Control Techniques

CONTROL TECHNIQUES

Mentor II
Product Data

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Product Overview

Mentor II

DC drives are widely used in applications that require regeneration, precise speed control, dynamic performance and constant torque over wide speed ranges. The technology is mature and extremely reliable.

Applications that traditionally favour DC drives include web handling, winders, extruders, paper production, cranes, hoists, plastic production and wire drawing.

Mentor II is a range of fully featured, microprocessor controlled DC variable speed industrial drives. All sizes share common control, monitoring, protection and serial commuications features.

All units are available in either Single Quadrant or Four Quadrant configurations.Single Quadrant providing forward rotation only. Four Quadrant drives providing full control in both directions of rotation and the ability to electrically brake from either of those directions. Both types offer comprehensive control of motor speed and–or torque.

Operating parameters are selected and changed either at the drive keypad, through the serial communications interface, or through MentorSoft a Windows™ based configuration software tool.

Sizes

There are five physical sizes comprising 28 different models ranging from 25A to 1850A (7.5kW, 10HP– 750kW, 1000HP) The drive is designed for stand alone as well as co-ordinated systems applications. There are hundreds of configurable functions in 16 logically organised menus. All functions are factory defaulted to typical values to facilitate easy setup.

Key Features

Flexibility

Mentor II has many embedded configurable functions which are easily adapted for virtiallly any application. These configurable functions include items such as assignable I/O, autotune, feedback selection, ratio control, and many more.

Technology

These product features would not be possible without the use of advanced technology. The drive employs advanced microprocessor technology, controlling all of the drive functions, including control of the ASIC (Application Specific Integrated Circuit) which determines the thyristor gate control signal pattern.

Printed circuit boards are manufactured using the latest surface mount technology.

General Features

- Both Single & Four Quadrant Models
- Wide Model Range
- Speed Feedback Variants
- Two Line LED Display
- Programmable Security Code
- Encoder Reference Input
- Motorised Potentiometer
- Four Preset Speeds
- Fast & Ramp to Stop Modes

Avanced Features

- Digital Lock
- Taper Current Limit Function
- Mains Dip Ride Through
- Programmable Logic
- Phase Sequence Tolerant
- Current Loop Auto Tune
- Field Control

Flexibility Features

- Fully programmable I/O
- Well Structured Menu System
- Configurable Menu Zero
- Programmable Thresholds
- High Speed Communications
- Application Module
- Armature Current Slew Rate Limiting
- Serial Comms

Maintenance Features

- Last Four Trips Stored
- Full Internal Protection
- Full Overload Protection
- Customer Security
- Current Loop Auto-Tune
- MentorSoft
- Generous Thyristor Rating

Configurable Functions

Assignable I/O

The Mentor Inputs and Outputs are configurable enabling the user to define which I/O points operate with which functions. For example, digital input 1 could be defined as a preset speed select.This capability provides optimum usage and maximum flexiblity of the Mentors I/O and it applies to the analogue as well as digital I/O.

I/O TYPE	QUANTITY	FUNCTION
Analogue Input	5	Assignable
Analogue Output	3	Assignable
Digital Input	9	Assignable
Digital Output	6	Assignable

Analogue Input Modes

There are multiple analogue signal input possibilities for the main speed reference. This analogue input can be voltage or current type.

PARAMETER 7.26	PARAMETER 7.27	PARAMETER 7.28	INPUT MODE
0	N/A	N/A	Voltage +/- +/- 10 VDC
1	0	0	0-20mA
1	1	0	20-0mA
1	0	1	4-20mA
1	1	1	20-4mA

Torque Mode Selection

There are three types of torque control possible: Basic torque control, torque control with speed overide, and winder/unwinder torque control, providing safeguard against web breaks.

PARAMETER 4.12	PARAMETER 4.13	CONTROL MODE
0	0	Speed Control Mode
1	0	Basic Torque Control
0	1	Torque mode with speed override
1	1	Winder/unwinder torque control

Current Loop Self Tune

If optimum response is required from the drive, the current loop which is the innermost control loop of the drive must be setup to enable the outer control loop, the speed loop, to function correctly. The dynamics of the current loop are principally a function of the electrical characteristics of any particular motor.

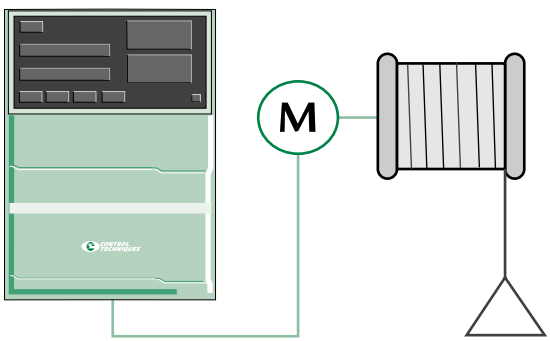
The Mentor II has a built in self tuning procedure and in order to carry out this procedure the motor armature must be locked or the field removed to allow the drive to inject armature current and determine the electrical characteristics of the armature. The armature must not be allowed to rotate during the test procedure. Normally if the field is disconnected, the armature of a shunt wound motor will not move.

Continuous autotune can be enabled to continuously optimise current loop performance for changing load conditions.

Torque Proving

This function will provide the facility to enable the drive to provide an output, when a preset level of torque is achieved. Thus allowing an holding brake to be lifted only when the required torque is available

Electronic Holding Brake Illustration ▼

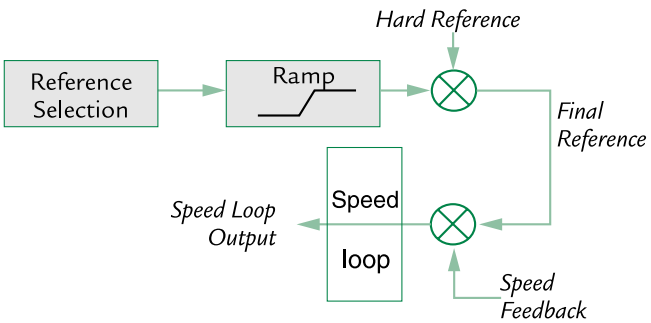


Configurable Functions

Hard reference input

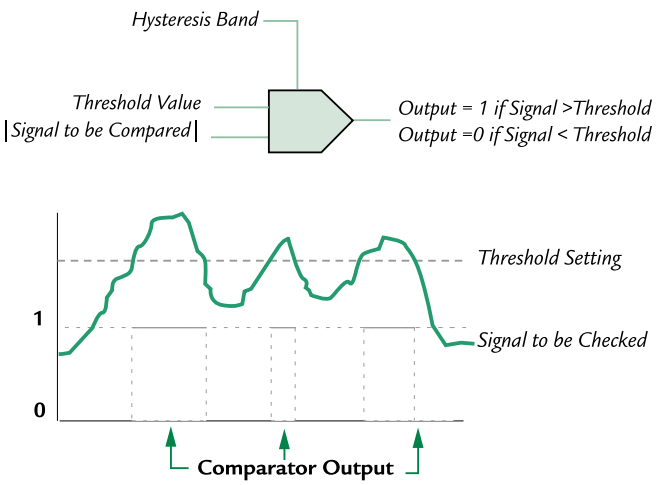
This function is useful in applications requiring a dancer input. By routing the dancer feedback directly into the hard reference input, all drive ramps are ignored and the value is added to the normal post ramp speed reference.

Hard Reference Input Illustration ▼



Programmable Thresholds

The drive supports two software controllable comparators. These comparators can be used to detect when an internal or external signal exceeds a user set point threshold. These threshold comparators provide a hysteresis band to prevent erratic operation at or near the threshold point.



Applications

Release external brake when torque>50%.
Turn on output when motor speed>20%.

Programmable Logic

The Mentor has several unique programmable logic functions that are built into the drive.

This programmable logic soft circuitry can AND/OR/NAND/NOR up to 2 logic signals. These signals can be internal drive states, external user inputs, or a combination of each. In addition the resultant boolean logic can be sent through a built in adjustable time delay before being used by the drive or sent out through its logic output driver circuitry.

