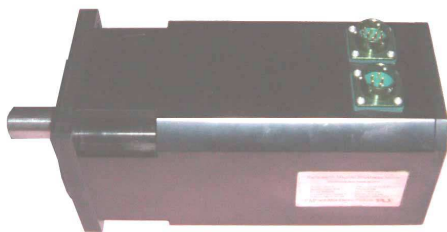
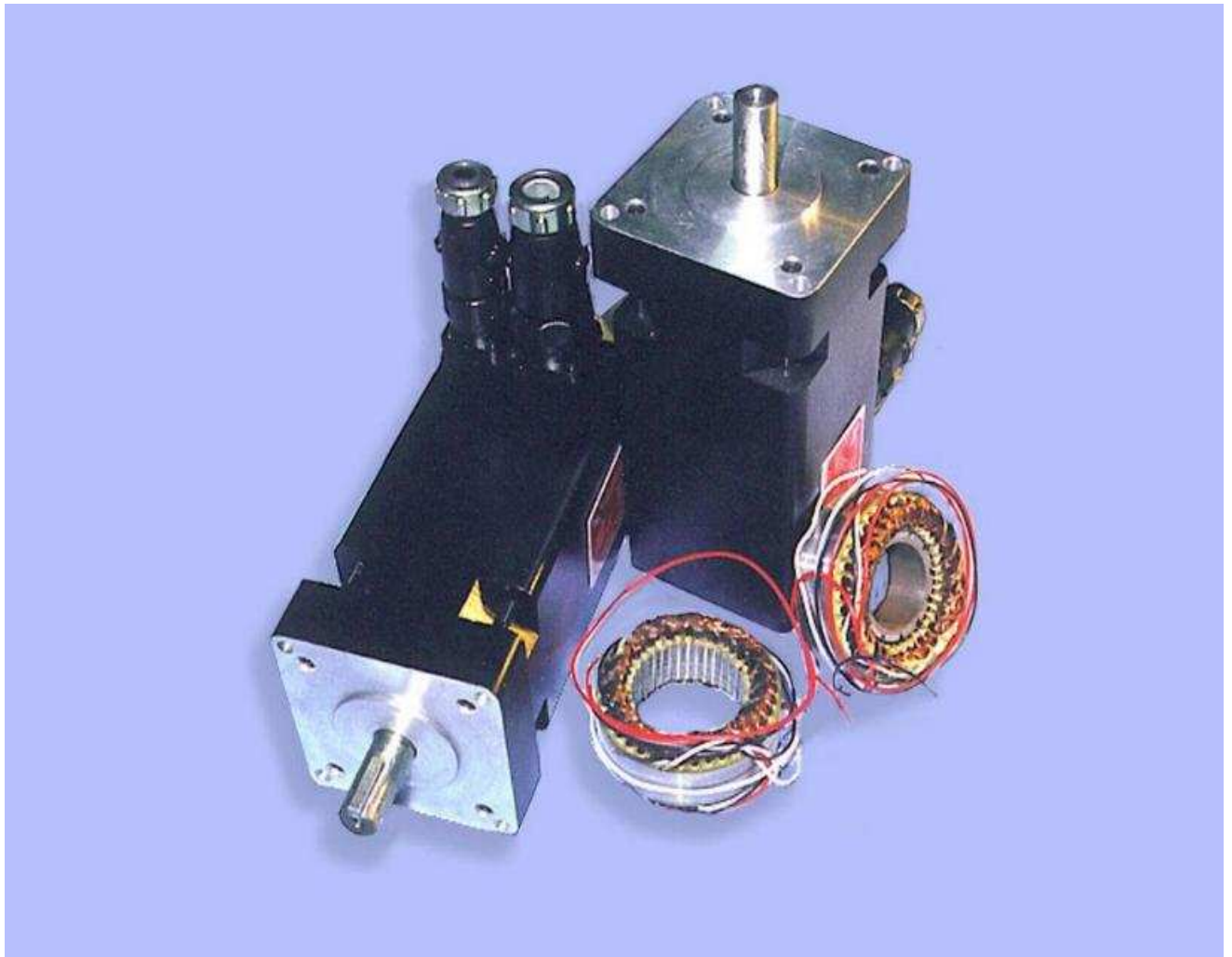


# HIGH PERFORMANCE FM Brushless Rotary Servo Motors



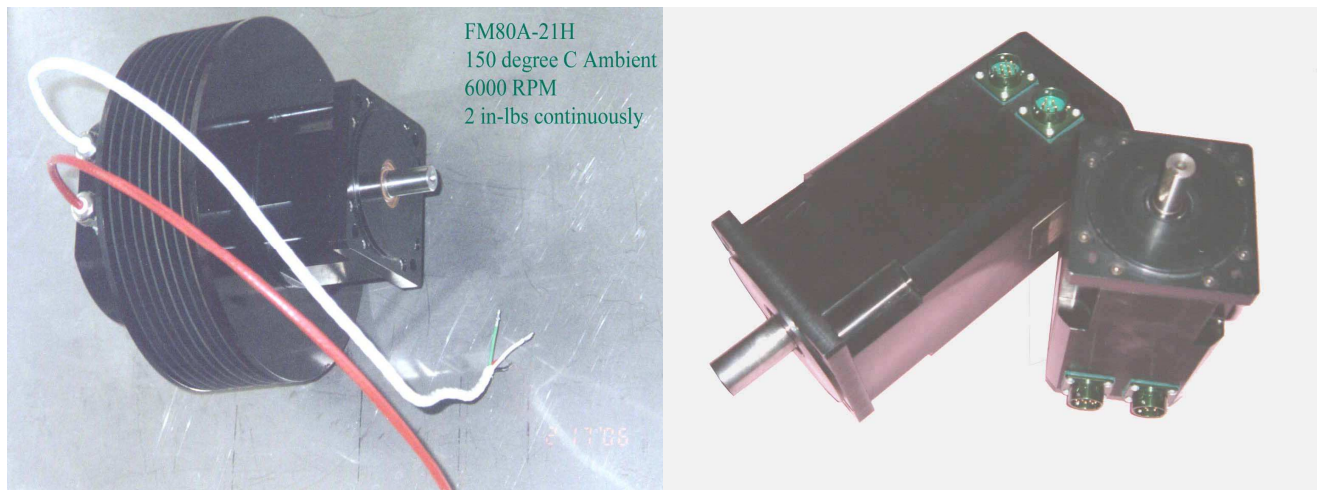
**Expro Engineering**

**Phone:** (315) 453-0515      **Fax:** (315) 451-5193

## Expro Engineering

**Expro Engineering** provides brushless motors to industry with high quality products and competitive price. Expro has various experiences to meet custom needs. The applications of brushless motors will help you automating production processes as well as associated facilities.

Customer service and satisfaction are our top priority. The quality of our products is guaranteed by selecting best materials and processes in manufacturing under quality certification of ISO 9002 and UL E237741.



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## **Rare-earth Magnet Brushless Motors**

### **FM Series Brushless Motors**

The FM series brushless motors are reliable servo motors for motion control applications. The rare-earth magnets make the motors powerful, delivering super servo performance in compact sizes.

#### **Specifications:**

- UL Recognized Class H Insulation System (180°C).
- Motor Winding Temperature: 155°C Max.
- Continuous Torque: 0.45 NM (4 in-lb) ~ 109 NM (960 in-lb).
- Power: 0.12 KW (0.16 H.P.) up to 50 KW (67 H.P.).
- IP65 Protection
- Strong Neodymium Iron Boron (Nd-Fe-B) Magnets.
- Low Inertia
- Rugged Resolver Feedback (Options: Hall Sensor & Encoder)

#### **Special Features:**

- Custom Design for Different Applications (high temperature, etc.)
- NEMA Mounting Available. Washdown Types Available.

---

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7500 Thunderbird Rd. Liverpool, NY 13088

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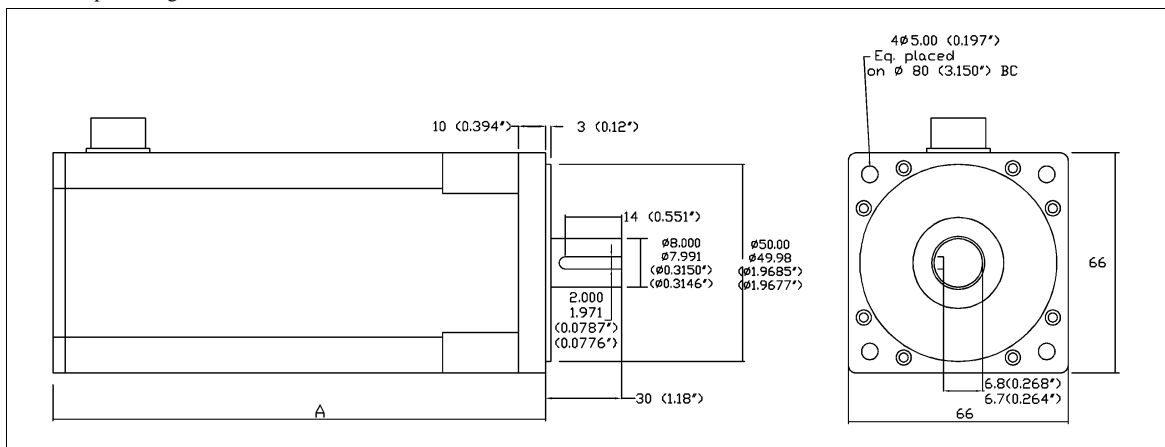
## FM Brushless Motor Performance

### FM50 Series Motor Data 66 mm Frame 230 V

Motor Parameters	Units	FM50A -20	FM50A -23	FM50A -29	FM50B -20	FM50B -29	FM50B -40
Horsepower	HP	0.35	0.31	0.17	0.62	0.57	0.31
Kilowatts	KW	0.26	0.24	0.12	0.47	0.43	0.24
Max. Speed	RPM	6000	5000	2500	6000	5000	2500
Rated Speed	RPM	6000	5000	2500	6000	5000	2500
Continuous Rated Torque	Nm(In-Lbs)	0.41(3.6)	0.45 (4)	0.47 (4.2)	0.75 (6.6)	0.81 (7.2)	0.93 (8.2)
Continuous Stall Torque	Nm(In-Lbs)	0.56 (5)	0.56 (5)	0.56 (5)	1.0 (9)	1.0 (9)	1.0 (9)
Peak Torque	Nm(In-Lbs)	1.4 (13)	1.6 (14)	1.7 (15)	2.6 (23)	2.8 (25)	3.2 (29)
Continuous Line Current	Amps RMS	1.7	1.6	1.3	2.8	2.1	1.7
Peak Current	Amps RMS	5.9	5.5	4.7	10	7.5	6.1
Torque Constant $K_T$	Nm/Amps (RMS)	0.29	0.33	0.42	0.29	0.42	0.58
Back EMF Constant $K_B$	Vrms/Krpm	20.0	23.1	28.7	20.0	28.7	39.9
DC Resistance	Ohms	18.8	24.8	41.5	5.9	12.5	24.8
Inductance	Millihenries	17.2	23	35.6	8.6	17.8	34.3
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.00001 (0.000088)	0.00001 (0.000088)	0.00001 (0.000088)	0.00002 (0.00018)	0.00002 (0.00018)	0.00002 (0.00018)
Static Friction	Nm(In-Lbs)	0.05 (0.4)	0.05 (0.9)	0.05 (0.4)	0.06 (0.5)	0.06 (0.5)	0.06 (0.5)
Motor Weight	Kg(Lbs)	1 (2)	1 (2)	1 (2)	2(3)	2 (3)	2 (3)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		4	4	4	4	4	4

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 250 mm X 250 mm X 6 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac.



