CONTROL TECHNIQUES

www.controltechniques.com

Commander SE
Product Data

Product Overview & Key Features

Responding to Customer Driven Priorities

Since its formation in 1973, Control Techniques has become a global specialist dedicated to the design, manufacture and supply of AC and DC drives, servos and drive systems, with over 1 million drives commissioned to date. This dedication to understanding and satisfying customers needs ensures that we produce a range of world class products all designed to meet the varying application requirements of industry. In response to customer driven priorities for a simple, easy to use, general purpose open loop inverter, Control Techniques have developed the Commander SE.

Commander SE

The Commander SE is an advanced AC drive for use with AC induction motors. Every unit can operate in either V/Hz, or sensorless vector mode.

Sizes

There are four physical sizes comprising 21 different models. The input voltage ranges are single phase input, 200 to 240V, three phase input, 200 to 240V, three phase input 380 to 480V and are power dependent.

Simple to Use

Reducing complexity and cost is what Commander SE is all about. The SE stands for Simple and Easy and it is SIMPLE to install and EASY to use. The drives first 10 parameters cover most applications easily, quickly and cost effectively.

Technology

Many of the features of Commander SE would not be possible without the use of advanced technology. The SE drive employs State of the Art microprocessor technology which controls all drive functions. The drive incorporates 2 microprocessors, a DSP (Digital Signal Processor) which synthesises an adjustable carrier frequency PWM (Pulse Width Modulation) output controlling the IGBT (Insulated Gate Bipolar Transistor) inverter section and a microcontroller which handles the user interface functions. All printed circuit boards are manufactured using surface mount technology.

Product Overview & Key Features

General Features

- Minimum motor noise with maximum drive protection via unique Intelligent Thermal Management (ITM)
- RS485 serial communications as standard on all sizes
- Complies with power drive systems standard EN 61800-3 for the second environment 'Industrial sites' without an additional EMC filter.
- Small enough to fit - big enough to use
- Plug-in communication packages that will include, Profibus-DP, DeviceNet, CAN Open, Interbus S and CT Net
- The mains dip ride-through feature gives maximum protection against expensive process stoppages and minimises product wastage, breakages and downtime
- Level 2 parameters easily accessible if added flexibility and functionality are required
- Commander SE's level 3 parameters give the user, via serial communications, access to advanced features such as:
  PID Controller,
  kW hour meter,
  8 preset speeds,
  motorised potentiometer,
  second motor map
  and lots more
- With true space vector modulation - open loop vector control, full torque down to 1 Hz
- Rugged, industrial 50°C ambient rating for applications where operating conditions are hot and tough
- IP20/NEMA 1, rating for added protection
- Fast, accurate drive to drive parameter transfer and storage with the QuicKey - saves time and money
- Coast & Ramp to Stop modes
- Programmable security code

'Simple to Install' Features

- Mounting brackets are cast into the heatsink - cannot be misplaced during installation
- Large easy access, power terminals
- Pluggable control terminal for fast installation
- Standard size terminal screwdriver can be used for control cable connection
- Quick installation with convenient cable management
- Power and control connections shown on inside of terminal cover
- Conduit entry directly onto solid metal gland plate
- Commander SE up to 4 kW, fits 200mm deep cubicles even with footprint EMC filter fitted

'Ease of Use' Features

- Only 10 parameters in level 1 menu covering most applications
- Multi-lingual quickstart guide for fastest set-up in anyone's language
- Level 1 parameters on the front of the drive
- No spin autotune for fast drive/motor optimisation

Operating Modes

Introduction

The Commander SE can be configured to operate in the following operating modes:

Open-Loop

For use with standard AC induction motors. The Drive applies power to the motor at frequencies which are varied by the user. The motor speed is a result of the output frequency of the Drive and slip due to the mechanical load.

V/Hz Mode

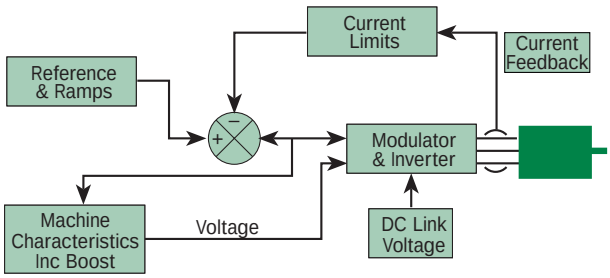
In this mode the drive can power one motor or a number of motors connected in parallel (each motor must be individually protected against overload).

Improved motor performance can be achieved by applying the following:

- Slip compensation
- Fixed boost

Fixed boost applies a fixed voltage boost at low frequencies.

Open Loop V/Hz Mode



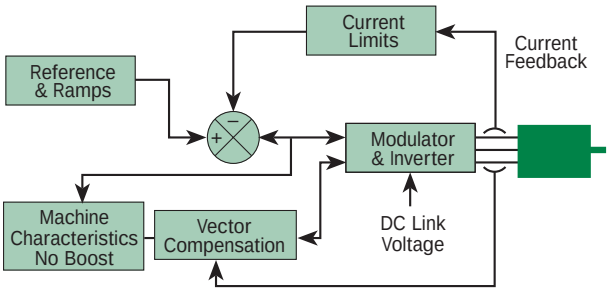
Typical examples of Applications

Conveyors, Centrfugal Loads (Fans & Pumps), Multi-Motor Control, etc

Open Loop Vector Mode

This mode of operation maintains almost constant flux by dynamically adjusting the motor voltage according to the load on the motor.

Open-loop Vector Control provides full torque down to 1Hz giving an excellent speed range to cover most general purpose applications.



Typical examples of Applications

Conveyors, Extruders, Mixers, Textile Machines, etc

Default Configurations

The Drive is supplied in either of two default configurations to suit the continent in which it is sold. The configurations are distinguished as follows:

- European/Rest of world voltage, 50Hz supply
- USA voltage, 60Hz supply

The drive is dispatched from the factory in the appropriate default configuration for the continent in which it is to be sold.

Default Parameters

Listed below are the default values for Commander SE along with the relevant parameters which are for monitoring only. Parameters 01 - 10 are Level 1 parameters which are initially accessible at power up, with Parameters 11 - 44 accessible after setting P10 = L2.

Access to Level 3 parameters (menus 1 to 21) ie. any function other than detailed in levels 1 or 2 are only accessible via serial communications ie. SE Soft, Universal Keypad or Fieldbus.

