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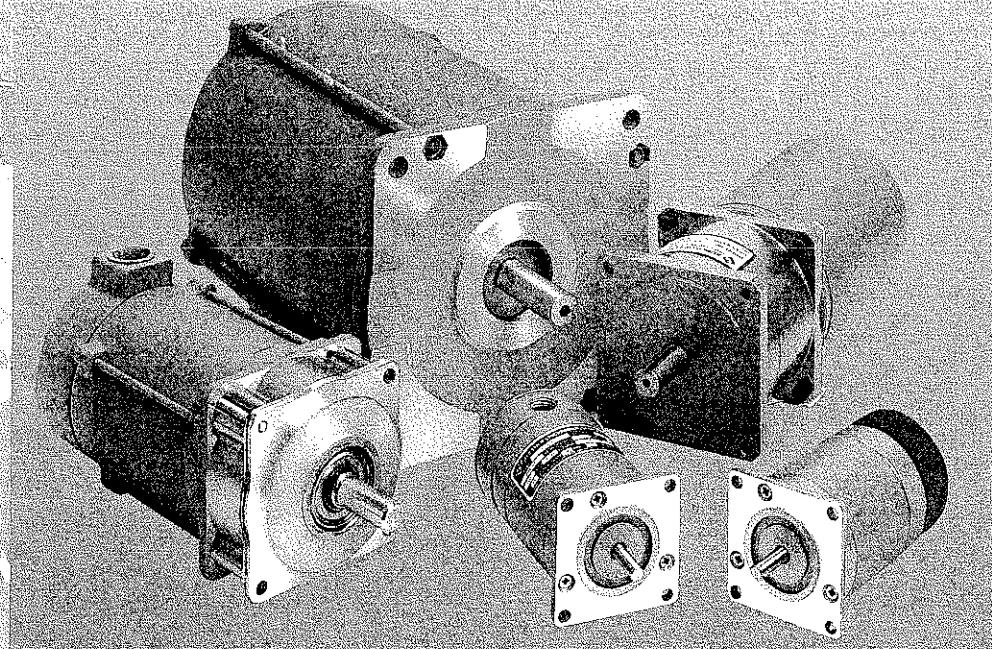
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DANA

WARNER ELECTRIC®

SLO-SYN® DC STEP MOTORS,

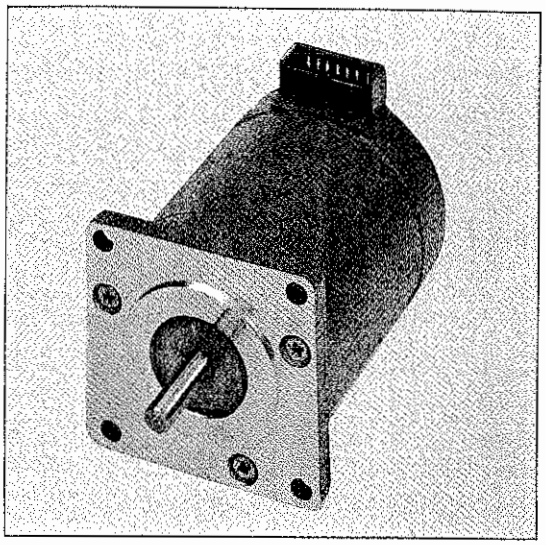


DC-Step

People Finding A Better Way®

60mm Frame Size Models (NEMA Size 23D)

- *±3% step accuracy, noncumulative (all models)*
- *48-50 tooth pitch configuration give smooth operation, soft step motion, less resonance and instability*
- *Outstanding microstep performance characteristics*
- *Proprietary molding process yields improved rotor and stator insulation and increased mechanical integrity*
- *New loopless winding technique and internal circuit board virtually eliminate chance of interference between internal wiring and rotor/stator*
- ***Can withstand up to 2-1/2 times rated current (instantaneous) without demagnetization***
- *Holes in rear end bell for mounting encoder (double end shafts only)*
- *Excellent thermal properties and resistance to vibration*
- *Class B insulating materials*
- *Rated for operation in ambient temperatures from -40°C to +65°C (-40°F to +149°F)*



- *+100°C (212°F) maximum motor shell temperature*
- *Available with 4, 6 or 8 connections*
- *Can be supplied with leads, connector or cast enclosure*
- *Constructed to provide long life with no regular maintenance*

TYPE NUMBER EXPLANATION - M060 SERIES MOTORS

M06□ - □ □ ** □

- 1 = Single Stack, 2 = Double Stack, 3 = Triple Stack
- C = Connector Type, L = Lead Type, T = Cast Enclosure
- F = 4 Connections, S = 6 Connections, E = 8 Connections
- Identification Suffix (Coil Rating)
- E = Double End Shaft