Example

If speed is 0 AND Motor Current >80% for > 3seconds +Then Motor Stalled

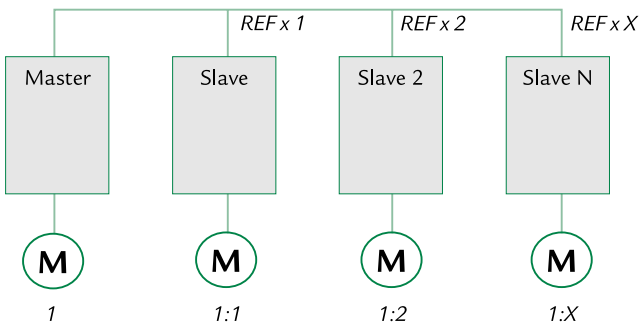
Master Slave Ratio Control

The Mentor has the ability to allow the use of its serial port as a means of rapid transfer of parameter value information between two or more drives in a digital format.

This permits a digital reference to be transmitted down a line of drives, and offers the possibility of setting individual ratios at each drive stage.

It could also be used in applications that require current sharing between two drives

Frequency Slaving Control Illustration ▼



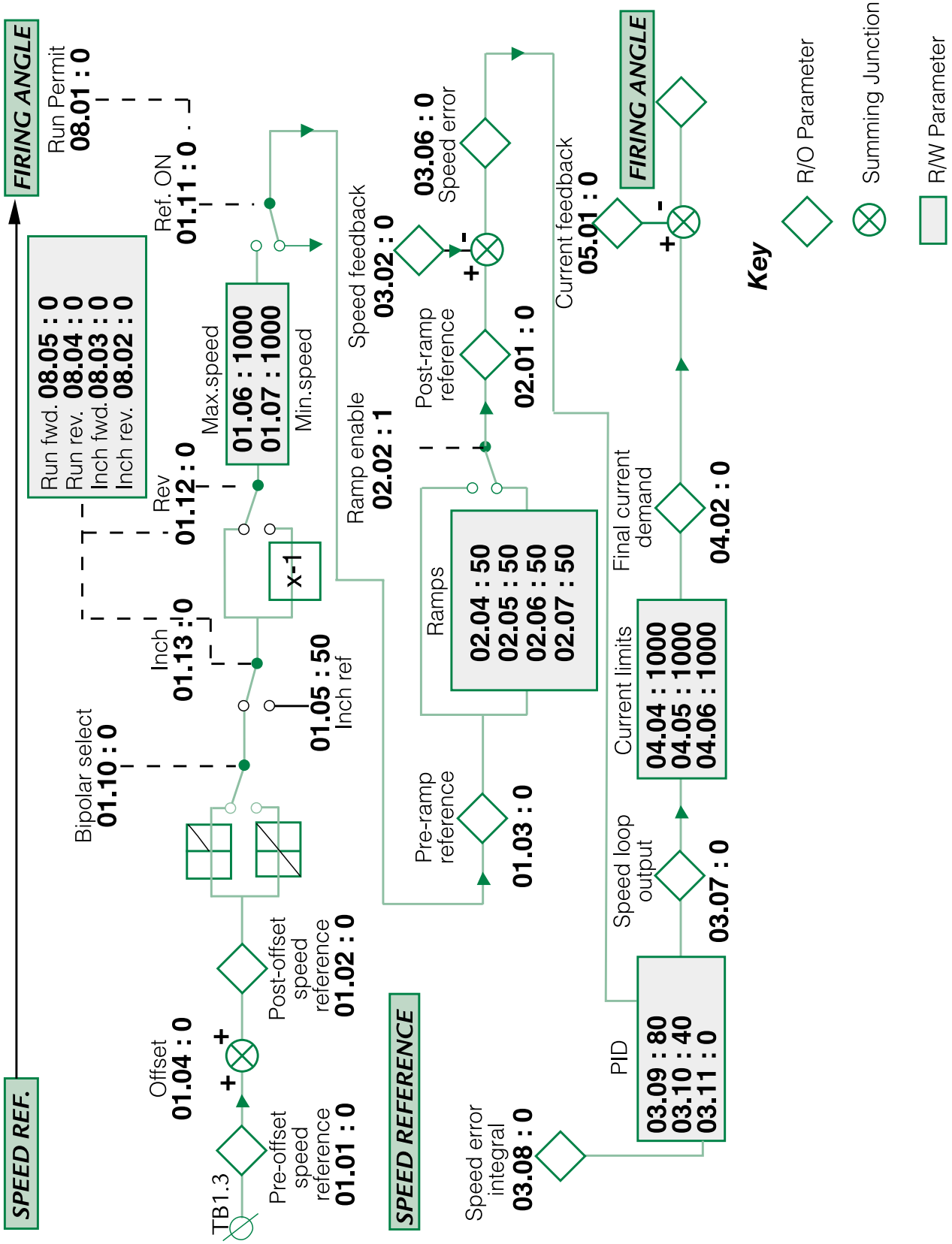
Digital Speed Position Loop

This allows several drives to be run in speed or position synchronisation.

Shaft positions can be offset or an adjustable speed ratio introduced to control elongation or shrinkage in applications such as plastics extrusion, wire drawing and textile manufacture.

Mentor Menus

BASIC BLOCK DIAGRAM



Mentor Menus

Mentor Parameter Menus

Mentor has more than 400 parameters organised into similar functional groups designated as menus. For example Menu1 holds the parameters associated with the selection of the speed reference. Menu 2 holds the parameters associated with the selection of acceleration and deceleration rates.

Menus 0

Customer defined, can be used for quick selection of the most commonly accessed parameters.

Menu 1 Speed reference selection
Speed limits
Offset

Menu 2 Acceleration and Deceleration ramps
Ramp Selection, Ramp Hold
Jog ramps

Menu 3 Speed feedback selection
Speed loop PID gain adaption
Encoder adaption, Armature voltage
Feedback adaption
Hard speed reference selection

Menu 4 Current monitoring
Current limits
Taper current limiting
Torque control

Menu 5 Current loop control
Current loop PI adaption
Autotune
12 pulse mode
Motor protection
Armature current monitoring
Standstill mode selection

Menu 6 Field Control
Field current feedback scaling
Field economy modes
Dynamic speed loop gain compensation

Menu 7 Programmable Analogue Inputs & Outputs
Tachogenerator feedback scaling
Motor Thermistor Input

Menu 8 Programmable Digital Inputs

Menu 9 Programmable Digital Outputs

Menu 10 Status and diagnostic information
Process generated trips

Menu 11 Menu 0 assignments
Initial parameter displayed
Serial communications setup and mode select
Mains dip ride through selection

Menu 12 Programmable thresholds

Menu 13 Digital Lock

Menu 14 MD29 system setup

Menu 15 User parameters MD29

Menu 16 User parameters MD29

Mentor Options

- Applications card (MD29) -
  Easy plug in expansion card
- CT Net Interface -
  High Speed Network
- Profibus DP Interface -
  High Speed Network
- Interbus S -
  High Speed Network
- Expansion I/O Module -
  Expansion I/O for Mentor II
- Field Controller FXM5 -
  Field Control to 20A

Specifications

Ambient Temperature

0 – 40 Degrees Centigrade (32 – 104 Degrees F)
At ambient temperatures above 40 degrees C. (104 degrees F) derate 1.5% per degree C up to 55 degrees C.(0.75% per Degree F up to 131 Degrees F)

Storage Temperature

-40 to 55 Degrees Centigrade (-40 to 131 Degrees F)

Rated Altitude

Sea level to 1000 metres (3300 feet)
At heights above 1000m reduce the Full Load Current by 1.0% for each additional 100m (320ft)

Humidity

Non Condensing to 85% at 40 Degrees Centigrade

AC Supply Requirements

208 – 480v AC -5 to +10% Three Phase
Optional 208 - 525/660v AC -5 to +10% Three Phase