Level 1

Pr	Function	Default Value & Units
01	Minimum Speed	0 Hz
02	Maximum Speed	50 (60 USA) Hz
03	Acceleration Rate	5 s/100 Hz
04	Deceleration Rate	10 s/100 Hz
05	Speed Reference Select	A1.A2 (Pad USA)
06	Rated Current	Drive Rating
07	Rated Speed	1500 (1800 USA) rpm
08	Rated Voltage	230/400 Volts (230/460 USA)
09	Power Factor	0.85
10	Parameter Access	L1

Level 2

11	Preset 1	0.0
12	Preset 2	0.0
13	Preset 3	0.0
14	Preset 4	0.0
15	Jog Reference	1.5
16	Current Input Mode	4-.20
17	Enable Negative Preset Speeds	Off
18	Last Trip	-
19	Trip Before P18	-
20	Trip Before P19	-
21	Trip Before P20	-
22	Load Display Units	Ld
23	Speed Display Units	Fr
24	Customer Defined Scaling	1.00
25	Security Setup	0
26	Fwd/Rev Key Enable	Off
27	Power Up Keypad Ref.	0
28	Parameter Cloning	No
29	Load Defaults	No
30	Ramp Mode	1
31	Stopping Mode	1

Pr	Function	Default Value & Units
32	Variable Torque Select	Off
33	Spinning Motor Select	0
34	Positive Logic Select	On
35	Start/Stop Logic Select	0
36	Analogue Output Select	Fr
37	Switching Frequency	6 kHz
38	Autotune	0
39	Rated Frequency	50 (60 USA) Hz
40	No. of Poles	Auto
41	Serial Mode	ANSI
42	Baud Rate	4.8
43	Serial Address	1.1
44	Software Version	-
The following 3 parameters are hidden and only appear when P41 is set to Fbus:		
45	Fieldbus Node Address	0
46	Fieldbus Baud Rate	0
47	Fieldbus Diagnostics	0

Commander SE Options

Drive Flexibility

- Bi-polar input card - Reference SE51
  Accepts a +10v to -10v reference and gives this as the reference to the drive

Drive Setup

- QuicKey cloning module - Reference SE55
- Easy setup of multiple drives
- Simplifies the transfer of parameters between drives
- Stores 1 full parameter set
- Can remain in the drive and swapped to a replacement drive in the event of the drive failing. Therefore transferring the parameters from the failed unit into the new one quickly and accurately

Drive Communications

- RS 232 to 485 communications lead - reference SE71, for easy commissioning and drive programming using a P.C. and SE Soft
- Plugs directly from a P.C. into RJ45 connector on the drive
- Universal keypad - reference 8500-0000:
  2 line, back-lit, plain text IP65 keypad, can be hand held or door mounted
- Fieldbus communications
  Commander SE is able to communicate with some of the world's leading PLCs via our high speed communications modules;
  Profibus DP - Reference SE73
  Interbus S - Reference SE74
  CTNet - Reference SE75
  DeviceNet - Reference SE77 DeviceNet
  CAN Open - Reference SE77 CAN Open

Specification

AC Supply Requirements

- 200V to 240V ±10% single phase
- 200V to 240V ±10% 1 and 3 phase (dual rated)
- 200V to 240V ±10% 3 phase
- 380V to 480V ±10% three phase
- Maximum supply imbalance: 2% negative phase sequence (equivalent to 3% voltage imbalance between phases) 48 - 62Hz

Motor Requirements

- No. of phases: 3
- Voltage:
  200V - 240V ±10%
  380V - 480V ±10%

Temperature, Humidity and Cooling Method

- Ambient temperature range: -
  -10°C to + 40°C (14°F to 104°F)
  at 6kHz switching frequency
  -10°C to + 50°C (14°F to 140°F)
  at 3kHz switching frequency.
- Cooling method: Natural convection (size 1)
  Fan assisted (1.5kW and upwards)
- Maximum humidity: 95% non condensing
- Storage temperature range: -
  -40°C to + 60°C (-4°F - 140°F)
  for 12 months maximum

Altitude

- Reduce the normal full load current by 1% for every 100m (325ft) above 1000m (3250ft) to a maximum of 4000m (13000ft).

Vibration (Random)

- Packaged and unpackaged - tested to $0.01g^2/Hz$ (Equivilant to 1.2grms) from 5 - 150 Hz for 1 hour in each of 3 axes as in IEC68-2-34 and IEC68-2-36.

Ingress Protection

- Sizes 1 and 2 IP20, NEMA 1 when the drive is fitted with the rubber grommets supplied.
- Sizes 3 and 4 TBA

Starts Per Hour

- By using the electronic control terminals: unlimited.
- By switching the supply: 20 starts per hour maximum. (3 minute intervals between starts)

Accuracy and Resolution

- Output frequency accuracy: 0.01%
- Output frequency resolution: 0.1Hz

Frequencies and Speed

- PWM switching frequency;
  6KHz nominal (selectable 3,6 or 12KHz)
  Max output frequency: 1000Hz
- Intelligent thermal management software automatically changes the switching frequencies depending on load conditions, heatsink temperature and output frequency to prevent heatsink over-temperature trips

Specification

Power and Current ratings

Model	Frame size	Number of input phases	Supply volts +/-10%	kW rating	HP rating	100% Output current A	150% Output current A
SE11200025	1	1	200-240	0.25	0.33	1.5	2.3
SE11200037	1	1	200-240	0.37	0.5	2.3	3.5
SE11200055	1	1	200-240	0.55	0.75	3.1	4.7
SE11200075	1	1	200-240	0.75	1	4.3	6.5
SE2D200075	2	1 or 3	200-240	0.75	1	4.3	6.5
SE2D200110	2	1 or 3	200-240	1.1	1.5	5.8	8.7
SE2D200150	2	1 or 3	200-240	1.5	2	7.5	11.3
SE2D200220	2	1 or 3	200-240	2.2	3	10.6	15.9
SE23200400	2	3	200-240	4	5	17	25.5
SE33200550	3	3	200-240	5.5	7.5	25	37.5
SE33200750	3	3	200-240	7.5	10	28.5	42.8
SE23400075	2	3	380-480	0.75	1	2.1	3.2
SE23400110	2	3	380-480	1.1	1.5	3	4.5
SE23400150	2	3	380-480	1.5	2	4.2	6.3
SE23400220	2	3	380-480	2.2	3	5.8	8.7
SE23400300	2	3	380-480	3	4	7.6	11.4
SE23400400	2	3	380-480	4	5	9.5	14.3
SE33400550	3	3	380-480	5.5	7.5	13	19.5
SE33400750	3	3	380-480	7.5	10	16.5	24.8
SE43401100	4	3	380-480	11	15	24.5	36.8
SE43401500	4	3	380-480	15	20	30.5	45.8