Refer to page DC-27 for available options

60MM (NEMA 23) RATINGS and SPECIFICATIONS

MOTOR TYPE 3% ACCURACY	CONNECTIONS		TYPICAL TIME FOR SINGLE STEP (mS) (1)	UNIPOLAR CONFIGURATION						BIPOLAR CONNECTIONS											
										SERIES CONNECTION						PARALLEL CONNECTION					
														MINIMUM HOLDING TORQUE OZ-IN (Ncm)						MINIMUM HOLDING TORQUE OZ-IN (Ncm)	
	NUMBER	TYPE		NOMINAL DC VOLTS (3)	RATED AMPERES PER WINDING	NOMINAL RESISTANCE PER WINDING (25 C) OHMS (2)	NOMINAL INDUCTANCE PER PHASE (MILLI-HENRYS) (2) (4)	MINIMUM HOLDING TORQUE OZ-IN (Ncm) 2Ø ON	MINIMUM HOLDING TORQUE OZ-IN (Ncm) 1Ø ON	VOLTS	AMPERES	R	L	2Ø ON	1Ø ON	VOLTS	AMPERES	R	L	2Ø ON	1Ø ON
M061-CE02	8	CONN.	2.5	5	1	5	9.57	60 (42)	36 (25)	7	0.7	10	38.3	75 (53)	45 (32)	3.54	1.4	2.5	9.57	75 (53)	45 (32)
M061-LE02	8	LEADS	2.5	5	1	5	9.57	60 (42)	36 (25)	7	0.7	10	38.3	75 (53)	45 (32)	3.54	1.4	2.5	9.57	75 (53)	45 (32)
M061-CS02	6	CONN.	2.5	5	1	5	9.57	60 (42)	36 (25)	7	0.7	10	38.3	75 (53)	45 (32)	—	—	—	—	—	—
M061-LS02	6	LEADS	2.5	5	1	5	9.57	60 (42)	36 (25)	7	0.7	10	38.3	75 (53)	45 (32)	—	—	—	—	—	—
M061-CE08	8	CONN.	2	1.25	3.8	0.33	0.635	60 (42)	36 (25)	1.8	2.7	0.66	2.54	75 (53)	45 (32)	0.89	5.4	0.165	0.635	75 (53)	45 (32)
M061-LE08	8	LEADS	2	1.25	3.8	0.33	0.635	60 (42)	36 (25)	1.8	2.7	0.66	2.54	75 (53)	45 (32)	0.89	5.4	0.165	0.635	75 (53)	45 (32)
M061-CS08	6	CONN.	2	1.25	3.8	0.33	0.635	60 (42)	36 (25)	1.8	2.7	0.66	2.54	75 (53)	45 (32)	—	—	—	—	—	—
M061-LS08	6	LEADS	2	1.25	3.8	0.33	0.635	60 (42)	36 (25)	1.8	2.7	0.66	2.54	75 (53)	45 (32)	—	—	—	—	—	—
M061-FF-206	4	LEADS	—	—	—	—	—	—	—	6.3	1	6.3	24.8	75 (53)	—	—	—	—	—	—	—
M061-CS-301*	6	CONN.	7.5	11	0.44	22.5	38.4	53 (37)	32 (23)	15.6	0.3	45	154	65 (46)	39 (28)	—	—	—	—	—	—
M061-LS-301*	6	LEADS	7.5	11	0.44	22.5	38.4	53 (37)	32 (23)	15.6	0.3	45	154	65 (46)	39 (28)	—	—	—	—	—	—
M061-CS-302*	6	CONN.	4.2	5.5	0.88	6.2	9.57	53 (37)	32 (23)	7.7	0.6	12.4	38.3	65 (46)	39 (28)	—	—	—	—	—	—
M061-LS-302*	6	LEADS	4.2	5.5	0.88	6.2	9.57	53 (37)	32 (23)	7.7	0.6	12.4	38.3	65 (46)	39 (28)	—	—	—	—	—	—
M061-CS-311*	6	CONN.	12	20	0.22	91	126	47 (33)	28 (20)	28.3	0.16	182	504	58 (41)	35 (25)	—	—	—	—	—	—
M061-LS-311*	6	LEADS	12	20	0.22	91	126	47 (33)	28 (20)	28.3	0.16	182	504	58 (41)	35 (25)	—	—	—	—	—	—
M061-CF-408	4	CONN.	—	—	—	—	—	—	—	8	0.5	15.9	61	75 (53)	45 (32)	—	—	—	—	—	—
M061-LR-408	4	LEADS	—	—	—	—	—	—	—	8	0.5	15.9	61	75 (53)	45 (32)	—	—	—	—	—	—
M062-CS03	6	CONN.	3.5	5.3	1.6	3.3	8.28	100 (71)	60 (42)	7.5	1.13	6.6	33.12	125 (88)	75 (53)	—	—	—	—	—	—
M062-LS03	6	LEADS	3.5	5.3	1.6	3.3	8.28	100 (71)	60 (42)	7.5	1.13	6.6	33.12	125 (88)	75 (53)	—	—	—	—	—	—
M062-CS04	6	CONN.	2.8	4.2	1.9	2.2	5.89	100 (71)	60 (42)	5.9	1.34	4.4	23.56	125 (88)	75 (53)	—	—	—	—	—	—