Input Frequency	48 – 62Hz Auto Sensing
Phase Rotation	Non Sensitive

DC Armature Output

6 Pulse Full Wave
Maximum Recommended Armature Outputs

Supply	DC Armature
380V	440V
415	460
440	500
460	510
480	530

Ingress Protection

To IP 00

Specifications

Drive Model No.	Typical ❶ D.C. Motor Rating at 400V Arm		Drive Type	Maximum Continuous Current Rating (Amps)		Recommended Fuse Ratings		Typical ❷ Cable Size AC Input & DC Output	Cooling	Max. Field Current Rating A
	KW	HP		AC Input	DC Output	AC Input Amps (HRC)	DC ❺ Output (500V DC rated)			
M25	7.5	10	Single Quad	21	25	32	Not Required	4mm²	Nat.Conv.	8 ❸
M45	15	20	Single Quad	38	45	50	Not Required	6mm²	Nat. Conv.	8 ❸
M75	30	40	Single Quad	60	75	100	Not Required	25mm²	Nat. Conv.	8 ❸
M105	37.5	50	Single Quad	88	105	100	Not Required	35mm²	Nat. Conv.	8 ❸
M155	56	75	Single Quad	130	155	160	Not Required	50mm²	Fan Cooled	8 ❸
M210	75	100	Single Quad	175	210	200	Not Required	95mm²	Fan Cooled	8 ❸
M350	125	168	Single Quad	292	350	355	Not Required	150mm²	Fan Cooled.	10 ❹
M420	150	200	Single Quad	350	420	450	Not Required	185mm²	Fan Cooled	10 ❹
M550	200	268	Single Quad	460	550	560	Not Required	300mm²	Fan Cooled	10 ❹
M700	250	335	Single Quad	585	700	630	Not Required	2x185mm²	Fan Cooled	10 ❹
M825	300	402	Single Quad	690	825	800	Not Required	2x240mm²	Fan Cooled	10 ❹
M900	340	456	Single Quad	750	900	1000	Not Required	2x240mm²	Fan Cooled	20 ❹
M1200	450	603	Single Quad	1000	1200	1250	Not Required	2x400mm²	Fan Cooled	20 ❹
M1850	750	1000	Single Quad	1540	1850	2000	Not Required	3x400mm²	Fan Cooled	20 ❹
M25R	7.5	10	4 Quad	21	25	32	40 ❺ ❻	4mm²	Nat. Conv.	8 ❸
M45R	15	20	4 Quad	38	45	50	75 ❺ ❻	6mm²	Nat. Conv.	8 ❸
M75R	30	40	4 Quad	60	75	100	125 ❺ ❻	25mm²	Nat. Conv.	8 ❸
M105R	37.5	50	4 Quad	88	105	100	175 ❺ ❻	35mm²	Nat. Conv.	8 ❸
M155R	56	75	4 Quad	130	155	160	250 ❺ ❻	50mm²	Fan Cooled	8 ❸
M210R	75	100	4 Quad	175	210	200	300 ❺ ❻	95mm²	Fan Cooled	8 ❸
M350R	125	168	4 Quad	292	350	355	550 ❺ ❻	150mm²	Fan Cooled	10 ❹
M420R	150	200	4 Quad	350	420	450	700 ❺ ❻	185mm²	Fan Cooled	10 ❹
M550R	200	268	4 Quad	460	550	560	900 ❺ ❻	300mm²	Fan Cooled	10 ❹
M700R	250	335	4 Quad	585	700	630	1000 ❺ ❻	2x185mm²	Fan Cooled	10 ❹
M825R	300	402	4 Quad	690	825	800	1200 ❺ ❻	2x240mm²	Fan Cooled	10 ❹
M900R	340	456	4 Quad	750	900	1000	1500 ❺ ❻	2x240mm²	Fan Cooled	20 ❹
M1200R	450	603	4 Quad	1000	1200	1250	1800 ❺ ❻	3x400mm²	Fan Cooled	20 ❹
M1850R	750	1000	4 Quad	1540	1850	2000	2000 ❺ ❻	3x400mm²	Fan Cooled	20 ❹

❶ This rating may be increased at higher armature voltage

❷ Cable sizes are for 3-core and 4-core PVC insulated armoured cable with copper conductors, and laid in accordance with defined conditions.

❸ M25-M210 fitted with MDA3 field controller as standard.

❹ Fixed voltage. Optional field regulator FXM5 available.

❺ DC fuses must be fast 'semiconductor' type, rated - for 380V supply - 500V dc for 480V supply - 700V dc

❻ In applications where load inertia is low and regeneration infrequent, dc fuses may not be needed.

Specifications

Current, Input and Output Ratings

DRIVE TYPE & MODEL Single Quadrant	Four Quadrant	Typical* ratings at 400v (armature) kW	HP	at 500V AC kW	HP	Maximum continuous current rating DC input A	output A
M25	M25R	7.5	10	9	12	21	25
M45	M45R	15	20	19	25	38	45
M75	M75R	30	40	38	50	60	75
M105	M105R	37.5	50	47	63	88	105
M155	M155R	56	75	70	94	130	155
M210	M210R	75	100	94	126	175	210
M350	M350R	125	168	156	209	292	350
M420	M420R	150	200	188	252	350	420
M550	M550R	200	268	250	335	460	550
M700	M700R	250	335	313	420	585	700
M825	M825R	300	402	375	503	690	825
M900	M900R	340	456	425	570	750	900
M1200	M1200R	450	603	563	755	1000	1200
M1850	M1850R	750	1000	938	1258	1540	1850

** Motor rating may be increased at higher armature voltages.*

Ventilation and Weight

DRIVE TYPE & MODEL Single Quadrant	Four Quadrant	Ventilation Type	Flow $m^3\ min^{-1}$	$ft^3\ min^{-1}$	Approx. weight kg	lb
M25, M45, M75		1	-	-	10	22
	M25R, M45R, M75R	1	-	-	11	24
M105		1	-	-	14	31
	M105R	1	-	-	15	33
M155		2	1.98	70	14	31
	M155R	2	1.98	70	15	33
M210	M210R	2	1.98	70	21	46
M350, M420		2	7.6	270	22	48
	M350R, M420R	2	7.6	270	23	51
M550		2	17	600	22	48
	M550R	2	17	600	23	51
M700, M825		2	17	600	27	59
	M700R, M825R	2	17	600	30	66
M900, M1200, M1850		2	20	700	70	154
	M900R, M1200R, M185R	2	20	700	120	264

Type of Ventillation

1. Natural convection
2. Forced ventilation

NOTE Supply voltages for ventilation fans are as follows -

M350 - M825 110V AC single phase (or 220V option if requested).
M350 - M825 110V AC single phase (or 220V option if requested).
M900 - M1850 415V AC three phase.

Losses

Losses are equivalent to 0.5% of drive rated output across the range. The following table lists the losses in kW and HP for all models, at 400V armature voltage.

DRIVE TYPE & MODEL Single Quadrant	Four Quadrant	Typical motor ratings		*LOSSES*	
		kW	HP	kW	HP
M25	M25R	7.5	10	0.038	0.05
M45	M45R	15	20	0.075	0.1
M75	M75R	30	40	0.15	0.2
M105	M105R	37.5	50	0.19	0.25
M155	M155R	56	75	0.28	0.37
M210	M210R	75	100	0.38	0.5
M350	M350R	125	168	0.63	0.83
M420	M420R	150	200	0.75	1
M550	M550R	200	268	1.0	1.3
M700	M700R	250	335	1.3	1.7
M825	M825R	300	402	1.5	2
M900	M900R	340	456	1.5	2
M1200	M1200R	450	603	2.3	3
M1850	M1850R	750	1005	3.8	5

Protection

Armature overcurrent Trip	200% Drive rated current
Heatsink Overtemperature Trip	Drive heatsink temperature exceeds 95 Degrees C. (Frame size 155 & above.)
Motor Thermal Trip	Electronically protects the motor from overheating, due to loading conditions.
MOV voltage transient protection	160 Joules 1400V clamping
Drive Overload trip	Current overload is exceeded. Programmable to allow up to 150% of drive current for 30 seconds.
Phase Sequence	Protection of the electronic supply phase rotation
Supply Loss	Protects against one or more supply phases being lost.
Field Loss	Protects against loss of motor field current
Feedback Loss	Protection against loss of either tachogenerator or encoder signal

Pre-Installation

Terminals Classified

Analog Outputs

- Terminal block TB2, terminals 11 to 14 inclusive.
- One dedicated as Armature current, 5mA drive capability.
- Three undedicated outputs, 5mA drive capacity.
- Output voltage range - 10V to +10V.

