Epsilon EP-xDN

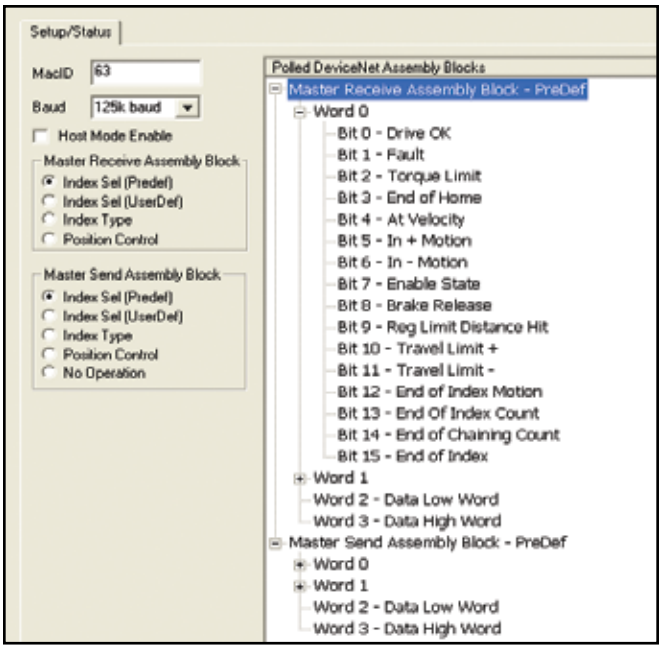
DeviceNet-Ready EP-IDN & EP-PDN

EP-I DN

Both the Indexer and Programmable drives have a DeviceNet option, which makes them a natural fit in any DeviceNet related motion application. The drives retain the same footprint as the standard drive. Both use Polled I/O and Explicit Messages to change or initiate any user parameter in the drive via DeviceNet. With the EP-IDN choose between any one of four predefined DeviceNet word setups:

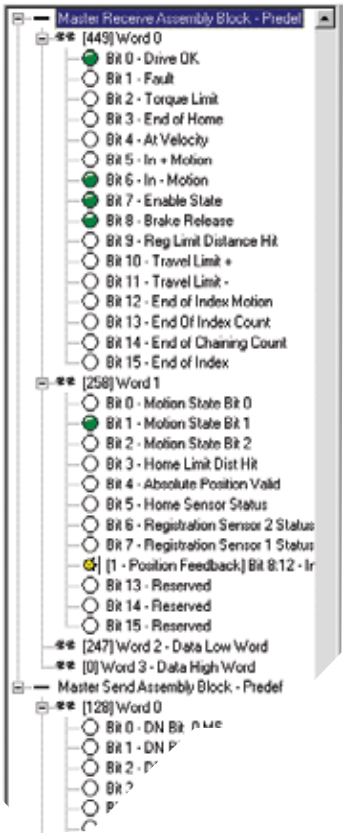
- **Index Select Predefined** (Static DeviceNet Word Block, full EP-I features)
- **Index Select User defined** (Dynamic DeviceNet Word Block, full EP-I features)
- **Index Type** (Position Control with EP-I functionality)
- **Position Control** (Position Control only)
- **Position Tracker™ – Fieldbus Indexing**

- **Same Features as standard drive offering**
- **Supports Explicit Messaging**
- **Polled (8 bytes in, 8 bytes out)**
- **Access to all Motion Parameters within Polled I/O.**
- **Up to 63 devices per network**
- **Baud Rate (125 k, 250 k, 500 k) and MacID configurable via PowerTools Pro or the "one-touch" reset button**
- **Status LEDs located on the front of the drive**
- **25 mA DeviceNet draw**
- **Easy 5-wire terminal block for DeviceNet connection**



Change the nature of the pre-configured assembly blocks by simply changing the mapping of the DN Bits. The DN Bits are user defined bits that can have different I/O functions mapped to them.

PowerTools Pro includes the most advanced diagnostic interface on the market for display of network data. When online, with PowerTools Pro, the online DeviceNet view gives the user a view of the actual data that is being sent and received through the DeviceNet network. Watch functions turn on and off over DeviceNet right in PowerTools Pro. Observe, transmit and receive message counters, check the established connections, even look at the current baud rate, MacID and Master MacID.



Epsilon EP

NEW

Position Tracker™

Use these features, standard in the Epsilon EP to replace an expensive PLC based position control module with a simple analog signal or fieldbus register.

Typically a servo drive controls a motor's velocity or torque based upon an analog command input. An external position controller is needed to calculate the position error and adjust the analog command to cause the motor to adjust its actual position.

With the Position Tracker™ mode, the closed loop feature of the position controller has been brought into the drive itself. The user simply needs to feed the drive an analog or fieldbus signal that is proportional to absolute motor position.

No complex ladder logic to send acceleration, velocity and position information, just predefine the maximum values of acceleration and velocity in PowerTools Pro software and then send the position information, via analog input or over the network (Modbus RTU, Modbus TCP/IP, EtherNet/IP, Profibus DP or DeviceNet), and the drive will command the motor to that exact position.

The CPU continually monitors the register for changes and commands the motor when changes occur. Network or analog signal loss can be enabled for fault detection. This solution offers all of the advantages of a fully closed loop servo without the cost of a traditional position controller.