M062-LS04	6	LEADS	2.8	4.2	1.9	2.2	5.89	100 (71)	60 (42)	5.9	1.34	4.4	23.56	125 (88)	75 (53)	—	—	—	—	—	—
M062-CE04	8	CONN.	2.8	4.2	1.9	2.2	5.89	100 (71)	60 (42)	5.9	1.34	4.4	23.56	125 (88)	75 (53)	3	2.7	1.1	5.89	125 (88)	75 (53)
M062-LE04	8	LEADS	2.8	4.2	1.9	2.2	5.89	100 (71)	60 (42)	5.9	1.34	4.4	23.56	125 (88)	75 (53)	3	2.7	1.1	5.89	125 (88)	75 (53)
M062-CS06	6	CONN.	—	2.6	3.1	0.88	2	100 (71)	60 (42)	3.9	2.2	1.76	8	125 (88)	75 (53)	—	—	—	—	—	—
M062-LS06	6	LEADS	—	2.6	3.1	0.88	2	100 (71)	60 (42)	3.9	2.2	1.76	8	125 (88)	75 (53)	—	—	—	—	—	—
M062-CE06	8	CONN.	—	2.6	3.1	0.88	2	100 (71)	60 (42)	3.9	2.2	1.76	8	125 (88)	75 (53)	1.9	4.4	0.44	2	125 (88)	75 (53)
M062-LE06	8	LEADS	—	2.6	3.1	0.88	2	100 (71)	60 (42)	3.9	2.2	1.76	8	125 (88)	75 (53)	1.9	4.4	0.44	2	125 (88)	75 (53)
M062-CS09	6	CONN.	2.2	1.65	4.7	0.35	0.8	100 (71)	60 (42)	2.3	3.3	0.7	3.2	125 (88)	75 (53)	—	—	—	—	—	—
M062-LS09	6	LEADS	2.2	1.65	4.7	0.35	0.8	100 (71)	60 (42)	2.3	3.3	0.7	3.2	125 (88)	75 (53)	—	—	—	—	—	—
M062-CE09	8	CONN.	2.2	1.65	4.7	0.35	0.8	100 (71)	60 (42)	2.3	3.3	0.7	3.2	125 (88)	75 (53)	1.2	6.65	0.175	0.8	125 (88)	75 (53)
M062-LE09	8	LEADS	2.2	1.65	4.7	0.35	0.8	100 (71)	60 (42)	2.3	3.3	0.7	3.2	125 (88)	75 (53)	1.2	6.65	0.175	0.8	125 (88)	75 (53)
M062-FF-206	4	LEADS	—	—	—	—	—	—	—	4.2	1.5	2.8	12.5	125 (88)	—	—	—	—	—	—	—
M062-CF-401	4	CONN.	—	—	—	—	—	—	—	6.6	1	6.6	33	125 (88)	75 (53)	—	—	—	—	—	—
M062-LF-401	4	LEADS	—	—	—	—	—	—	—	6.6	1	6.6	33	125 (88)	75 (53)	—	—	—	—	—	—
M063-CE06	8	CONN.	2.6	3.36	2.9	1.16	2.85	150 (106)	90 (64)	4.9	2.1	2.32	11.4	190 (134)	115 (81)	2.4	4.1	0.58	2.85	190 (134)	115 (81)
M063-LE06	8	LEADS	2.6	3.36	2.9	1.16	2.85	150 (106)	90 (64)	4.9	2.1	2.32	11.4	190 (134)	115 (81)	2.4	4.1	0.58	2.85	190 (134)	115 (81)
M063-CS06	6	CONN.	2.6	3.36	2.9	1.16	2.85	150 (106)	90 (64)	4.9	2.1	2.32	11.4	190 (134)	115 (81)	—	—	—	—	—	—
M063-LS06	6	LEAD	2.6	3.36	2.9	1.16	2.85	150 (106)	90 (64)	4.9	2.1	2.32	11.4	190 (134)	115 (81)	—	—	—	—	—	—
M063-CE09	8	CONN.	2.4	2.25	4.6	0.49	1.15	150 (106)	90 (64)	3.2	3.25	0.98	4.6	190 (134)	115 (81)	1.6	6.5	0.245	1.15	190 (134)	115 (81)
M063-LE09	8	LEADS	2.4	2.25	4.6	0.49	1.15	150 (106)	90 (64)	3.2	3.25	0.98	4.6	190 (134)	115 (81)	1.6	6.5	0.245	1.15	190 (134)	115 (81)
M063-CS09	6	CONN.	2.4	2.25	4.6	0.49	1.15	150 (106)	90 (64)	3.2	3.25	0.98	4.6	190 (134)	115 (81)	—	—	—	—	—	—
M063-LS09	6	LEADS	2.4	2.25	4.6	0.49	1.15	150 (106)	90 (64)	3.2	3.25	0.98	4.6	190 (134)	115 (81)	—	—	—	—	—	—
M063-FF-206	4	LEADS	—	—	—	—	—	—	—	5.4	1.5	3.6	14.5	190 (134)	—	—	—	—	—	—	—
M063-CF-401	4	CONN.	—	—	—	—	—	—	—	5.66	1	5.66	29	160 (113)	96 (68)	—	—	—	—	—	—
M063-LF-401	4	LEADS	—	—	—	—	—	—	—	5.66	1	5.66	29	160 (113)	96 (68)	—	—	—	—	—	—

