Tools

### CTSoft

Software for commissioning, monitoring and parameter setting and storage

CTSOFT

### SyPT Lite

Software used to program PLC functions when optional LogicStick is fitted

SYPT-LITE

## Software

### CTScope

Full featured software oscilloscope for viewing and analyzing dynamic drive parameters

CTSCOPE

### CT Energy Savings Estimator

Software helps you to estimate pay-back periods and carbon dioxide savings for fan and pump applications



## Drive Programming and Operator Interface Options

### SmartStick



Upload drive parameters to the SmartStick for storage or for easy set-up of identical drives

SMARTSTICK

### LogicStick



The LogicStick enables the user to program PLC functions within the drive. It can also be used as a SmartStick

LOGICSTICK

### CTOPCserver



### HMI Operator Interface



See the Options & Accessories brochure for order codes

### SM-Keypad Plus



Remote panel mounting LCD multilingual text keypad display to IP54 (NEMA 12)

SM-KEYPAD-PLUS

### SK-Keypad Remote



Remote panel mounting LED display to IP65 (NEMA 12)

SK-KEYPAD-REMOTE



## Communications

### Standard



### Options



### Modbus RTU

SM-CANOPEN  
SM-DEVICENET  
SM-ETHERCAT  
SM-ETHERNET:  
EtherNet/IP, Modbus TCP/ IP, Email, Web server, Simple Network Time Protocol  
SM-INTERBUS  
SM-PROFIBUS-DP  
SM-PROFINET



### Standard



4 Digital inputs  
1 Digital I/O  
1 Relay output  
2 Analog inputs  
1 Analog output

## Input/Output

### Options



### SM Option Modules

SM-I/O-32 (32 digital I/O)  
SM-I/O-24V (Protected)  
SM-I/O-LITE  
SM-I/O-TIMER (Real-Time Clock)  
SM-I/O-120V (120Vac I/O)  
SM-PELV  
SM-BIPOLAR

## Dynamic Braking Options



### Filters

Internal EMC Filter



Standard

Options

### External EMC Filter

**Heatsink Mounted  
Brake Resistors E-Stop Duty**  
(size 2 only)



SM-HEATSINK-DBR2

**Dynamic Brake Resistors**  
E-Stop or Cyclic Duty



See the Options & Accessories  
brochure for order codes

These additional filters are  
designed to operate together with  
the drive's integral EMC filter in  
areas of sensitive equipment

See the Options & Accessories  
brochure for order codes

## Installation Accessories

### SK Bracket\*



Cable management  
brackets  
SK-BRACKET

### Conduit Boxes



Available on all sizes for  
wall-mount applications

### NEMA 1 Covers

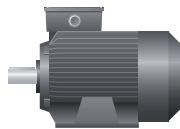


Includes top  
and side covers for  
frame sizes A to D

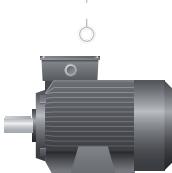
See page 5 for order codes

## Motor Control Mode

### Open-loop Vector Control

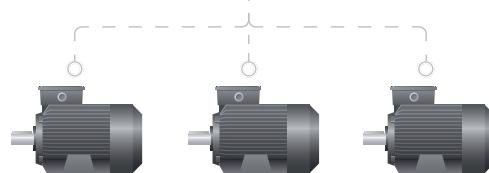


### V/Hz Control



#### Single Motor

#### Multi Motor



Separate motor overload protection is required with  
multi-motor operation

\* Applicable on sizes A to C only; sizes 2 to 6 have cable management accessories included as standard

## Terminal Diagram

RS485	
Pin #	Function
1	Not Connected
2	TX
3	RX
4	DTR
5	GND
6	Not Connected
7	RTS
8	Not Connected
9	Not Connected



Size B frame image. Location of power terminals varies by frame.

Power - Bottom Row	
Pin #	Function
-	DC Bus -
+	DC Bus +
•	DB Resistor
PE	Supply Ground
PE	Supply Ground
—	Motor Ground

### Control Terminals - Top Row

Pin #	Function
T1	0V Common
T2	Analog Input A1, 0-10V or 4-20mA/0-20mA
T3	10Vdc Source, 5mA
T4	Analog Input A2, 0-10V or Digital Input
T5	Status Relay
T6	Status Relay

### Control Terminals - Bottom Row

Pin #	Function
B1	Analog Output, 0-10V
B2	24Vdc Output, 100mA
B3	Digital I/O or Pulse Output 10kHz max or PWM Output
B4	Digital Input
B5	Digital Input
B6	Digital Input
B7	Digital Input or Motor Thermistor or Pulse Input, 50kHz max

### Power - Top Row

Pin #	Function
L1	Line In
L2	Line In
L3	Line In
U	Motor Connection
V	Motor Connection
W	Motor Connection

