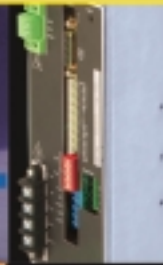


Product Manual

Put Your Ideas
In Motion.



BAYSIDE[®]
MotionGroup
PRECISION IN MOTION

Brushless Servo Motor
Product Manual



BM Series Brushless Servo Motor

Product Manual

Rev: 3.1 / 702
P/N: 12197008

Please check www.baysidemotion.com for latest revisions.

Product Manual

BM Series

Brushless Servo Motor Manual

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I. Introduction

Thank you for purchasing the Bayside BM Series Brushless Servo Motor. The BM Series brushless servo motors are high performance rare earth based products providing exceptional torque and efficiency in a compact, rugged package.

This manual provides installation and maintenance information for the:

- BM60 Series
- BM90 Series
- BM115 Series
- BM142 Series

If there are any questions regarding the installation of your product, please contact Bayside Motion Group Technical Services at (516)484-5353, for additional support.

II. Packaging

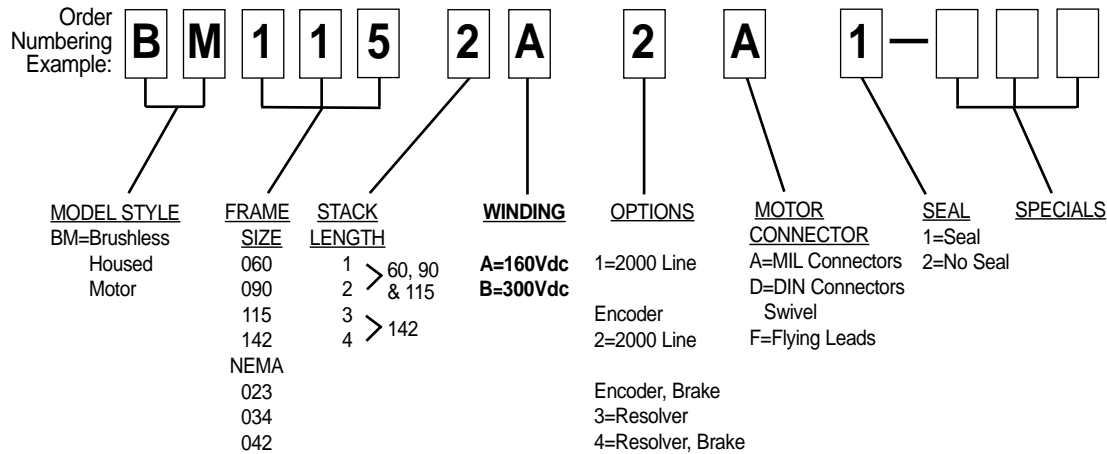
Standard servo motors are wrapped in plastic and packaged in a cardboard box, with environmentally safe, foam-in-place padding. The cardboard box may be recycled and the packing material can be disposed of normally. In some cases, quantity shipments may be provided in wooden crates.

Standard servo motors will arrive with a key pressed into the output shaft. If the key must be removed, do not apply shock loading to the output shaft. The motor can also be ordered without the key.

III. Electrical Specifications

Motor

Standard motors are provided with a single or double stack motor winding, for 160 vdc or 300 vdc operation. To identify the specific winding please refer to the following model number definition.



Call 1-800-305-4555 for application engineering assistance or for the name of your local distributor.