(1) With 24 volts drive.

(2) Values shown are for reference only and are correct to the best of our knowledge at the time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.

(3) Voltage shown is per phase at rated current at zero steps per second, with winding at 25°C. Resistance tolerance and winding temperature will influence voltage.

(4) Tolerance is ±20%. Measured at 1 kHz with a General Radio #1650B impedance bridge having a 1 volt rms open circuit sinusoidal signal. Rotor position preconditioned by energizing same phase, then deenergizing same phase during measurement without changing rotor position.

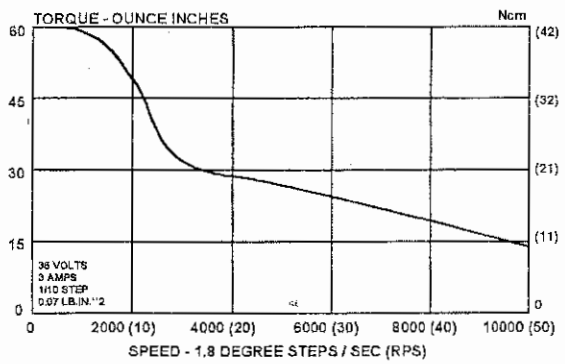
* These motors are obsolete and should not be used in a new application design. They can be provided to support existing systems.

MECHANICAL SPECIFICATIONS [1]

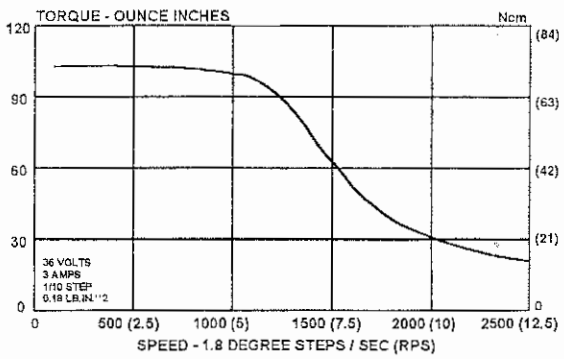
BASIC MOTOR SERIES	NOMINAL ROTOR INERTIA LB-IN² (kg-cm²)	MINIMUM RESIDUAL TORQUE OZ-IN (Ncm)	TYPICAL TORQUE TO INERTIA RATIO	MAXIMUM OVERHANG LOAD LBS (kg)	MAXIMUM THRUST LOAD LBS (kg)	APPROX. WEIGHT LBS. (kg)	
						NET	SHIPPING
M061	0.04 (0.12)	1.0 (0.71)	36×10^3 (36^3)	15 (6.8)	25 (11.3)	1.25 (0.57)	1.5 (0.68)
M062	0.08 (0.23)	1.4 (0.99)	30×10^3 (30^3)	15 (6.8)	25 (11.3)	2 (0.91)	2.5 (1.14)
M063	0.11 (0.32)	2.5 (1.77)	33×10^3 (33^3)	15 (6.8)	25 (11.3)	2.75 (1.25)	3.25 (1.48)

[1] Values shown are for reference information and are correct to the best of our knowledge at time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.

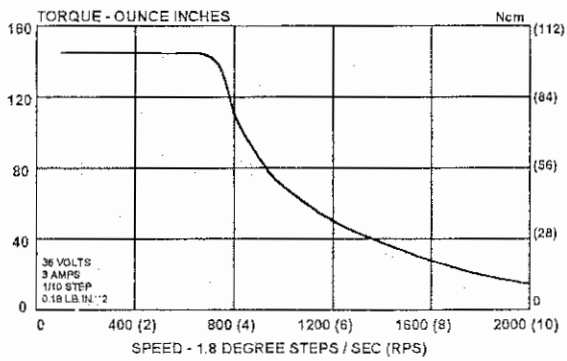
Typical Torque Versus Speed Characteristics



M061-C308 OR M061-LE08
MOTOR WITH SS2000MD4 3.0 AMP, 36 VDC
SLO-SYN MOTION CONTROL

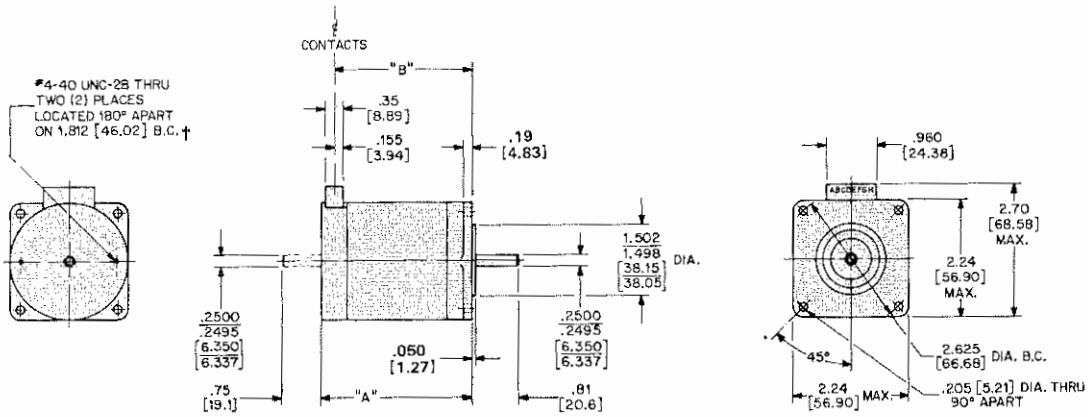


M062-CE09 OR M062-LE09
MOTOR WITH SS2000MD4 3.0 AMP, 36 VDC
SLO-SYN MOTION CONTROL



M063-CE09 OR M063-LE09 MOTOR WITH SS2000MD4
3.0 AMP, 36 VDC SLO-SYN MOTION CONTROL

DIMENSIONS, M060 SERIES MOTORS

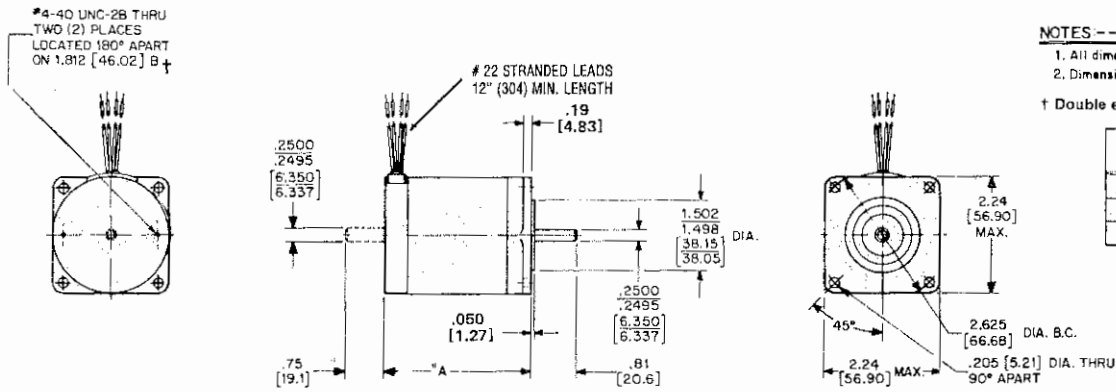


MOTOR TYPE	"A" MAX.	"B"
M061	2.02 [51.31]	1.64 [41.66]
M062	3.02 [76.71]	2.64 [67.06]
M063	4.02 [102.11]	3.64 [92.46]

NOTES:--
1.- All dimensions apply before painting/plating.
2.- Dimensions in brackets are millimeters.