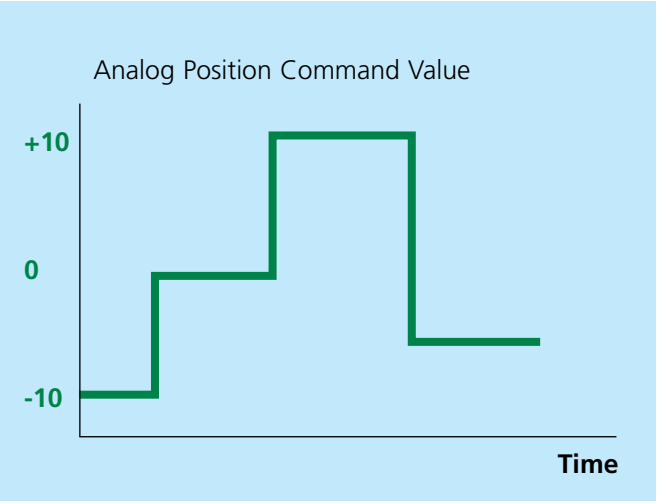
POSITION TRACKER™ – ANALOG MODE

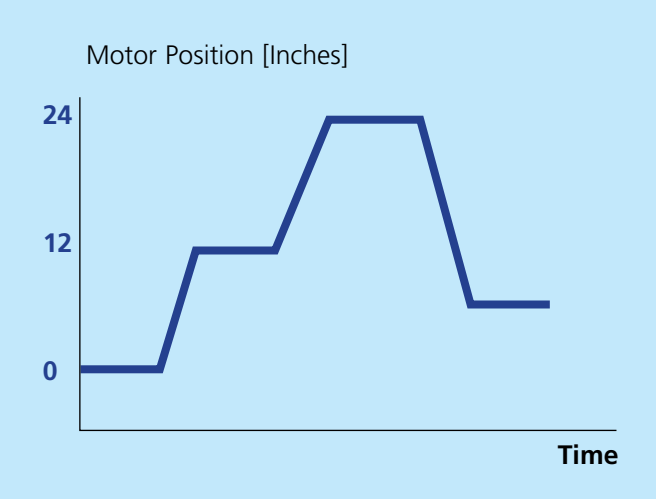
The advantage of the Position Tracker analog mode is that the drive can now use a simple and low cost analog output module from a PLC (or analog joystick, potentiometer, Lab View Analog output, etc.) instead of a costly position control module. Potentially saving the OEM or end user up to $1400 per two axis system, while still allowing for complete programmable position control. Analog feedback is not required, but a feedback is provided with the analog output on the drive.

Analog Position mode has several features that allow its intelligence to go beyond the initial setup. Using the "Motion Made Easy"™ philosophy, Control Techniques developed the Analog Position mode with many advanced features such as: Mode Enable, Velocity Limits, Dead Band, Preset Calibration and Teach functions.

POSITION TRACKER™ – FIELDBUS INDEXING (EP-I, EP-P, SM-EZMOTION)

If you like the simplicity of analog position mode but require a optional command source. Upgrade to the Position Tracker™ – Fieldbus Indexing. This indexing option tracks the updated command and dynamically indexes the motor/load. Just send a single numeric value, using fieldbus communication of choice, to a predefined register and the motor will go to that position and hold it's position until another command is sent. Commands can be sent on-the-fly even when the motor is in motion, positioning to the latest command.





EP SERIES DRIVE TERMINALS AND PINOUTS

RS485 (J2)

Pin Number	Signal
1	120 Ohm Term
2	RX TX
3	Isolated OV
4	+ 15V
5	Isolated OV
6	TX Enable
7	RX/ TX/
8	RX/ TX/
Shell	PE

Ethernet (J4) (EP-P ONLY)

Pin Number	Signal
1	TX+Ve
2	TX-Ve
3	RX+Ve
4	N/C
5	N/C
6	RX-Ve
7	N/C
8	N/C

DeviceNet (J9) (EP-PDN, IDN ONLY)

Pin Number	Signal
1	V-
2	CAN_L
3	Shield
4	CAN_H
5	V+

Profibus (J13) (EP-PPB ONLY)

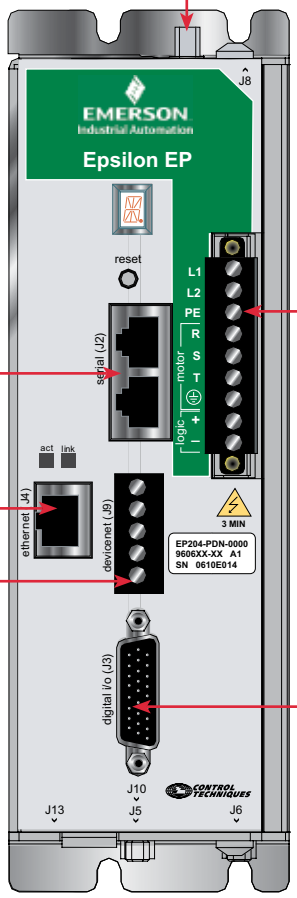
Pin Number	Signal
3	B
8	A

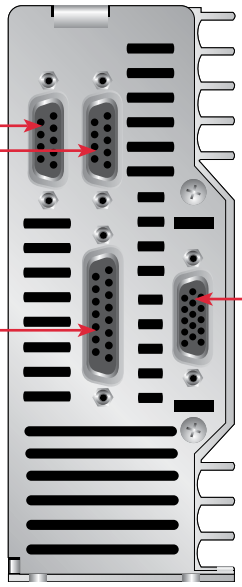
Sync In (J10)

Pin Number	Signal
1	Encoder In A
2	Encoder In A/
3	Encoder In B
4	5 VDC
5	Encoder In B/
6	Encoder In Z
7	Encoder In Z/
8	Logic Common
9	N/C