Motor Specifications

PART NO.	STACK LGTH	NO. OF POLES	WDG VOLTS	CONT. STALL TORQUE T _c	PEAK TORQUE T _p	TORQUE CON. K _t	THERMAL RES. O	INDUCT L	COLD RES.	MAX OUTPUT SPEED	WEIGHT W/O BRAKE	WITH BRAKE	INERTIA W/O BRAKE	WITH BRAKE
	(mm)		(volts)	(Nm)	(Nm)	(Nm/amp)	(°c/w)	(mH)	(ohms)	(RPM)	(Kg)	(Kg)	(Kg-cm ²)	(Kg-cm ²)
BM060	38.1	6	160	.54	1.63	.22	1.93	7.99	7.55	6800	1.5	1.8	.0931	.098
BM060	38.1	6	300	.54	1.63	.45	1.93	31.95	29.9	6400	1.5	1.8	.0931	.098
BM060	76.2	6	160	.86	2.58	.22	1.93	3.99	3.01	6800	2.08	2.42	.1486	.1536
BM060	76.2	6	300	.86	2.58	.45	1.93	15.97	12.15	6400	2.08	2.42	.1486	.1536
BM090	38.1	8	160	1.86	5.57	.26	1.055	2.90	1.61	5800	3.48	4.3	.5582	.5933
BM090	38.1	8	300	1.86	5.57	.52	1.055	12.0	6.43	5500	3.48	4.3	.5582	.5933
BM090	76.2	8	160	2.97	8.90	.26	1.055	1.44	.63	5700	4.83	5.64	.7103	.7454
BM090	76.2	8	300	2.97	8.90	.52	1.055	5.78	2.52	5350	4.83	5.64	.7103	.7454
BM115	38.1	12	160	4.65	14.0	.27	.61	1.09	.47	5700	4.68	5.72	2.366	2.401
BM115	38.1	12	300	4.65	14.0	.54	.61	4.36	1.87	5350	4.68	5.72	2.366	2.401
BM115	76.2	12	160	7.92	23.8	.28	.61	0.55	.18	5700	5.85	6.9	4.279	4.314
BM115	76.2	12	300	7.92	23.8	.54	.61	2.18	.73	5350	5.85	6.9	4.279	4.314
BM142	63.5	12	300	12.5	37.4	.61	.50	2.07	.35	4500	14.82	18.6	11.825	12.767
BM142	127	12	300	21.9	66.0	.61	.45	2.33	.34	3000	22	25.78	22.794	23.795

*Specifications are subject to change without notice.

Maximum case temperature: Maximum case temperature depends on RMS motor dissipation, mounting surface temperature and ambient temperature.

All motor speed/torque curves and ratings are based on 25 deg C ambient with a winding temperature of 155 deg C, at stall. Ambient temperatures above 25 deg C will require de-rating. Consult Bayside Motion Group Technical Services at (516) 484-5353 for application assistance.

Encoder

The standard encoder is a 2000 line rotary encoder, providing 8000 pulses per revolution, post quadrature and commutation signals.

Electrical Characteristics

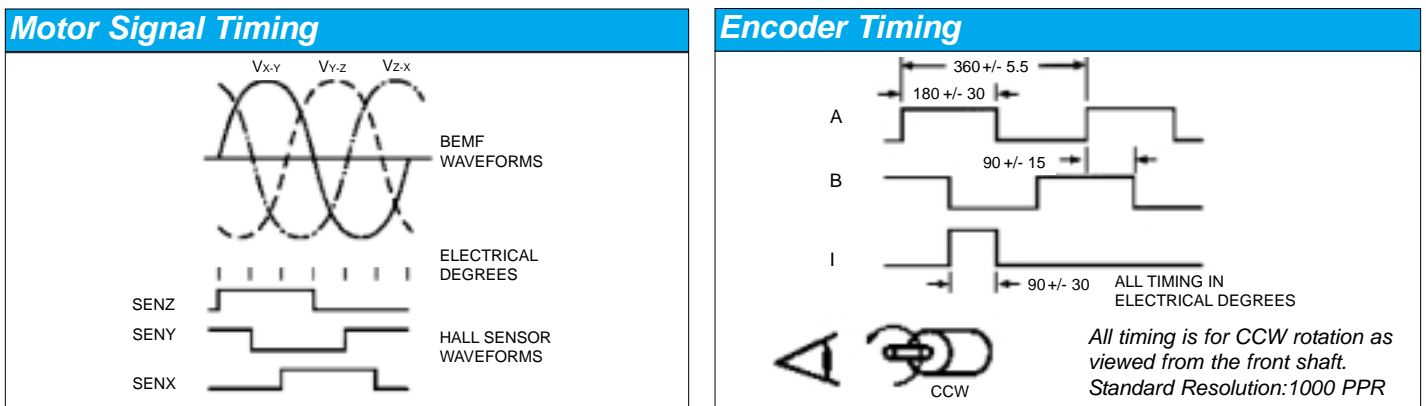
Supply Voltage	5Vdc +/- 10% at 60mA maximum
Output Format	Dual channel quadrature plus index; diff line driver Commutation, X, Y & Z; TTL
Frequency Response	125 kHz

Environmental Conditions

Operating Temperature	-40 to 100 deg C
Storage Temperature	-40 to 100 deg C

Signal Timing

The following chart shows the timing of the commutation signals in relation to the motor bemf. See section IV, Wiring, for signal pin designations.



