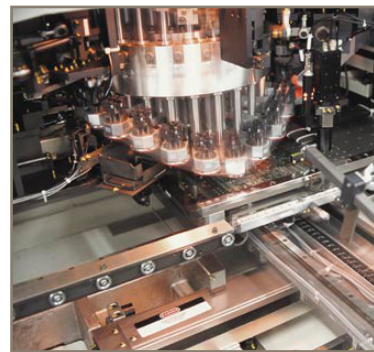


## SM Series Servo Motors

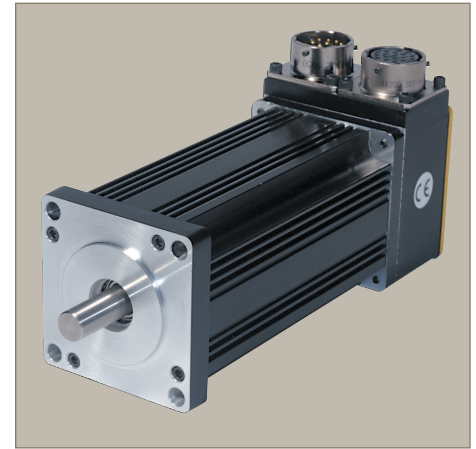
Brushless servo motors featuring high performance slotless design



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# SM Series Servo Motors

High-Performance Slotless Design



The SM Series brushless servo motors feature a slotless stator design.

SM Motor Model	161	162	231	232	233
Stall Torque – Cont. Nm (oz-in)	0.2 (26)	0.3 (47)	0.4 (54)	0.7 (106)	1.1 (156)
Peak Torque Nm (oz-in)	0.6 (78)	0.1 (141)	1.1 (160)	2.2 (316)	3.3 (467)
Rated Speed (rpm)	7,500	7,500	7,500	7,500	5,800
Rotor inertia kg-m <sup>2</sup> (oz-in-s <sup>2</sup> )	1.1x10 <sup>-5</sup> (1.5x10 <sup>-3</sup> )	1.8x10 <sup>-6</sup> (2.6x10 <sup>-4</sup> )	5.2x10 <sup>-5</sup> (7.4x10 <sup>-3</sup> )	9.3x10 <sup>-5</sup> (1.3x10 <sup>-2</sup> )	1.4x10 <sup>-4</sup> (1.9x10 <sup>-2</sup> )

This design eliminates all detent torque in the motor, allowing the SM Series motors to provide extremely smooth motion, especially at low speeds. The slotless design also creates a higher rotor inertia, which is ideal for applications involving high inertial loads (such as lead screws and belt drives).

The SM Series motors also feature a rugged anodized aluminum body and connector housing. An IP65 rating can be obtained on motors with PS or MS connectors and an optional shaft seal. All SM motors are CE (LVD) compliant.

## Features

- NEMA size 16 and 23
- 0.8 to 11.3 lb-in continuous torque
- Brushless construction
- Slotless design provides negligible detent torque, reduced torque ripple and high inertia
- High-performance neodymium magnets
- Thermostat protected
- TENV housing
- IP65 option
- Feedback options
  - Encoder/Hall effect
  - Resolver
- Connectorization choices
- Special winding availability
- Custom modifications available
- Two-year warranty
- CAD models available
- CE Compliant

## Contact Information:

Parker Hannifin Corporation  
Hydraulic Pump and Power Systems Div.  
14249 Industrial Pkwy.  
Marysville, OH 43040 USA  
Tel: (937) 644-3915  
Fax: (937) 642-3738  
Web: [parker.com/hps](http://parker.com/hps)



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# SM Series NEMA Size 16

## Size 16 Specifications

Parameter	Symbol	Units	SM161A	SM161B	SM162A	SM162B
<b>Stall Torque, Continuous</b> <sup>1</sup>	Tcs	oz-in	27	27	49	50
		Nm	0.19	0.19	0.34	0.35
<b>Stall Current, Continuous</b> <sup>1,4,8</sup>	Ics	A <sub>rms</sub>	2.0	3.8	1.9	3.7
<b>Peak Torque</b> <sup>6</sup>	Tpk	oz-in	81	81	147	151
		Nm	0.57	0.57	1.03	1.06
<b>Peak Current</b> <sup>4,6,8</sup>	Ipk	A <sub>rms</sub>	5.9	11.3	5.8	11.2
<b>Rated Speed</b> <sup>2</sup>	wr	rpm	7500	7500	7500	7500
<b>Current @ Rated Speed</b>	I <sub>r</sub>	A <sub>rms</sub>	1.8	3.4	1.8	3.4
<b>Torque @ Rated Speed</b>	T <sub>r</sub>	oz-in	22	22	42	44
		Nm	0.16	0.16	0.30	0.31
<b>Shaft Power @ Rated Speed</b>	P <sub>o</sub>	watts	122	121	233	240
<b>Voltage Constant</b> <sup>3</sup>	K <sub>b</sub>	Volts/rad/s	0.079	0.041	0.147	0.078
<b>Voltage Constant</b> <sup>3,4</sup>	K <sub>e</sub>	V <sub>rms</sub> /krpm	5.85	3.04	10.89	5.78
<b>Torque Constant</b> <sup>9</sup>	K <sub>t</sub>	oz-in/A <sub>rms</sub>	13.7	7.1	25.49	13.53
		Nm/A <sub>rms</sub>	0.097	0.050	0.180	0.096
<b>Resistance</b> <sup>3</sup>	R	Ohms	4.53	1.24	6.50	1.73
<b>Inductance</b> <sup>5</sup>	L	mH	0.80	0.20	1.41	0.35
<b>Maximum Bus Voltage</b>	V <sub>m</sub>	Volts DC	170	170	170	170
<b>Rotor Inertia</b>	J	lb-in-sec <sup>2</sup>	9.4 <sup>-5</sup>	9.4 <sup>-5</sup>	1.6 <sup>-4</sup>	1.6 <sup>-4</sup>
		kg-m <sup>2</sup>	1.1 <sup>-5</sup>	1.1 <sup>-5</sup>	1.8 <sup>-5</sup>	1.8 <sup>-5</sup>
<b>Number of Poles</b>	N <sub>p</sub>		4	4	4	4
<b>Motor Weight</b>	#	lbs (kg)	1.1 (0.5)	1.1 (0.5)	1.6 (0.7)	1.6 (0.7)

<sup>1</sup> @ 25°C ambient, 125°C winding temperature, motor connected to a 10" x 10" x 1/4" aluminum mounting plate.

@ 40°C ambient derate phase currents and torques by 12%.

<sup>2</sup> Operating at maximum bus voltage. Higher speed operation possible as custom.

<sup>3</sup> Measured line-to-line, ±10%.

<sup>4</sup> Value is measured rms of sine wave.

<sup>5</sup> ±30%, line-to-line, inductance bridge measurement @1Khz.