Analog, Sync Out (J5)

Pin Number	Signal
1	Encoder Out A
2	Encoder Out A/
3	Encoder Out Z
4	Pulse In
5	Analog In +
6	Analog Ground
7	Analog Out 1
8	Logic Common
9	Encoder Out A/
10	Encoder Out B/
11	Encoder Out Z/
12	Direction In
13	Analog In -
14	Analog Ground
15	Analog Out 2





(Bottom View)

Shunt (J10)

Pin Number	Signal
1	B+
2	PE
3	SH
4	PE
5	B-

Power (J1)

Terminal	Signal
L1	AC Input L1
L2	AC Input L2
PE	PE
Motor R	Motor Power R
Motor S	Motor Power S
Motor T	Motor Power T
Gnd	Motor Ground
Logic +	Logic +24 VDC
Logic -	Logic 0 VDC

Digital I/O (J3)

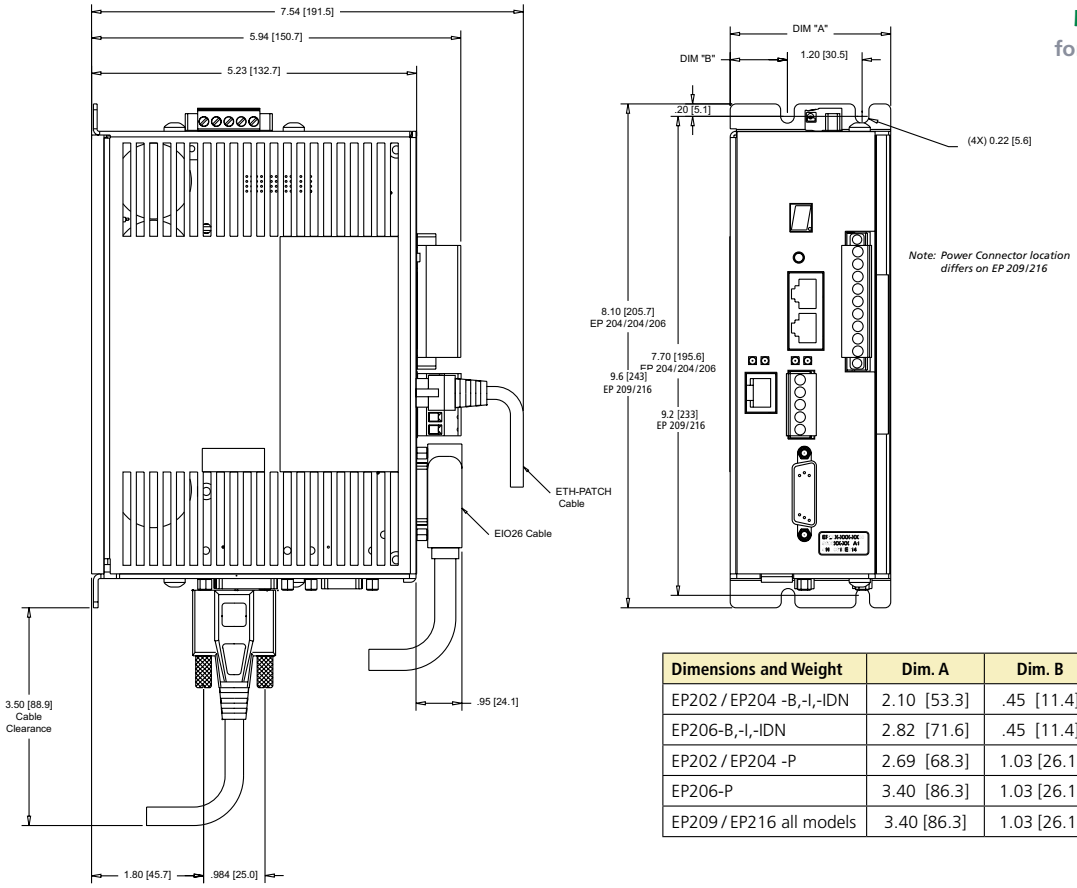
Pin Number	Signal
1	Input 1
11	Input 2
2	Input 3
12	Input 4
3	Input 5
13	Input 6
4	Input 7
14	Input 8
5	Input 9
15	Input 10
6	Input 11
16	Input 12
10	Drive Enable
19	I/O + VDC
20	I/O Common
7	Output 1
17	Output 2
8	Output 3
18	Output 4
9	Output 5
25	Output 6
26	Output 7
21	Output 8
22	Input 13
23	Input 14
24	Input 15

Motor Feedback (J6)

Pin Number	Signal
1	Encoder A
2	Encoder A/
3	Encoder B
4	Encoder B/
5	Encoder Z
6	Encoder Z/
7	Commutation U
8	Commutation U/
9	Commutation V
10	Commutation V/
11	Commutation W
12	Commutation W/
13	5VDC Power
14	Ground
15	Motor OverTemp

EPSILON EP SPECIFICATIONS AND DIMENSIONS

Go to **Power CD** for complete data



Dimensions and Weight	Dim. A	Dim. B	Weight
EP202 / EP204 -B,-I,-IDN	2.10 [53.3]	.45 [11.4]	3.6 lb [1.63]
EP206-B,-I,-IDN	2.82 [71.6]	.45 [11.4]	4.2 lb [1.91]
EP202 / EP204 -P	2.69 [68.3]	1.03 [26.1]	3.9 lb [1.77]
EP206-P	3.40 [86.3]	1.03 [26.1]	4.5 lb [2.04]
EP209 / EP216 all models	3.40 [86.3]	1.03 [26.1]	5.5 lb [2.49]