Model	FM50A-20	FM50A-23	FM50A-29	FM50B-20	FM50B-29	FM50B-40
A	150 (5.91")	150 (5.91")	150 (5.91")	175 (6.89")	175 (6.89")	175 (6.89")

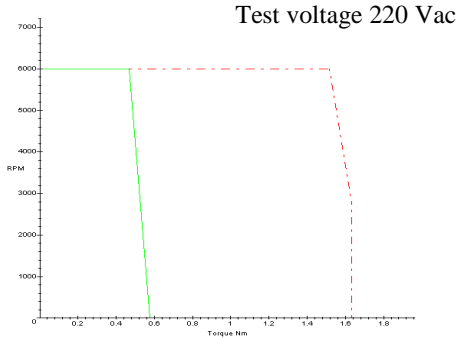
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 89 N (20 Lbs). Axial load should be < 67 N (15 Lbs).
  - All data are subject to change without notice.

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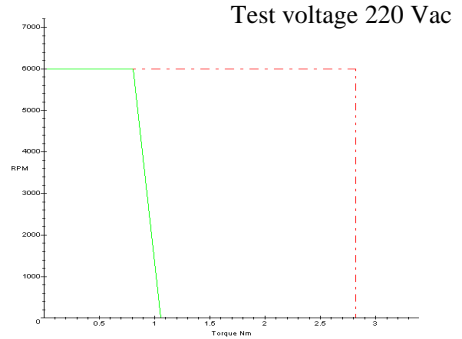
# FM Brushless Motor Performance

## FM50 Series Motor Data      66 mm Frame    230 Vac

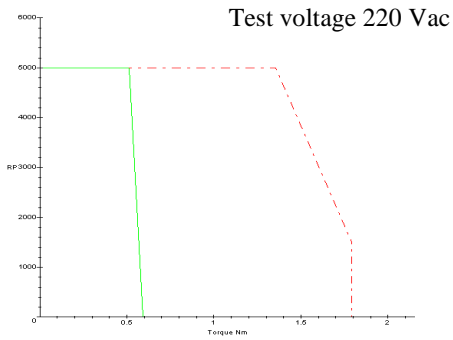
FM50A-20 PERFORMANCE



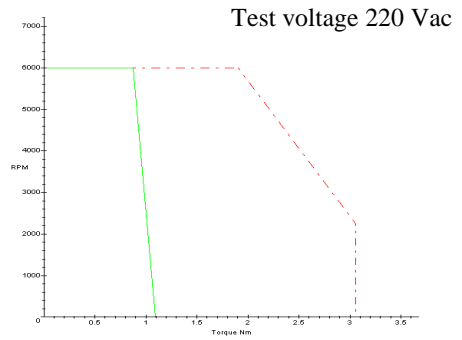
FM50B-20 PERFORMANCE



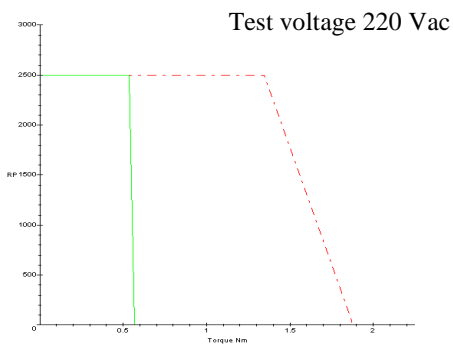
FM50A-23 PERFORMANCE



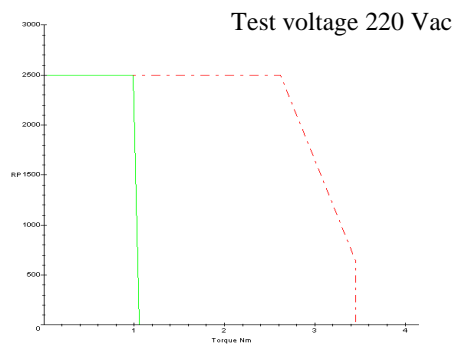
FM50B-29 PERFORMANCE



FM50A-29 PERFORMANCE



FM50B-40 PERFORMANCE



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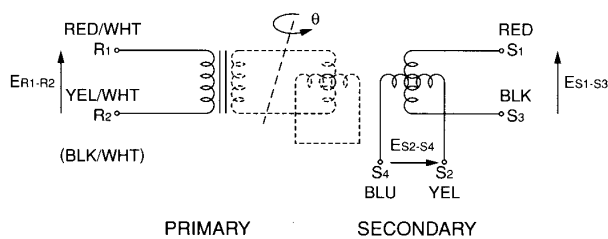
## FM50 Motor Connectors and Connector Pin Outs

<b>Resolver Connector(PT02E-14-18P) Straight Mating Plug: PT06E-14-18S</b>		
<b>Pin</b>	<b>Function</b>	<b>Wire Color</b>
A	$\phi U$	Red
B	$\phi V$	Black
C	$\phi W$	White
D	GND	Green
E	COS-(S1)	Red
F	COS+(S3)	Black
G	SIN-(S2)	Yellow
H	SIN+(S4)	Blue
J	Excit (R1)	Red/White
K	Excit GND (R2)	Yellow/White
L	THERM	Green
M	THERM	Green
N		
P	* BRK(+)	
R		
S		
T	* BRK(-)	
U		

\* For brake option only.

### RESOLVER ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -55°C to 155°C
2. Maximum speed: 10,000 rpm
3. Dielectric strength: Vac 500, 1 minute
4. Excitation voltage: 7 Vrms 10 KHz
5. Electric error:  $\pm 10'$  Max.
6. Transformation ratio: 0.5 nominal



Excitation :  $E_{R1-R2} = E_{sin} \omega t$   
 Output :  $E_{S1-S3} = K E_{R1-R2} \cos \theta$   
            $E_{S2-S4} = K E_{R1-R2} \sin \theta$   
 K : Transformation Ratio

---

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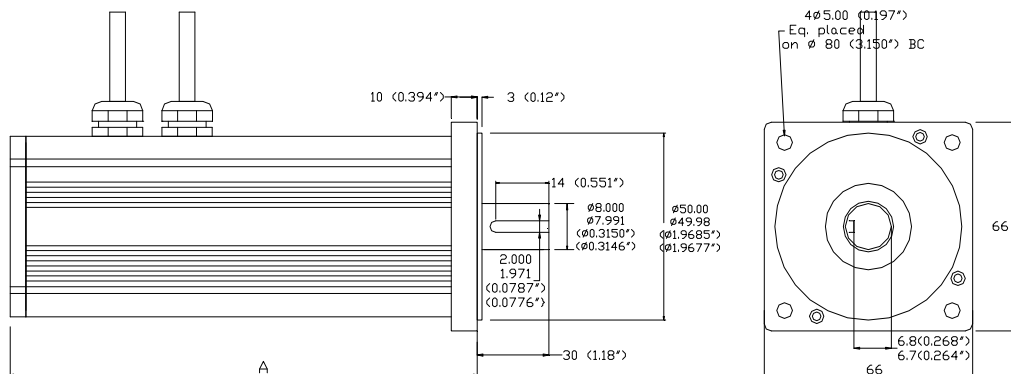
## FM Brushless Motor Performance

### FM53 Series Motor Data 57 mm Frame 230 V

Motor Parameters	Units	FM53A -16	FM53A -24	FM53B -16	FM53B -24	FM53C -16	FM53C -24
Horsepower	HP	0.33	0.25	0.64	0.47	0.86	0.67
Kilowatts	KW	0.25	0.18	0.48	0.36	0.65	0.50
Max. Speed	RPM	6000	4000	6000	4000	6000	4000
Rated Speed	RPM	6000	4000	6000	4000	6000	4000
Continuous Rated Torque	Nm(In-Lbs)	0.40(3.5)	0.44 (3.9)	0.77 (6.8)	0.85 (7.5)	1.0 (9.1)	1.2 (10.6)
Continuous Stall Torque	Nm(In-Lbs)	0.55 (4.9)	0.56 (5)	1.1 (9.4)	1.0 (9.1)	1.5 (13)	1.4 (12.8)
Peak Torque	Nm(In-Lbs)	1.1 (9.9)	1.2 (11)	2.4 (21)	2.7 (24)	3.2 (28)	3.7 (33)
Continuous Line Current	Amps RMS	2.0	1.4	3.5	2.6	4.8	3.5
Peak Current	Amps RMS	5.2	3.7	10.5	7.7	14.3	10.6
Torque Constant $K_T$	Nm/Amps (RMS)	0.229	0.356	0.237	0.356	0.229	0.356
Back EMF Constant $K_B$	Vrms/Krpm	15.6	24.3	16.2	24.3	15.6	24.3
DC Resistance	Ohms	13.0	30	40	9.5	2.0	5.0
Inductance	Millihenries	4.0	9.8	2.2	4.9	1.3	3.3
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.000027 (0.00023)	0.000027 (0.00023)	0.000053 (0.00047)	0.000053 (0.00047)	0.00008 (0.0007)	0.00008 (0.0007)
Static Friction	Nm(In-Lbs)	0.05 (0.4)	0.05 (0.9)	0.05 (0.4)	0.05 (0.4)	0.06 (0.5)	0.06 (0.5)
Motor Weight	Kg(Lbs)	1 (2)	1 (2)	1.5 (3)	1.5 (3)	2 (4)	2 (4)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		4	4	4	4	4	4

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 250 mm X 250 mm X 6 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac.



Model	FM53A-16	FM53A-24	FM53B-16	FM53B-24	FM53C-16	FM53C-24
A	135 (5.31")	135 (5.11")	160 (6.30")	160 (6.30")	185 (7.28")	185 (7.28")

- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact FMEP Engineering for information.
  - Radial load on output shaft < 89 N (20 Lbs). Axial load should be < 67 N (15 Lbs).
  - All data are subject to change without notice.