Dissipation

Model	Nominal rating		Maximum total power dissipation		
	@380V	@460V	3kHz	6kHz	12kHz
SE11200025	0.25KW	0.33HP	20W	20W	20W
SE11200037	0.37KW	0.48HP	25W	25W	30W
SE11200055	0.55KW	0.73HP	35W	40W	45W
SE11200075	0.75KW	1.0HP	50W	60W	65W
SE2D200075	0.75KW	1.0HP	50W	55W	65W
SE2D200110	1.1KW	1.45HP	65W	70W	80W
SE2D200150	1.5KW	2.0HP	85W	90W	105W
SE2D200220	2.2KW	3.0HP	115W	125W	150W
SE23200400	4.0KW	5.0HP	160W	175W	210W
SE23400075	0.75KW	1.0HP	35W	45W	65W
SE23400110	1.1KW	1.45HP	45W	60W	80W
SE23400150	1.5KW	2.0HP	65W	80W	105W
SE23400220	2.2KW	3.0HP	80W	100W	130W
SE23400300	3.0KW	4.0HP	95W	125W	160W
SE23400400	4.0KW	5.0HP	130W	160W	195W
SE33200550	5.5KW	7.5HP	135W	195W	300W
SE33200750	7.5KW	10.0HP	280W	305W	335W
SE33400550	5.5KW	7.5HP	135W	195W	300W
SE33400750	7.5KW	10.0HP	220W	270W	390W
SE33401100	11KW	15HP	TBA	TBA	TBA
SE33401500	15KW	25HP	TBA	TBA	TBA

Specification

Dimension

Dimension	Model size			
	1	2	3	4
H	176 mm 6.86 in	260 mm 10.24 in	315 mm 12.4 in	390 mm 15.35 in
W	102 mm 4 in	147 mm 5.79 in	190 mm 7.48 in	250 mm 9.84 in
D	130 mm 5.12in	130 mm 5.12 in	155 mm 6.1 in	185 mm 7.28 in

Overall dimensions

H Height excluding mounting feet

W Width

D Projection forward of panel when surface mounted

Weights

Model size	kg	lb
1	1.25	2.75
2	3.20	7.05
3	6.80	15.0
4	11.0	24.2

Dynamic Braking

Resistor Connections

The external braking resistor should be connected to the Commander SE terminals labelled (+) and DBR on the terminal strip on Commander SE sizes 2, 3 + 4. The resistor must be thermally protected in the unlikely event that the braking transistor fails. This thermal device must either disconnect the input AC power to the inverter or disconnect the resistor from the circuit. Please contact the Drive Centre for additional application information.

Custom Resistor Values

The resistor ohmic value is based on the torque required to stop the motor (and connected load) in the time dictated by the application. The first equation to be solved is the torque required knowing the required stop time.

$$T = \frac{J \times N}{t_d \times 307} \text{ (Ft - Lb) or } T = \frac{2\pi J \times N}{t_d \times 60} \text{ (Nm)}$$

Where:

J = Total Inertia (Lb-Ft^2 or Kgm^2)

N = Motor Max. Speed (RPM)

t_d = Decel Time (Sec.)

T = Torque (Ft-Lb or Nm)

The torque required must be equal or less than 1.5 x motor/drive capability.

$$HP(brake) = \frac{T \times N}{5250} \quad \text{or } P_{(kW)} = \frac{T \times N}{30}$$

The ohmic value of the resistor can now be calculated using the following formula:

$$R = \frac{(V_b)^2}{HP_{(brake)} \times 746} \quad \text{or } R = \frac{(Vb)^2}{P_{(kW)}}$$

Where:

V_b = Bus voltage level when braking

= 780 Vdc for 400V units

= 390 Vdc for 200V units

Specification

Minimum Values

The calculated minimum ohmic value is limited by the braking transistor supplied in the Commander SE being used. The following is a list of the minimum values.

Minimum resistance values and peak power rating for the braking resistor at 40°C (104°F).

The minimum resistance allows the braking resistor to dissipate up to approximately 150% of the power rating of the Drive for up to 60 seconds.

Average Power Dissipation

The average power dissipated in the resistor for intermittent operation is then simply the number of watts dissipated per stop times the duty cycle (D).

Where:

$$D = \frac{t_d}{T_d + t_{off}}$$

In order to use this formula for average power dissipation, the brake resistor must be off long enough for the temperature of the resistor to return to ambient temperature between braking cycles. Also, the maximum on time (or decel time) should not exceed the peak capabilities of the power resistor. Typically, a power resistor has the capability of dissipating 10 times rated wattage for 5 to 10 seconds.

Key:

D = duty cycle

t_d = Max time on or deceleration ramp time (S)

t_{off} = Time between braking

Peak Power Rating

The peak power handling ability of the resistor must meet or exceed the following:

PPK = (Vb)2/R

Model	Minimum Resistance	Recommended Value	Max Brake A	Resistor Peak Power Rating
SE2D200075	50 Ω	100 Ω	9.0	1.8
SE2D200110	50 Ω	100 Ω	9.0	1.8
SE2D200150	50 Ω	75 Ω	9.0	2.4
SE2D200220	40 Ω	50 Ω	11.0	3.5
SE23200400	30 Ω	30 Ω	14.0	5.9
SE23400075	100 Ω	200 Ω	10.0	3.4
SE23400110	100 Ω	200 Ω	10.0	3.4
SE23400150	100 Ω	200 Ω	10.0	3.4
SE23400220	75 Ω	100 Ω	12.5	6.9
SE23400300	75 Ω	100 Ω	12.5	6.9
SE23400400	75 Ω	100 Ω	12.5	6.9
SE33200550	11 Ω	15 Ω	28.0	11.8
SE33200750	11 Ω	15 Ω	28.0	11.8
SE33400550	33 Ω	50 Ω	16.6	13.8
SE33400750	33 Ω	50 Ω	16.6	13.8
SE33401100	TBA	TBA	TBA	TBA
SE33401500	TBA	TBA	TBA	TBA