Power Requirements

AC Input Voltage, 47-63 Hz
EP 202/204/206: 1Ø, 20 to 264 VAC
EP 209: 1Ø, 90 to 264 VAC
EP 216: 3Ø, 90 to 264 VAC

(240 VAC for rated performance) SCCR 10kA

DC Input Voltage
EP 202/204/206: 10-340 VDC
EP 209/216: 140-340VDC

AC Input Current (max. continuous)
EP202: 5.0 Arms (140A for 2 ms inrush)
EP204: 8.5 Arms (140A for 2 ms inrush)
EP206: 12.0 Arms (140A for 2 ms inrush)
EP209: 16 Arms (34A for 5 ms inrush)
EP216: 16 Arms (34A for 5 ms inrush)

Output Current Continuous (rms) / Peak (4 sec.)
EP202: 2.2A / 4.4A
EP204: 4.0A / 8A
EP206: 6.5A / 13A
EP209: 9.0 A / 18A
EP216: 16.0A / 32A

Continuous Output Power
EP202: 0.77 kW
EP204: 1.27 kW
EP206: 1.77 kW
EP209: 2.32 kW
EP216 3Ø: 4.8 kW
EP216 1Ø: 2.32 kW

Switching Frequency 10 kHz
External Logic Supply +18 to 30 VDC @ 0.5A
Encoder Supply Output +5 VDC, 250 mA
I/O Supply +10 to 30 VDC
System Efficency 93%

Cooling Method

Convection EP202 through EP209
Internal Fan EP216

Regeneration

Internal Energy Absorption (115V / 230V)

EP202: 39 Joules / 8 Joules
EP204: 58 Joules / 12 Joules
EP206: 97 Joules / 20 Joules
EP209: 117 Joules / 24 Joules
EP216: 132 Joules / 28 Joules

External: Connection to external resistor,
EP 202-209: 30 Ohm min, 12A peak, 2 kW avg.
EP216: 20 Ohm min, 20A peak, 5 kW avg.

Drive Control Inputs

Analog: (1) +/-10 VDC, 14 bit, 100 kOhm, Differential

Analog Max. Input Rating: Differential +/-14 VDC, Each Input with Reference to Analog Ground +/-14 VDC

Digital: (16) (5 on EP-B) +10 to 30 VDC, 2.8 kOhm, Sourcing, Optically Isolated

Pulse: (1) Differential RS-422, 1 MHz/Channel, 50% Duty Cycle

Single Ended: (1) TTL Schmitt Trigger 500 kHz/ Channel, 50% Duty Cycle

Motor Overtemperature: 0 to +5 VDC, 10 kOhm, single ended

Drive Control Outputs

Analog: (2) +/-10 VDC, 10 bit, Single-ended 20mA

Digital: (8) (3 on EP-B) +10 to 30 VDC, 150 mA, Sourcing Optically Isolated
Short Circuit Protected

Pulse: Differential RS-422 and TTL compatible, 20 mA/Channel Sink or Source

Environmental

Rated Ambient Temperature: 32° to 104°F (0° to 40°C) for rated performance

Maximum Ambient Temperature: 32° to 122°F (0° to 50°C) with power derating of 3.0%/1.8F (1°C) above 104°F (40°C)

Rated Altitude: 3280' (1000 m)

Maximum Altitude: For altitudes >3280' (1000 m) derate output by 1%/328' (100 m)

Vibration: 10 to 2000 Hz @ 2g

Humidity: 10 to 95% non-condensing

Storage Temperature: -13° to 167°F (-25° to 75°C)

Ingress Protection: IP-20

Serial Interface

2 RS485 connectors for multi-drop applications Modbus RTU w/ 32-bit extension, 9600 to 19.2 kBaud

Ethernet Interface (EP-P only)

1 RJ-45, Modbus TCP/IP or EtherNet/IP

DeviceNet (EP-xDN models only)

Power Consumption: 25 mA
Baud Rates: 125, 250 and 500 kps
Node Addresses: 00-63

Profibus-DP (EP-PPB model only)

Baud: 1.5 to 12 Mb
Address Range: 00-126

HOW TO ORDER

Use one of the next few pages to configure a basic Epsilon EP system by selecting one item from each of the four ordering columns, and the fifth column if you are choosing a brake motor. Note that item ❷ motor selection requires additional input as to flange, and on NT systems, connector type. (See the Motor Order String boxes for details.) Items ❸ through ❺ require cable lengths to be provided. The basic systems represented on these pages can be customized with a variety of components depending on your needs. A guide to Epsilon EP Options and Accessories can be found at the end of this section.

SELECT SYSTEM AND MOTOR

❶ Select the Epsilon EP drive appropriate to the needs of your application and operating environment, either EP-B (base), EP-I (indexing) or EP-P (Programmable) and the size of drive: 2 Amp, 4 Amp, 6 Amp, 9 Amp or 16 Amp Epsilon EP (202, 204, 206, 209 and 216 respectively).

❷ Select a motor for your drive. The system selection matrix for NT motors is found on the next page. The matrix with other motors are found on the pages following NT motors.

CABLE ORDERING OPTIONS

Motor power, feedback and brake cables are fully shielded with IP65 molded connectors and are available in standard and custom lengths. For more information on these and other cables, *see Options and Accessories section*.

Standard lengths of 5, 15, 25, 50 and 100 feet are available from stock. Non-standard lengths require additional lead time. ***Note: Equivalent FM Motor cable lengths are in meters.***

Feet=xxx or meters=yyy with specified lengths. Example: 005 = 5 feet. For applications involving continuous flexing, flexible cables are available. Cable components such as connector kits and raw cable are also available. See Options and Accessories section for details or consult factory for special requirements.