Analog Inputs

- Terminal block TB1, terminals 3 to 10 inclusive.
- Five undedicated inputs, impedance 100kΩ. Input voltage range - 10v to +10V.
- Dedicated inputs for motor thermistor (thermal) or thermostat (trip level 3kΩ, reset. 1.8kΩ approx.) and tachogenerator (tachometer) feedback.

Digital Outputs

- Terminal block TB2, terminals 15 to 19 inclusive.
- Terminal block TB4, terminals 34 to 39 inclusive.
- Five undedicated open-collector outputs.
- Maximum current-sinking capability 100mA.
- One dedicated relay output “Drive Ready”.
- Maximum relay current at-

250V AC	2.2A
110V AC	5A
5V DC	5A

Encoder (Pulse Tachometer) - Reference & Feedback

Channel A must lead channel B for forward rotation.

Digital Inputs

- Terminal block TB3, terminals 21 to 30 inclusive.
- Terminal block TB4, terminals 31, 32
- Nine undedicated inputs, impedance 10kΩ.
- Drive enable signal - operates directly on the output gate-pulse circuits for safety. Delay 30ms between removal of enable signal and inhibit firing. Drive enable control is internally interlocked with fault detection signals for maximum safety.
- Drive reset input for external control. Input logic selectable - ‘active high’ or ‘active low’.
- Circuit voltage +24V.
- Provision for inputs from two encoders.
- Run Forward and Run Reverse, latched.

Programmable Outputs

- Terminal block TB2, terminals 12 to 14 inclusive - Analog.
- Terminal block TB2, terminals 15 to 19 inclusive - Open collector (digital)
- Terminal block TB4, terminals 34 to 36 inclusive - Relay.

Programmable Inputs

- Terminal block TB1, terminals 3 to 7 inclusive - Analog.
- Terminal block TB3, terminals 22 to 30 inclusive - Digital.

Connections for	Encoder		Serial Comms.
Pin	Reference Pl4	Feedback Sk3/PL3*	PL2
1	0V	0V	0V isolated
2	NC	Supply	$\overline{TX}$
3	A	A	$\overline{RX}$
4	$\overline{A}$	$\overline{A}$	NC
5	B	B	NC
6	$\overline{B}$	$\overline{B}$	TX
7	NC	NC	RX
8	C	C	NC
9	$\overline{C}$	$\overline{C}$	NC
10	0V	0V(NOTSK3)	-

**PL3 is connected in parallel with SK3*
PL4 is a 10-way header for the Reference Encoder.
SK3 is a 9-way D-type female socket for the Feedback Encoder.

Control Inputs and Outputs

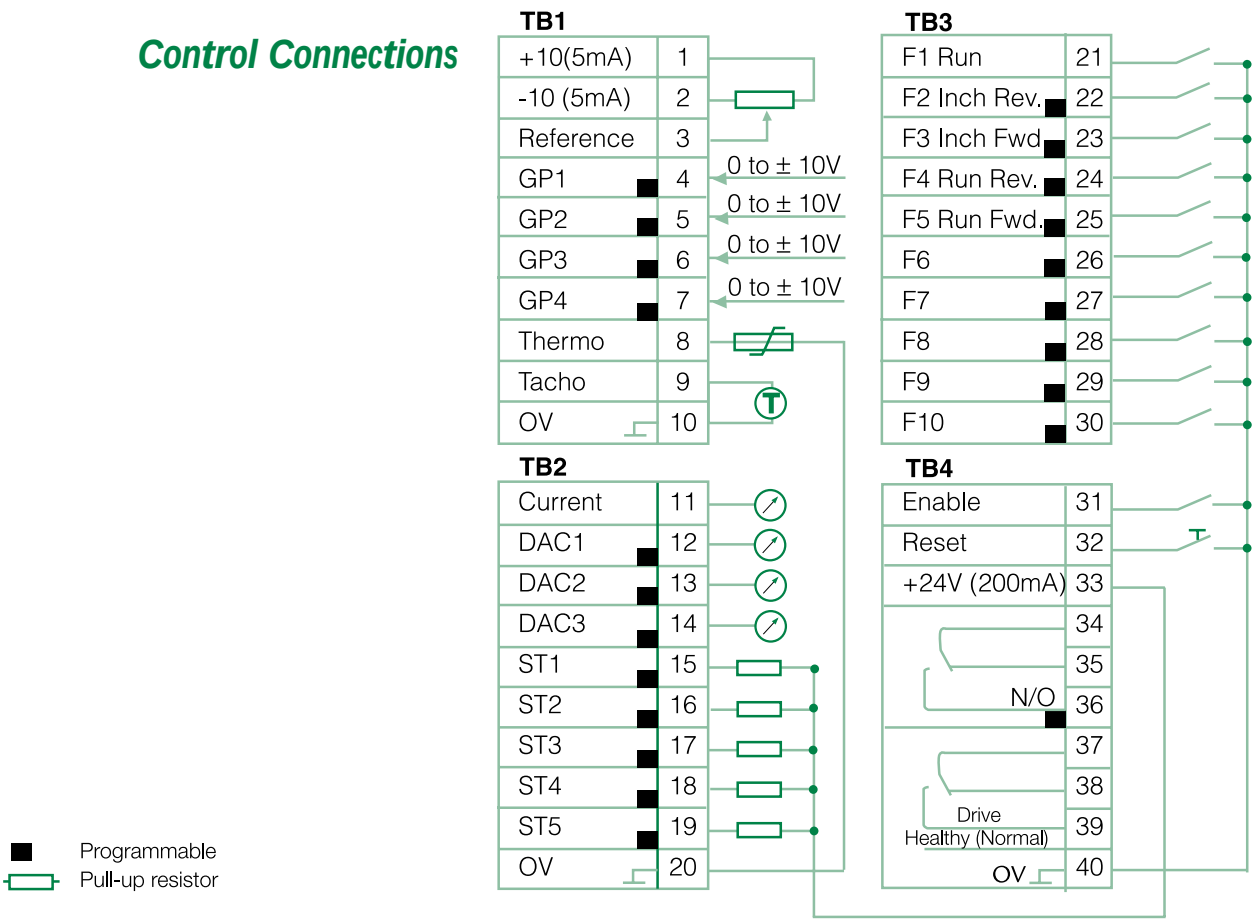
Terminal	I/O Type & Function	Rating
1	+10VDC User Supply for external analogue signal	Voltage Tolerance +- 1% Maximum Output 5mA
2	-10VDC User Supply for external analogue signal	Voltage Tolerance +- 1% Maximum Output 5mA
3	Analogue input for main speed reference. Single ended. Programmable	Bipolar + - 10VDC 4-20mA 100kOhm input impedance. 12bit + sign. 1.2mS Sampling time
4	Analogue input GP1 Programmable. Single ended analogue input	Bipolar + -10VDC 100kOhm input impedance. 10bit + sign. Sampling 6 times per mains cycle.
5	Analogue input GP2 Programmable. Single ended analogue input	Bipolar + -10VDC 100kOhm input impedance. 10bit + sign. Sampling 6 times per mains cycle.
6	Analogue input GP3 Programmable. Single ended analogue input	Bipolar + -10VDC 100kOhm input impedance. 10bit + sign. Sampling 3 times per mains cycle.
7	Analogue input GP4 Programmable. Single ended analogue input	Bipolar + -10VDC 100kOhm input impedance. 10bit + sign. Sampling 3 times per mains cycle.
8	Motor Thermistor Input	Dedicated Thermistor input
9	Tachogenerator Input	Scaleable from 10 – 300V
10	Tachogenerator Common	Tachogenerator 0v reference
11	Analogue Output Armature Current	0-6.6v = 0-150% Full Load Armature Current. True analogue signal. Max Load 5mA
12	Analogue Output DAC1 Programmable Single ended output Default Speed Demand	0 - +/- 10VDC. 10bit. Sampling 6 times per mains cycle. Max Load 5mA
13	Analogue Output DAC2 Programmable Single ended output Default Speed feedback	0 - +/- 10VDC. 10bit. Sampling 3 times per mains cycle. Max Load 5mA
14	Analogue Output DAC3 Programmable Single ended output Default Armature Voltage.	0 - +/- 10VDC. 10bit. Sampling 3 times per mains cycle. Max Load 5mA
15	Programmable Logic Output ST1 Default Enabled	Open collector transistor Output 100mA Max Load +24VDC Max
16	Programmable Logic Output ST2	Open collector transistor Output 100mA Max Load +24VDC Max
17	Programmable Logic Output ST3 Default Alarm I*T	Open collector transistor Output 100mA Max Load +24VDC Max