# Specifications

## Environment

Ambient temperature	Size A-D: 14 to 104 °F (-10 to 40 °C) 14 to 131 °F (-10 to 55 °C) with de-rating
	Size 2-6: 32 to 104 °F (0 to 40 °C) 32 to 122 °F (0 to 50 °C) with de-rating
Cooling method	Forced ventilation
Humidity	95% maximum (non-condensing) at 104 °F (40 °C)
Storage temperature	Size A-D: -40 to 140 °F (-40 to 60 °C) Size 2-6: -40 to 122 °F (-40 to 50 °C)
Altitude	0 to 9,900ft (3000m), derate 1% per 328ft (100m) between 3,280ft (1000m) and 9,842ft (3000m)
Vibration	Tested in accordance with IEC60068-2-6, 29, 36 & 64
Enclosure	Circuit boards have conformal coating (standard late 2011) Size A-D: IP20 standard, NEMA1 with optional covers Size 2-6: IP20/NEMA1 standard, IP54/NEMA 12 through-panel mounted heatsink with optional fan kits
Electromagnetic immunity	In compliance with IEC 61000-4-2,3,4,5,6,11, IEC61000-6-1,2 and IEC 61800-3
Electromagnetic emissions	IEC 61800-3 with built-in filter; compliance category depends on installation conditions; external filters are available

## AC Supply Requirements

Voltage	100 to 120Vac ±10% 200 to 240Vac ±10% 380 to 480Vac ±10% 500 to 575Vac ±10% 500 to 690Vac ±10%
Phases	100 to 120V 1Ø 200 to 240V 1Ø and 3Ø 380 to 690V 3Ø
Input Phase imbalance	3% between phases or 2% negative phase sequence
Frequency	48 to 62Hz
Input displacement power factor	>0.97

## Control

Carrier frequency	Size A-C (200V): 3, 6, 12 & 18kHz Size B-C (400V): 3, 6 & 12kHz Size D: 3, 6 & 12kHz Size 2-3: 3, 6 & 12kHz (3 & 6 only for 575V models) Size 4-6: 3 & 6kHz
Output frequency	0 to 1500Hz
Frequency accuracy	0.01%

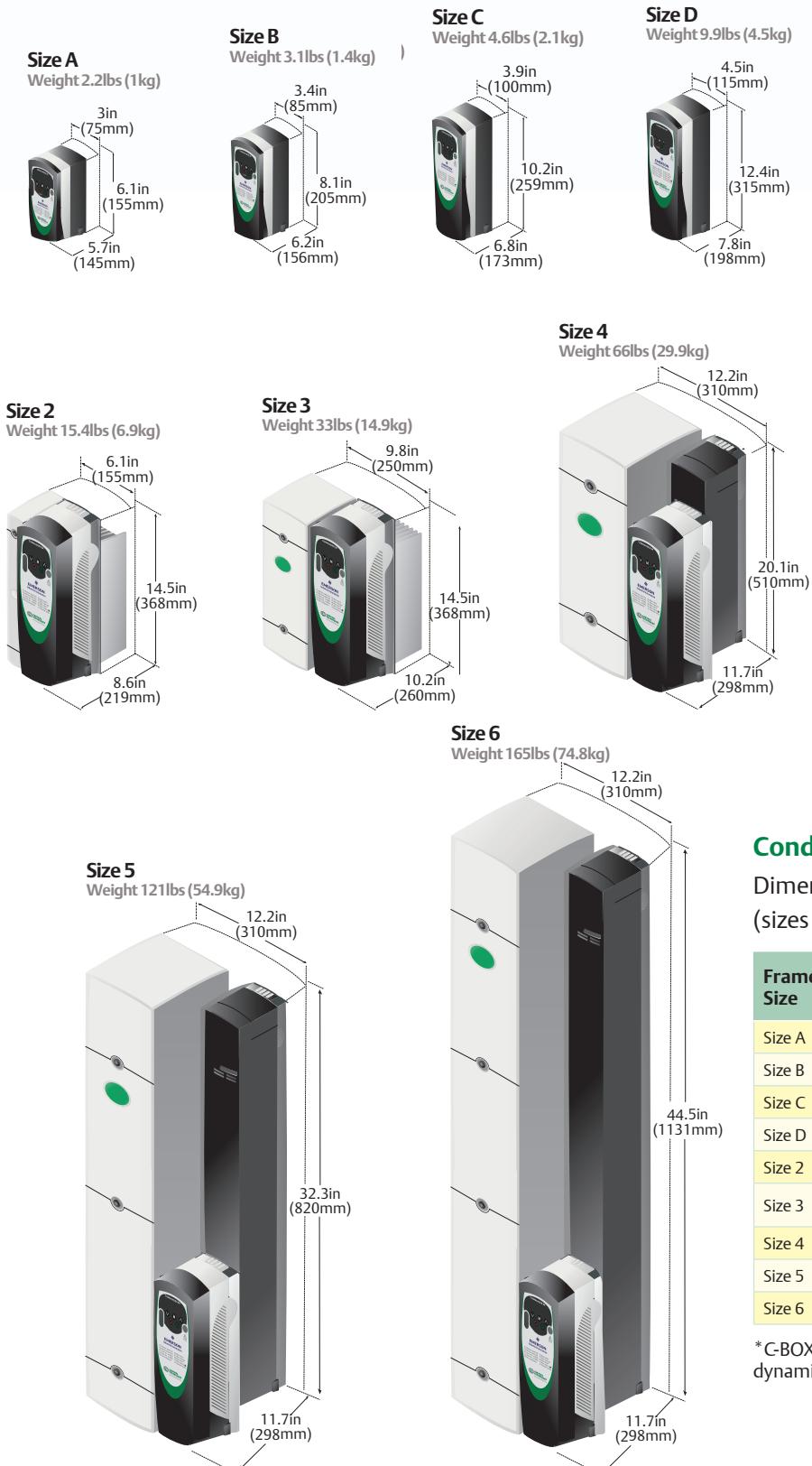
Frequency resolution	0.1Hz
Analog input resolution	0.1%
Serial communications	2-wire RS485 via RJ45 connector Modbus RTU protocol selectable baud rate 2.4, 4.8, 9.6, 19.2 and 38.4k
Braking	DC injection standard, dynamic braking transistor standard on all frames except 115V size A.
<b>Protection</b>	
DC under voltage trip	175/330/435Vdc (approximately 124/233/307Vac)
DC over voltage trip	415/830/990/1190Vdc (approximately 293/587/700/841Vac) 0/1190Vdc
Overload trip (from cold)	Size A-D: 150% for 60s Size 2-5: 110% for 215s (Normal Duty), 150 for 60s (Heavy Duty) Size 6: 110% for 165s (Normal Duty), 129% for 97s (Heavy Duty)
Instantaneous over current trip	200%, protects against sudden overloads and output short circuits
Phase loss trip	DC bus ripple threshold exceeded
Over temperature trips	Drive heatsink, DC bus, power module and IGBT monitoring
Motor protection	Motor thermistor and thermostat inputs and motor thermal model