I/O Specification

1 0V common	
2 Local Speed Reference Input (A1)	
Type of input	Single-ended
Voltage range	0 to +10V
Scaling	0V represents the value in parameter 01, Minimum speed. +10V represents the value in parameter 02, Maximum speed
Absolute maximum voltage range	+35V to -18V with respect to 0V common
Input impedance	100kΩ
Resolution	0.1% (10 bit)
Accuracy	± 2%
Sample time	6ms
3 +10V Reference Output	
Voltage accuracy	± 2%
Maximum output current	5mA
Protection	tolerates continuous short circuit to 0V
4 0V Common	
5 Remote Current Speed-Reference Input (A2)	
Default	4 - .20mA (See parameter 16)
Type of input	Single ended
Current range (programmable)	0-20mA, 20-0mA, 4-20mA, 20-4mA, 4-.20mA, 20-.4mA
Absolute maximum voltage range	+35V to -18V with respect to 0V common
Input impedance	200Ω
Resolution	0.1% (10 bit)
Accuracy	± 2%
Sample time	6ms
6 Analog Voltage Output	
Default	Motor Speed (See parameter 36)
Absolute maximum voltage range	+ 35V to -1V with respect to 0V common
Voltage range	0 to +10V
Scaling: Motor speed output	0V represent 0Hz/0 rpm output + 10V represents the value of parameter 02, Maximum speed
% full load current output	0V represent 0% Drive rated current + 10V represents 150% Drive rated current
Maximum output current	5mA
Resolution	0.1% (10 bit)
Accuracy	± 5%
Update time	22ms
Protection	tolerates continuous short circuit to 0V
7 +24V Output	
Voltage accuracy	± 10%
Maximum output current	100mA
Protection	tolerates continuous short circuit to 0V
8 Digital Output	
Function	Zero Speed Output
Absolute maximum voltage range	+35V to -1V with respect to 0V common
Voltage range	0V to +24V
Maximum output current	50mA at +24V
Output impedance	10kΩ pull-down resistor in inactive state
Update time	1.5ms

Note: The total current from the +24V rail, which includes the digital output, is 100mA.
Therefore if the digital output is providing 30mA, the +24V rail will only provide 70mA.

I/O Specification

9 Digital Input - Enable / Reset †	
10 Digital Input - Run Forward (Edge Triggered) *	
11 Digital Input - Run Reverse (Edge Triggered) *	
12 Digital Input - Local/Remote Speed Ref (A1/A2)	
13 Digital Input - Jog	
Default	Positive logic (See parameter 34)
Voltage range	0V to +24V
Absolute maximum voltage range	+35V to -18V with respect to 0V common
Nominal threshold voltage	+10V
Input impedance	6.6kΩ
Sample time	1.5ms

† Following a Drive trip, open and close the Enable terminal to reset the Drive. If the Run Forward or Run Reverse terminal is closed, the Drive will run straight away.

* Following a Drive trip and a reset via the Stop/Reset key the Run Forward or Run Reverse terminals will need to be opened and closed to allow the Drive to run. This ensures that the Drive does not start when the Stop/Reset key is pressed.

14 +24V Output	
Voltage accuracy	± 10%
Maximum output current	100mA
Protection	tolerates continuous short circuit to 0V
15 Status Relay (Normally Open)	
16	
Function	Drive Healthy
Voltage rating	240VAC /30VDC
Current rating	2A/6A (resistive)
Contact isolation	2.5kVAC (meets IEC664-1 with over voltage category II)
Update time	6ms
Operation of contact	OPEN - AC supply removed from Drive - AC supply applied to Drive with the Drive in a tripped condition CLOSED - AC supply applied to Drive with the Drive in a 'ready to run' or 'running' condition (not tripped)

Protection (Fuses/Cables, EMC/Filters and Diagnostics)

DC Link Undervoltage: UU

200V units = 180V DC

400V units = 400V DC

DC Link Overvoltage: OU

200V units = 420V DC

400V units = 830V DC

***The Enable/Reset Terminal will not reset an O.Ld1 trip - use the key

****These trips cannot be reset for 10 seconds

Trip Code	Trip Number	Condition	Possible Cause
UU	1	DC link under voltage	Low AC supply voltage Low DC link voltage when supplied by external DC power supply
OU	2	DC link over voltage	Excessive inertia in the machine during deceleration. Deceleration rate set too fast for inertia of machine
OI.AC**	3	AC instantaneous over current trip	Insufficient ramp times Phase to phase or phase to earth short-circuit at the Drive output
OI.br**	4	Overcurrent on braking IGBT	(Size 2, 3 and 4 units only)
Et	6	External trip	External trip terminal opened (when programmed)
O.SP	7	Over speed	Excessive motor speed (typically caused by the mechanical load driving the motor)
tunE	18	Auto-tune failure	Motor loaded or no motor connected
It.br	19	Ixt on braking resistor	Sizes 2, 3 and 4 units only
It.AC	20	Motor thermal trip	Too much mechanical load
Oht1	21	Overheat	Overheat thermal model
Oht2	22	Overheat (heatsink thermistor)	Temperature exceeds 95°C (203°F)
th	24	Over temperature (Motor thermistor)	Excessive motor temperature
O.Ld1*	26	+24V or digital output overload	Excessive load or short circuit on +24V output
cL	28	Current loop loss on terminal 5	Input current less than 3mA when 4-20 or 20-4 modes used
SCL	30	User serial communications watchdog failure	Failure of serial communications between Drive and master
EEF	31	Failure of internal EEPROM	Possible loss of parameter values
PH	32	Phase loss	One of the input phases has become disconnected from the Drive. (This applies to 200V/400V three phase units only, not dual rated units).
rS	33	Stator resistance measurement failure	Motor cable disconnected during measurement. Motor too small for Drive
trxx	40-99	User trips where xx is the user trip number	
F.bus	180	Field bus disconnection whilst in use	
C.Err	182	Quickey memory corrupt	Bad connection or memory corrupt
C.dat	183	Quickey with no data	New / empty Quickey being read
C.Acc	185	Quickey write fail	Bad connection or faulty Quickey
C.rtg	186	Quickey power rating change	Already programmed Quickey read by Drive of different rating
O.Ld2	188	+28V serial communications power supply overload	Overload of more than 110 mA or short circuit on +28V serial communications power supply
O.cL	189	Current loop input overload	Input current exceeded 25mA
		Motor runs unstable	Motor or motor connections changed. Check motor connections and re-autotune Drive to motor (see parameter 38)