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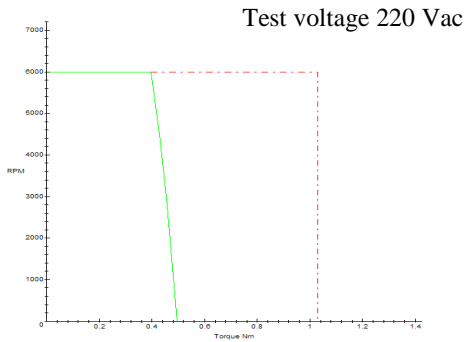
**Fax:**  
(315) 362-9062

**Email:**  
contact@fmepinc.com

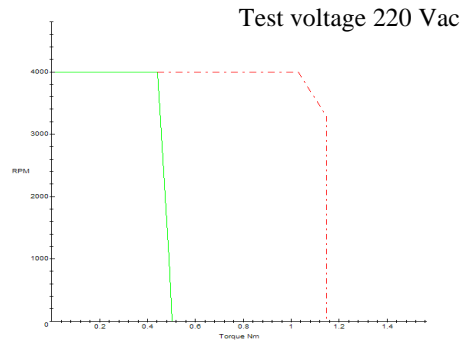
# FM Brushless Motor Performance

## FM53 Series Motor Data      57 mm Frame    230 Vac

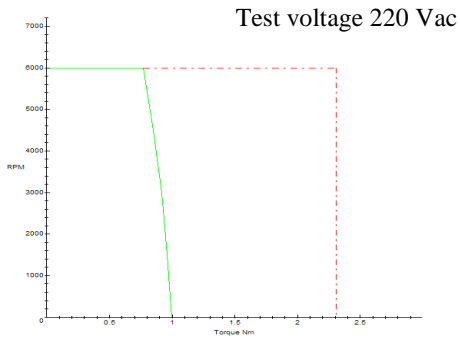
FM53A-16 PERFORMANCE



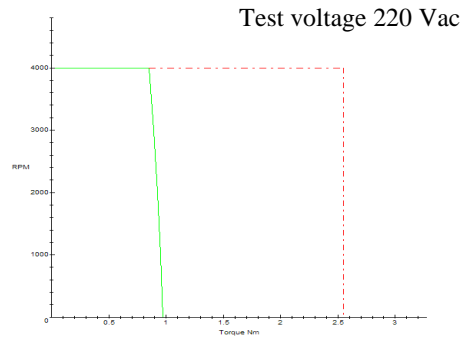
FM53A-24 PERFORMANCE



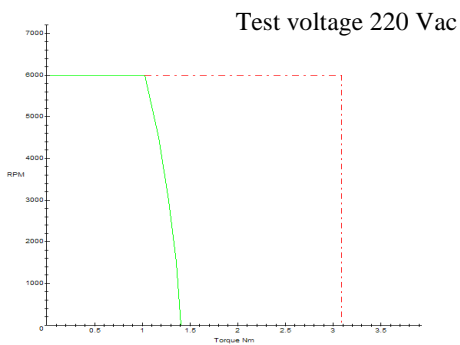
FM53B-16 PERFORMANCE



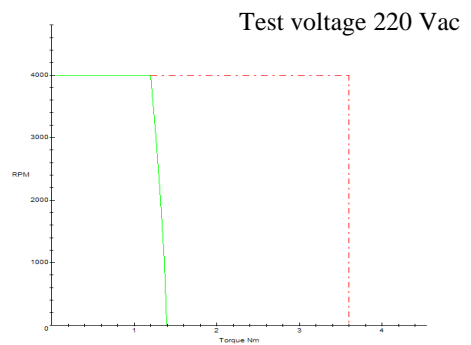
FM53B-24 PERFORMANCE



FM53C-16 PERFORMANCE



FM53C-24 PERFORMANCE



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## FM53 Motor Power Out

Function	Wire Color
$\phi$ U	Red
$\phi$ V	Black
$\phi$ W	White
GND	Green
THERM	Blue
THERM	Blue

## ZKU3508 Encoder Wire Outs

Function	Wire Color
+ 5 V	Red
0 V	Black
A	Green
/A	Green/Black
B	White
/B	White/Black
Z	Yellow
/Z	Yellow/Black
U	Brown
/U	Brown/Black
V	Grey
/V	Grey/Black
W	Orange
/W	Orange/Black

The encoder shell has been connected to shield

### ENCODER ZKU3508 ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -25°C to 100°C
2. Maximum speed: 10000 rpm
3. Power supply: +5V DC
4. Response frequency: 0~200kHz
5. Output wave form: square
6. IP protection: IP 50
7. Vibration: 5G, 10~200Hz
8. Rotor inertia: 0.1kg-cm<sup>2</sup>
9. Resolution: various CPR

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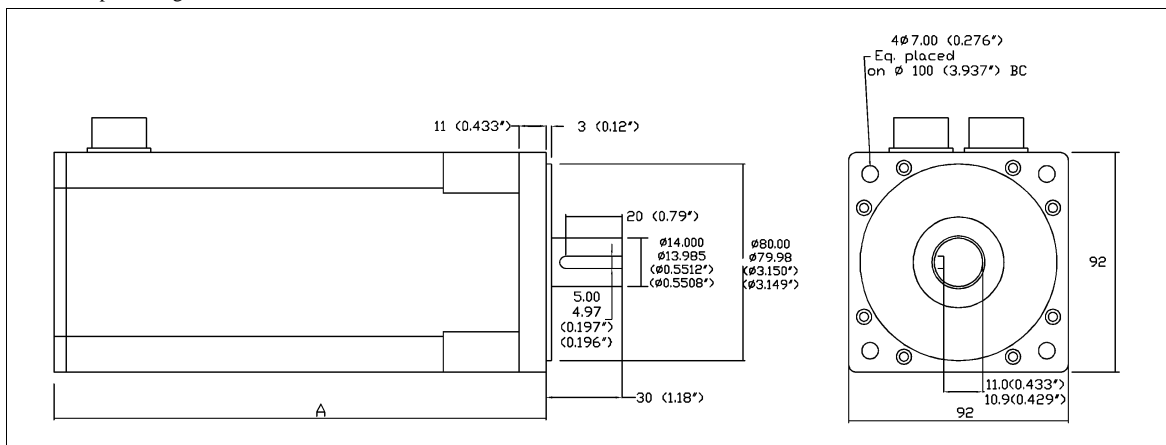
## FM Brushless Motor Performance

### FM80 Series Motor Data 90 mm Frame 230 V

Motor Parameters	Units	FM80A -40	FM80A -63	FM80B -40	FM80B -69	FM80C -44	FM80C -70
Horsepower	HP	0.9	0.5	1.5	1.1	1.9	1.5
Kilowatts	KW	0.7	0.4	1.1	0.8	1.4	1.1
Max. Speed	RPM	4000	2400	4000	2400	4000	2400
Rated Speed	RPM	4000	2400	4000	2400	4000	2400
Continuous Rated Torque	Nm(In-Lbs)	1.6 (14)	1.7 (15)	2.7 (24)	3.2 (28)	3.4 (30)	4.3 (38)
Continuous Stall Torque	Nm(In-Lbs)	1.9(17)	1.9 (17)	3.5 (31)	3.5 (31)	4.8 (43)	4.8 (43)
Peak Torque	Nm(In-Lbs)	5.5 (49)	5.9 (53)	9.59(84)	11.1(98)	11.9(105)	15.0(133)
Continuous Line Current	Amps RMS	2.9	2.0	4.8	3.2	5.5	4.3
Peak Current	Amps RMS	10.1	6.9	16.9	11.3	19.2	15.0
Torque Constant $K_T$	Nm/Amps (RMS)	0.58	0.92	0.58	1.01	0.64	1.03
Back EMF Constant $K_B$	Vrms/Krpm	40.2	62.6	40.2	69.3	43.6	70.4
DC Resistance	Ohms	7.8	18.8	2.5	7.4	1.5	4.2
Inductance	Millihenries	19.3	46.8	9.6	28.7	7.6	19.7
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.00006 (0.00053)	0.00006 (0.00053)	0.00011 (0.00097)	0.00011 (0.00097)	0.00015 (0.0013)	0.00015 (0.0013)
Static Friction	Nm(In-Lbs)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)
Motor Weight	Kg(Lbs)	3 (7)	3 (7)	5 (10)	5 (10)	6 (13)	6 (13)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 250 mm X 250 mm X 6 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac.



Model	FM80A-40	FM80A-58	FM80B-40	FM80B-69	FM80C-44	FM80C-70
A	165 (6.50")	165 (6.50")	190 (7.48")	190 (7.48")	215 (8.46")	215 (8.46")

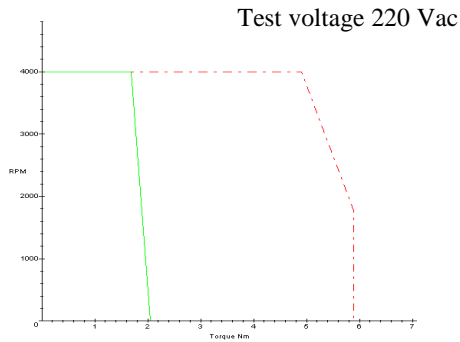
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 180 N (40 Lbs). Axial load should be < 100 N (22 Lbs).
  - All data are subject to change without notice.

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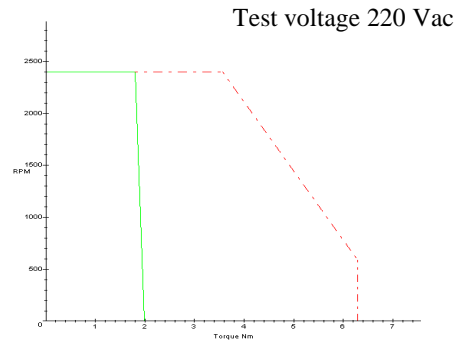
# FM Brushless Motor Performance

## FM80 Series Motor Data      90 mm Frame    230 Vac

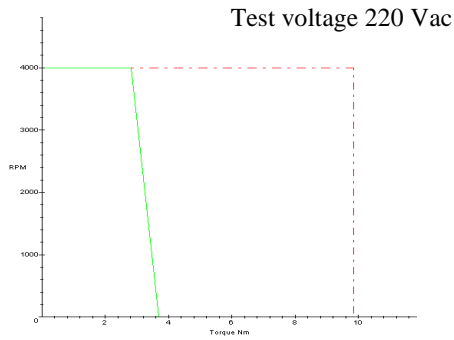
FM80A-40 PERFORMANCE



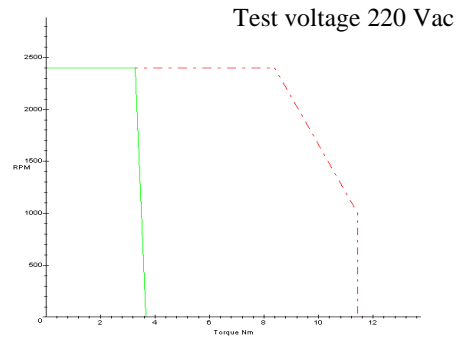
FM80A-63 PERFORMANCE



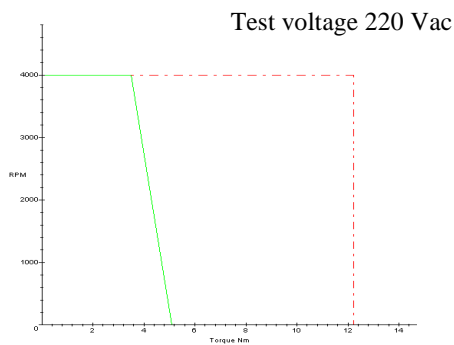
FM80B-40 PERFORMANCE



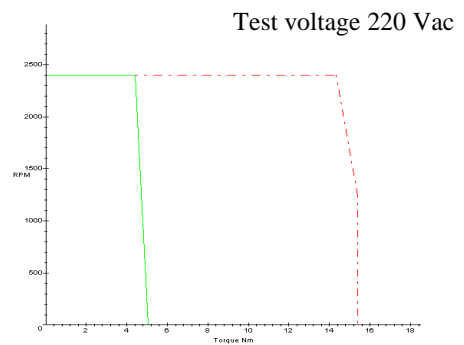
FM80CB-69 PERFORMANCE



FM80C-44 PERFORMANCE



FM80C-70 PERFORMANCE



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## FM80 Motor Connectors and Connector Pin Outs

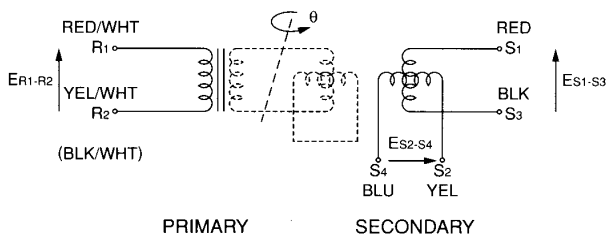
<b>Motor Connector (PT02E-14-05P) Straight Mating Plug: PT06E-14-05S</b>		
Pin	Function	Wire Color
A	$\phi U$	Red
B	$\phi V$	Black
C	$\phi W$	White
D	GND	Green
E		

<b>Resolver Connector(PT02E-14-12P) Straight Mating Plug: PT06E-14-12S</b>		
Pin	Function	Wire Color
A	COS-(S1)	Red
B	COS+(S3)	Black
C	SIN-(S2)	Yellow
D	SIN+(S4)	Blue
E	Excit (R1)	Red/White
F	Excit GND (R2)	Yellow/White
G	THERM	Green
H	THERM	Green
J		
K	* BRK(+)	
L		
M	* BRK(-)	

\* For brake option only.