## Approvals and Listings

UL, cUL	UL508C file # E171230
IEC	IEC 60146-1-1 general requirements IEC 61800-5-1 safety of power drive systems IEC 61131-2 I/O
CE	CE marked
EN	EN 60529 ingress protection
ISO	ISO 9001 quality management system ISO 14001 environment management



# Dimensions



## How to Select a Drive

### 1. Electrical Considerations

- What is the supply voltage?
- Single- or 3-phase input power?
- What is the motor rating?
  - Continuous current - FLA (Full Load Amps)
  - Select the drive based on Amps rather than horsepower
- Add capability with SM option modules for drive sizes B-D and 2-6 and/or the LogicStick PLC option.

### 2. Load Type (choose one)

- Normal Duty: 110% overload (fans and pumps)
- Heavy Duty: 150% overload (mixers, conveyors, etc.)

### 3. Drive Mechanical Mounting

- Panel mounting - standard
- Wall mounting - select conduit kit

## Conduit Box Dimensions

Dimensions of conduit boxes for Commander SK (sizes A-D and 2-6).

Frame Size	Order Code	Overall Dimensions	
		Height in (cm)	Width in (cm)
Size A	SK-NEMA1-KIT-A	8.46 (21.5)	2.95 (7.5)
Size B	SK-NEMA1-KIT-B	8.89 (26.6)	3.35 (8.5)
Size C	SK-NEMA1-KIT-C	12.56 (31.9)	3.94 (10.0)
Size D	SK-NEMA1-KIT-D	15.45 (39.2)	4.53 (11.5)
Size 2	C-BOX-S2	17.8 (45.2)	6.1 (15.5)
Size 3	C-BOX-S3B* C-BOX-S3T*	21.7 (55.1)	9.9 (25.1)
Size 4	C-BOX-S4	33 (83.9)	12.2 (31.0)
Size 5	C-BOX-S5	45.3 (115)	12.2 (31.0)
Size 6	C-BOX-S6	57.5 (146)	12.2 (31.0)

\* C-BOX-S3T (top) is only necessary when a DC input power or dynamic braking resistor is required.