Cable & Fuse Recommendations

FUSES and CABLES										
	AC Supply Cables		Motor Cables		Control Cables		Braking Resistor Cables		Fuse Ratings	
Model	mm²	AWG	mm²	AWG	mm²	AWG	mm²	AWG	Amps	
SE11200025	1.0	16	1.0	16	≥0.5	20	NA	NA	6	
SE11200037	1.0	16	1.0	16	≥0.5	20	NA	NA	10	
SE11200055	1.0	16	1.0	16	≥0.5	20	NA	NA	16	
SE11200075	1.5	14	1.0	16	≥0.5	20	NA	NA	16	
	1PH	3PH	1PH	3PH	1PH	3PH	1PH	3PH			1PH	3PH
SE2D200075	1.5	1.0	14	16	1.0	1.0	16	16	≥0.5	20	1.0	16	16	10
SE2D200110	2.5	1.5	12	14	1.0	1.0	16	16	≥0.5	20	1.0	16	20	16
SE2D200150	2.5	1.5	12	14	1.0	1.0	16	16	≥0.5	20	1.0	16	25	16
SE2D200220	4.0	2.5	10	12	1.5	1.5	14	14	≥0.5	20	1.5	14	32	20
SE23200400	4.0		10		2.5		12		≥0.5	20	2.5	12	32	
SE23400075	1.0		16		1.0		16		≥0.5	20	1.5	14	10	
SE23400110	1.0		16		1.0		16		≥0.5	20	1.5	14	10	
SE23400150	1.0		16		1.0		16		≥0.5	20	1.5	14	10	
SE23400220	1.5		14		1.0		16		≥0.5	20	1.5	14	16	
SE23400300	1.5		14		1.0		16		≥0.5	20	1.5	14	16	
SE23400400	2.5		12		1.5		14		≥0.5	20	1.5	14	20	
SE33200550	4.0		10		4.0		10		≥0.5	20	4.0	10	30	
SE33200750	4.0		10		4.0		10		≥0.5	20	4.0	10	30	
SE33400550	1.5		14		1.0		16		≥0.5	20	2.5	12	16	
SE33400750	2.5		12		1.5		14		≥0.5	20	2.5	12	20	
SE334001100	TBA		TBA		TBA		TBA		TBA	TBA	TBA	TBA	TBA	
SE334001500	TBA		TBA		TBA		TBA		TBA	TBA	TBA	TBA	TBA	

RFI Filters

Part Number	Size	Mounting Style	Drive	Filter Current Rating
4200-6101	1	Low cost	SE1120 0025 to 0075	12
4200-6102	1	Footprint	SE1120 0025 to 0075	12
4200-6103	1	Low leakage	SE1120 0025 to 0075	12
4200-6204	2	Low cost	SE2D20 0075 to 0220	26
4200-6201	2	Footprint	SE2D20 0075 to 0220	26
4200-6205	2	Low leakage	SE2D20 0075 to 0220	26
4200-6206	2	Low cost	SE2D20 0075 to 0220	16
4200-6202	2	Footprint	and	16
4200-6207	2	Low leakage	SE2340 0075 to 0400	16
4200-6208	2	Low cost	SE2320 0400	26
4200-6203	2	Footprint	SE2320 0400	26
4200-6209	2	Low leakage	SE2320 0400	26
4200-6303	3	Bookend	SE3320 0550 to 0750	30
4200-6302	3	Footprint	SE3320 0550 to 0750	30
4200-6304	3	Bookend	SE3340 0550 to 0750	18
4200-6301	3	Footprint	SE3340 0550 to 0750	18
4200-6402	4	Bookend	SE4340 1100 to 1500	33
4200-6401	4	Footprint	SE4340 1100 to 1500	33

Commander SE Size 1

- RFI filters are available as optional extra parts where required. Note that for compliance with EN61800-3 in the second environment, no filter is required.
- Three alternative filters are available:
- Standard footprint/side-mounting filter part number: 4200-6102. For general use, mounted behind or next the Drive.
- Low earth leakage filter, part number: 4200-6103. For applications where earth leakage currents must be restricted. This filter can only be used with motor cables up to 15m long.
- Low cost filter, part number: 4200-6101. An economical side-mounting filter. This filter can only be used with motor cables up to 20m long.

EMC

- EN50082-2 and EN61800-3 for immunity
- EN61800-3 second environment, without RFI filter
- *EN50081-1, EN50081-2 and EN61800-3 first environment with optional RFI filter.

See sections 3.3 and 4.5.

* Size 1 units only.

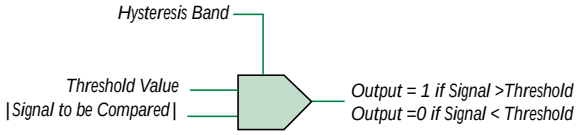
Additional Configurable Functions

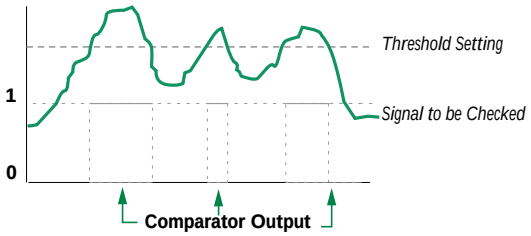
Acceleration and Deceleration Ramp Selection

There are eight acceleration rates and eight deceleration rates which are selectable by logic inputs. The rates are operational in the forward and reverse directions.

Programmable Threshold

The drive software supports one software controllable 'numerical comparator'. This comparator can be used to detect when an internal or external signal exceeds a user set point threshold. This threshold comparator provides a hysteresis band to prevent erratic operation at or near the threshold point.



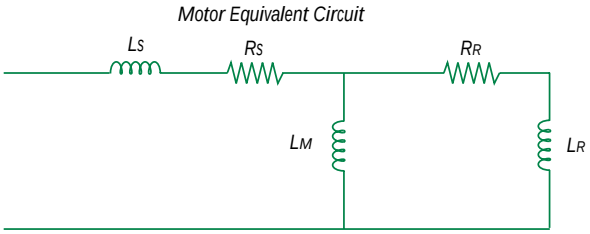


Application:

- Release External Brake when Torque > 50%
- Turn on Motor Fan when Speed < 20%

Autotune

The Commander SE is capable of measuring the motor's stator resistance (Rs) and magnetising inductance (Lm). These values allow the drive to establish a mathematical model of the motor's electrical circuit for use in open loop vector control. The magnetising inductance is measured upon command through a bit parameter, and is only performed when instructed to. The Commander SE may be configured to measure the stator resistance automatically every time the drive is enabled or powered up.



Non-rotating autotune

The Drive measures the stator resistance and voltage offset. After this autotune has been carried out, the motor will run as requested.

Rotating autotune

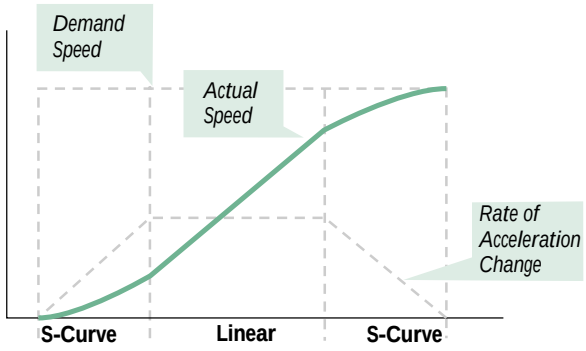
The Drive will always carry out a rotating autotune on the motor in the forward direction of motor rotation even if the Run Reverse command is given to start the autotune routine. The motor must be unloaded for this test.