† Double ended shafts only

CONNECTOR MODELS

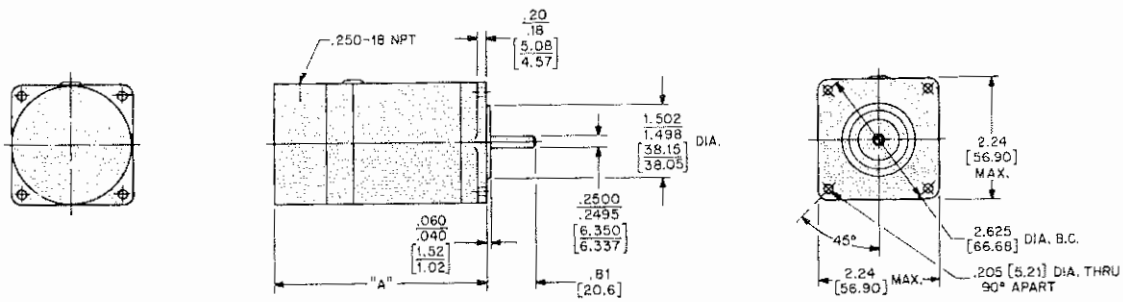


NOTES:--
1. All dimensions apply before painting/plating.
2. Dimensions in brackets are millimeters.

† Double ended shafts only

MOTOR TYPE	"A" MAX.
M061	2.02 [51.31]
M062	3.02 [76.71]
M063	4.02 [102.11]

MODELS WITH LEADS

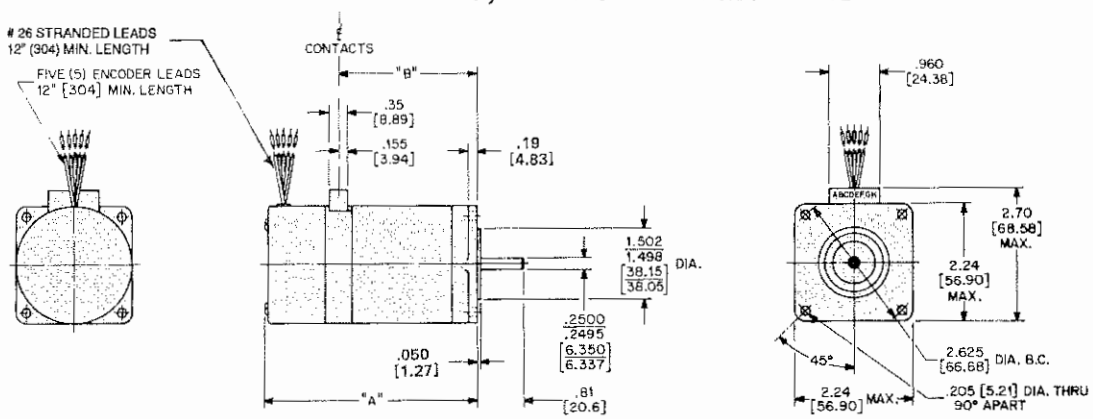


MOTOR TYPE	"A" MAX.
M061-TE08	3.00 [76.2]
M062-TE09	4.00 [101.6]
M063-TE09	5.00 [127.0]

NOTES:--
1.- All dimensions apply before painting/plating.
2.- Dimensions in brackets are millimeters.

MODELS WITH CAST ENCLOSURE

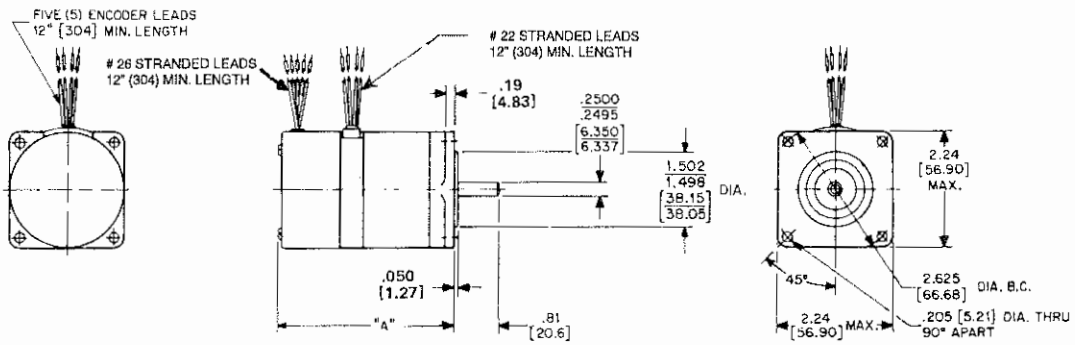
DIMENSIONS, M060 SERIES MOTORS



MOTOR TYPE	"A" MAX.	"B"
M061	3.06 [77.72]	1.64 [41.66]
M062	4.06 [103.12]	2.64 [67.06]
M063	5.06 [128.52]	3.64 [92.46]

NOTES:—
1.– All dimensions apply before painting/plating.
2.– Dimensions in brackets are millimeters.