Resolver

The standard brushless resolver is for use with typical R/D (resolver to digital) converters. The resolver is a single cycle type, having 1 resolver cycle per revolution of the motor shaft.

Electrical Characteristics

Nominal Frequency	5000 Hz
Input Voltage	4 to 12 Vrms
Input Current	23 mA max @ 4V
Impedance ZRO	105 + J170 ohms
Impedance ZRS	95 + J140 ohms
Impedance ZSO	200 + J270 ohms
Impedance ZSS	185 + J220 ohms
Transformation Ratio	.5 (+/- 10%)
Output Voltage	2 to 6 (+/- 10%)
DC Rotor Resistance	41 ohms (+/- 15%)
DC Stator Resistance	94 ohms (+/- 15%)
Sensitivity	35 mV/deg

Environmental Conditions

Operating Temperature	-55 to 155 deg C
-----------------------	------------------

Signal Timing

The start of the S1-S3 resolver signal is coincident with the start of the X-Y bemf motor signal.

Brake

The brake is fail safe type, i.e. braking action occurs when power is removed. Therefore, for motor rotation, the brake must be electrically energized.

Power requirements are:

BM060	24 vdc @ 0.19 amp
BM090	24 vdc @ 0.3 amp
BM115	24 vdc @ 0.3 amp
BM142	TBD

IV. Wiring

Motor Power Connector (DIN Connector)

BM60 / BM90 / BM115 / BM142

Pin	Signal
1	Phase U (X)
4	Phase V (Y)
3	Phase W (Z)
2	Chassis Gnd
A	Thermistor +
B	Thermistor -
C	Brake
D	Brake

Description:

Rotateable angle receptacle with axial sealing to the Motor

8 Contact Male
20 Amp
4 Pins (20-16) AWG
4 Pins (26-18) AWG
Shell Size: LEOB
Flange Mtg hole 2.7mm

Mating Connector

Straight Plug Female Connector with cable clamp from OD 5.5 to 12mm

Bayside #	Hypertac # ⁽¹⁾	Qty.	Description
10318017	LPA08BFRKB170	1	Connector & Clamp
10966032	020.232.2000	4	Socket Pin (26-18) AWG
10966035	020.090.1020	4	Socket Pin (20-16) AWG

(1) Hypertac Interconnectron are used by Bayside.

Motor Power Cable Options (DIN Connector)

The following mating power cables are available to enable connecting the motor to your controller. The cables have mating connector at the motor end and flying leads at the controller end.

BM Power Cable (DIN Connector)

Circular	Connector	Cable Wire
Pin	Function	Color Code
1	Phase U (X)	Black #1
4	Phase V (Y)	Black #2
3	Phase W (Z)	Black #3
2	Chassis Gnd	Green/Yellow
A	Thermistor +	Black #5
B	Thermistor -	Black #6
C	Brake +	Black #7
D	Brake -	Black #8
--	Shield	Drain

Power cables with flying leads
3m length 10963093 Rev A
8m length 10963117 Rev A

Motor Sensor Connector (DIN Connector)

BM60 / BM90 / BM115 / BM142

<p>Description: Rotateable angle receptacle with axial sealing to the Motor.</p> <p>17 Contact Male 9 Amp (26-18) AWG Shell Size: SFMB Mtg hole for Flange: 2.7mm</p>
--

<p>Mating Connector Straight Plug Female Connector with cable clamp from OD 5.5 to 12mm</p>			
Bayside #	Hypertac # ⁽¹⁾	Qty.	Description
10318018	SPNA17HFRON	1	Connector & Clamp
10966033	020.256.1020	13	Socket Pin (26-18) AWG

Sensor Cable Options (DIN Connector)

The following mating sensor cables are available to enable connecting the motor to your controller. The cables have mating connector at the motor end and flying leads at the controller end, or D type connector if you use Bayside i-Drive.