### RESOLVER ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -55°C to 155°C
2. Maximum speed: 10,000 rpm
3. Dielectric strength: Vac 500, 1 minute
4. Excitation voltage: 7 Vrms 10 KHz
5. Electric error:  $\pm 10'$  Max.
6. Transformation ratio: 0.5 nominal



Excitation :  $E_{R1-R2} = E_{sin} \omega t$   
 Output :  $E_{S1-S3} = K E_{R1-R2} \cos \theta$   
            $E_{S2-S4} = K E_{R1-R2} \sin \theta$   
 K : Transformation Ratio

---

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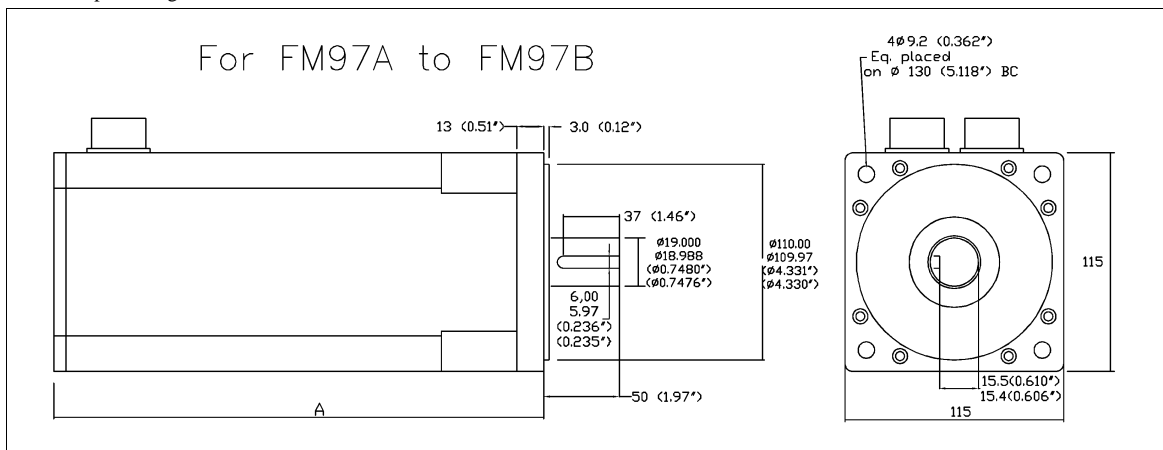
## FM Brushless Motor Performance

### FM97 Series Motor Data      115 mm Frame      230 V

Motor Parameters	Units	FM97B-54	FM97B-97	FM97D-57	FM97D-107	FM97F-54	FM97F-107
Horsepower	HP	2.4	1.3	3.8	2.3	4.7	3.1
Kilowatts	KW	1.8	1.0	2.8	1.7	3.5	2.3
Max. Speed	RPM	3000	1500	3000	1500	3000	1500
Rated Speed	RPM	3000	1500	3000	1500	3000	1500
Continuous Rated Torque	Nm(In-Lbs)	5.7 (50)	6.3 (56)	8.9 (79)	10.6 (96)	11.1(98)	14.7 (130)
Continuous Stall Torque	Nm(In-Lbs)	6.7 (59)	6.7 (59)	11.8 (104)	11.8(104)	16.0(141)	16.0 (141)
Peak Torque	Nm(In-Lbs)	17.0 (150)	19.0 (168)	26.8 (237)	32.6 (288)	33.3 (294)	44.1 (389)
Continuous Line Current	Amps RMS	7.4	4.6	10.9	7.0	14.4	9.5
Peak Current	Amps RMS	22.2	13.7	32.6	21.1	43.2	28.5
Torque Constant $K_T$	Nm/Amps (RMS)	0.78	1.40	0.83	1.56	0.78	1.56
Back EMF Constant $K_B$	Vrms/Krpm	53.6	96.6	57.2	107.3	53.6	107.3
DC Resistance	Ohms	1.7	6.0	0.8	2.5	0.36	1.5
Inductance	Millihenries	9.6	31.1	5.5	19.2	3.2	12.8
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.00051 (0.0045)	0.00051 (0.0045)	0.00096 (0.0085)	0.00096 (0.0085)	0.0014 (0.012)	0.0014 (0.012)
Static Friction	Nm(In-Lbs)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)
Motor Weight	Kg(Lbs)	8 (18)	8 (18)	11.5(25)	11.5(25)	15 (33)	15 (33)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 300 mm X 300 mm X 6 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac.



Model	FM97B-54	FM97B-97	FM97D-57	FM97D-107	FM97F-54	FM97F-107
A	240 (9.45")	240 (9.45")	290 (11.42")	290 (11.42")	340(13.39")	340 (13.39")

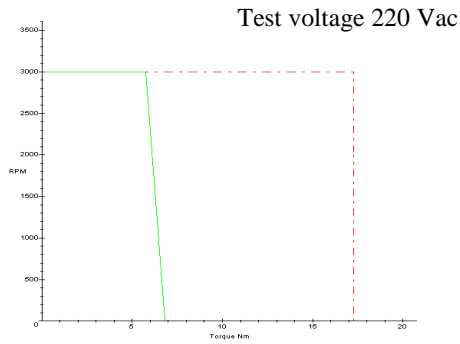
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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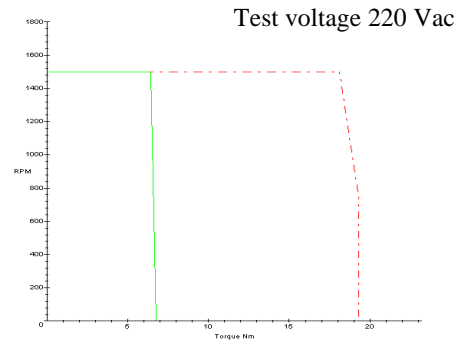
# FM Brushless Motor Performance

## FM97 Series Motor Data      115 mm Frame    230 Vac

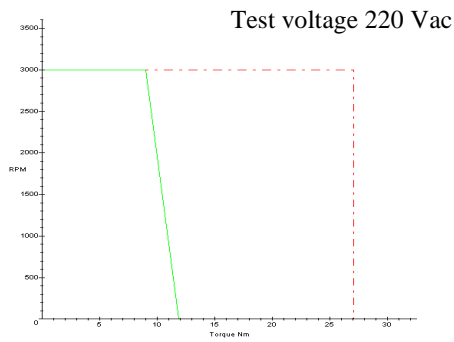
FM97B-54 PERFORMANCE



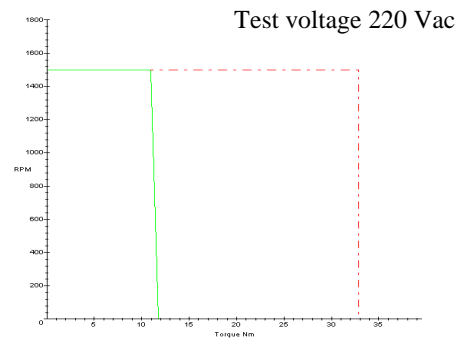
FM97B-97 PERFORMANCE



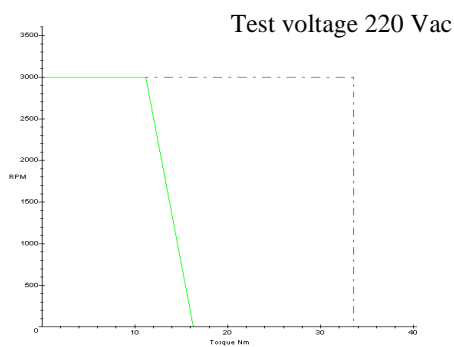
FM97D-57 PERFORMANCE



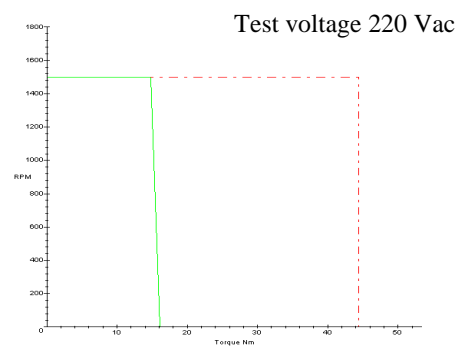
FM97D-107 PERFORMANCE



FM97F-54 PERFORMANCE



FM97F-107 PERFORMANCE



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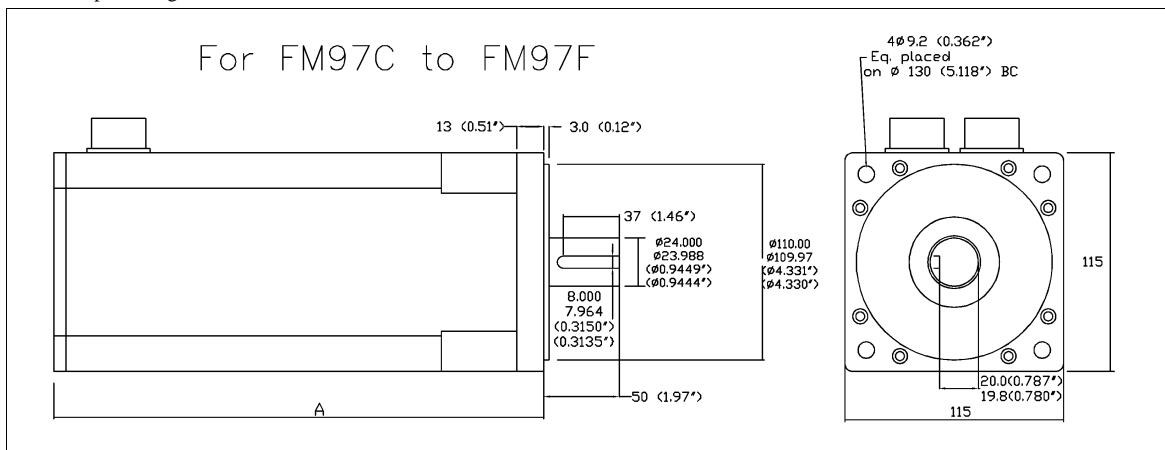
## FM Brushless Motor Performance