❸ Motor Power Cable Example;
CMDS-xxx 16 AWG for 2-3" motors; connector on motor end, ferrules on drive end

❹ Motor Feedback Cable Example;
UFCS-xxx Connectors on both ends.

❺ Motor Brake Cable Example;
CBMS-xxx Required for all motors with brake option; connector on motor end only.

Software is Free!

The Control Techniques "Motion Made Easy"™ Power CD (CT-MME-POWER-CD) is shipped with every product. Software updates are free and can be downloaded from our web site, as are firmware updates.

EPSILON EP OPTIONS AND ACCESSORIES

Control Techniques provides a complete array of options and accessories to complete your system. For details, see the Options and Accessories section of the catalog.

Brake Relay
BRM-1

Breakout Boards/Cables
STI-24IO, STI-SNCOA, STI-SNCI ,EIO26-005

Communications Accessories
ETH-S4, ETH-PATCH-xxx, CT-COMMS-CABLE, CT-USB-CABLE

External Shunt/Resistor
SM-HEATSINK-DBR-1 (see Power Accessories)

AC Line Filters
960307-01

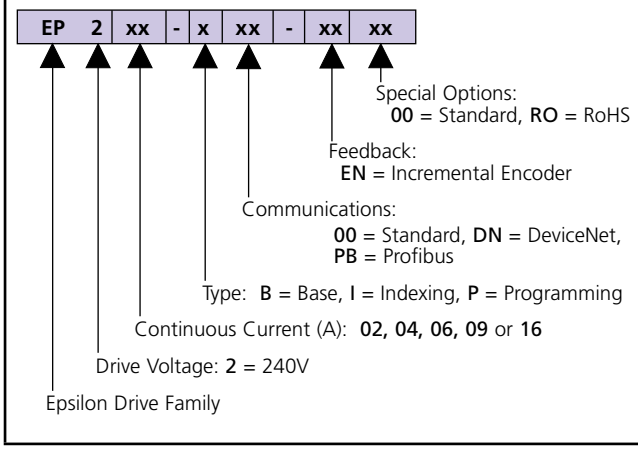
Synchronization Encoders
SCSLD-4, SCSLD-4R

Synchronization Cables
SNCFLI, SNCMD-89-xxx

Operator Interface
OIT, CTIU, CTVue

Extended Warranty
Extends Two Year Warranty to Five Years

Order String



Epsilon EP
230V FM Motor Selection

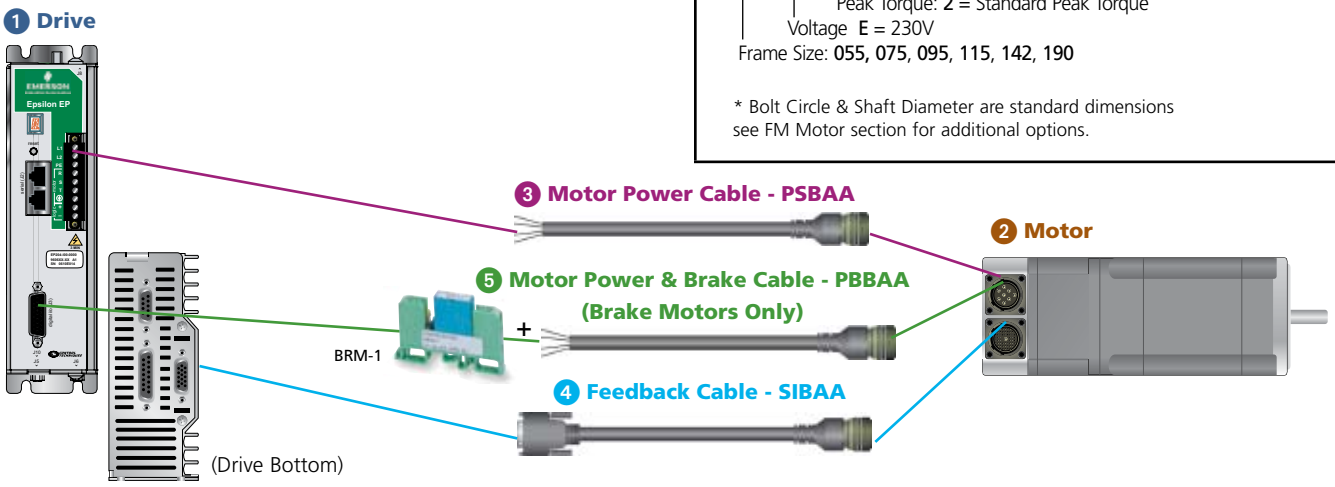
The FM motor line is a medium inertia line for larger load applications. The FM motor line uses a 4096 line encoder for high precision and is designed with low cogging torque to provide smooth operation and excellent velocity regulation. FM motors are available with or without brakes. The system torque range is from 10.6 lb-in (1.2 Nm) to 198 lb-in (22.4 Nm).

Order String

xxx	E	2	x	xx	x	V	A	CA	A	BCD*	DIA*

- Frame Size: **055, 075, 095, 115, 142, 190**
- Voltage **E** = 230V
- Peak Torque: **2** = Standard Peak Torque
- Stator Length: **A, B, C, D, E, F, G, H**
- Rated Speed: **20** = 2,000 rpm, **30** = 3,000 rpm, **40** = 4,000 rpm, **50** = 5,000 rpm
- Brake: **0** = None, **1** = 24 VDC
- Connection Type: **V** = Vertical Connectors
- Shaft Key: **A** = With Key
- Feedback Device: **CA** = 4096 Incremental Encoder
- Inertia: **A** = Standard

* Bolt Circle & Shaft Diameter are standard dimensions see FM Motor section for additional options.