Pre-Installation

Terminal	I/O Type & Function	Rating
18	Programmable Logic Output ST4 Default In Current Limit	Open collector transistor Output 100mA Max Load +24VDC Max
19	Programmable Logic Output ST5 Default Standstill	Open collector transistor Output 100mA Max Load +24VDC Max
20	Circuit Common 0 VDC Analogue reference	
21	Logic Input F1 Run Permit	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
22	Programmable Logic Input F2 Default Inch Reverse	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
23	Programmable Logic Input F3 Default Inch Forward	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
24	Programmable Logic Input F4 Default Run Reverse	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
25	Programmable Logic Input F5 Default Run Forward	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
26	Programmable Logic Input F6 Default 00	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
27	Programmable Logic Input F7 Default 00	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
28	Programmable Logic Input F8 Default 00	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
29	Programmable Logic Input F9 Default 00	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
30	Programmable Logic Input F10 Default 00	User defined Negative (default) or Positive Logic. 100K Ohm input impedance
31	Logic Input Drive enable	Negative (default) or Positive Logic. 100K Ohm input impedance. Internally interlocked with fault detection signals.
32	Logic Input Drive reset	Negative (default) or Positive Logic. 100K Ohm input impedance
33	+24VDC User Supply	Voltage Tolerance +/-10% Max loading 200mA

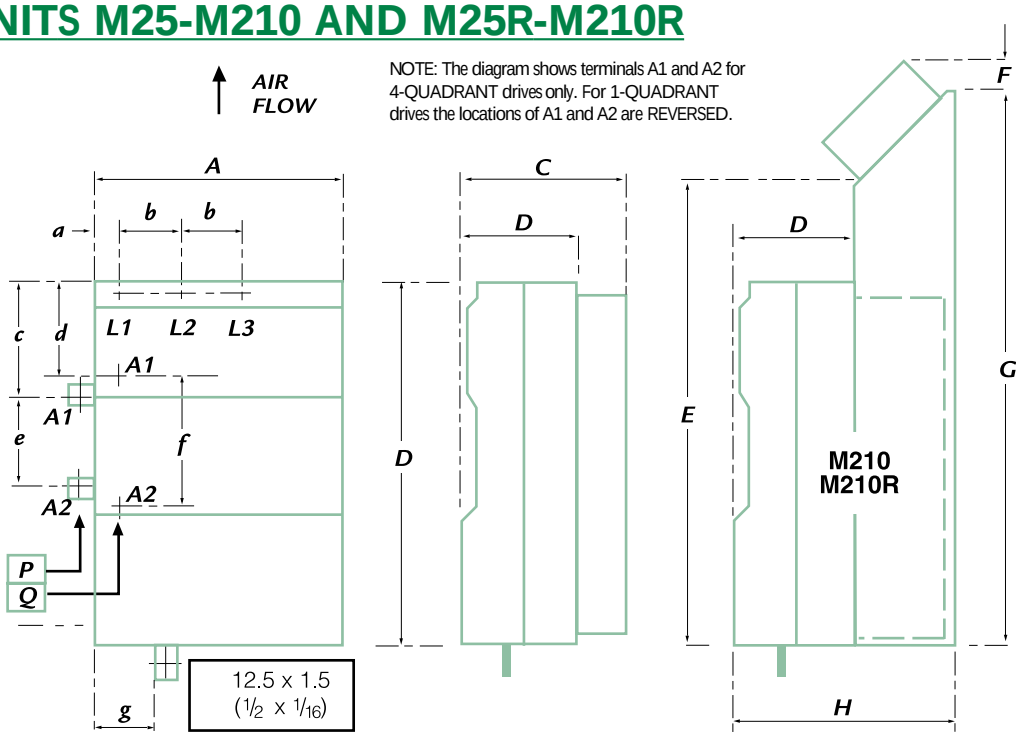
Terminal	I/O Type & Function	Rating
34	Programmable Status relay Default Zero Speed Dry Contact Common Pole	240VAC 2.2A Resistive 110VAC 5A 5VDC 5A
35	Programmable Status relay Dry Contact Normally Closed Pole	
36	Programable Status relay Dry Contact Normally Open Pole	
37	Status relay Drive Healthy Dry Contact Common Pole	240VAC 2.2A Resistive 110VAC 5A 5VDC 5A
38	Status relay Drive Healthy Dry Contact Normally Closed Pole	
39	Status relay Drive Healthy Dry Contact Normally Open Pole	
40	Circuit Common 0 VDC Digital reference	

Control Connections



Pre-Installation

UNITS M25-M210 AND M25R-M210R



Unit Dimensions

	mm	in
A	250	9 13/16
B	370	14 9/16
C	*	†
D	112	4 7/16
E	195	7 11/16
F	420	16 9/16
G	30	1 3/16
H	505	19 7/8
	197	7 3/4

* For **M25** to **M75R**
C = 150 mm, 5 in

† For **M105** to **M155R**
C = 195mm, 7

UNIT	TERMINALS A1,A2
M25	Q
M25R	Q
M45	Q
M45R	Q
M75	Q
M75R	Q
M105	Q
M105R	P
M155	Q
M155R	P
M210	Q
M210R	P

Terminal Dimensions

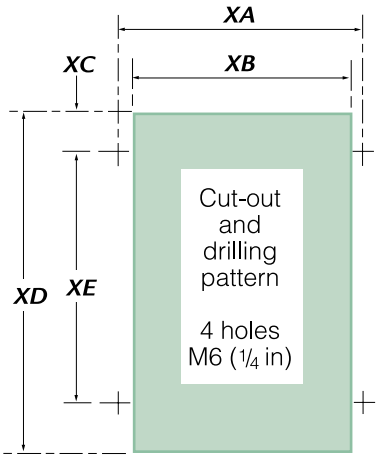
	mm	in
a	30	1 3/16
b	60	2 3/8
c	110	4 5/16
d	100	3 15/16
e	115	4 1/2
f	140	5 1/2
g	54	2 1/8

TERMINALS L1, L2, L3 - M8 stud
TERMINALS A1, A2 and earth (ground)
- drilled for M8 (in) bolt

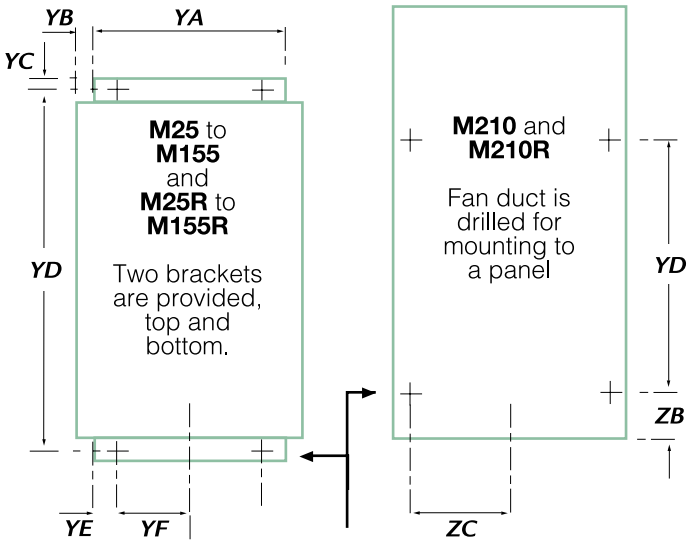
CUT-OUT & DRILLING PATTERN
FOR THROUGH-PANEL MOUNTING