Sensor cables with flying leads

Encoder

Cable Color Code	Encoder/Halls	Pin #
Black	A+	1
Red	B+	2
Brown/Green	+5V	7
Shielding	SHIELD	8
Violet	A-	9
Blue	B-	10
White/Green	GND	15
Grey/Pink	SPARE	12
Brown	1+	5
White	1-	13
Yellow	S1	3
Green	S2	11
Red/Blue	S3	4
White/Yellow	T1	16
Yellow/Brown	T2	17

Sensor cables with flying leads

Resolver

Cable Color Code	Resolver	Pin #
Black	S1 (SIN+)	1
Red	S4 (COS+)	2
Brown/Green	R2 (REF+)	7
Shielding	SHIELD	8
Violet	S3 (SIN-)	9
Blue	S2 (COS-)	10
White/Green	R1 (REF-)	15
Grey/Pink	SPARE	12
Brown		5
White		13
Yellow		3
Green		11
Red/Blue		4
White/Yellow	T1	16
Yellow/Brown	T2	17

Sensor cables with flying leads

3m length 10963094 Rev B

8m length 10963123 Rev A

(1)Hypertac Connector are used by Bayside.

Sensor Cable Options (DIN Connector)

Sensor cables using Bayside i-Drive Encoder

Color Code	Encoder Halls	15 D Conn	Pin #
Black	A+	1	1
Red	B+	2	2
Brown/Green	+5V	7	7
Shielding	SHIELD	8	8
Violet	A-	9	9
Blue	B-	10	10
White/Green	GND	15	15
Grey/Pink	SPARE	--	12
Brown	1+	5	5
White	1-	13	13
Yellow	S1	--	3
Green	S2	--	11
Red/Blue	S3	--	4

Sensor cables using Bayside i-Drive Resolver

Color Code	Resolver Function	15 D Conn	Pin #
Black	S1 (SIN+)	1	1
Red	S4 (COS+)	2	2
Brown/Green	R2 (REF+)	7	7
Shielding	SHIELD	8	8
Violet	S3 (SIN-)	9	9
Blue	S2 (COS-)	10	10
White/Green	R1 (REF-)	15	15
Grey/Pink	SPARE	--	12
Brown		5	5
White		13	13
Yellow		--	3
Green		--	11
Red/Blue		--	4

Sensor cables using Bayside i-Drive
3m length 10963096 Rev B
8m length 10963118 Rev A

**Motor Power Connector
(MIL Connector)**

BM60

Pin	Signal
A	Phase U (X)
B	Phase V (Y)
C	Phase W (Z)
D	Chassis Gnd
E	Brake
F	Brake

Description:

6 Pins #20 Contact (Male)
7.5 amp.
20-24 AWG
Shell Size: 10
Mtg Flange: 0.954 (24.23) square

Mating Connector

Straight Plug - (Female)

Part Numbers:

Array	PW06F10-6S
Bendix	PT06E10-6S(SR)
Cannon *	KPT06J10-6S
Amphenol	PT06E10-6S(SR)
Military	MS3116F10-6S

BM90 / BM115 / BM142

Pin	Signal
A	Phase U (X)
B	Phase V (Y)
C	Phase W (Z)
D	Chassis Gnd
E	Brake
F	Brake
G	Spare

Description:

7 Pins #12 Contact (Male)
23 amp.
12-14 AWG
Shell Size: 10
Mtg Flange: 1.531 (38.89) square

Mating Connector

Straight Plug - (Female)

Part Numbers:

Cannon *	CA3106E20-15SB
----------	----------------

* Cannon Connectors are used by Bayside.

Motor Power Cable Options (MIL Connector)

The following mating power cables are available to enable connecting the motor to your controller. The cables have mating connector at the motor end and flying leads at the controller end.

BM60 Power Cable

Pin	Signal	Cable Wire	Terminal Block Pin #
A	Phase U (X)	Red	3
B	Phase V (Y)	Black	2
C	Phase W (Z)	White	1
D	Chassis Gnd	Green	4
E	Brake	Orange	--
F	Brake	Blue	--
--	Shield	Drain	--

Power cables for Bayside Digital Drive

3m length 10963051 Rev B

8m length 10963052 Rev B

Power cable with flying leads.