<sup>6</sup> Initial winding temperature must be 60°C or less before peak current is applied.

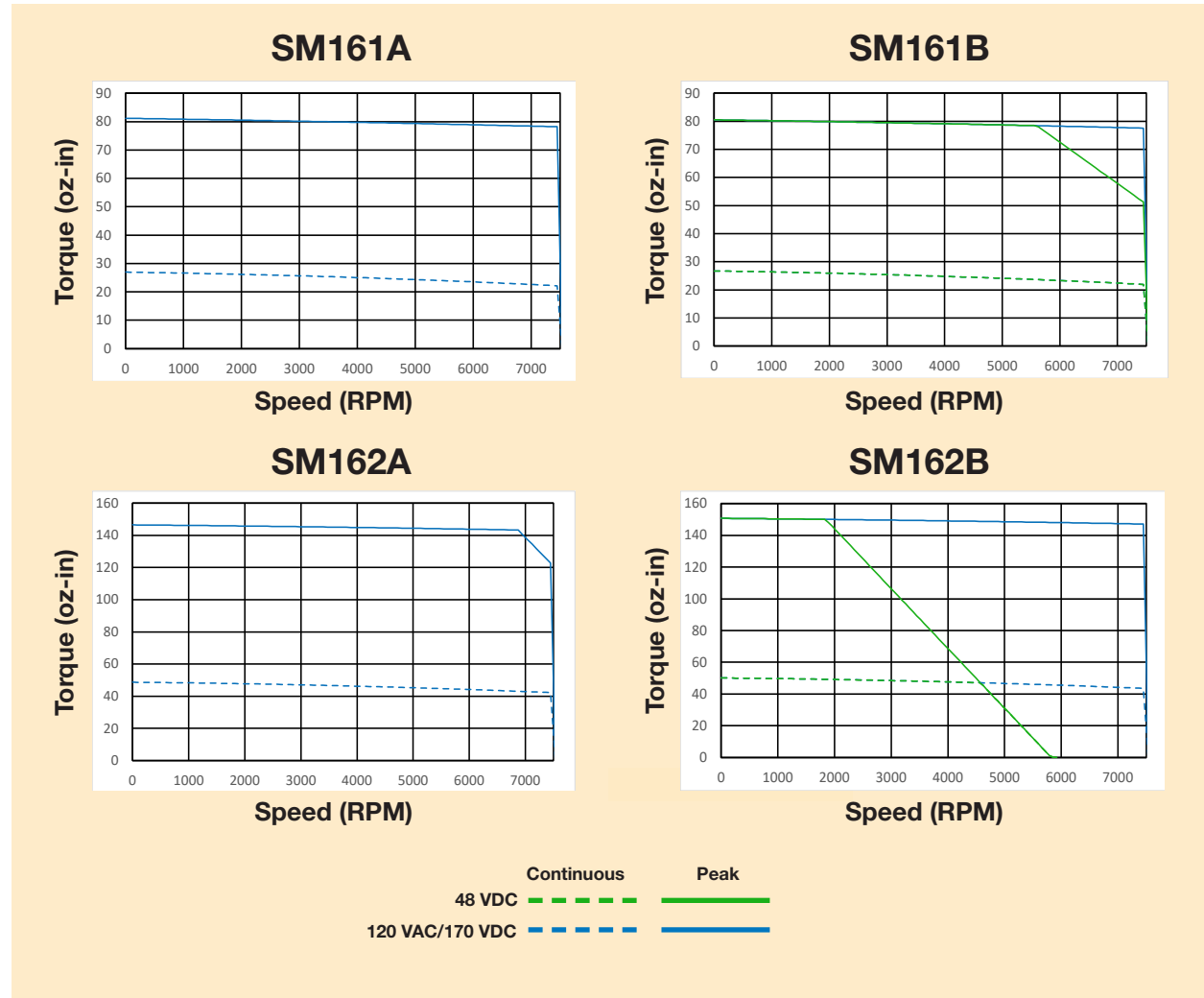
<sup>8</sup> A<sub>rms</sub> current in any phase for a sinusoidally commutated motor.

<sup>9</sup> Total motor torque per A<sub>rms</sub> measured in any phase, ±10%.

**Note: These specifications are based on theoretical motor performance and are not specific to any amplifier.**

# SM Series NEMA Size 16

## NEMA Size 16 Performance Curves



# SM Series NEMA Size 23

## Size 23 Specifications

Parameter	Symbol	Units	SM231A	SM231B	SM232A	SM232B	SM233A	SM233B
<b>Stall Torque, Continuous</b> <sup>1</sup>	Tcs	oz-in	62	55	99	104	166	161
		Nm	0.44	0.39	0.70	0.74	1.17	1.13
<b>Stall Current, Continuous</b> <sup>1,4,8</sup>	Ics	A <sub>rms</sub>	2.1	4.0	1.8	3.6	2.0	3.9
<b>Peak Torque</b> <sup>6</sup>	Tpk	oz-in	188	166	297	313	501	484
		Nm	1.33	1.17	2.10	2.21	3.54	3.42
<b>Peak Current</b> <sup>4,6,8</sup>	Ipk	A <sub>rms</sub>	6.4	12.1	5.5	10.7	6.0	11.6
<b>Rated Speed</b> <sup>2</sup>	wr	rpm	7500	7500	7500	7500	6100	6030
<b>Current @ Rated Speed</b>	I <sub>r</sub>	A <sub>rms</sub>	2.0	3.8	1.7	3.3	1.8	3.5
<b>Torque @ Rated Speed</b>	T <sub>r</sub>	oz-in	56	49	91	96	148	143
		Nm	0.40	0.35	0.64	0.68	1.04	1.01
<b>Shaft Power @ Rated Speed</b>	P <sub>o</sub>	watts	309	272	499	528	667	639
<b>Voltage Constant</b> <sup>3</sup>	K <sub>b</sub>	Volts/rad/s	0.169	0.079	0.310	0.169	0.484	0.242
<b>Voltage Constant</b> <sup>3,4</sup>	K <sub>e</sub>	V <sub>rms</sub> /krpm	12.51	5.85	22.95	12.51	35.84	17.92
<b>Torque Constant</b> <sup>9</sup>	K <sub>t</sub>	oz-in/A <sub>rms</sub>	29.31	13.70	53.76	29.31	83.94	41.97
		Nm/A <sub>rms</sub>	0.207	0.097	0.380	0.207	0.593	0.296
<b>Resistance</b> <sup>3</sup>	R	Ohms	5.22	1.46	7.50	2.00	9.65	2.58
<b>Inductance</b> <sup>5</sup>	L	mH	1.88	0.47	3.34	0.60	5.07	1.27
<b>Maximum Bus Voltage</b>	V <sub>m</sub>	Volts DC	170	170	340	170	340	170
<b>Rotor Inertia</b>	J	lb-in-sec <sup>2</sup>	4.6 <sup>-4</sup>	4.6 <sup>-4</sup>	8.2 <sup>-4</sup>	8.2 <sup>-4</sup>	1.2 <sup>-3</sup>	1.2 <sup>-3</sup>
		kg-m <sup>2</sup>	5.2 <sup>-5</sup>	5.2 <sup>-5</sup>	9.3 <sup>-5</sup>	9.3 <sup>-5</sup>	1.3 <sup>-4</sup>	1.3 <sup>-4</sup>
<b>Number of Poles</b>	N <sub>p</sub>		4	4	4	4	4	4
<b>Motor Weight</b>	#	lbs (kg)	2.1 (1.0)	2.1 (1.0)	3.0 (1.4)	3.0 (1.4)	3.9 (1.8)	3.9 (1.8)

<sup>1</sup> @ 25°C ambient, 125°C winding temperature, motor connected to a 10" x 10" x 1/4" aluminum mounting plate.