Servo System Order Guide

❶ Drive Model x=B,I,P cc=00, DN or PB	❷ Motor Model*	❸ Motor Power Cable** (yyy=meters)	❹ Feedback Cable (yyy=meters)	❺ Motor Power & Brake Cable (required w/all brake motors) (yyy= meters)
EP202-xcc-EN00	055E2C300 BACPA063110	PSBAA-yyy	SIBAA-yyy	-
	075E2A400 BACAA075110	PSBAA-yyy	SIBAA-yyy	-
EP204-xcc-EN00	075E2B400 BACAA075140	PSBAA-yyy	SIBAA-yyy	-
	075E2C400 BACAA075140	PSBAA-yyy	SIBAA-yyy	-
	075E2D300 BACAA075140	PSBAA-yyy	SIBAA-yyy	-
EP206-xcc-EN00	055E2C600 BACPA063110	PSBAA-yyy	SIBAA-yyy	-
	095E2B400 BACAA100190	PSBAA-yyy	SIBAA-yyy	-
EP209-xcc-EN00	095E2D400 BACAA100190	PSBAA-yyy	SIBAA-yyy	-
	095E2D300 BACAA100190	PSBAA-yyy	SIBAA-yyy	-
	095E2E300 BACAA100190	PSBAA-yyy	SIBAA-yyy	-
EP216-xcc-EN00	115E2B600 BACAA115190	PSBAA-yyy	SIBAA-yyy	-
	115E2C400 BACAA115190	PSBAA-yyy	SIBAA-yyy	-
	115E2D400 BACAA115240	PSBAA-yyy	SIBAA-yyy	-
	115E2D300 BACAA115240	PSBAA-yyy	SIBAA-yyy	-
	142E2B400 BACAA165240	PSBAA-yyy	SIBAA-yyy	-
	142E2C300 BACAA165240	PSBAA-yyy	SIBAA-yyy	-
	142E2D200 BACAA165240	PSBAA-yyy	SIBAA-yyy	-
	142E2E200 BACAA165240	PSBAA-yyy	SIBAA-yyy	-
Note: For brake motors: A combination motor power and brake cable (part numbers ending with a 1 in the brake field - i.e. 095E2B401) replaces a standard motor power cable. Example below.				
Drive Model	095E2B401 BACAA100190	-	SIBAA-yyy	PBBAA-yyy

* Standard motor configuration. (230VAC, Standard peak torque, No brake, 90° rotatable connectors, Keyed shaft, 4096 incremental encoder, standard BCD and Shaft Diameter)
** Standard feedback cable for use with incremental encoder and EP drive.

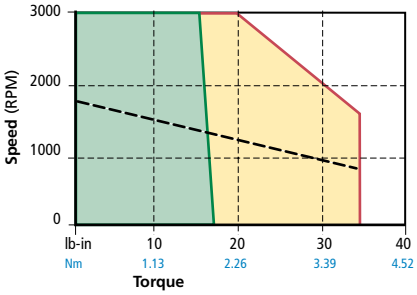
Epsilon EP - 230V FM Motor Specifications

Drive Model EP	Motor Model*	Cont. Stall Torque lb-in / Nm	Peak Stall Torque lb-in / Nm	Rated Torque @Rated Speed* lb-in / Nm	Rated Power HP / kWatts	Max.** Operating Speed RPM	Encoder Resolution lines/rev	Inertia lb-in-sec² / kg-cm²	Motor Ke Vrms/krpm	Motor Kt lb-in/Arms / Nm/Arms	Motor Weight lb / kg
-202	055E2C30	16.7 1.9	33.5 3.8	15.9 1.8	0.9 0.64	3000	4096	0.000 0.34	53	7.61 0.86	4.0 1.80
-206	055E2C60	18.7 2.1	50.6 5.7	11.9 1.4	1.3 0.99	6000	4096	0.000 0.34	27	3.89 0.44	4.0 1.80
-202	075E2A40	10.62 1.20	25.49 2.88	8.85 1.00	0.56 0.42	4000	4096	0.00619 0.7	44	6.37 0.72	7.9 3.6
-204	075E2B40	19.5 2.23	50.98 5.76	15.05 1.70	0.95 0.71	4000	4096	0.00106 1.2	44	6.37 0.72	9.7 4.4
-204	075E2C40	25.49 2.88	50.98 5.76	20.35 2.30	1.28 0.96	4000	4096	0.00142 1.6	44	6.37 0.72	11.4 5.2
-204	075E2D30	32.92 3.72	65.84 7.44	30.97 3.50	1.47 1.10	3000	4096	0.00117 2	57	8.23 0.93	13.2 6.0
-206	095E2B40	38.1 4.32	76.46 8.64	26.55 3.00	1.68 1.26	4000	4096	0.00257 2.9	44	6.37 0.72	13.9 6.3
-209	095E2D30	66.4 7.53	148.15 16.74	60.18 6.80	2.85 2.14	3000	4096	0.00451 5.1	57	8.23 0.93	19.1 8.7
-209	095E2D40	57.35 6.48	114.70 12.96	43.37 4.90	2.73 2.05	4000	4096	0.00451 5.1	44	6.37 0.72	19.1 8.7
-209	095E2E30	74.07 8.37	148.15 16.74	71.68 8.10	3.39 2.54	3000	4096	0.00549 6.2	57	8.23 0.93	21.8 9.9
-216	115E2B60	58.2 6.6	133.1 15.0	35.4 4.0	3.3 2.51	6000	4096	0.006 6.70	29	4.16 0.47	21.3 9.70
-216	115E2C40	83.2 9.4	203.9 23.0	55.8 6.3	3.5 2.64	4000	4096	0.008 9.00	44	6.37 0.72	25.5 11.60
-216	115E2D40	102.0 11.5	203.9 23.0	66.4 7.5	4.2 3.14	4000	4096	0.010 11.40	44	6.37 0.72	29.7 13.50
-216	142E2B40	95.6 10.8	203.9 23.0	61.9 7.0	3.9 2.93	4000	4096	0.014 15.60	44	6.37 0.72	29.3 13.30
-216	115E2E30	130.0 14.4	263.4 29.8	111.0 12.3	5.3 3.96	3000	4096	0.012 13.80	57	8.23 0.93	33.9 15.40
-216	142E2C30	131.7 14.9	263.4 29.8	108.0 12.2	5.1 3.83	3000	4096	0.020 22.20	57	8.23 0.93	35.4 16.10
-216	142E2D20	174.7 19.7	396.5 44.8	162.8 18.4	5.1 3.85	2000	4096	0.025 28.80	86	12.39 1.40	41.6 18.90
-216	142E2E20	198.2 22.4	396.5 44.8	188.5 21.3	5.9 4.46	2000	4096	0.031 35.40	86	12.39 1.40	47.7 21.70