3m length 10963013 Rev B

8m length 10963059 Rev B

BM90, BM115 & BM142 Power Cable

Circular Pin	Connector Function	Cable Wire Color Code	Terminal Block Pin #
A	Motor Phase U (X)	Black #1	3
B	Motor Phase V (Y)	Black #2	2
C	Motor Phase W (Z)	Black #3	1
D	Chassis Gnd	Green/Yellow	4
E	Brake	Black #4	--
F	Brake	Black #5	--
G	Spare	--	--
--	Spare	Black #6	--
--	Shield	Drain	--

Power cables for Bayside Digital Drive

3m length 10963064 Rev B

8m length 10963065 Rev B

Power cables with flying leads

3m length 10963021 Rev B

8m length 10963061 Rev B

Sensor Cables & Connector Details (MIL Connector)

Description:

19 Pins #20 Contact (Male)
7.5 amp.
20-24 AWG
Shell Size: 14
Mtg Flange: 1.141 (28.98) square

Mating Connector

Straight Plug - (Female includes Pins)

Part Numbers:

Array	PW06F14-19S
Bendix	PT06E14-19S(SR)
Cannon *	KPT06J14-19S
Amphenol	PT06E14-19S(SR)
Military	MS3116F14-19S

Sensor Cables Options

Encoder

Cable Pair #	Color Code	Function	Conn. Pin #	Molex Pin #
1	Black	Gnd	N	11
	Red	+ 5V	L	12
2	Black	T1	M	14
	White	Mtr Hall 1 (x)	B	10
3	Black	T2	P	13
	Green	Mtr Hall 2 (y)	C	9
4	Black	Index`	K	6
	Blue	Index	H	5
5	Black	Enca`	J	4
	Yellow	Enca	F	3
6	Black	Spare	S	No Con
	Brown	Mtr Hall 3 (z)	D	8
7	Black	Enca`	A	2
	Orange	Enca	E	1
--	Drain	Shield	No Con	7

Sensor cables for Bayside Digital Drive
3m length 10963046 Rev A
8m length 10963055 Rev A

Sensor Cable with Flying Leads
3m length 10963011 Rev A
8m length 10963058 Rev A

Resolver

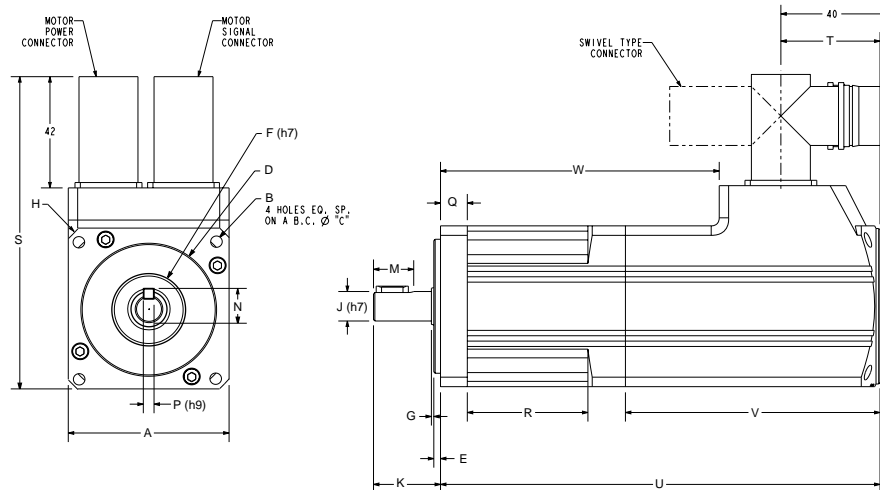
Cable Pair #	Color Code	Function	Conn. Pin #	Molex Pin #
1	Black	R1 (Ref +)	A	5
	Red	R2 (Ref -)	E	6
2	Black	S1 (Cos +)	J	3
	White	S3 (Cos -)	K	4
3	Black	S2 (Sin +)	F	2
	Green	S4 (Sin -)	H	1
4	Black	T1	M	13
	Blue	T2	P	14
--	Drain	Shield	No Con	7

Resolver cables for Bayside Digital Drive
3m length 10963071 Rev B
8m length 10963072 Rev B

Resolver Cable with Flying Leads
3m length 10963073 Rev A
8m length 10963074 Rev A

* Cannon Connectors are used by Bayside.