In addition to measuring the stator resistance and voltage offset, the Drive measures the total leakage inductance. The motor is accelerated up to 2/3 x rated speed in the forward direction to measure the rated magnetising current. The speed will be less if insufficient DC bus voltage is available to operate at 2/3 x rated speed without field weakening. After this autotune has been carried out, the Run Forward/Reverse terminal will need to be opened and then closed to allow the motor to run as requested. The stator resistance and voltage offset are stored in their respective parameters. The rated magnetising current and leakage inductance are used to set up the motor rated power factor (parameter 09). The main advantage of carrying out a rotating autotune over a non-rotating autotune is that the Drive calculates the correct power factor, rated torque current and magnetising current for the motor. This will give more accurate slip compensation (if enabled).

Additional Configurable Functions

S-Ramp

The acceleration and deceleration ramps can be configured as S-ramps. This function provides smoother starting and stopping for sensitive loads. The user can adjust the maximum rate of change of acceleration (time squared), which in effect defines the curvature of the S-ramp.



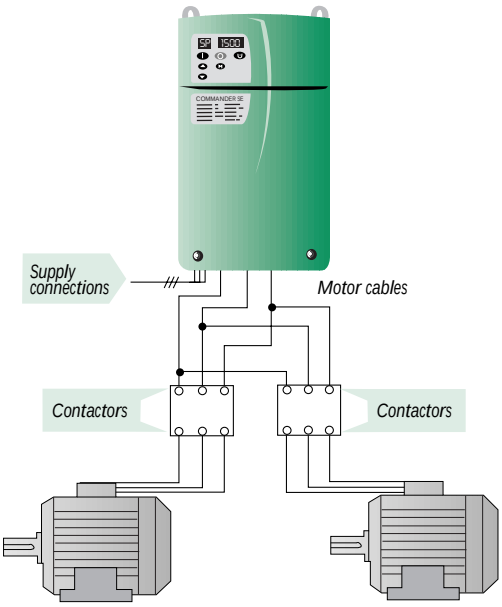
Preset Speed

The Commander SE has eight preset speeds which can be selected by terminal inputs.

Logic Input			
A	B	C	Selected Preset
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6
1	1	0	7
1	1	1	8

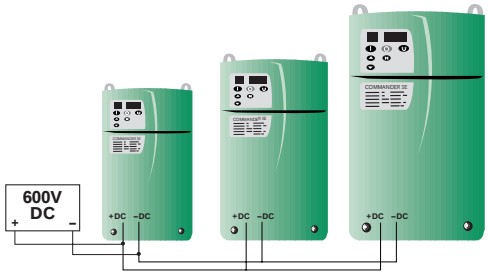
Dual Motor Setup

Commander SE has 2 separate motor maps allowing individual control of 2 motors with differing nameplate characteristics from one drive. An internal parameter is set up to be switched via a digital input to select motor 2 parameters. Only 1 motor can be run at any one time.



DC Bus Parallelling

Commander SE sizes 2, 3 and 4 can be DC bus paralleled and supplied from a DC source. Simply connect using the +DC -DC terminals on the drive. Please note, the drives to be connected on a parallel DC bus must be of the same voltage rating.



Additional Configurable Functions

Analogue Input Modes

There are multiple analogue signal input possibilities. Commander SE has 2 analogue inputs. Analogue input 1 is a unipolar voltage input having a range of 0 to +10V. Analogue input 2 is a unipolar current input. There are several choices for signal type and two choices for how the drive handles a signal loss.

Analogue Mode	Signal Type	Action Upon Signal Loss
0	0-20mA	N/A
1	20-0mA	N/A
2	4-20mA	Trip on Loss
3	20-4mA	Trip on Loss
4	4-.20mA	Min (or low) Speed on Loss
5	20-.4mA	Min (or low) Speed on Loss

Power Cost and Consumption Calculator

Commander SE can calculate the instantaneous cost per hour to operate the drive based on the current power consumption rate and the electricity cost per kWatt hour. The electricity cost can be scaled to any currency so that the cost is calculated according to that currency. Additionally, there is a power meter which measures consumed power in MWHrs and kWHrs.

Parameter	Units	Range
6.26	Currency/Hour	0.00-32000
6.25	KwHrs	0.00-99.99
6.24	MwHrs	0.00-999.9

Run Time Log: Years, Days, Hours, Minutes

Commander SE keeps a running log of it's total operating time. This data is useful for maintenance purposes and allows the user to easily identify run time down to the minute.

Parameter	Units	Range
6.22	Years/Days	0-9.364
6.23	Hours/Minutes	0-23.59

Assignable I/O

Commander SE has inputs and outputs which are user assignable, the user defines which I/O points operate with which functions. For example, digital input 1 could be defined as a preset speed or a drive reset. This capability provides optimum usage and maximum flexibility of Commander SE's I/O and it applies to analogue as well as digital I/O.

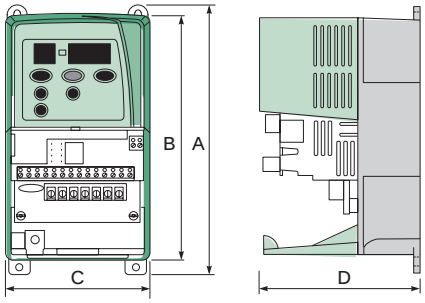
I/O Type	Quantity	Function
Analogue In	2	1 Voltage, 1 Current
Analogue Out	1	Assignable
Digital In	5	Assignable
Digital In or Out	1	Assignable

Sequence Logic Control Modes

There are 5 logic control modes available run for sequencing. Two of the modes are used with momentary run inputs (the drive provides latching software). Two of the modes are used with maintained run inputs (non latching), and one mode can be used to assign the terminals as the user prefers.

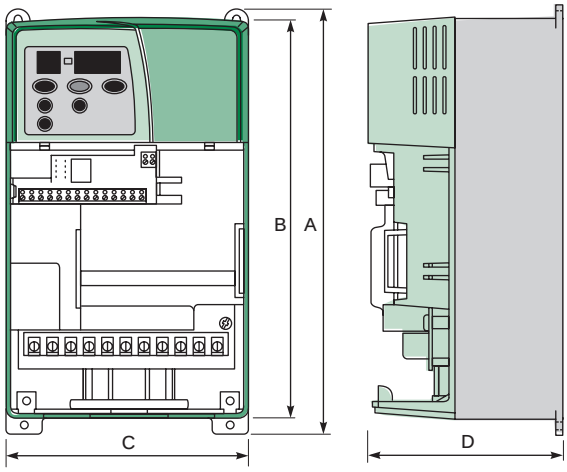
#6.04 Start/ Stop Logic	Run Signal Contact Type
0	Non Latching
1	Latching
2	Non Latching
3	Latching
4	User Definable