@ 40°C ambient derate phase currents and torques by 12%.

<sup>2</sup> Operating at max bus voltage. Higher speed operation possible as custom.

<sup>3</sup> Measured line-to-line, ±10%.

<sup>4</sup> Value is measured rms of sine wave.

<sup>5</sup> ±30%, line-to-line, inductance bridge measurement @1Khz.

<sup>6</sup> Initial winding temperature must be 60°C or less before peak current is applied.

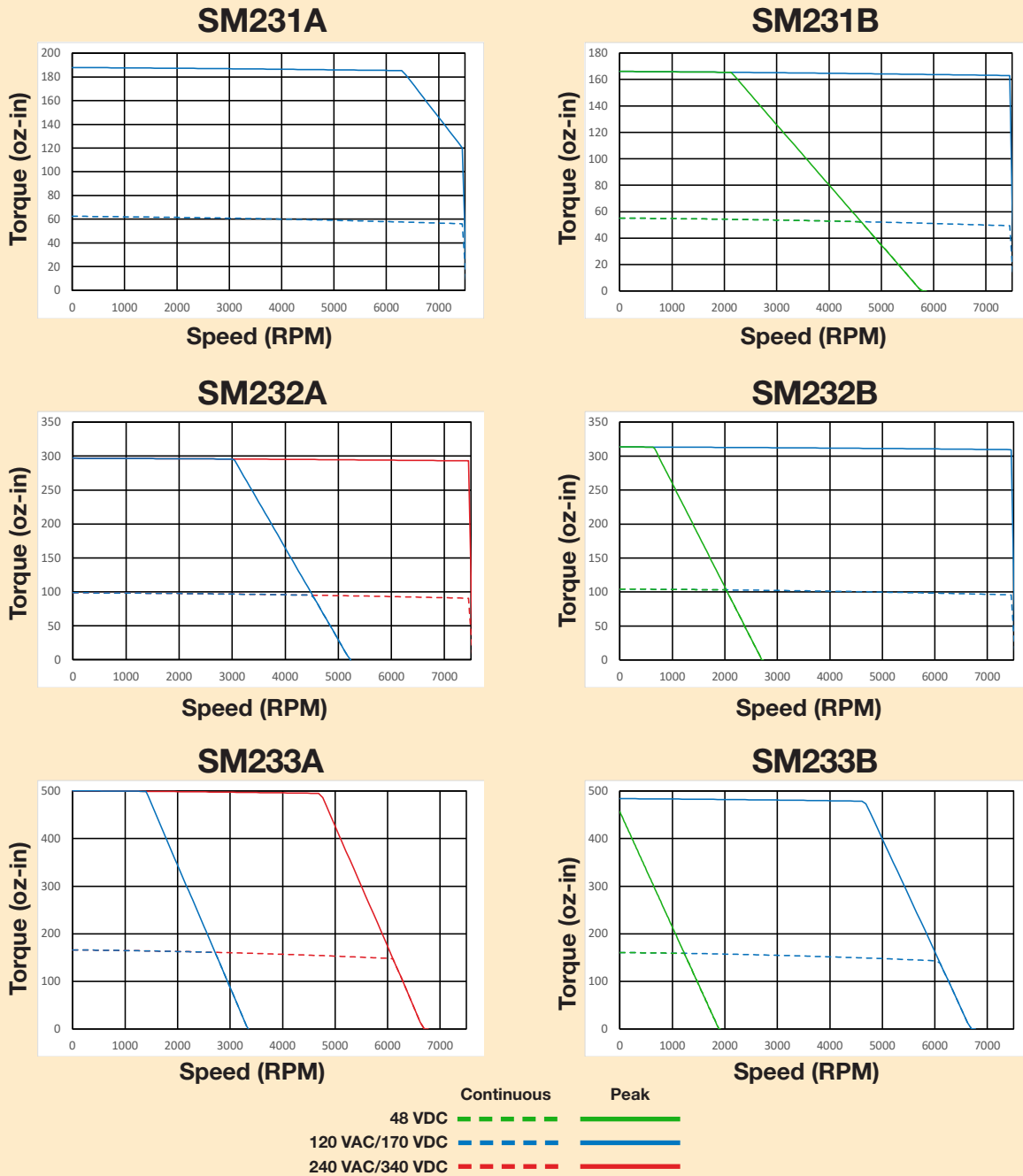
<sup>8</sup> A<sub>rms</sub> current in any phase for a sinusoidally commutated motor.

<sup>9</sup> Total motor torque per A<sub>rms</sub> measured in any phase, ±10%.