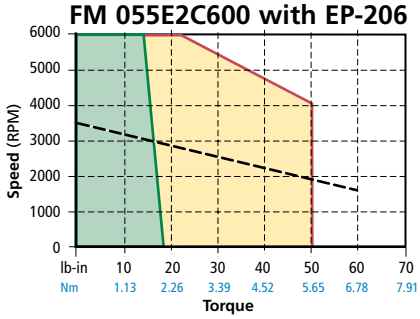
*See order guide on previous page for complete motor model number.
**Rated Speed = Maximum Operating Speed

Epsilon EP - 230V FM Motor Speed Torque Curves

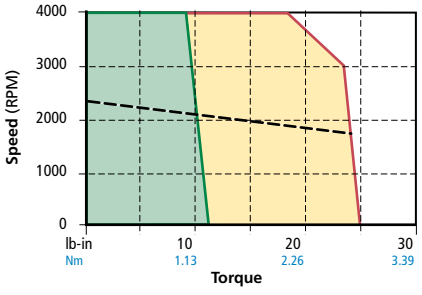
FM 055E2C300 with EP-202



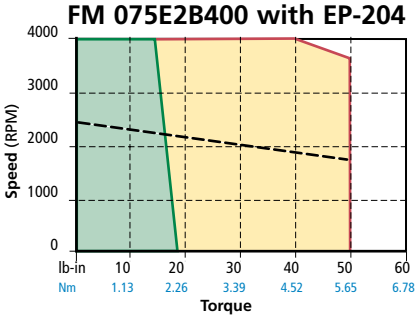
FM 055E2C600 with EP-206



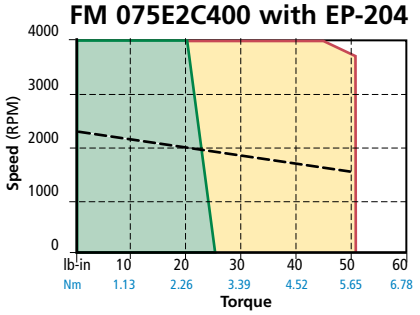
FM 075E2A400 with EP-202



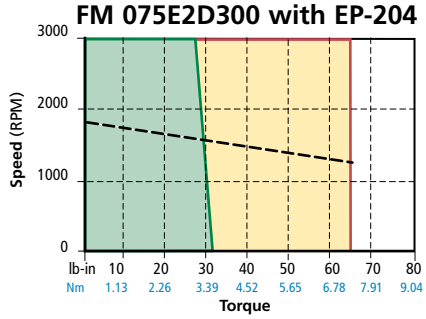
FM 075E2B400 with EP-204



FM 075E2C400 with EP-204

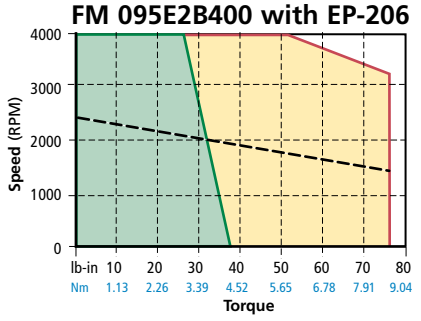


FM 075E2D300 with EP-204

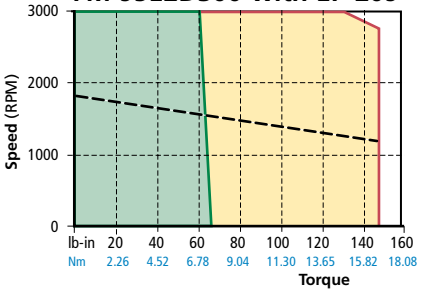


Epsilon EP - 230V FM Motor Speed Torque Curves continued

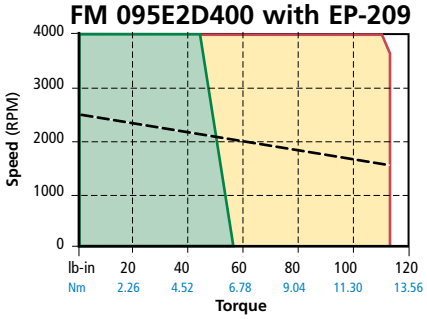
FM 095E2B400 with EP-206



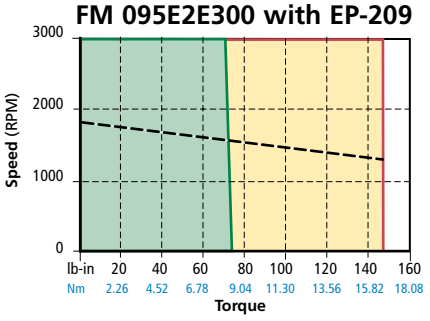
FM 95E2D300 with EP-209



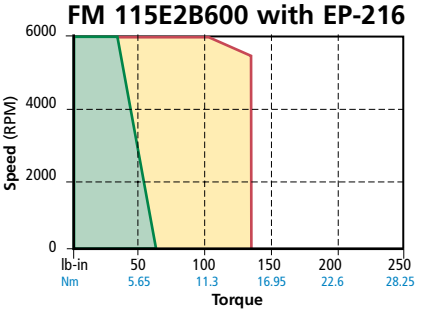
FM 095E2D400 with EP-209



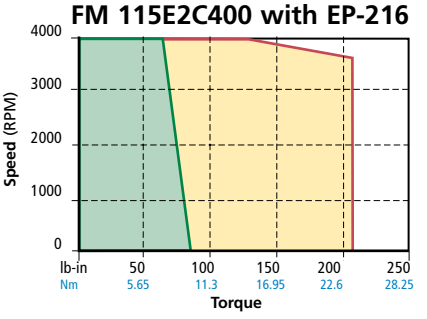
FM 095E2E300 with EP-209



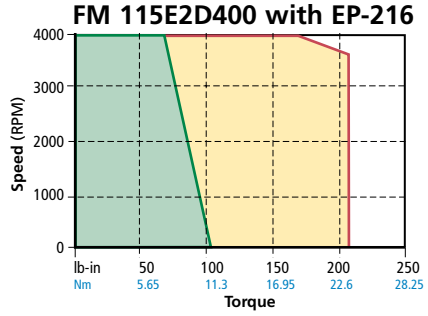