### FM97 Series Motor Data      115 mm Frame      460 V

Motor Parameters	Units	FM97B-114	FM97B-215	FM97D-114	FM97D-215	FM97F-129	FM97F-236
Horsepower	HP	2.4	1.3	3.8	2.3	4.6	3.0
Kilowatts	KW	1.8	1.0	2.8	1.7	3.4	2.3
Max. Speed	RPM	3000	1500	3000	1500	3000	1500
Rated Speed	RPM	3000	1500	3000	1500	3000	1500
Continuous Rated Torque	Nm(In-Lbs)	5.7 (50)	6.2 (55)	9.1 (80)	10.9 (96)	10.9 (96)	14.5 (128)
Continuous Stall Torque	Nm(In-Lbs)	6.6 (58)	6.6 (58)	11.5 (102)	11.5 (102)	16.0 (141)	16.0 (141)
Peak Torque	Nm(In-Lbs)	17.0 (150)	18.7 (165)	27.1 (240)	32.6 (288)	32.6 (288)	43.4 (384)
Continuous Line Current	Amps RMS	3.5	2.0	5.5	3.5	5.9	4.3
Peak Current	Amps RMS	10.4	6.1	16.5	10.5	17.6	12.8
Torque Constant $K_T$	Nm/Amps (RMS)	1.66	3.12	1.66	3.12	1.87	3.42
Back EMF Constant $K_B$	Vrms/Krpm	114.4	214.6	114.4	214.6	128.7	236
DC Resistance	Ohms	8.3	30.4	2.9	10.6	2.2	7.5
Inductance	Millihenries	43.6	154	21.8	76.8	18.4	61.9
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.00051 (0.0045)	0.00051 (0.0045)	0.00096 (0.0085)	0.00096 (0.0085)	0.0014 (0.012)	0.0014 (0.012)
Static Friction	Nm(In-Lbs)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)	0.1 (0.9)
Motor Weight	Kg(Lbs)	8 (18)	8 (18)	11.5(25)	11.5(25)	15 (33)	15 (33)
Maximum Line Voltage	Vrms	460	460	460	460	460	460
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 300 mm X 300 mm X 6 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 460 Vac.



Model	FM97B-114	FM97B-215	FM97D-114	FM97D-215	FM97F-129	FM97F-236
A	240 (9.45")	240 (9.45")	290 (11.42")	290 (11.42")	340(13.39")	340 (13.39")

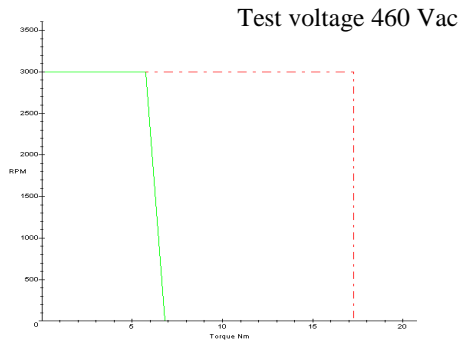
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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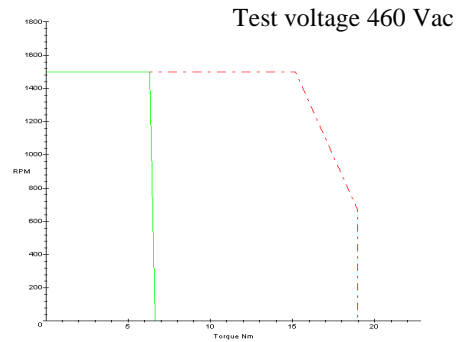
# FM Brushless Motor Performance

## FM97 Series Motor Data      115 mm Frame    460 Vac

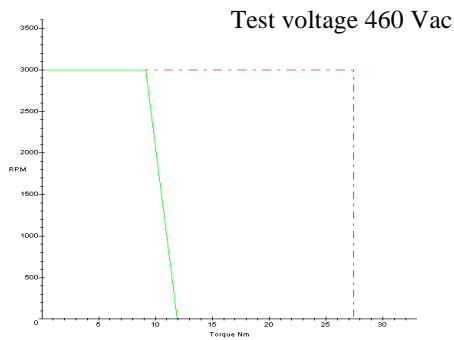
FM97B-114 PERFORMANCE



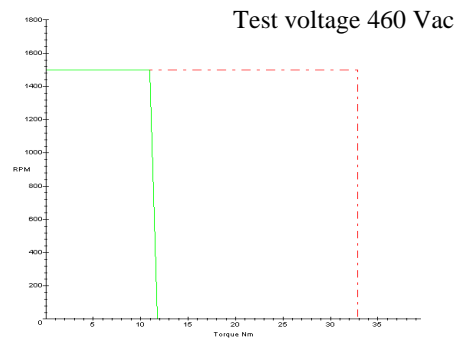
FM97B-215 PERFORMANCE



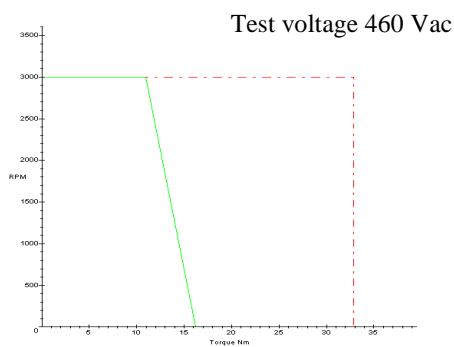
FM97D-114 PERFORMANCE



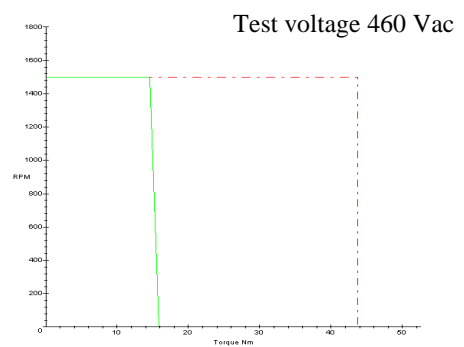
FM97D-215 PERFORMANCE



FM97F-129 PERFORMANCE



FM97F-236 PERFORMANCE



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## FM97 Motor Connectors and Connector Pin Outs

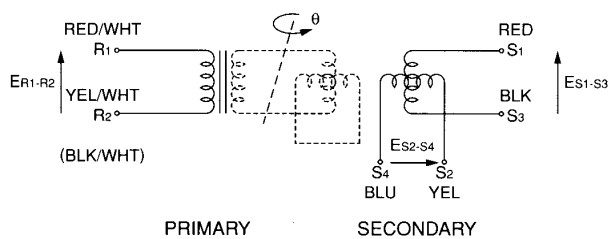
<b>Motor Connector (PT02E-14-04P)</b> <b>Straight Mating Plug: PT06E-14-04S</b>		
Pin	Function	Wire Color
A	$\phi U$	Red
B	$\phi V$	Black
C	$\phi W$	White
D	GND	Green

<b>Resolver Connector(PT02E-14-12P)</b> <b>Straight Mating Plug: PT06E-14-12S</b>		
Pin	Function	Wire Color
A	COS-(S1)	Red
B	COS+(S3)	Black
C	SIN-(S2)	Yellow
D	SIN+(S4)	Blue
E	Excit (R1)	Red/White
F	Excit GND (R2)	Yellow/White
G	THERM	Green
H	THERM	Green
J		
K	* BRK(+)	
L		
M	* BRK(-)	

\* For brake option only.

### RESOLVER ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -55°C to 155°C
2. Maximum speed: 10,000 rpm
3. Dielectric strength: Vac 500, 1 minute
4. Excitation voltage: 7 Vrms 10 KHz
5. Electric error:  $\pm 10'$  Max.
6. Transformation ratio: 0.5 nominal



Excitation :  $E_{R1-R2} = E_{sin} \omega t$   
 Output :  $E_{S1-S3} = K E_{R1-R2} \cos \theta$   
 $E_{S2-S4} = K E_{R1-R2} \sin \theta$   
 K : Transformation Ratio

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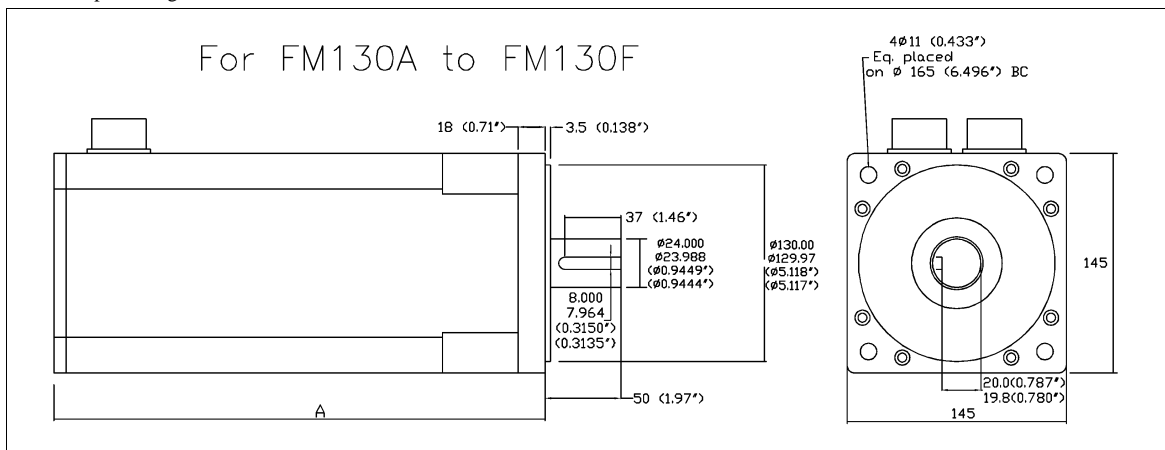
## FM Brushless Motor Performance

### FM130 Series Motor Data 145 mm Frame 230 V

Motor Parameters	Units	FM130C -62	FM130C -104	FM130F -69	FM130F -97	FM130J -69	FM130J -92
Horsepower	HP	5.5	3.8	8.8	6.4	11.4	9.3
Kilowatts	KW	4.1	2.8	6.5	4.8	8.5	6.9
Max. Speed	RPM	2400	1500	2400	1500	2400	1500
Rated Speed	RPM	2400	1500	2400	1500	2400	1500
Continuous Rated Torque	Nm(In-Lbs)	16.4 (145)	18.1 (160)	26.0 (230)	30.5 (270)	33.9(300)	44.1 (390)
Continuous Stall Torque	Nm(In-Lbs)	19.1 (169)	19.1 (169)	33.4 (295)	33.4 (295)	49.3(436)	49.3 (436)
Peak Torque	Nm(In-Lbs)	41.0 (363)	45.2 (400)	65.0 (575)	76.4 (675)	84.8 (750)	110 (975)
Continuous Line Current	Amps RMS	18.4	12.2	26.2	21.9	34.1	33.1
Peak Current	Amps RMS	46.0	30.4	65.4	54.7	85.2	82.9
Torque Constant $K_T$	Nm/Amps (RMS)	0.90	1.50	1.00	1.40	1.00	1.38
Back EMF Constant $K_B$	Vrms/Krpm	62.2	103.7	69.1	96.8	69.1	92.2
DC Resistance	Ohms	0.43	1.2	0.19	0.38	0.10	0.18
Inductance	Millihenries	6.5	18.0	4.0	7.8	2.4	4.3
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.0019 (0.017)	0.0019 (0.017)	0.0036 (0.032)	0.0036 (0.032)	0.0058 (0.051)	0.0058 (0.051)
Static Friction	Nm(In-Lbs)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)
Motor Weight	Kg(Lbs)	22 (48)	22 (48)	28 (62)	28 (62)	34 (75)	34 (75)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 330 mm X 330 mm X 10 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac.