**Note: These specifications are based on theoretical motor performance and are not specific to any amplifier.**

# SM Series NEMA Size 23

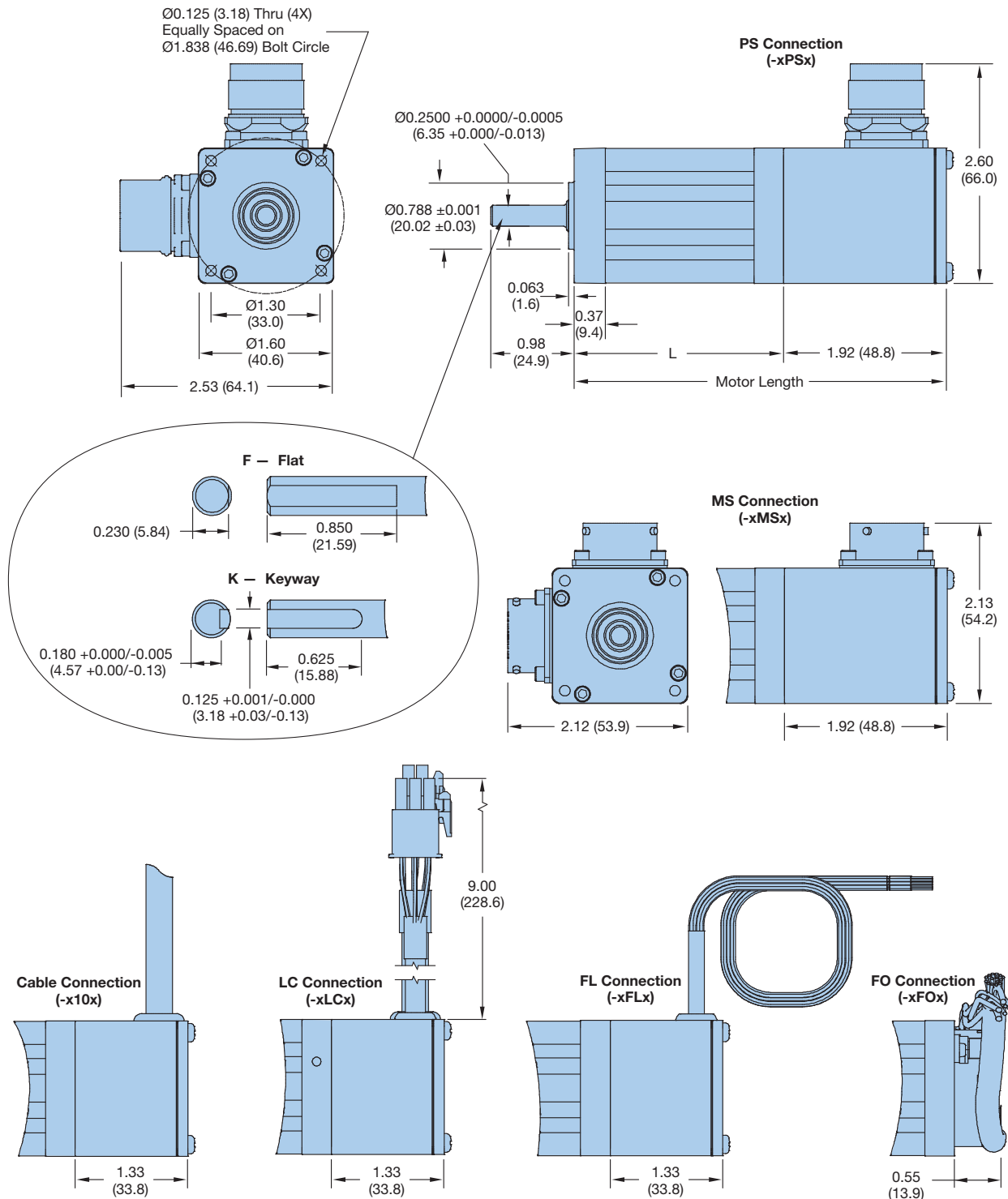
## NEMA Size 23 Performance Curves



# SM Series Dimensions

NEMA Size 16 — Inches (mm)

See pages 11 – 15 for further connector details



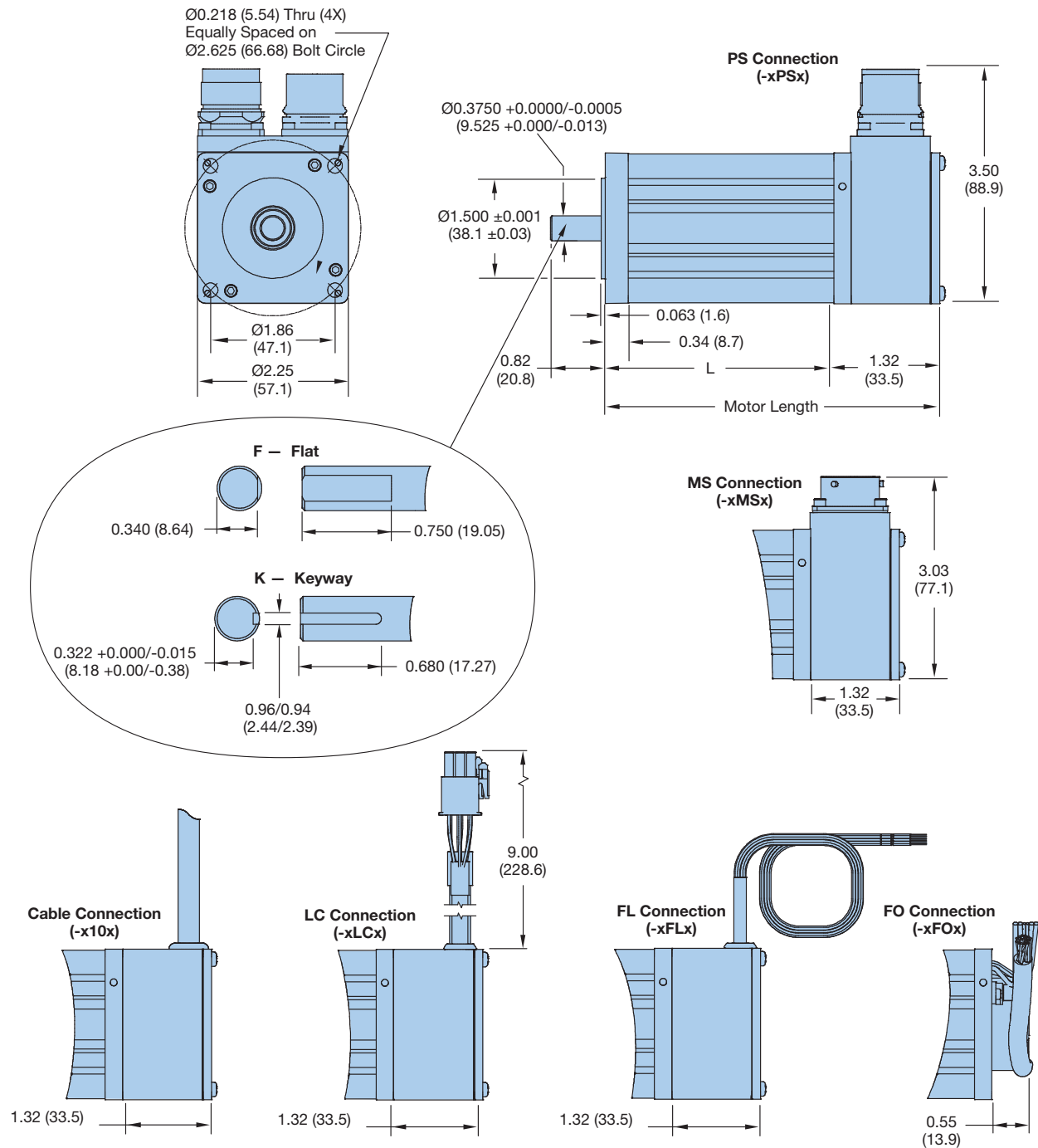
Motor Size	Dimension "L"	Motor Length (by Connection Type)		
		PS & MS	Cable, FL, LC	FO
SM161	2.48 (62.9)	4.40 (111.7)	3.81 (96.7)	3.03 (76.9)
SM162	3.48 (88.3)	5.40 (137.1)	4.81 (122.1)	4.03 (102.3)