V. Mechanical Specifications (DIN Connector Series)



MODEL NO.	A SQUARE FLANGE		B BOLT HOLE		C BOLT CIRCLE		D PILOT DIAMETER		E PILOT THICK.		F SHOULDER DIAMETER		G SHOULDER HEIGHT		H HOUSING DIAMETER		J SHAFT DIAMETER	
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
BM060	60	2.36	5.5	0.217	70	2.76	50	1.97	2.5	0.098	14	0.551	1	0.039	80	3.15	11	0.433
BM090	90	3.54	6.5	0.256	100	3.94	80	3.15	3	0.118	19	0.748	1	0.039	120.5	4.74	14	0.551
BM115	115	4.53	8.5	0.335	130	5.12	110	4.33	3.5	0.138	25.4	1.00	1	0.039	152	5.98	19	0.748
BM142	142	5.59	11	0.433	165	6.50	130	5.12	3.5	0.138	25.4	1.00	1	0.039	194	7.64	24	0.945

MODEL NO.	K SHAFT LENGTH		M KEYWAY LENGTH		N KEYWAY HEIGHT		P KEYWAY WIDTH		Q FLANGE THICK.		S HEIGHT		T CONNECTOR LOCATION	
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
BM060	25	0.984	15	0.591	13.0	0.511	4	0.157	10	0.394	117	4.61	37	1.46
BM090	30	1.18	20	0.787	16.5	0.650	5	0.197	13	0.512	147	5.79	39	1.54
BM115	50	1.97	35	1.38	22.0	0.866	6	0.236	15	0.591	175	6.89	46	1.81
BM142	50	1.97	35	1.38	24.7	0.972	8	0.315	18	0.709	181.3	7.14	45*	1.77
													63**	2.48

* without a brake.

** with a brake.

BM NEMA Frame Sizes

MODEL NO.	B BOLT HOLE		C BOLT CIRCLE		D PILOT DIAMETER		J OUTPUT SHAFT DIAMETER		K OUTPUT SHAFT LENGTH		M KEYWAY LENGTH		N KEYWAY HEIGHT		P KEYWAY WIDTH	
	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
BM023	0.195	5.0	2.625	66.7	1.500	38.1	0.375	9.5	1.000	25.4	0.750	19.1	0.015	0.4	--	--
BM034	0.218	5.5	3.875	98.4	2.875	73.0	0.500	12.7	1.250	31.8	1.063	27.0	0.072	1.8	0.125	3.2
BM042	0.281	7.1	4.950	125.7	2.187	55.5	0.625	15.9	1.500	38.1	1.130	28.7	0.108	2.7	0.188	4.8