Model	FM130C-62	FM130C-104	FM130F-69	FM130F-97	FM130J-69	FM130J-92
A	325 (12.80")	325 (12.80")	400 (15.75")	400 (15.75")	500 (19.69")	500 (19.69")

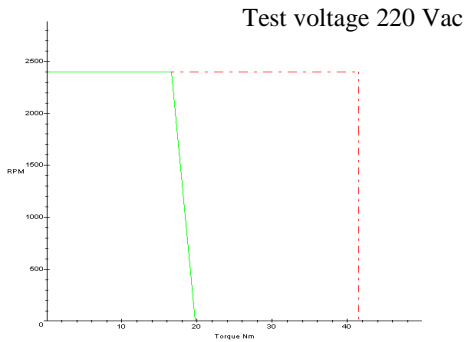
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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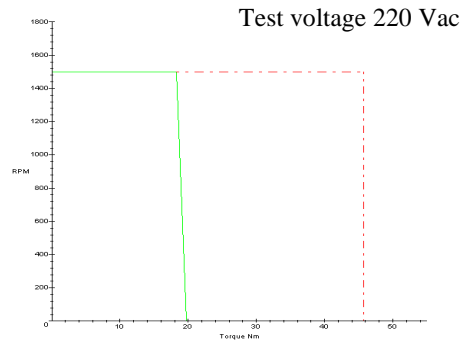
# FM Brushless Motor Performance

## FM130 Series Motor Data      145 mm Frame    230 Vac

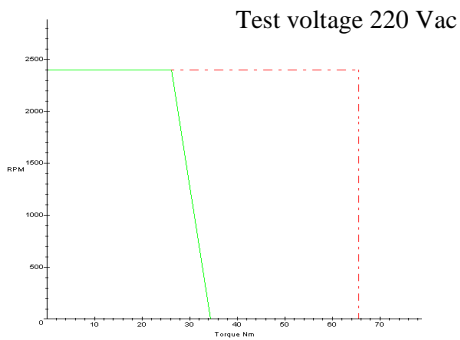
FM130C-62 PERFORMANCE



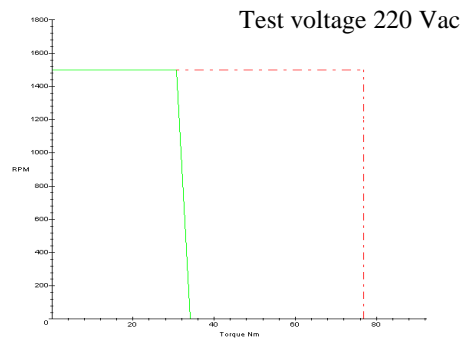
FM130C-104 PERFORMANCE



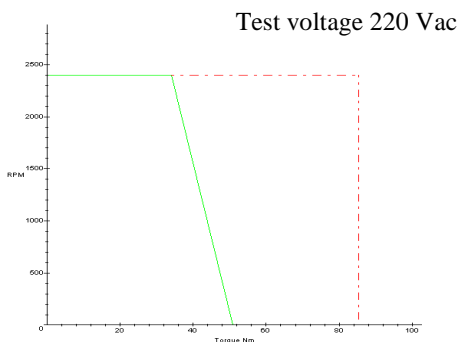
FM130F-69 PERFORMANCE



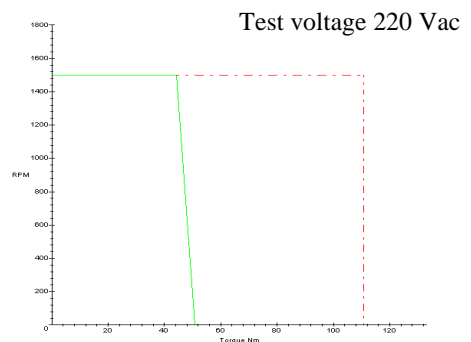
FM130F-97 PERFORMANCE



FM130J-69 PERFORMANCE



FM130J-92 PERFORMANCE



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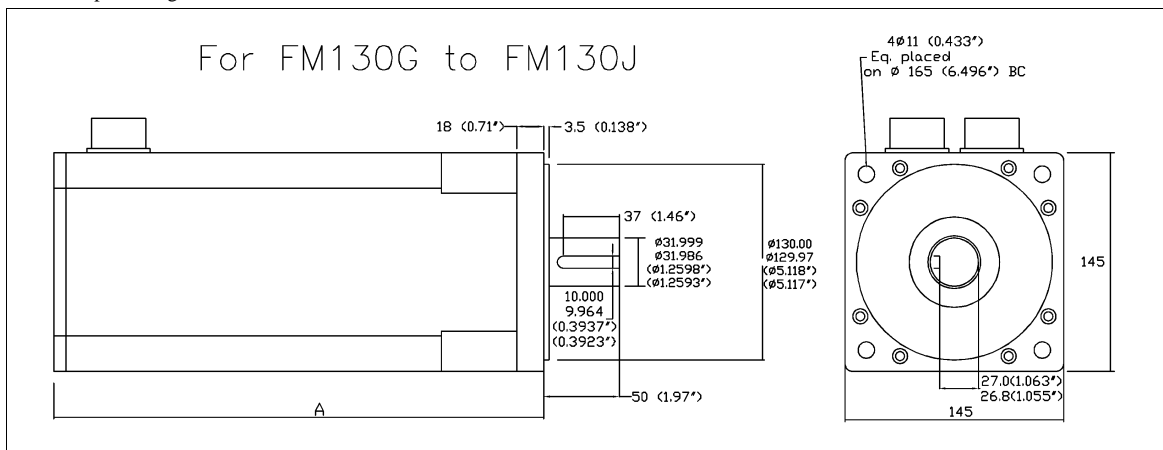
## FM Brushless Motor Performance

### FM130 Series Motor Data 145 mm Frame 460 V

Motor Parameters	Units	FM130C -124	FM130C -207	FM130F -138	FM130F -221	FM130J -138	FM130J -230
Horsepower	HP	5.5	3.8	8.6	6.4	11.0	9.2
Kilowatts	KW	4.1	2.8	6.4	4.8	8.2	6.8
Max. Speed	RPM	2400	1500	2400	1500	2400	1500
Rated Speed	RPM	2400	1500	2400	1500	2400	1500
Continuous Rated Torque	Nm(In-Lbs)	16.4 (145)	18.1 (160)	25.5 (225)	30.5 (270)	32.8 (290)	43.6 (385)
Continuous Stall Torque	Nm(In-Lbs)	19.1 (169)	19.1 (169)	33.4 (295)	33.4 (295)	49.3 (436)	49.3 (436)
Peak Torque	Nm(In-Lbs)	41.0 (363)	45.2 (400)	63.6 (563)	76.4 (675)	82.0 (725)	109 (963)
Continuous Line Current	Amps RMS	9.2	6.1	12.8	9.6	16.4	13.1
Peak Current	Amps RMS	23.0	15.2	31.9	23.9	41.1	32.6
Torque Constant $K_T$	Nm/Amps (RMS)	1.80	3.00	2.00	3.22	2.00	3.35
Back EMF Constant $K_B$	Vrms/Krpm	124.4	207.3	138.2	221.2	138.2	230.4
DC Resistance	Ohms	1.7	4.8	0.77	2.0	0.40	1.1
Inductance	Millihenries	25.9	71.9	16.0	40.9	9.6	26.7
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.0019 (0.017)	0.0019 (0.017)	0.0036 (0.032)	0.0036 (0.032)	0.0058 (0.051)	0.0058 (0.051)
Static Friction	Nm(In-Lbs)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)	0.2 (1.8)
Motor Weight	Kg(Lbs)	22 (48)	22 (48)	28 (62)	28 (62)	34 (75)	34 (75)
Maximum Line Voltage	Vrms	460	460	460	460	460	460
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 330 mm X 330 mm X 10 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 460 Vac.



Model	FM130C-124	FM130C-207	FM130F-138	FM130F-221	FM130J-138	FM130J-230
A	325 (12.80")	325 (12.80")	400 (15.75")	400 (15.75")	500 (19.69")	500 (19.69")

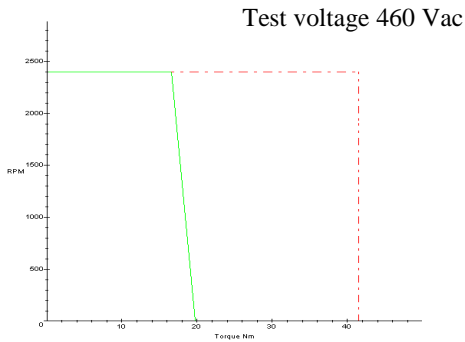
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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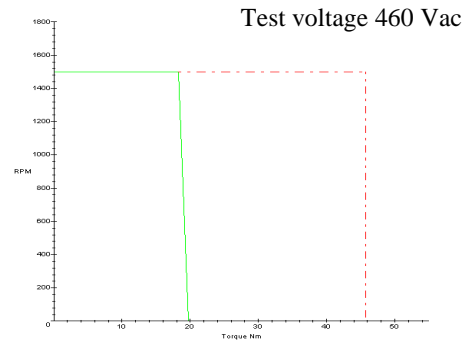
# FM Brushless Motor Performance

## FM130 Series Motor Data      145 mm Frame    460 Vac

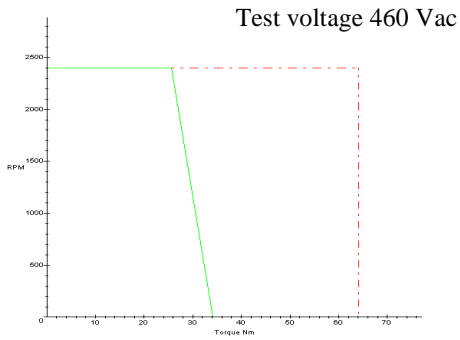
FM130C-124 PERFORMANCE



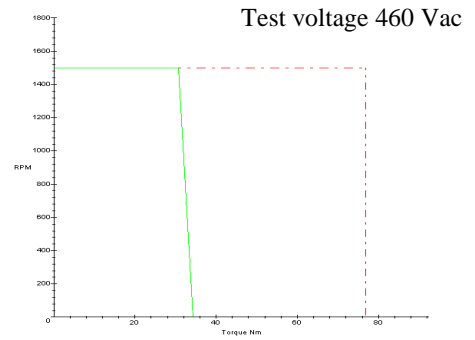
FM130C-207 PERFORMANCE



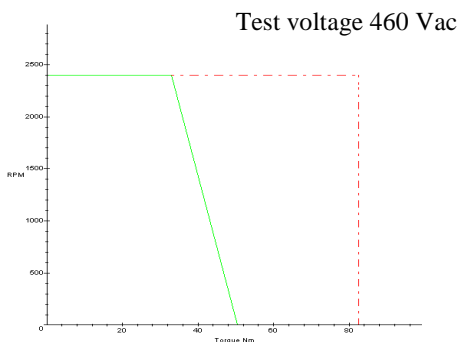
FM130F-138 PERFORMANCE



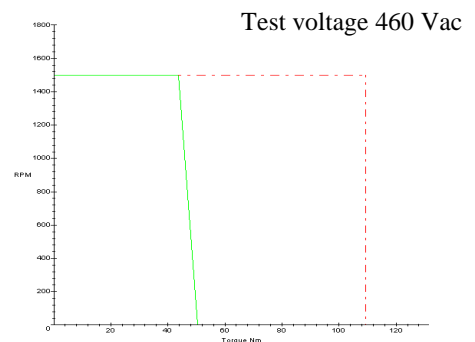
FM130F-221 PERFORMANCE



FM130J-138 PERFORMANCE



FM130J-230 PERFORMANCE



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## FM130 Motor Connectors and Connector Pin Outs

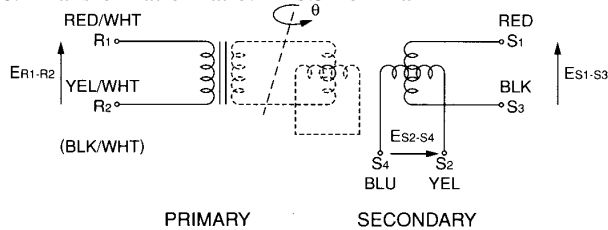
<b>Motor Connector (MS3102E-22-22P)</b> <b>Straight Mating Plug: MS3106E-22-22S</b>		
Pin	Function	Wire Color
A	$\phi U$	Red
B	$\phi V$	Black
C	$\phi W$	White
D	GND	Green

<b>Resolver Connector (MS3102E-22-19P)</b> <b>Straight Mating Plug: MS3106E-22-19S</b>		
Pin	Function	Wire Color
A	COS-(S1)	Red
B	COS+(S3)	Black
C	SIN-(S2)	Yellow
D	SIN+(S4)	Blue
E	Excit (R1)	Red/White
F	Excit GND (R2)	Yellow/White
G	THERM	Green
H	THERM	Green
J		
K	GND	Green
L		
M	* BRK(+)	
N	* BRK GND	
P	* BRK(-)	

\* For brake option only.