# SM Series Dimensions

NEMA Size 23 — Inches (mm)

See pages 11 – 15 for further connector details



Motor Size	Dimension "L"		Motor Length (by Connection Type)			
	Standard	With Brake	PS, FL, LC, Cable & MS		FO	
			Standard	With Brake	Standard	With Brake
SM231	2.67 (67.8)	3.85 (97.7)	3.99 (101.3)	5.17 (131.3)	3.22 (81.7)	4.40 (111.7)
SM232	3.67 (93.2)	4.85 (123.1)	4.99 (126.7)	6.17 (156.7)	4.22 (107.1)	5.40 (137.1)
SM233	4.67 (118.6)	5.85 (148.5)	5.99 (152.1)	7.17 (182.1)	5.22 (132.5)	6.40 (162.5)



# SM Series - Recommended Drives

Recommended Parker Drives for SM Series Motor  
(AC powered)

Frame Size	SM Model Size	P Series	IPA	Compax3
NEMA 16	SM161AE or SM161AL	PD-04	IPA04-HC	S025V2F12
	SM162AE or SM162AL	PD-04	IPA04-HC	S025V2F12
NEMA 23	SM231AE or SM231AL	PD-04	IPA04-HC	S025V2F12
	SM232AE or SM232AL	PD-04	IPA04-HC	S025V2F12
	SM233AE or SM233AL	PD-04	IPA04-HC	S025V2F12
	SM231AR	—	—	S025V2F10
	SM232AR	—	—	S025V2F10
	SM233AR	—	—	S025V2F10



Recommended Parker Drives for SM Series Motor  
(DC powered)

Frame Size	SM Model Size	ACR7000 Servo
NEMA 16	SM161BE or SM161BL	ACR74V-A5V4 or ACR78V-A5V4
	SM162BE or SM162BL	ACR74V-A5V4 or ACR78V-A5V4
	SM231BE or SM231BL	ACR74V-A5V4 or ACR78V-A5V4
NEMA 23	SM232BE or SM232BL	ACR74V-A5V4 or ACR78V-A5V4
	SM233BE or SM233BL	ACR74V-A5V4 or ACR78V-A5V4



# SM Series - Cable Options

## Power Cables

SM Model Size	SM Pin Connector Type		
	PS - Standard Drives	PS - P Series Drives	MS or GS - All Drives
SM16 (all models)	P-1A1-XX	P-1A1P-XX	71-018304-XX
SM23 (all models)	P-1A1-XX	P-1A1P-XX	71-018304-XX

P-1A1 power cable has 6 conductors (3 phases, 1 ground, 2 brake leads).

P-1A1P power cable is for use with P series drives and has extended ground wire to reach drive ground lug (heatsink).

Brake leads included in either cable and not used when motor does not have a brake.

Parker motors include brake rectifier preventing miswiring of the brake leads and either brake wire (red/blue) can be used as + or -

## High Flex Power Cables

SM Model Size	SM Connector Type	
	PS - Standard Drives	PS - P Series Drives
SM16 (all models)	PH-1A1-XX	PH-1A1P-XX
SM23 (all models)	PH-1A1-XX	PH-1A1P-XX

## Feedback Cables (with Parker drive-compatible terminations)

Feedback Option	SM Pin Connector Type with Drive Compatible Termination					
	PS				GS (No Brake)	GS (w/Brake)
	IPA/ACR7	P Series	Compax3/PSD	Gemini	Gemini	Gemini
J 2000 line Incremental Encoder	F-1A1-XX	F-4A1-xx	F-2C1-XX*	F-3C1-XX	71-018308-XX	71-018309-XX
L 5000 line Incremental Encoder	F-1A1-XX	F-4A1-xx	F-2C1-XX*	F-3C1-XX	71-018308-XX	71-018309-XX
R Resolver	—	—	F-2B1-XX	F-3D1-XX	71-018307-XX	71-018307-XX

\*PSD requires rev E or newer cable. Existing cables may need to be replaced (check label). New cables are rev E.

## Feedback Cables (with pin connector one end and flying leads)

PS Connector	F-9F1-XX
MS with Encoder*	71-015871-XX
MS with Resolver*	71-015870-XX

\*Include brake leads, whether or not the motor has a brake.

## High Flex Feedback Cables

SM Model Size	SM Pin Connector Type with Drive Compatible Termination		
	IPA/ACR7	Compax3/PSD	Gemini
SMxxxxE-xPSx	FH-1A1-xx	FH-2C1-XX*	FH-3C1-XX
SMxxxxR-xPSx	—	FH-2B1-XX	FH-3D1-XX

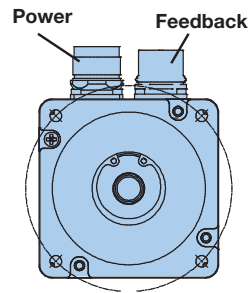
## High Flex Feedback Cables (with pin connector one end and flying leads)

PS Connector	FH-9F1-XX
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# SM Series Options

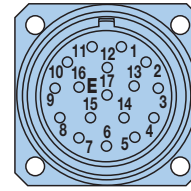
## PS – Parker Standard (-xPSx) Pin Connections

The PS connector option for the SM motors features high-quality Hypertac - Interconnectron circular connectors mounted to the motor body.



Mating cables are specified and ordered separately. The PS option joins the motor phase wires and brake leads into one connector. The second connector has motor feedback signals, hall effect signals, and thermistor signals. The Parker Standard connectors are rated to IP65.

Note: On SM and BE motors, connectors have a straight mount. On MPP motors, PS connectors are a right-angle mount and can be fully rotated. This allows for greater cable routing options.



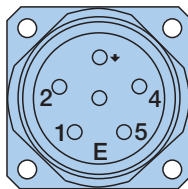
Feedback

**Feedback Connector**  
PN: 43-025367-01

**Mating Connector**  
PN: 43-021660-01

### PS Resolver (R) Pin Connections

Designation	Motor Feedback Pin Connector #
Sin+	2
Sin-	1
Cos+	11
Cos-	12
Ref+	14
Ref-	17
Temp	9
Temp	13



Power

**Size 1.0 Power Connector**  
PN: 43-024091-01

**Mating Connector**  
PN: 43-021659-01

### PS Incremental Encoder/Hall (J and L) Pin Connections

Designation	Motor Feedback Pin Connector #
Vcc	8
Gnd	7
CH A+	2
CH A-	1
CH B+	11
CH B-	12
Index +	15
Index -	16
Temp	13
Temp	9
Hall Gnd	7
Hall +5V	8
Hall 1	4
Hall 2	5
Hall 3	6

### PS Power & Brake Pin Connections

Designation	1.0 Motor Power Pin Connector #	Drive Connection
Phase A	1	U
Phase B	2	V
Phase C	6	W
Gnd	3	⊥
Shield	3	⊥
Brake	4	+
Brake	5	-

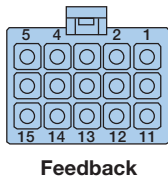
NOTE: Brake will operate regardless of polarity of connection

NOTE: For customers preferring to build their own mating cables, a PS connector kit (Part #: PS-CONN-KIT), is available. The kit contains a mating PS power connector, PS feedback connector and connector pins, allowing customers to build cables to their own specification. Special tools are not included in the kit.