FM 115E2B600 with EP-216



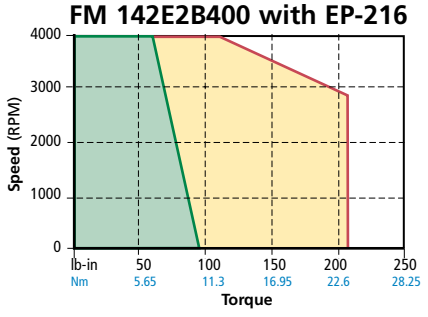
FM 115E2C400 with EP-216



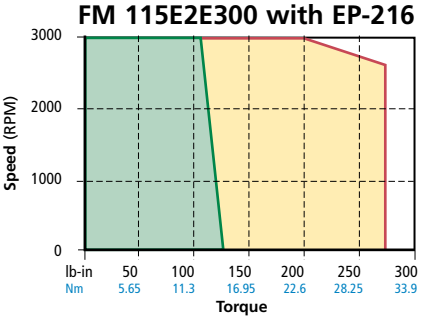
FM 115E2D400 with EP-216



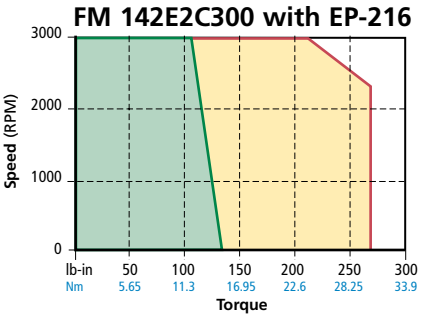
FM 142E2B400 with EP-216



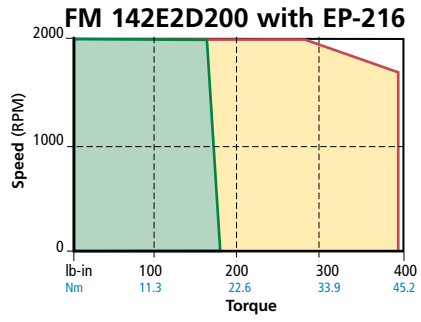
FM 115E2E300 with EP-216



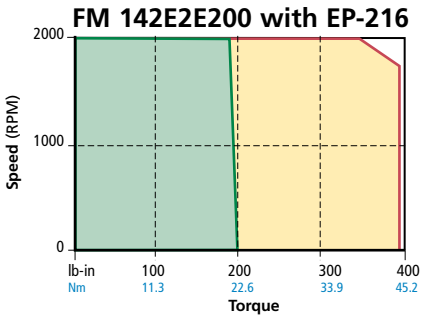
FM 142E2C300 with EP-216



FM 142E2D200 with EP-216



FM 142E2E200 with EP-216



Legend

- Continuous Torque
- Peak Torque
- 120V Curve

SPECIFICATIONS

Voltage	240 VAC
Drive Frequency	10 °°°kHz
Ambient Temperature	25°C (77°F)
Case Temperature	100°C (212°F)

All performance data listed above has a +/-10% tolerance and is subject to change at any time without notice. For more detailed information on performance data and test conditions please refer to the motor section of the catalog. For brake motor information, complete motor specifications and dimensions please refer to our motor section.