Commander SE Size 1



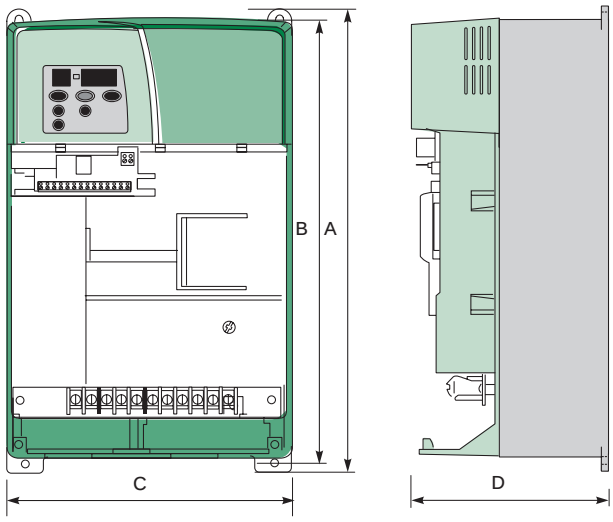
A		B		C		D	
mm	in	mm	in	mm	in	mm	in
191	7.52	176	6.86	102	4	130	5.12

Commander SE Size 2



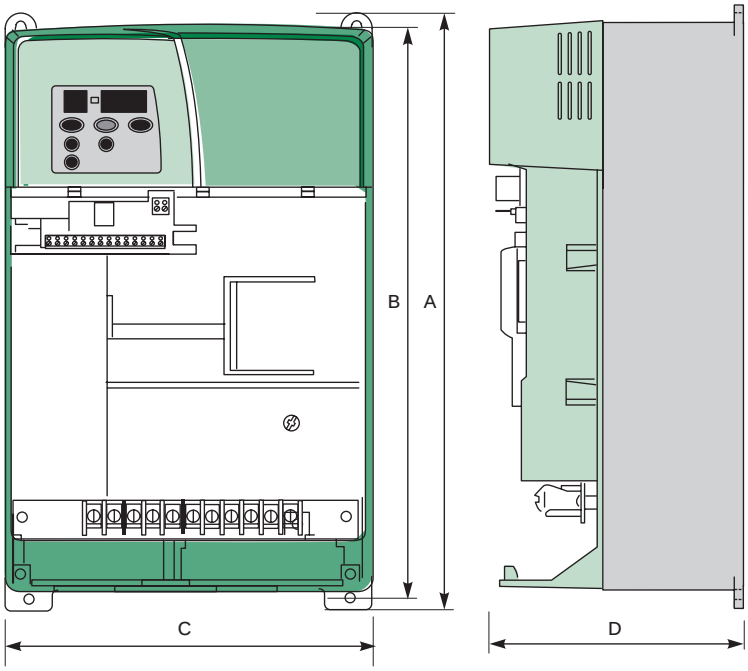
A		B		C		D	
mm	in	mm	in	mm	in	mm	in
280	11.02	260	10.1	147	5.79	130	5.12

Commander SE Size 3

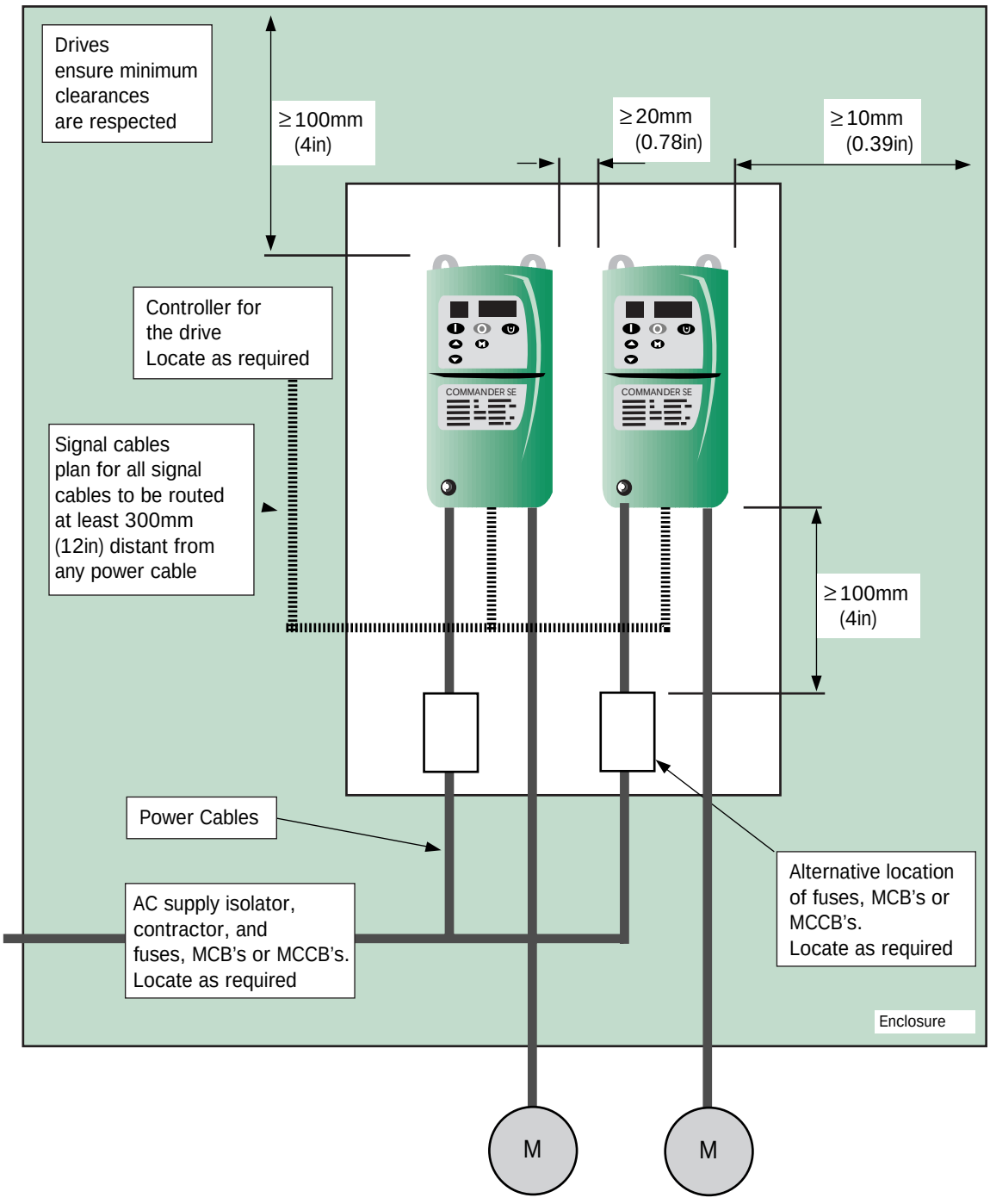


A		B		C		D	
mm	in	mm	in	mm	in	mm	in
336	13.23	315	12.4	190	7.48	155	6.1

Commander SE Size 4



A		B		C		D	
mm	in	mm	in	mm	in	mm	in
412	6.22	390	15.21	250	9.84	185	7.28


Drives
ensure minimum
clearances
are respected
≥100mm
(4in)
≥20mm
(0.78in)
≥10mm
(0.39in)
Controller for
the drive
Locate as required
Signal cables
plan for all signal
cables to be routed
at least 300mm
(12in) distant from
any power cable
COMMANDER SE
COMMANDER SE
≥100mm
(4in)
Power Cables
AC supply isolator,
contractor, and
fuses, MCB's or MCCB's.
Locate as required
Alternative location
of fuses, MCB's or
MCCB's.
Locate as required
Enclosure
M
M