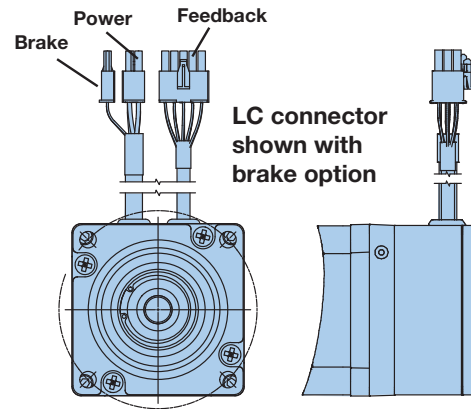
# SM Series Options

## LC – Low Cost (-xLCx) Pin Connections

The LC connector option for the SM motors features a high-quality and low cost molded connector. This option uses the very common Amp, or Tyco brand of connectors on the ends of 8" motor and feedback cables. These connectors are usually available from most electrical supply houses.



**Feedback Connector**  
Tyco 172171-1  
**Mating Connector**  
Tyco 172163-1  
**Mating Pin (F) Connector**  
Tyco 170362-1



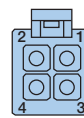
**LC connector shown with brake option**

The LC connector option is available on all SM size 16 and 23 stack length motors. The feedback type selections that are available with the LC option are J (incremental encoder) and R (resolver) feedback options.

The LC connections support the brake option for SM motors. When the brake option is ordered, the motor ships with three individual connectors: One for feedback, one for power and the last for the brake. Without a brake, the motor only comes with the feedback and power connectors.

### LC Resolver (R) Pin Connections

Designation	Motor Feedback Pin Connector #
Sin+	8
Sin-	7
Cos+	12
Cos-	11
Ref+	4
Ref-	15
Temp	6
Temp	10



**Power Connector:** Tyco 172167-1  
**Mating Connector:** Tyco 172159-1  
**Mating Pin (F) Connector:** Tyco 170362-1

**Power**

### LC Incremental Encoder/Hall (R) Pin Connections

Designation	Motor Feedback Pin Connector #
Index +	1
Index -	2
Gnd	3
Hall Gnd	3
Hall +5V	5
Vcc	5
Temp	6
CH A -	7
CH A +	8
Hall 1	9
Temp	10
CH B -	11
CH B +	12
Hall 2	13
Hall 3	14

### LC Power (J and R) Pin Connections

Designation	Motor Power Pin Connector #
Phase A	1
Phase B	2
Phase C	3
Gnd	4



**Brake Connector:** Tyco 1721765-1  
**Mating Connector:** Tyco 172157-1  
**Mating Pin (F) Connector:** Tyco 170362-1

**Brake**

### LC Brake (J and R) Pin Connections

Designation	Motor Brake Pin Connector #
Brake	1
Brake	2

NOTE: Brake will operate regardless of polarity of connection

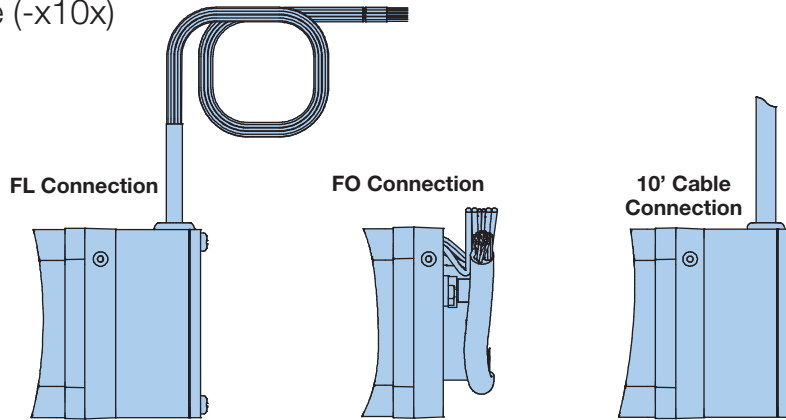
# SM Series Options

Wiring Connections for:

FL – Flying Leads with Enclosed Feedback (-xFLx)

FO – Flying Leads with Exposed Feedback (-xFOx)

10 – 10' Cable (-x10x)



## FO/FL Flying Leads

The FO/FL cable option for the SM motors features flying leads for both feedback and power connections. The only variable is whether or not the feedback device is fully enclosed (FL) or fully exposed (FO).

These options are for OEM customers that wish to reduce cost as much as possible and fully integrate their own cable solutions.

## 10 - 10' hard wired cable

The "10" cable option for the SM motors uses the standard Parker cable hard wired into the rear of the motor. The cables have full strain relief and completely enclosed feedback. While custom lengths are available, it is not recommended to exceed 10 feet between motor and drive.

## FL and FO Cable Motor Power, Motor Feedback and Brake (J) Wiring Connections

Designation	Wire Color
Vcc	Red
Gnd	Black
CH A +	Yellow
CH A -	Yellow/White
CH B +	Blue
CH B -	Blue/White
Index +	Orange
Index -	Orange/White
Brake	Red/Blue
Brake	Red/Blue
Temp	Yellow/Orange
Temp	Yellow/Orange
Hall Gnd	Green/White
Hall +5V	Brown/White
Hall 1	Brown
Hall 2	Green
Hall 3	Violet
Phase A	Red/Yellow
Phase B	White/Yellow
Phase C	Black/Yellow
Gnd	Green/Yellow

## 10' Cable Motor Power, Motor Feedback and Brake (J) Wiring Connections

Designation	Wire Color
Vcc	Red
Gnd	Black
CH A +	Yellow/Brown
CH A -	White/Yellow
CH B +	Brown
CH B -	White
Index +	Green
Index -	Yellow
Brake	Gray/Brown
Brake	White/Gray
Temp	Pink/Brown
Temp	White/Pink
Hall Gnd	Blue
Hall +5V	Violet
Hall 1	White/Green
Hall 2	Brown/Green
Hall 3	Gray/Pink

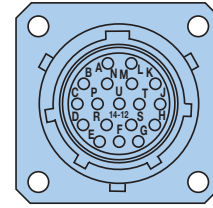
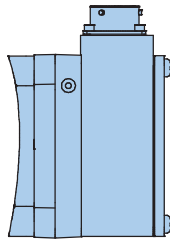
NOTE: Brake will operate regardless of polarity of connection

# SM Series Options

## MS – Military Style (-xMSx) Pin Connections

The “MS” connection option for the SM Series motors provides quick disconnect, bayonet style connectors attached to the motor body.