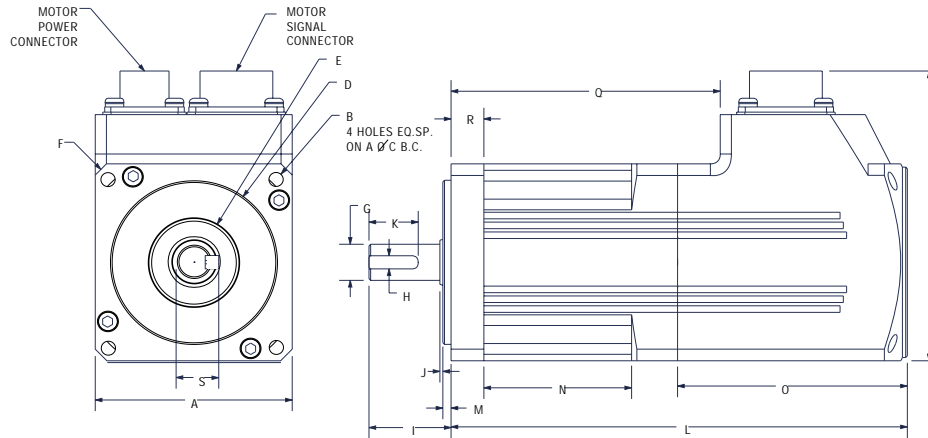
Options

	U LENGTH		V REAR COVER LENGTH		W FLANGE OFFSET		R RECESS LENGTH	
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
BM060 Single Stack – Encoder or Resolver	139	5.47	70	2.76	72	2.83	45	1.77
BM060 Single Stack – Encoder or Resolver and Brake	164	6.46	95	3.74	94	3.70	45	1.77
BM060 Double Stack – Encoder or Resolver	177	6.97	70	2.76	110	4.33	75	2.95
BM060 Double Stack – Encoder or Resolver and Brake	202	7.95	95	3.74	132	5.20	75	2.95
BM090 Single Stack – Encoder or Resolver	154	6.06	83	3.27	95	3.74	45	1.77
BM090 Single Stack – Encoder or Resolver and Brake	182	7.17	111	4.37	123	4.84	45	1.77
BM090 Double Stack – Encoder or Resolver	192	7.56	83	3.27	133	5.24	65	2.56
BM090 Double Stack – Encoder or Resolver and Brake	220	8.66	111	4.37	161	6.34	65	2.56
BM115 Single Stack – Encoder or Resolver	155	6.10	70	2.76	95	3.74	49	1.93
BM115 Single Stack – Encoder or Resolver and Brake	188	7.40	103	4.06	118	4.65	49	1.93
BM115 Double Stack – Encoder or Resolver	193	7.60	70	2.76	133	5.24	79	3.11
BM115 Double Stack – Encoder or Resolver and Brake	226	8.90	103	4.06	156	6.14	79	3.11
BM142 Single Stack – Encoder or Resolver	208	8.18	75.4	2.97	140	5.53	75	2.95
BM142 Single Stack – Encoder or Resolver and Brake	243	9.56	110.4	4.35	144	5.69	75	2.95
BM142 Double Stack – Encoder or Resolver	271	10.7	75.4	2.97	186	7.32	105	4.13
BM142 Double Stack – Encoder or Resolver and Brake	306	12.1	110.4	4.35	208	8.19	105	4.13

Encoder Specifications

<p>2000 Line Rotary Encoder</p> <p>8000 cts / rev Post Quadrature</p> <p>Electrical Input:</p> <p style="padding-left: 40px;">5Vdc, 60mA maximum</p> <p>Encoder Output:</p> <p style="padding-left: 40px;">A, B, I</p> <p style="padding-left: 40px;">Square wave, Diff.</p> <p style="padding-left: 40px;">Frequency Response 125kHz</p>

Mechanical Specifications (MIL Connector Series)



Dimensions

MODEL NO.	A SQUARE FLANGE	B BOLT HOLE	C BOLT CIRCLE	D PILOT DIAMETER	E SHOULDER DIAMETER	F HOUSING DIAMETER	G OUTPUT SHAFT DIAMETER	H KEYWAY WIDTH	I OUTPUT SHAFT LENGTH	J SHOULDER HEIGHT	K KEYWAY LENGTH	M PILOT THICK.	P HEIGHT	R FLANGE THICK.
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
BM060	60	5.5	70	50	14	80	11	4	25	1	15	2.5	88	10
BM090	90	6.5	100	80	19	120.5	14	5	30	1	20	3	118	13
BM115	115	8.5	130	110	25.4	152	19	6	50	1	35	3.5	146	15
BM142	142	11	165	130	25.4	194	24	8	50	1	35	3.5	181.3	18

Options

All standard BM Series Motors are provided with 2000 line encoder resolutions (8000 ppr). Other resolutions available.	L LENGTH	O REAR COVER THICKNESS	Q FLANGE OFFSET	N RECESS THICKNESS
	(mm)	(mm)	(mm)	(mm)
BM060 Single Stack – Encoder or Resolver	139	70	72	45
BM060 Single Stack – Encoder or Resolver and Brake	164	95	94	45
BM060 Double Stack – Encoder or Resolver	177	70	110	75
BM060 Double Stack – Encoder or Resolver and Brake	202	95	132	75
BM090 Single Stack – Encoder or Resolver	154	83	95	45
BM090 Single Stack – Encoder or Resolver and Brake	182	111	123	45
BM090 Double Stack – Encoder or Resolver	192	83	133	65
BM090 Double Stack – Encoder or Resolver and Brake	220	111	161	65
BM115 Single Stack – Encoder or Resolver	155	70	95	49
BM115 Single Stack – Encoder or Resolver and Brake	188	103	118	49
BM115 Double Stack – Encoder or Resolver	193	70	133	79
BM115 Double Stack – Encoder or Resolver and Brake	226	103	156	79
BM142 Single Stack – Encoder or Resolver	207.8	75.4	140.4	75
BM142 Single Stack – Encoder or Resolver and Brake	242.8	110.4	144.4	75
BM142 Double Stack – Encoder or Resolver	271.3	75.4	185.9	105
BM142 Double Stack – Encoder or Resolver and Brake	306.3	110.4	207.9	105