ENCODER MODELS WITH CONNECTOR

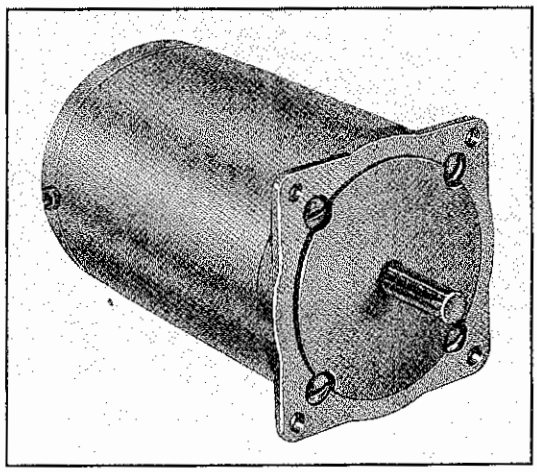


MOTOR TYPE	"A" MAX.
M061	3.06 [77.72]
M062	4.06 [103.12]
M063	5.06 [128.52]

NOTES:—
1. All dimensions apply before painting/plating.
2. Dimensions in brackets are millimeters.

ENCODER MODELS WITH LEADS

90mm Frame Size Models (NEMA SIZE 34D)



- *Step angle of 1.8° (full step) or 0.9° (half step)*
- *48-50 tooth pitch configuration gives smooth operation, soft step motion, less resonance and instability*
- *Excellent microstep characteristics*
- *Available with ±5% or ±3% step accuracy, noncumulative*
- ***Can withstand up to 2-1/2 times rated current (instantaneous) without demagnetization***
- *Offered with connector, leads or cast terminal enclosure*
- *Can be supplied with 4, 6 or 8 connections*
- *Class B insulating materials*
- *Rated for operation in ambient temperatures from -40°C to +65°C (-40°F to +149°F)*
- *+100°C (+212°F) maximum motor shell temperature*
- *Constructed to provide long life with no regular maintenance*

TYPE NUMBER EXPLANATION - M090 SERIES MOTORS

M □ □ □ - F □ * * * * □

Frame Diameter		1 = Single Stack	C = 6 Lead with optional post machining	Identification Suffix + (Coil Rating)	C3A = Encoder E = Double End Shaft
09 = 3.4"		2 = Double Stack			
		3 = Triple Stack	D = 6-Lead		
			F = 4-Lead		

+ NOTE: Motors with 8000 suffixes (i.e. M091-FD-8009) are supplied with integral cast terminal boxes and 8 screw terminals. Motors with 8100 suffixes (i.e. M091-FD-8109) have 8 leads and no terminal boxes.

Refer to page DC-27 for available options.