Enclosure Guidelines

Heat Dissipation in a sealed enclosure

If possible, locate heat-generating equipment in the lower part of the enclosure to encourage internal convection. Otherwise, use a taller enclosure or install stirrer fans.

The enclosure must be of adequate size to maintain sufficient cooling of the drive when it is installed inside a sealed enclosure. Heat generated by all the equipment in the enclosure must be taken into account. To calculate the minimum acceptable size of an enclosure, use the following procedure:

Calculate the minimum required surface area Ae for the enclosure from:

$$A_e = \frac{P}{K(T_i - T_{amb})}$$

Where:

T_{amb}	*Maximum ambient temperature in °C external to the enclosure.*
A_e	*Unobstructed heat-conducting are in mm2.*
K	*Heat transmission coefficient of the enclosure material.*
T_i	*Maximum permissible operating temperature in °C.*
P	*Power in watts dissipated by all heat sources in the enclosure.*

Example:

To calculate the size of an enclosure for model GPD 1403 (1.5kW, 2HP).

The following conditions are assumed:

The Drive is surface-mounted inside the enclosure. Only the top, front, and two sides of the enclosure are free to dissipate heat.
The enclosure is made from painted 2mm (.079in) sheet steel.
Maximum external air temperature: 30°C (86°F).

Insert the following values:

T_i =	40°C
T_{amb} =	30°C
K =	5.5 (typical for painted 2mm .079in sheet steel)
P =	100 at 3kHz (see pages 18 & 19)

Note:

It is essential to include any other heat sources in the value of P.

The minimum required heat conducting area is then:

$$A_e = \frac{100}{5.5(40 - 30)} = 1.81m^2$$

Estimate two of the enclosure dimensions - the height (H) and depth (D), for instance. Calculate the width (W) from:

$$W = \frac{A_e - 2HD}{H + D}$$

Inserting H = D = 0.5m, obtain the minimum width:

$$W = 1.81 - \frac{(2 \times 0.5 \times 0.5)}{0.5 + 0.5} = 0.81m$$

Heat Dissipation in a ventilated enclosure

If a high ingress protection rating is not required, the enclosure may be smaller. A ventilating fan can be used to exchange air between the inside and outside of the enclosure.

To calculate the volume of ventilating air, use the following equation:

$$V = \frac{3.1P}{T_i - T_{amb}}$$

Where V = Air-flow in m^3 per hour.

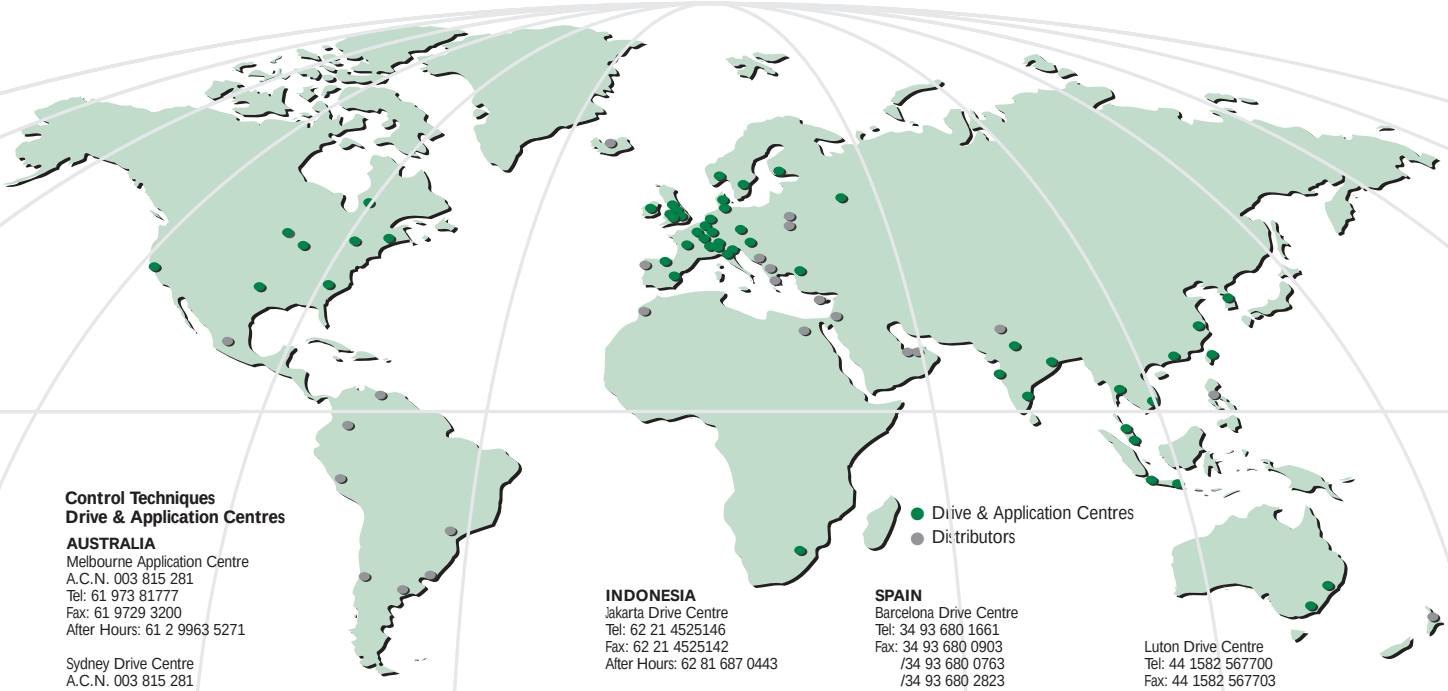
Example:

P =	100
T_i =	40°C
T_{amb} =	30°C

Then:

$$V = \frac{3.1 \times 73}{40 - 30} = 31m^3 / hr$$

driving the world...



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