### RESOLVER ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -55°C to 155°C
2. Maximum speed: 10,000 rpm
3. Dielectric strength: Vac 500, 1 minute
4. Excitation voltage: 7 Vrms 10 KHz
5. Electric error:  $\pm 10'$  Max.
6. Transformation ratio: 0.5 nominal



Excitation :  $E_{R1-R2} = E_{sin} \omega t$   
 Output :  $E_{S1-S3} = K E_{R1-R2} \cos \theta$   
 $E_{S2-S4} = K E_{R1-R2} \sin \theta$   
 K : Transformation Ratio

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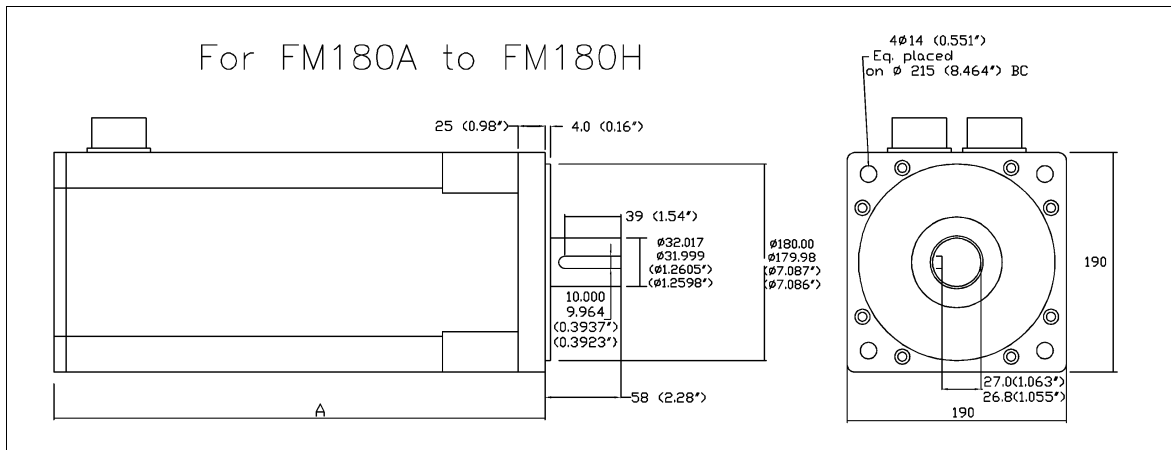
## FM Brushless Motor Performance

### FM180 Series Motor Data 190 mm Frame 230 V

Motor Parameters	Units	FM180D -88	FM180D -125	FM180I -85*	FM180I -141	FM180M -82*#	FM180M -122
Horsepower	HP	12.8	10.2	18.3	18.1	22.5	22.9
Kilowatts	KW	9.5	7.6	13.6	13.5	16.8	17.1
Max. Speed	RPM	2400	1500	2400	1500	2400	1500
Rated Speed	RPM	2400	1500	2400	1500	2400	1500
Continuous Rated Torque	Nm(In-Lbs)	37.9 (335)	48.6(430)	54.3 (480)	86.0 (760)	66.7 (590)	109 (960)
Continuous Stall Torque	Nm(In-Lbs)	54.3 (480)	54.3(480)	79.2 (700)	106 (940)	106 (940)	141 (1250)
Peak Torque	Nm(In-Lbs)	94.7 (838)	122 (1075)	136 (1200)	215 (1900)	167 (1475)	271 (2400)
Continuous Line Current	Amps RMS	29.8	26.8	44.2	42.1	56.6	61.3
Peak Current	Amps RMS	74.6	67.0	110	105	142	153
Torque Constant $K_T$	Nm/Amps (RMS)	1.28	1.82	1.23	2.05	1.18	1.77
Back EMF Constant $K_B$	Vrms/Krpm	87.8	125.4	84.8	141.1	81.5	122.3
DC Resistance	Ohms	0.13	0.27	0.07	0.11	0.04	0.05
Inductance	Millihenries	7.0	14.2	5.1	8.0	3.3	4.2
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.0084 (0.074)	0.0084 (0.074)	0.017 (0.15)	0.017 (0.15)	0.025 (0.22)	0.025 (0.22)
Static Friction	Nm(In-Lbs)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)
Motor Weight	Kg(Lbs)	32 (70)	32 (70)	56 (123)	56 (123)	75 (165)	75 (165)
Maximum Line Voltage	Vrms	250	250	250	250	250	250
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 360 mm X 360 mm X 12 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 220 Vac..



Model	FM180D-63	FM180D-88	FM180I-66	FM180I-85	FM180M-68	FM180M-82
A	325 (12.80")	325 (12.80")	450 (17.72")	450 (17.72")	550 (21.65")	550 (21.65")

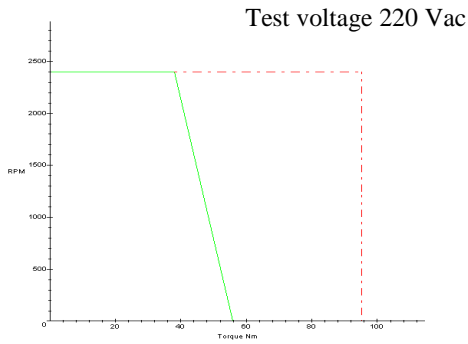
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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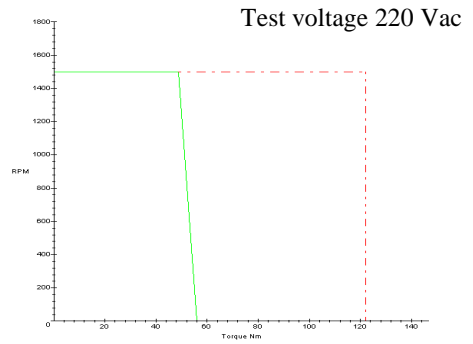
# FM Brushless Motor Performance

## FM180 Series Motor Data      190 mm Frame    230 Vac

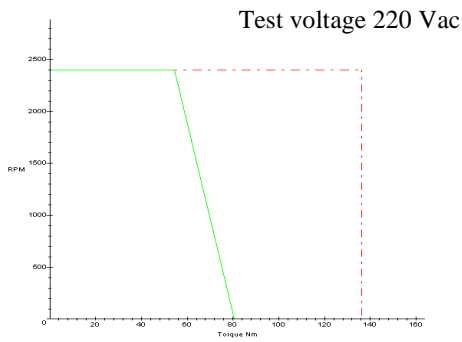
FM180D-88 PERFORMANCE



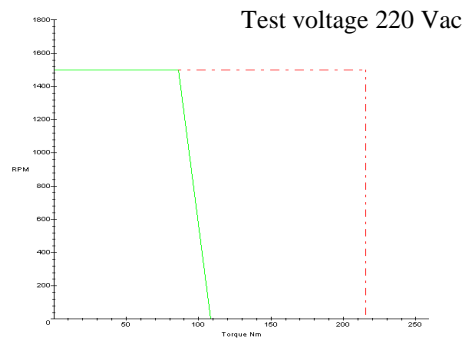
FM180D-125 PERFORMANCE



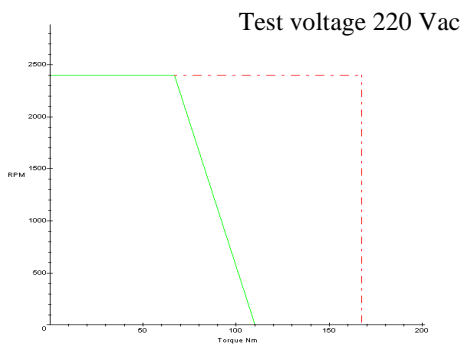
FM180I-85 PERFORMANCE



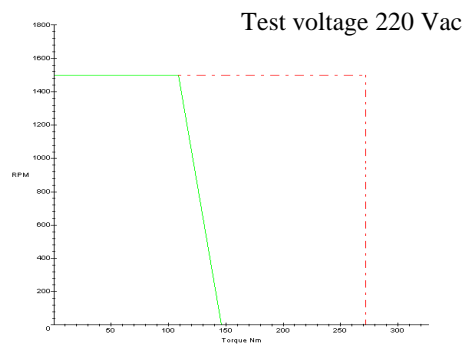
FM180I-141 PERFORMANCE



FM180M-82 PERFORMANCE



FM180M-122 PERFORMANCE



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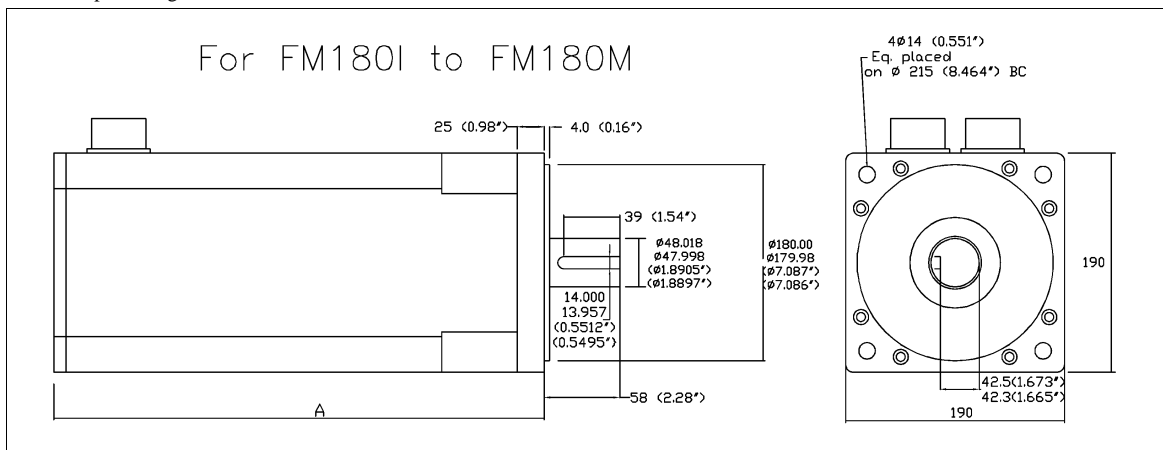
## FM Brushless Motor Performance