Through-Panel Mounting Dimensions

	mm	in
XA	220	8 11/16
XB	200	7 7/8
XC	42.5	1 11/16
XD	360	14 3/16
XE	245	9 5/8



DRILLINIG PATTERNS
FOR SURFACE MOUNTING



Surface Mounting Dimensions

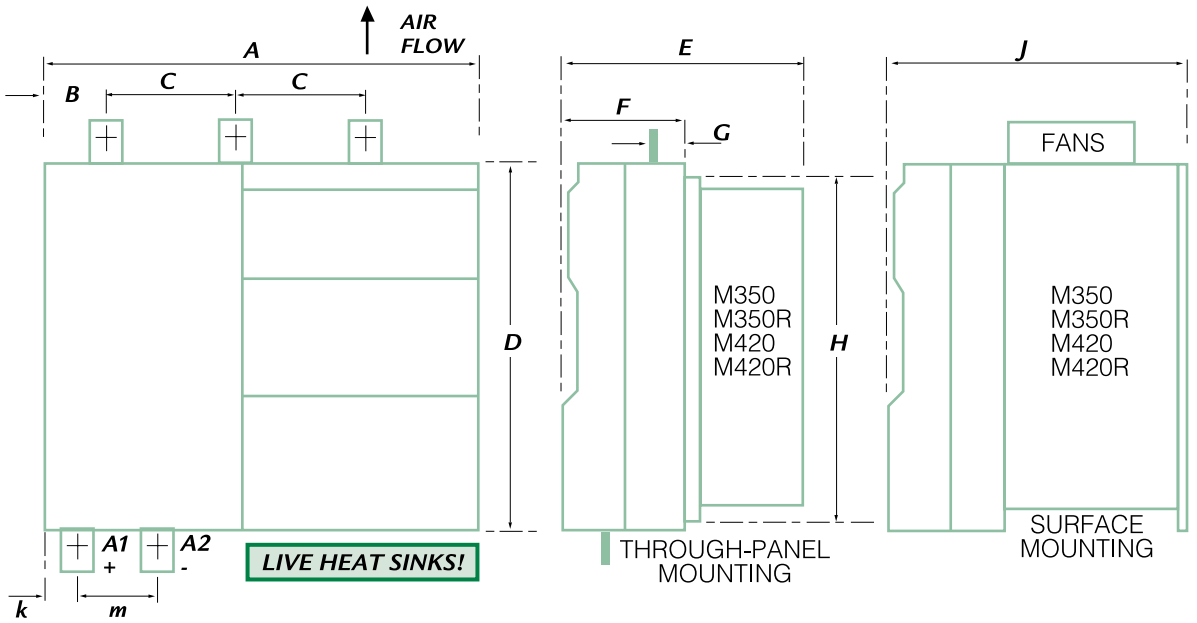
	mm	in
XA	186	7 5/16
XB	32	1 1/4
XC	10	7 7/16
XD	389	15 5/16
XF	42	1 11/16
XF	50	1 15/16

	mm	in
ZA	245	9 5/8
ZB	87	3 7/16
ZC	110	4 5/16

Not to scale
Metric dimensions are exact.
Inch dimensions are calculated.

Units M25 and M25R to M210 and M210R inclusive are suitable for both surface mounting and through panel mounting.

UNITS M350-M825 AND M350R-M825R



Unit Dimensions

	mm	in
A	450	17 3/4
B	85	3 3/8
C	140	5 1/2
D	363	14 5/16
E	225	8 7/8
F	112	4 7/16
G	30	1 3/16
H	293	11 9/16
J	280	11
K	405	15 15/16
L	423	16 11/16

TERMINAL DETAILS

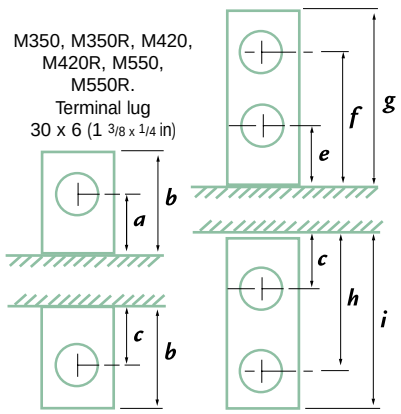
All terminal bolt holes are M12 (1/2 in) clearance

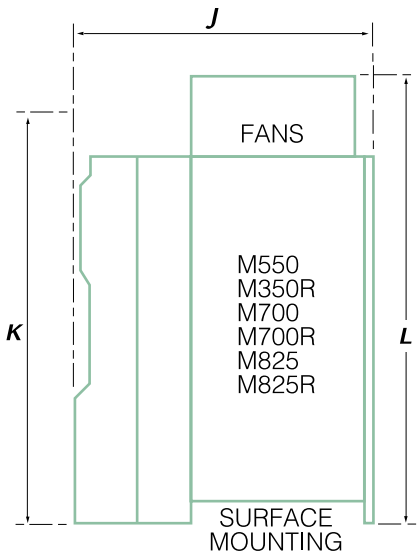
Terminal Dimensions

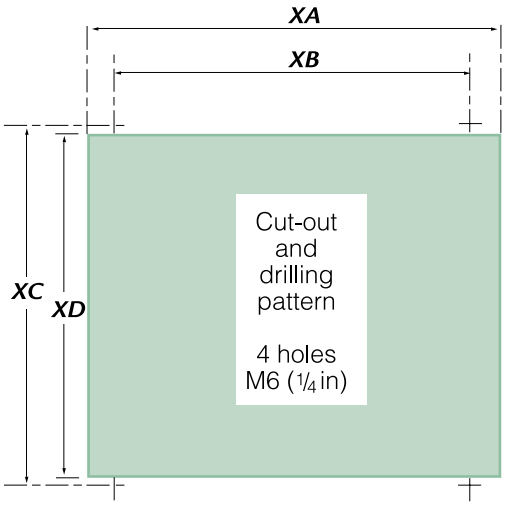
	mm	in
a	28	1 1/8
b	43	1 11/16
c	23	1 5/16
d	38	1 1/2
e	35	1 3/8
f	65	2 9/16
g	80	3 1/8
h	53	2 1/16
j	68	2 11/16
k	25	1
m	60	2 3/8

M350, M350R, M420, M420R, M550, M550R. Terminal lug 30 x 6 (1 3/8 x 1/4 in)

M700, M700R, M825, M825R, Terminal lug 40 x 10 (1 9/16 x 3/8 in)