90mm Frame Size Model (NEMA Size 34D) RATINGS and SPECIFICATIONS

MOTOR TYPE		CONNECTIONS		TYPICAL TIME FOR SINGLE STEP (mS) (1)	UNIPOLAR CONFIGURATION						BIPOLAR CONNECTIONS											
											SERIES CONNECTION						PARALLEL CONNECTION					
															MINIMUM HOLDING TORQUE OZ-IN (Ncm)						MINIMUM HOLDING TORQUE OZ-IN (Ncm)	
3% ACCURACY	5% ACCURACY	NUMBER	TYPE		NOMINAL DC VOLTS (3)	RATED AMPERES PER WINDING	NOMINAL RESISTANCE PER WINDING (25 C) OHMS (2)	NOMINAL INDUCTANCE PER PHASE (MILLI-HENRYS) (2) (4)	MINIMUM HOLDING TORQUE OZ-IN (Ncm) 2Ø ON	MINIMUM HOLDING TORQUE OZ-IN (Ncm) 1Ø ON	VOLTS	AMPERES	R	L	2Ø ON	1Ø ON	VOLTS	AMPERES	R	L	2Ø ON	1Ø ON
—	M091-FD03	6	LEADS	8.5	5.3	1.6	3.3	16.5	150(106)	90(64)	7.25	1.1	6.6	66	180(127)	110(78)	—	—	—	—	—	—
M091-FC06	M091-FD06	6	LEADS	3.9	2.6	3.1	0.85	4.12	150(106)	90(64)	3.75	2.2	1.7	16.5	180(127)	110(78)	—	—	—	—	—	—
M091-FC09	M091-FD09	6	LEADS	3.1	1.7	4.7	0.36	1.5	150(106)	90(64)	2.4	3.3	0.72	6	180(127)	110(78)	—	—	—	—	—	—
—	M091-FF-206	4	LEADS	—	—	—	—	—	—	—	3	3	1	10.4	180(127)	—	—	—	—	—	—	—
—	M091-FF-401	4	TERM.	—	—	—	—	—	—	—	6.8	1	6.8	52	180(127)	110(78)	—	—	—	—	—	—
—	M091-FD-8106	8	LEADS	3.9	2.6	3.1	0.85	4.12	150(106)	90(64)	3.75	2.2	1.7	16.5	180(127)	110(78)	1.9	4.4	0.425	4.12	180(127)	110(78)
—	M091-FD-8009	8	TERM.	3.1	1.7	4.7	0.36	1.5	150(106)	90(64)	2.4	3.3	0.72	6	180(127)	110(78)	1.2	6.6	0.18	1.5	180(127)	110(78)
—	M091-FD-8109	8	LEADS	3.1	1.7	4.7	0.36	1.5	150(106)	90(64)	2.4	3.3	0.72	6	180(127)	110(78)	1.2	6.6	0.18	1.5	180(127)	110(78)
M092-FC08	M092-FD08	6	LEADS	4	3	4	0.75	3.56	300(212)	180(127)	4.2	2.8	1.5	14.24	370(261)	225(158)	—	—	—	—	—	—
M092-FC09	M092-FD09	6	LEADS	3.9	2.5	4.6	0.55	2.76	300(212)	180(127)	3.6	3.25	1.1	11.04	370(261)	225(158)	—	—	—	—	—	—
—	M092-FF-206	4	LEADS	—	—	—	—	—	—	—	4	4	1	11.5	370(261)	—	—	—	—	—	—	—
—	M092-FD-310	6	TERM.	3.9	1.56	6.8	0.23	1.28	300(212)	180(127)	2.2	4.8	0.46	5.12	370(261)	225(158)	—	—	—	—	—	—
—	M092-FD-335(5)*	6	TERM.	3.9	1.56	6.8	0.23	1.28	300(212)	180(127)	2.2	4.8	0.46	5.12	370(261)	225(158)	—	—	—	—	—	—
—	M092-FF-402	4	TERM.	—	—	—	—	—	—	—	3.4	2	1.7	16.6	325(229)	195(138)	—	—	—	—	—	—
—	M092-FD-8008	8	TERM.	4	3	4	0.075	3.56	300(212)	180(127)	4.2	2.8	1.5	14.24	370(261)	225(158)	2.1	5.7	0.375	3.56	370(261)	225(158)
—	M092-FD-8108	8	LEADS	4	3	4	0.75	3.56	300(212)	180(127)	4.2	2.8	1.5	14.24	370(261)	225(158)	2.1	5.7	0.375	3.56	370(261)	225(158)
—	M092-FD-8009	8	TERM.	3.9	2.5	4.6	0.55	2.76	300(212)	180(127)	3.6	3.25	1.1	11.04	370(261)	225(158)	1.8	6.5	0.275	2.76	370(261)	225(158)
—	M092-FD-8109	8	LEADS	3.9	2.5	4.6	0.55	2.76	300(212)	180(127)	3.6	3.25	1.1	11.04	370(261)	225(158)	1.8	6.5	0.275	2.76	370(261)	225(158)
—	M092-FD-8114*	8	TERM.	3.9	1.65	6.8	0.023	1.18	300(212)	180(127)	2.3	4.8	0.46	4.72	370(261)	225(158)	1.2	9.6	0.115	1.18	370(261)	225(158)
M093-FC07	M093-FD07	6	LEADS	6.3	4.3	3.5	1.22	7.87	450(318)	270(191)	6.1	2.5	2.44	31.48	550(388)	330(233)	—	—	—	—	—	—
M093-FC11	M093-FD11	6	LEADS	4.1	2.64	5.5	0.48	3.19	450(318)	270(191)	3.75	3.9	0.96	12.76	550(388)	330(233)	—	—	—	—	—	—
M093-FC14	M093-FD14	6	LEADS	3.4	2.27	7	0.324	2	450(318)	270(191)	3.2	5	0.648	8	550(388)	330(233)	—	—	—	—	—	—
—	M093-FF-206	4	LEADS	—	—	—	—	—	—	—	3.85	4	0.96	12.76	550(388)	—	—	—	—	—	—	—
—	M093-FD-301*	6	TERM.	3.4	1.54	11	0.14	0.85	450(318)	270(191)	2.2	7.8	0.28	3.4	550(388)	330(233)	—	—	—	—	—	—
—	M093-FD-315(5)*	6	TERM.	3.4	1.54	11	0.14	0.85	450(318)	270(191)	2.2	7.8	0.28	3.4	550(388)	330(233)	—	—	—	—	—	—
—	M093-FF-402	4	TERM.	—	—	—	—	—	—	—	4.5	3	1.5	16.9	550(388)	330(233)	—	—	—	—	—	—
—	M093-FD-8007*	8	TERM.	6.3	4.3	3.5	1.22	7.87	450(318)	270(191)	6.1	2.5	2.44	31.48	550(388)	330(233)	3	4.95	0.61	7.87	550(388)	330(233)
—	M093-FD-8107*	8	LEADS	6.3	4.3	3.5	1.22	7.87	450(318)	270(191)	6.1	2.5	2.44	31.48	550(388)	330(233)	3	4.95	0.61	7.87	550(388)	330(233)
—	M093-FD-8011	8	TERM.	4.1	2.64	5.5	0.48	3.19	450(318)	270(191)	3.75	3.9	0.96	12.76	550(388)	330(233)	1.9	7.8	0.24	3.19	550(388)	330(233)
—	M093-FD-8014	8	TERM.	3.4	2.27	7	0.324	2	450(318)	270(191)	3.2	5	0.648	8	550(388)	330(233)	1.6	9.9	0.612	2	550(388)	330(233)

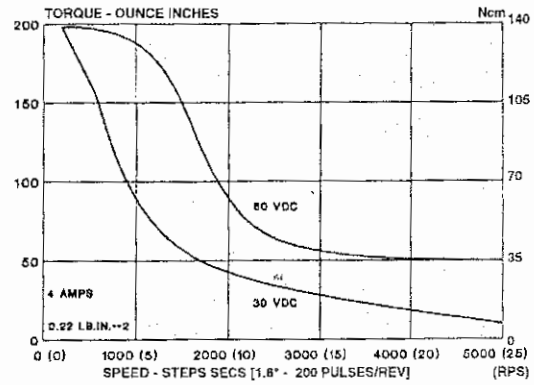
(1) With 24 volts drive.
(2) Values shown are for reference only and are correct to the best of our knowledge at the time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.
(3) Voltage shown is per phase at rated current at zero steps per second, with winding at 25°C. Resistance tolerance and winding temperature will influence voltage.
(4) Tolerance is ±20%. Measured at 1 kHz with a General Radio #1650B impedance bridge having a 1 volt rms open circuit sinusoidal signal. Rotor position preconditioned by energizing same phase, then deenergizing same phase during measurement without changing rotor position.
(5) Has double end shaft.
* These motors are obsolete and should not be used in a new application design. They can be provided to support existing systems.