### FM180 Series Motor Data 190 mm Frame 460 V

Motor Parameters	Units	FM180D -151	FM180D -259	FM180I -169*	FM180I -282	FM180M -153*	FM180M -285
Horsepower	HP	12.8	10.2	18.3	18.1	22.5	22.9
Kilowatts	KW	9.5	7.6	13.6	13.5	16.8	17.1
Max. Speed	RPM	2400	1500	2400	1500	2400	1500
Rated Speed	RPM	2400	1500	2400	1500	2400	1500
Continuous Rated Torque	Nm(In-Lbs)	37.9 (335)	48.6(430)	54.3 (480)	86.0 (760)	66.7 (590)	109 (960)
Continuous Stall Torque	Nm(In-Lbs)	54.3 (480)	54.3(480)	79.2 (700)	106 (940)	106 (940)	141 (1250)
Peak Torque	Nm(In-Lbs)	94.7 (838)	122 (1075)	136 (1200)	215 (1900)	167 (1475)	271 (2400)
Continuous Line Current	Amps RMS	17.4	13.0	22.1	21.1	30.2	26.3
Peak Current	Amps RMS	43.5	32.4	55.3	52.6	75.5	65.7
Torque Constant $K_T$	Nm/Amps (RMS)	2.19	3.77	2.46	4.09	2.22	4.14
Back EMF Constant $K_B$	Vrms/Krpm	150.5	259.1	169.3	282.2	152.9	285.4
DC Resistance	Ohms	0.39	1.15	0.28	0.43	0.14	0.28
Inductance	Millihenries	20.5	60.6	20.5	32.0	11.6	22.6
Rotor Inertia	Kg-M <sup>2</sup> (In-Lbs-Sec <sup>2</sup> )	0.0084 (0.074)	0.0084 (0.074)	0.017 (0.15)	0.017 (0.15)	0.025 (0.22)	0.025 (0.22)
Static Friction	Nm(In-Lbs)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)	0.7 (6.2)
Motor Weight	Kg(Lbs)	32 (70)	32 (70)	56 (123)	56 (123)	75 (165)	75 (165)
Maximum Line Voltage	Vrms	460	460	460	460	460	460
Number of Poles		6	6	6	6	6	6

**Notes:**

1. Continuous rating @25°C. Motor mounted on a 360 mm X 360 mm X 12 mm Aluminum heatsink. Maximum winding temperature 155°C.
2. Test drive input voltage was 460 Vac.



Model	FM180D-125	FM180D-201	FM180I-141	FM180I-198	FM180M-122	FM180M-204
A	325 (12.80")	325 (12.80")	450 (17.72")	450 (17.72")	550 (21.65")	550 (21.65")

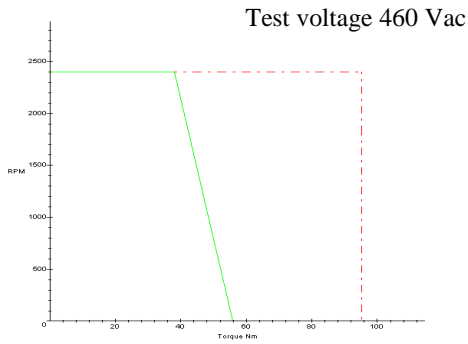
- Notes:**
- IEC mounting dimensions are shown. NEMA mountings are available, please contact Expro Engineering for information.
  - Radial load on output shaft < 450 N (100 Lbs). Axial load should be < 230 N (50 Lbs).
  - All data are subject to change without notice.

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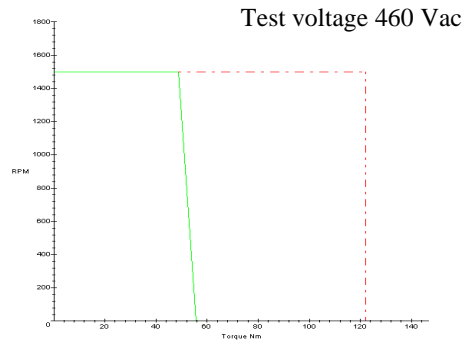
# FM Brushless Motor Performance

## FM180 Series Motor Data      190 mm Frame    460 Vac

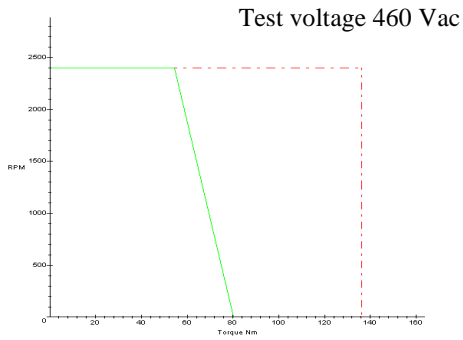
FM180D-151 PERFORMANCE



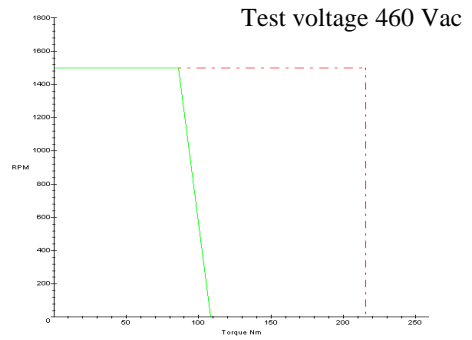
FM180D-259 PERFORMANCE



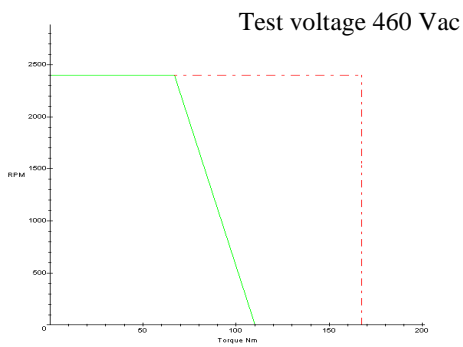
FM180I-169 PERFORMANCE



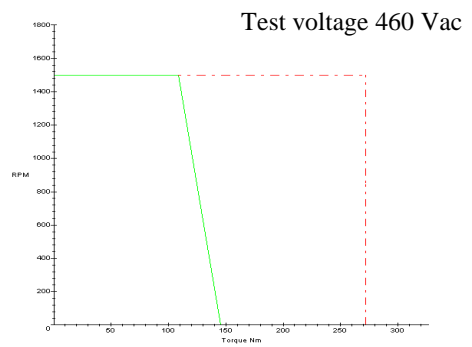
FM180I-282 PERFORMANCE



FM180M-153 PERFORMANCE



FM180M-285 PERFORMANCE



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## FM180 Motor Connectors and Connector Pin Outs

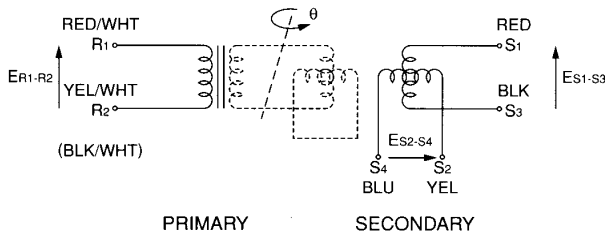
<b>Motor Connector (MS3102E-32-17P)</b> <b>Straight Mating Plug: MS3106E-32-17S</b>		
Pin	Function	Wire Color
A	$\phi U$	Red
B	$\phi V$	Black
C	$\phi W$	White
D	GND	Green

<b>Resolver Connector (MS3102E-22-19P)</b> <b>Straight Mating Plug: MS3106E-22-19S</b>		
Pin	Function	Wire Color
A	COS-(S1)	Red
B	COS+(S3)	Black
C	SIN-(S2)	Yellow
D	SIN+(S4)	Blue
E	Excit (R1)	Red/White
F	Excit GND (R2)	Yellow/White
G	THERM	Green
H	THERM	Green
J		
K	GND	Green
L		
M	* BRK(+)	
N	* BRK GND	
P	* BRK(-)	

\* For brake option only.

### RESOLVER ELECTRICAL SPECIFICATIONS:

1. Operation temperature: -55°C to 155°C
2. Maximum speed: 10,000 rpm
3. Dielectric strength: Vac 500, 1 minute
4. Excitation voltage: 7 Vrms 10 KHz
5. Electric error:  $\pm 10'$  Max.
6. Transformation ratio: 0.5 nominal



Excitation :  $E_{R1-R2} = E_{sin} \omega t$   
 Output :  $E_{S1-S3} = K E_{R1-R2} \cos \theta$   
 $E_{S2-S4} = K E_{R1-R2} \sin \theta$   
 K : Transformation Ratio

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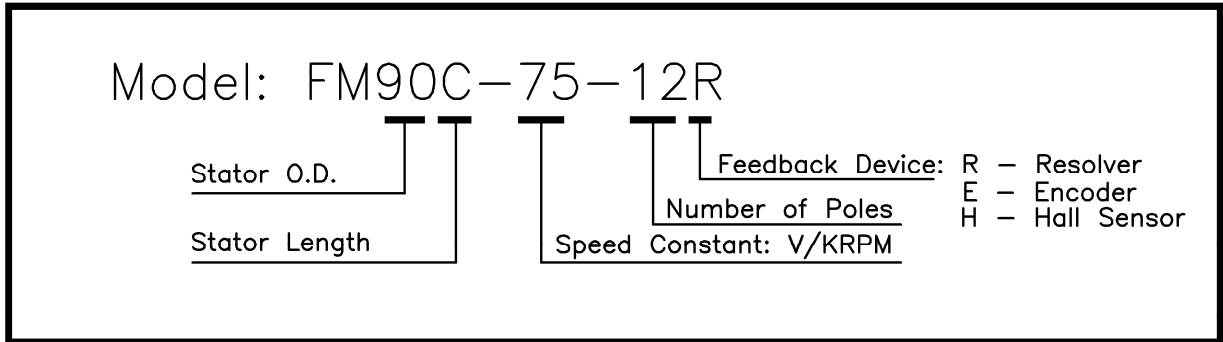
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## FM Brushless Motor Ordering Information

### How to Order:

- The following is an example showing how to order the motor, based on the speed requirement and feedback devices.



Servo motor	Stator O. D.	Stator length	Winding	Number of poles	Optional devices
<b>FM series</b>	50 mm	A 25 mm (1")	<b>* Special</b>	12	R - resolver
	53 mm	B 50 mm (2")		8	E - encoder
	76 mm	C 75 mm (3")		6	H - hall sensor
	80 mm	D 100 mm (4")		4	N - No sensor
	97 mm	E 125 mm (5")			B - Brake
	130 mm	F 150 mm (6")			<b>* Special</b>
	180 mm	G 175 mm (7")			
		H 200 mm (8")			
	<b>* Special</b>	I 225 mm (9")			
		J 250 mm (10")			
		K 275 mm (11")			
		L 300 mm (12")			
		M 325 mm (13")			

### More Important:

- For higher ambient temperature (> 25°C) applications, please consult Expro Engineering for motor derating information.**
- Expro Engineering will provide custom design to meet your specifications. Please consult Expro Engineering for information. Expro Engineering is more happy to help our customers.**

Notes:

- All data are subject to change without notice.

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