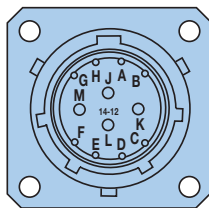
Mating cables are specified and ordered separately.



**Feedback**

With the “MS” connection option, the motor phase wires are in one connector, and the hall, encoder, temperature switch, and brake wires are in the other connector. This option works well when using an amplifier with a built-in controller, or when all cables enter into a cabinet or enclosure and then are wired into a terminal strip.

When specifying the “R” (resolver) feedback option, the motor phase wires reside in one connector, the resolver signal, temperature switch, and brake wires in the other.



**Power**

### MS Power Pin Connections

Designation	Motor Power Pin Connector Letter
Phase A	J
Phase B	K
Phase C	L
Gnd	M
Temp*	G
Temp*	H

Motor Power connector part number:  
Amphenol CONN PT06E-14-12P(023)

Feedback connector part number:  
Amphenol CONN PT02E-14-18S(023)

### MS Resolver and Brake (R) Pin Connections

Designation	Motor Feedback Pin Connector Letter
Sin+	L
Sin-	G
Cos+	E
Cos-	J
Ref+	C
Ref-	U
Brake	S
Brake	T
Temp	R
Temp	N

NOTE: Brake will operate regardless of polarity of connection

### MS Incremental Encoder/Hall and Brake (E and L) Pin Connections

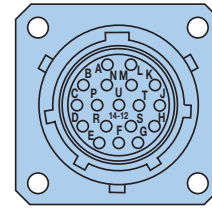
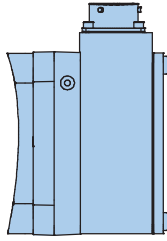
Designation	Motor Feedback Pin Connector Letter
Vcc	H
Gnd	G
CH A+	A
CH A-	B
CH B+	C
CH B-	D
Index +	E
Index -	F
Temp*	L
Temp*	N
Brake	R
Brake	S
Hall Gnd	K
Hall +5V	M
Hall 1	T
Hall 2	U
Hall 3	P

NOTE: Brake will operate regardless of polarity of connection

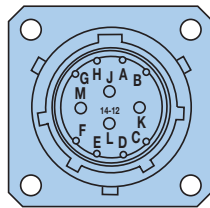
# SM Series Options

## GS – Gemini Amp Series Connection (-xGSx)

The “GS” connection option for the SM Series motors provides quick disconnect, bayonet style connectors attached to the motor body. Mating cables are specified and ordered separately. Wiring for the “GS” connection option for SM motors is similar to the “MS” option, except the temperature switch leads have been moved to the feedback connector. This connection option should be selected when operating the SM motors with the Gemini family of amplifiers.



**Feedback**



**Power**

### GS Motor Wiring Connections

Designation	Pin Connector # MS14-12	Wire Color
Phase A	J	Black 1
Phase B	K	Black 2
Phase C	L	Black 3
Gnd	M	Green/Yellow

### GS Encoder/Hall Feedback Wiring Connections

Designation	Pin Connector # MS14-18	Wire Color
Encoder +5	H	Red
Encoder Ground	G	Black
CH A +	A	White
CH A -	B	Yellow
CH B +	C	Green
CH B -	D	Blue
Index +	E	Orange
Index -	F	Brown
Hall Ground	K	White/Green
Hall +5	M	White/Blue
Hall 1	T	White/Brown
Hall 2	U	White/Orange
Hall 3	P	White/Violet
Brake*	R	Red/Blue
Brake*	S	Red/Blue
Temp	L	Orange/Yellow
Temp	N	Orange/Yellow

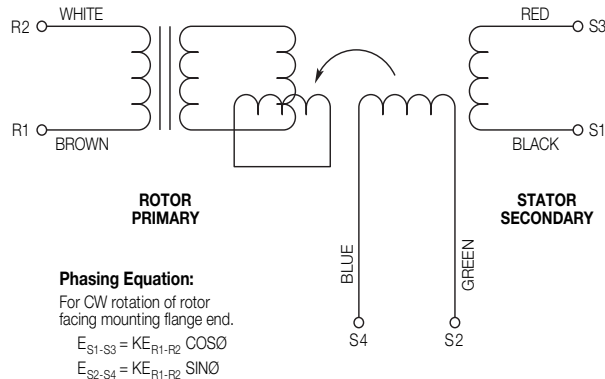
\*Brake will operate regardless of polarity of connection



# SM Series Options

## Feedback Options

### Resolver Schematic



### Resolver Specifications

Parameter	Value	
Input	Voltage @ 7 kHz	4.25 volts
	Current, max	55 mA
	Power, nom	0.12 watts
Impedance	ZSO*	58+j145 ohms
	ZRO	53+j72 ohms
	ZRS	42+j55 ohms
	ZSS	50+j128 ohms
Transformation Ratio	0.470 ±5%	
Output Voltage	2.0 ±5% volts	
DC Resistance	Rotor	23 ±10% ohms
	Stator	19 ±10% ohms
Sensitivity	35 mV/°	
Max Error from EZ	±10 minutes	
Phase Shift, Open Circuit	5° leading, ±3"	
Null Voltage, total	20 mV rms	
Inertia	See motor specification	

\* @ 90°C

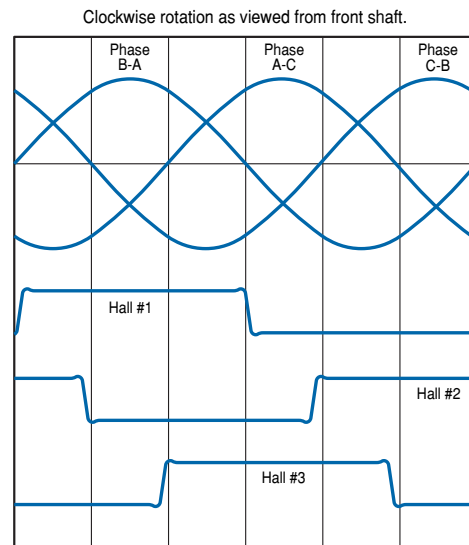
### Encoder Specifications

Parameter	Value	
Mechanical Accuracy	±2 min of arc	
Electrical	Input Power	5 VDC ±5%, 108 mA
	Operating Frequency	500 kHz max
	Output Device	AM26C31DBR
	Sink/Source, nom	20 mA
	Suggested User Interface	26LS32

### Hall-Effect Specifications

Parameter	Value	
Mechanical Accuracy	±2 min of arc	
Electrical	Input Power	5 VDC ±5%, 80 mA
	Output Device, Open Collector	LM339
	Sink	4 mA

### Commutation Chart



## Electrically-Released Brake

	Size 23
Static rated torque – lb-in	10
Coil voltage – VDC	24
Coil current – amps	0.38
Weight – lbs	0.7
Inertia – lb-in-sec <sup>2</sup>	1.87 E-05
Engage/Disengage Time – msec	10/20

# SM Series Ordering Information

Fill in an order code from each of the numbered fields to create a complete model order code.