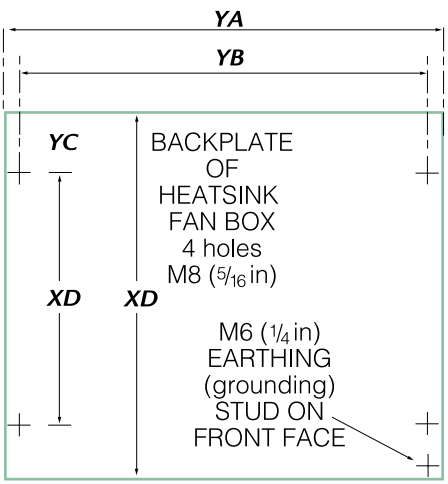


Through-Panel Mounting Dimensions

	mm	in
XA	420	16 9/16
XB	405	15 15/16
XC	310	12 3/16
XD	295.5	11 5/8

Surface Mounting Dimensions

	mm	in
XA	496	19 1/2
XB	472	18 9/16
XC	62	2 7/16
XD	225	8 7/8
XE	347	13 11/16

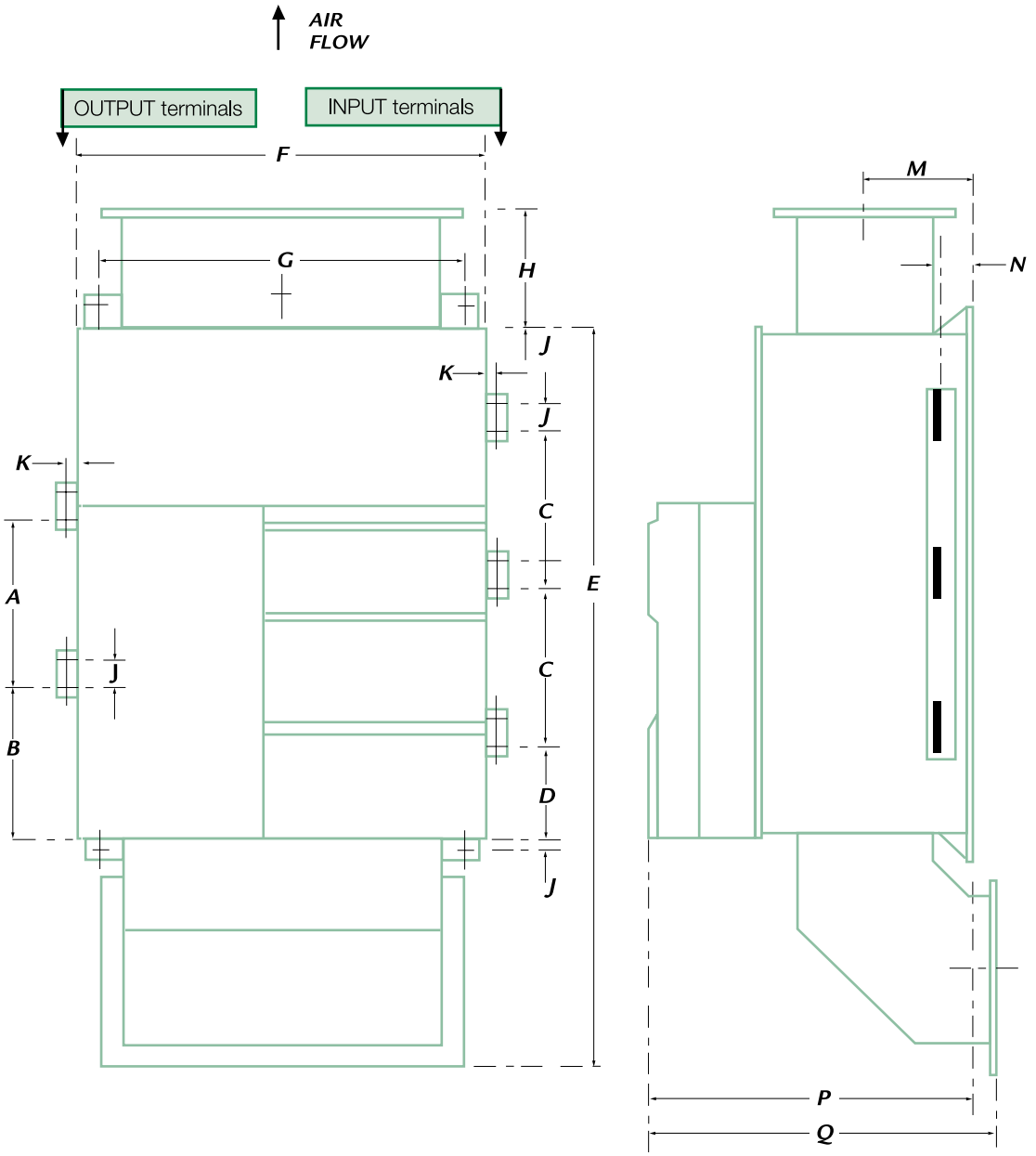


Not to scale
Metric dimensions are exact.
Inch dimensions are calculated

Pre-Installation

UNITS M900-M1850 AND M900R-M1850R

Not to scale
Metric dimensions are exact.
Inch dimensions are calculated



Unit Mxxx Dimensions

	mm	in
A	175	6 7/8
B	180	7 1/16
C	175	6 7/8
D	90	3 9/16
E	555	21 7/8

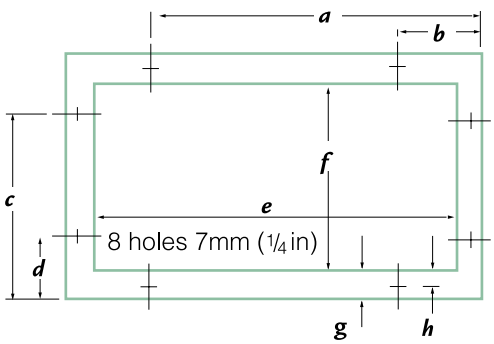
Unit MxxxR Dimensions

	mm	in
A	330	13
B	330	13
C	330	13
D	165	6 1/12
E	1015	39 15/16

Common Dimensions

	mm	in
A	450	17 3/4
B	393	15 1/2
C	125	4 15/16
D	25	1
A	30	1 3/16
B	315	12 3/8
C	185	7 5/16
D	48.5	1 15/16
C	470	18 1/2
D	510	20 1/16

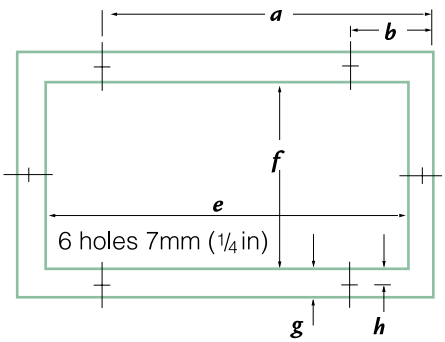
TOP FLANGE



Top Flange Dimensions

	mm	in
a	280	11
b	100	3 15/16
c	200	7 7/8
d	60	2 3/8
e	330	13
f	210	8 1/4
g	25	1
h	15	9/16

REAR FLANGE



Rear Flange Dimensions

	mm	in
a	290	11 7/16
b	80	3 1/8
c	200	7 7/8
d	-	-
e	330	13
f	208	8 3/16
g	25	1 3/16
h	15	3/8

Units M900 to M1850 and M900R to M1850R are suitable for surface mounting only.

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 area in m^2.*
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 Mentor M105.

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 = *190W*

Note:

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

The minimum required heat conducting area is then:

$$A_e = \frac{190}{5.5(40 - 30)} = 3.45m^2$$

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:

$$W = \frac{3.45 - (2 \times 0.5 \times 0.5)}{0.5 + 0.5} = 2.95m$$

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 = *190W*
T_i = *40°C*
T_{amb} = *30°C*

Then:

$$V = \frac{3.1 \times 190}{40 - 30} = 58.9m^3 / hr$$

Pre-Installation

Electromagnetic compatibility (EMC) conducted emission.

This is a summary of the EMC performance of the drive. For full details refer to the Mentor EMC data sheet which can be obtained from a Drive Centre or distributor listed on the back cover.