# Ratings

Frame Size	100-120 Vac +/- 10% 1Ø (200 / 240 Vac output)	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
A <sup>1</sup>	SKA1100025	1.7	0.33	0.25	1.7	0.33	0.25
	SKA1100037	2.2	0.5	0.37	2.2	0.5	0.37
B	SKB1100075	4	1	0.75	4	1	0.75
	SKB1100110	5.2	1.5	1.1	5.2	1.5	1.1

Frame Size	200-240 Vac +/- 10% 1Ø	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
A <sup>1</sup>	SKA1200025	1.7	0.33	0.25	1.7	0.33	0.25
	SKA1200037	2.2	0.5	0.37	2.2	0.5	0.37
	SKA1200055	3	0.75	0.55	3	0.75	0.55
	SKA1200075	4	1	0.75	4	1	0.75
B	SKBD200110	5.2	1.5	1.1	5.2	1.5	1.1
	SKBD200150	7	2	1.5	7	2	1.5
C	SKCD200220	9.6	3	2.2	9.6	3	2.2
D	SKDD200300	12.6	3	3	12.6	3	3

Frame Size	200-240 Vac +/- 10% 3Ø	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
B	SKBD200110	5.2	1.5	1.1	5.2	1.5	1.1
	SKBD200150	7	2	1.5	7	2	1.5
C	SKCD200220	9.6	3	2.2	9.6	3	2.2
D	SKDD200300	12.6	3	3	12.6	3	3
	SKD3200400	17	5	4	17	5	4
2	SK2201	15.5	5	4	12.6	3	3
	SK2202	22	7.5	5.5	17	5	4
3	SK2203	28	10	7.5	25	7.5	5.5
	SK3201	42	15	11	31	10	7.5
4	SK3202	54	20	15	42	15	11
	SK4201	68	25	18.5	56	20	15
4	SK4202	80	30	22	68	25	18.5
	SK4203	104	40	30	80	30	22

Frame Size	380-480 Vac +/- 10% 3Ø	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
B	SKB3400037	1.3	0.5	0.37	1.3	0.5	0.37
	SKB3400055	1.7	0.75	0.55	1.7	0.75	0.55
	SKB3400075	2.1	1	0.75	2.1	1	0.75
	SKB3400110	2.8	1.5	1.1	2.8	1.5	1.1
	SKB3400150	3.8	2	1.5	3.8	2	1.5
C	SKC3400220	5.1	3	2.2	5.1	3	2.2
	SKC3400300	7.2	3	3	7.2	3	3
	SKC3400400	9	5	4	9	5	4
D	SKD3400550	13	7.5	5.5	13	7.5	5.5
	SKD3400750	16.5	10	7.5	16.5	10	7.5

[1] Size A drives do not accept SM option modules.

[2] Size 6 drives require a +24Vdc - 3.5A power supply for the heatsink fans not provided with unit. See the Options & Accessories brochure for available power supplies.

NOTE: Motor power based on typical motors. Select model based on actual current rating.

Frame Size	380-480 Vac +/- 10% 3Ø	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
2	SK2401	15.3	10	7.5	13	7.5	5.5
	SK2402	21	15	11	16.5	10	7.5
	SK2403	29	20	15	25	20	11
	SK2404	29	20	15	29	20	15
3	SK3401	35	25	18.5	32	25	15
	SK3402	43	30	22	40	30	18.5
	SK3403	56	40	30	46	30	22
4	SK4401	68	50	37	60	40	30
	SK4402	83	60	45	74	50	37
5	SK5401	138	100	75	124	100	55
	SK5402	168	125	90	156	125	75
	SK6401	205	150	110	180	150	90
6 <sup>2</sup>	SK6402	236	200	132	210	150	110

Frame Size	575 Vac +/- 10% 3Ø	Normal Duty			Heavy Duty		
		Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)	Max Continuous Current (A)	Motor Power (hp)	Typical Output (kW)
		Order Code					
3	SK3501	5.4	3	3	4.1	2	2.2
	SK3502	6.1	5	4	5.4	3	3
	SK3503	8.4	7.5	5.5	6.1	5	4
	SK3504	11	10	7.5	9.5	7.5	5.5
	SK3505	16	15	11	12	10	7.5
4	SK3506	22	20	15	18	15	11
	SK3507	27	25	18.5	22	20	15
	SK4603	36	30	22	27	25	18.5
	SK4604	43	40	30	36	30	22
5	SK4605	52	50	37	43	40	30
	SK4606	62	60	45	52	50	37
	SK5601	84	75	55	63	60	45
6 <sup>2</sup>	SK5602	99	125	90	85	100	75
	SK6601	125	150	110	100	125	90
6 <sup>2</sup>	SK6602	144	175	132	125	150	110

Normal Duty	Heavy Duty
110% overload current for 165s; for applications which use self-ventilated induction motors and require a low overload capability (e.g. fans, pumps)	150% overload current for 60s; for constant torque applications which require a high overload capability (e.g. cranes, hoists)

# Driving Technology...



P/N BRO-CSK-1107 08/12