① ② ③ ④ ⑤ ⑥ ⑦

Order Example: SM 231 A E - N PS N

## ① Series

SM Brushless Servo Motors

## ② Frame (Magnet Length)

161 Size 16 frame, 1 stack magnet  
162 Size 16 frame, 2 stack magnet  
231 Size 23 frame, 1 stack magnet  
232 Size 23 frame, 2 stack magnet  
233 Size 23 frame, 3 stack magnet

## ③ Winding

A 16 or 23  
B 16 or 23

## ④ Feedback

E 1000 ppr encoder\*  
L 5000 line encoder\*  
R Resolver\*\*

\*Includes Hall-effect

\*\*Not available on any size 16 Frame

## ⑤ Shaft Options

N Normal  
F Flat  
K Keyway\*

\*Not available on size 16 motors

## ⑥ Connection

PS Parker standard connectors, all feedback options  
LC Low cost connectors  
10 10 ft. (3m) cable\*  
FL Flying leads (housed feedback)  
FO Flying leads (exposed feedback)  
MS Military style  
GS Gemini amp series \*\*

\*Cable is hard-wired

\*\*See amplifier sections for specific motor/amplifier compatibility

## ⑦ Options

N None  
B 24 V failsafe spring brake\*  
BV 24V failsafe spring Brake with IP 65 shaft seal  
V IP 65 shaft seal\*\*

\*Available on 23 frame with any connector option except FO, not available on 16 frame.

\*\*Available with PS, LC, MS or GS connectors only, not available on size 16 frame.

## Need more torque? Use a Parker gearhead!

### Gearhead Advantages

- Multiply torque allowing smaller motors (and drives) to be used, saving \$\$
- Reduce the reflected inertial load to the motor, making it easier to tune and increase stiffness and stability
- Have high sideload capacity
- Increase low speed smoothness
- Shorten inline length with right-angle gearheads



Parker Gen II Stealth gearheads are designed with helical planetary gears that provide low backlash, high-stiffness, high torque and long life. Stealth gearheads are ideal for high performance applications.

Parker PV series gearheads are standard-grade gearheads with high sideload capacity and the power of a planetary gearhead in a cost-effective solution.

# Electromechanical Product Sales Offices

## Australia

**Parker Hannifin (Australia) Pty Ltd.**  
9 Carrington Road  
Castle Hill NSW 2154  
Australia  
Tel: +61 (0) 2 9634-7777  
Fax: +61 (0) 2 9634 3749

## Brazil

**Parker Hannifin Ind. Com Ltda.**  
Av. Lucas Nogueira Garcez 2181  
Esperança  
12325-900 Jacareí, SP  
Tel: 12 3954 5100  
Fax: 12 3954 5262  
Email: automation.brazil@parker.com

## Canada

**Parker Hannifin (Canada) Inc.**  
160 Chisholm Dr  
Milton, Ontario L9T 3G9  
Tel: 905-693-3000  
Fax: 905-876-1958  
Email: miltoncustservice@parker.com

## China

**Parker Hannifin Motion & Control**  
(Shanghai) Co., Ltd  
280 Yunqiao Rd. Jin Qiao Export  
Processing Zone  
Shanghai 201206, China  
Tel: (86-21) 50312525  
Fax: (86-21) 64459717

## France

**Parker SSD Parvex**  
8 avenue du Lac  
B.P. 249  
F-21007 Dijon Cedex  
Tel: +33 (0) 3 80 42 41 40  
Fax: +33 (0) 3 80 42 41 23

## Germany

**Electromechanical Europe**  
**Parker Hannifin GmbH & Co KG**  
Robert-Bosch-Strasse 22  
D-77656 Offenburg  
Germany  
Tel: +49 (0) 781 509 0  
Fax: +49 (0) 781 509 98176  
Email: em-motion@parker.com

## India

**Parker Hannifin India Pvt. Ltd**  
**Automation Group-SSD Drives Div.**  
133 & 151 Developed Plots Estate  
Perungudi, Chennai 600 096  
Tel: 044-4391-0799  
Fax: 044-4391-0700

## Italy

**Parker Hannifin SpA**  
Via Gounod 1  
20092 Cinsello Balsamo  
Milano, Italy  
Tel: +39 02 361081  
Fax: +39 02 36108400  
Email: em-motion@parker.com

## Korea

Parker Hannifin Korea  
9th Floor KAMCO Yangjae Tower  
949-3 Dogok 1-dong Gangnam-gu  
Seoul 135-860, Korea  
Tel: 82-2-559-0454  
Fax: 82-2-556-8187

## Mexico

**Parker Hannifin de Mexico**  
Eje uno Norte No.100  
Parque Industrial Toluca 2000  
Toluca, CP 50100 México  
Tel: 52-722-275-4200  
Fax: 52-722-279-0316

## Singapore

**Parker Hannifin Singapore Pte Ltd**  
11, Fourth Chin Bee Road  
Singapore 619702  
Tel: (65) 6887 6300  
Fax: (65) 6265 5125/6261 4929

## Taiwan

**Parker Hannifin Taiwan Co., Ltd**  
No. 40, Wuchiuan 3rd Road  
Wuku Industrial Park  
Taipei County, Taiwan 248  
ROC  
Tel: 886 2 2298 8987  
Fax: 886 2 2298 8982

## Thailand

**Parker Hannifin (Thailand) Co., Ltd.**  
1265 Rama 9 Road  
Suanluang, Bangkok 10250  
Thailand  
Tel: (66) 2 186 7000  
Fax: (66) 2 374 1645

## UK

**Parker Hannifin Ltd.**  
Tachbrook Park Drive  
Tachbrook Park  
Warwick CV34 6TU  
Tel: +44 (0) 1926 317970  
Fax: +44 (0) 1926 317980

## USA

**Parker Hannifin Electronic Motion**  
**and Controls Division**  
1140 Sandy Hill Road  
Irwin, PA 15642  
Tel: 800-358-9070  
Email: emn\_support@parker.com

## Parker Hannifin Hydraulic Pump & Power Systems Division

2101 N. Broadway  
New Ulm, MN 56073  
Tel: 800-358-9070  
Email: emn\_support@parker.com



SM Series:  
Made in the USA