Immunity

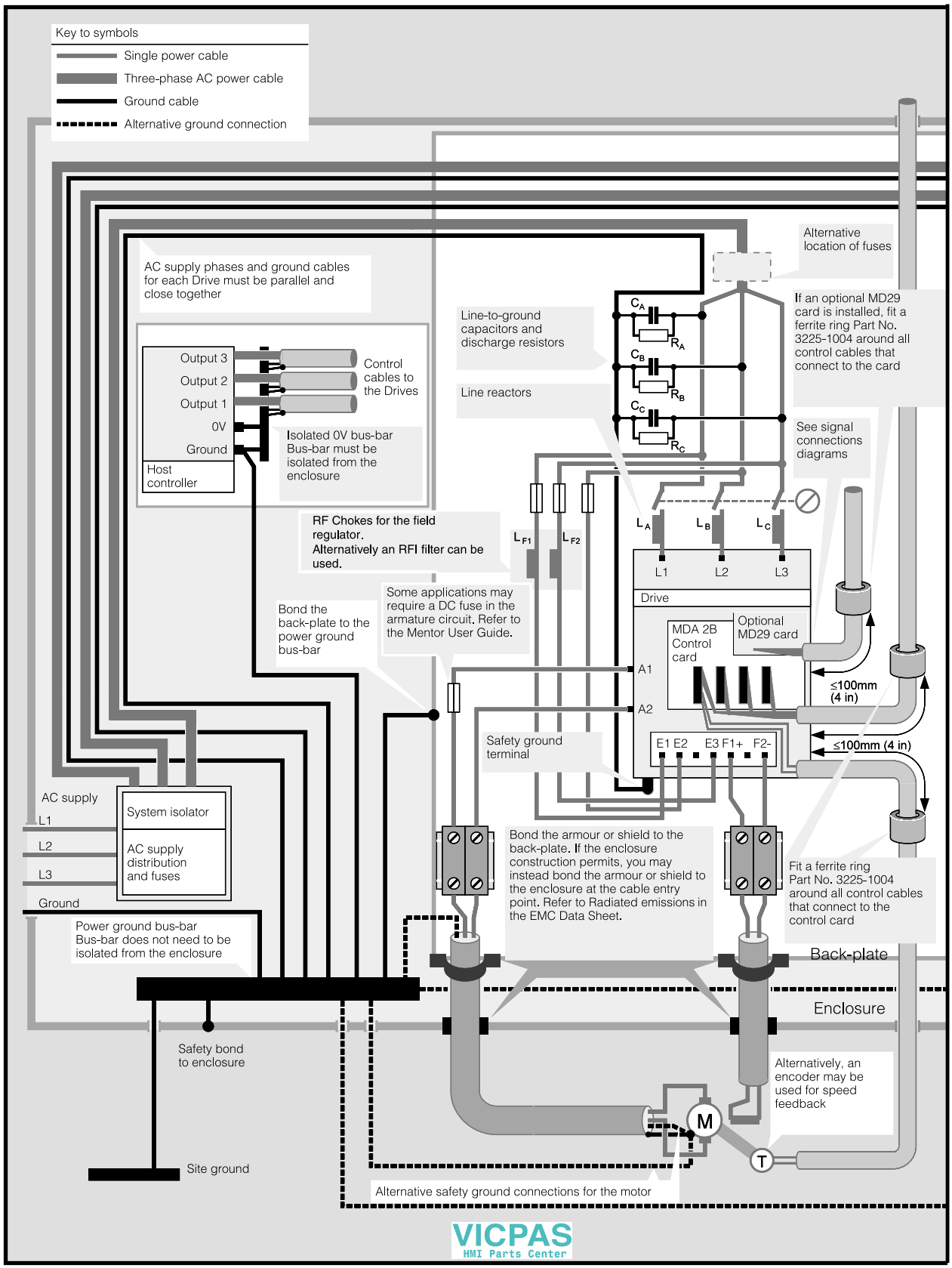
Compliance with immunity standards does not depend on installation details. The drive meets EN50082-2 (generic immunity standard for the industrial environment) and the following specifications from IEC1000-4
Part 2, Electostatic discharge: Level 3
Part 3, Radio frequency field: Level 3
Part 4, Transient burst: Level 4 at the control terminals
Part 5, Surge (at the AC supply terminals):
Level 4 line to ground
Level 3 line to line
Part 6, Conducted radio frequency:
Level 3

Emission

Compliance with emission standards depends on rigous adherence to the installation guideline, the length of the motor cables and includes the use of the specified RFI filter in the AC supply circuit.
For full details refer to the Mentor EMC Data Sheet which can be obtained from a Drive Centre or distributor listed at the end of this Product Data. Also please refer to IEC 1800-3 (EN61800-3) EMC standard for power drive systems.

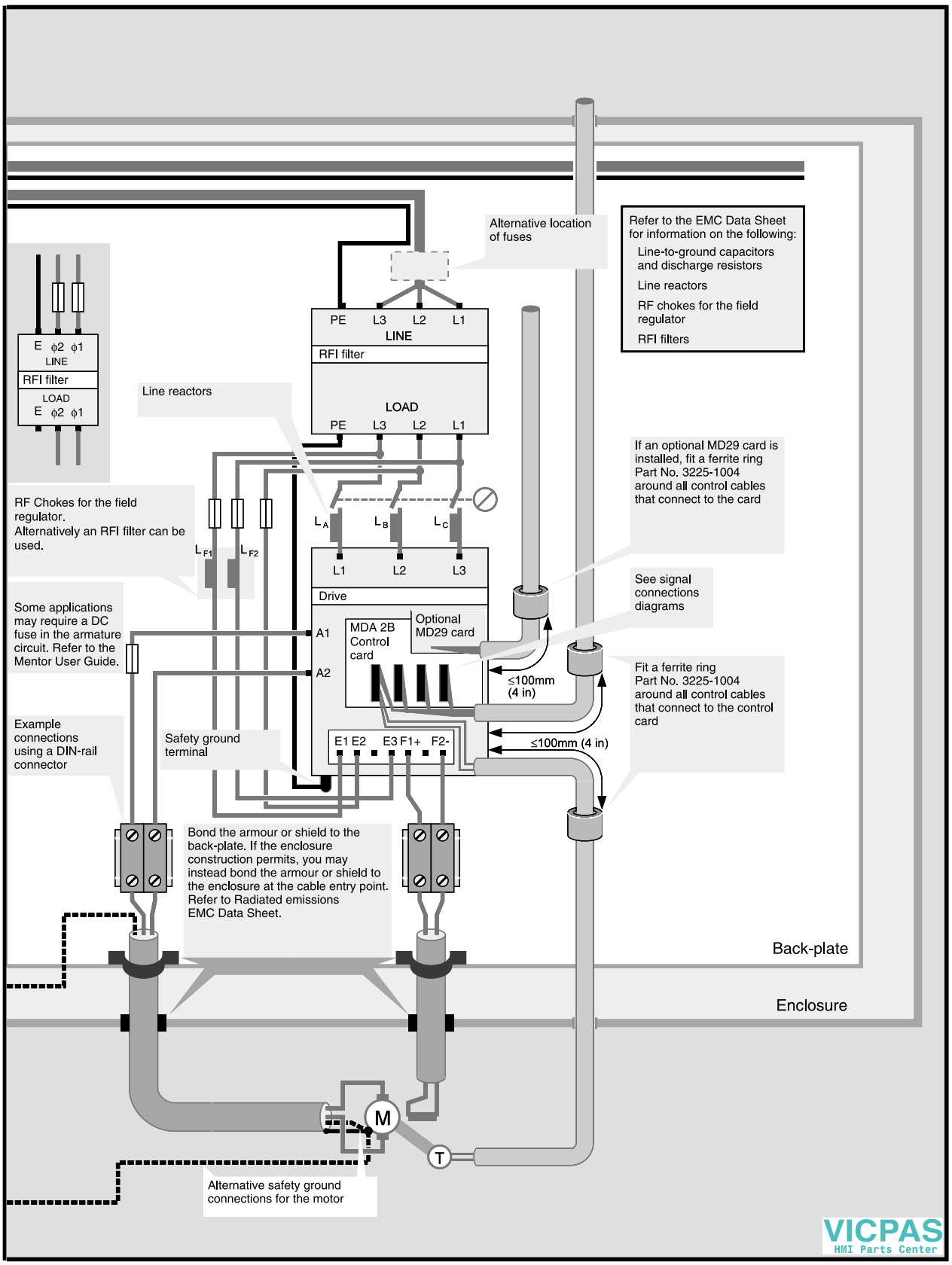
Connections

Line-to-ground capacitors used for AC supply filtering



Alternative Connections

Use these wiring techniques when an RFI filter is used in the AC supply to the drive



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