MECHANICAL SPECIFICATIONS (1)

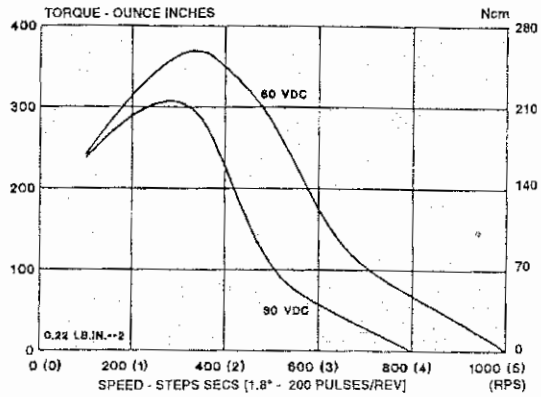
BASIC MOTOR SERIES	NOMINAL ROTOR INERTIA LB-IN² (kg-cm²)	MINIMUM RESIDUAL TORQUE OZ-IN (Ncm)	TYPICAL TORQUE TO INERTIA RATIO	MAXIMUM OVERHANG LOAD LBS (kg)	MAXIMUM THRUST LOAD LBS (kg)	APPROX. WEIGHT LBS. (kg)	
						NET	SHIPPING
M091	0.23 (0.67)	2 (1.41)	15.6×10^3 (15.6^3)	25 (11.3)	50 (22.7)	3.25 (1.48)	4 (1.82)
M092	0.42 (1.23)	4 (2.82)	17.2×10^3 (17.2^3)	25 (11.3)	50 (22.7)	5.5 (2.5)	6.75 (3.1)
M093	0.64 (1.87)	7 (4.94)	16.8×10^3 (16.8^3)	25 (11.3)	50 (22.7)	7.75 (3.52)	9 (4.1)

(1) Values shown are for reference information and are correct to the best of our knowledge at time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.

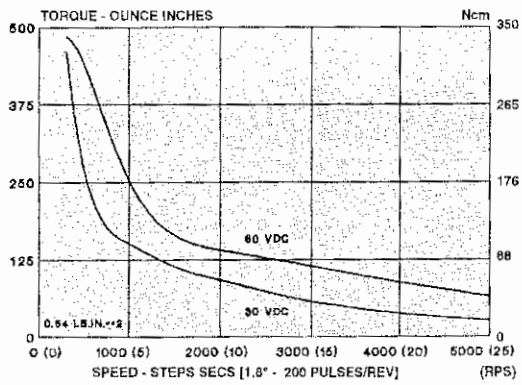
Typical Torque Versus Speed Characteristics



M091-FD-8009 OR M091-FD8109 MOTOR WITH SS2000MD7 4 AMP, 30 VDC/60 VDC SLO-SYN MOTION CONTROL - SERIES CONNECTION

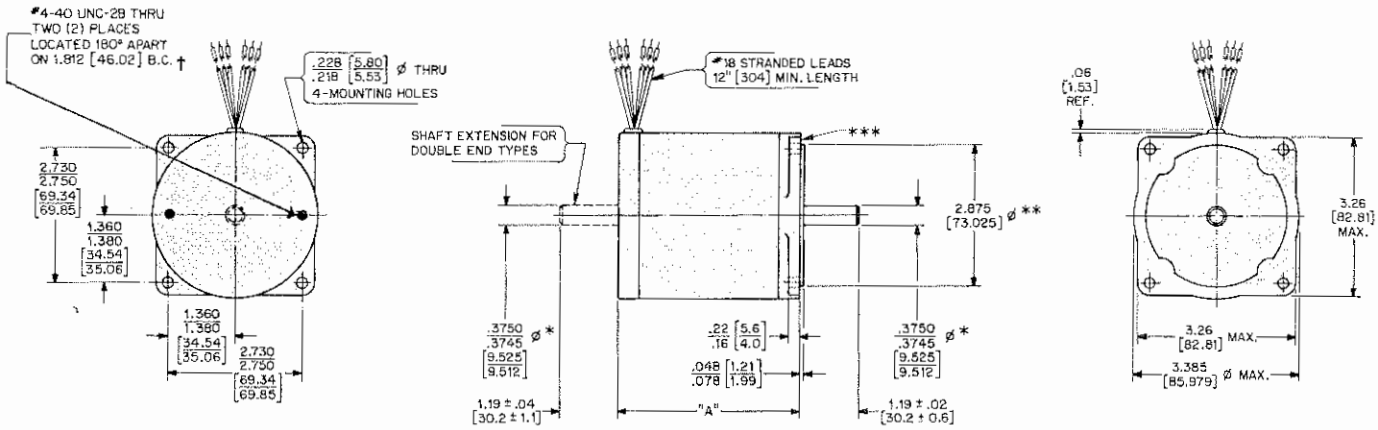


M092-FD-8009 OR M092-FD-8109 MOTOR WITH SS2000MD7 4 AMP, 30 VDC/60 VDC SLO-SYN MOTION CONTROL - SERIES CONNECTION



M093-FD-8014 OR M093-FD8114 MOTOR WITH SS2000MD7 5.0 AMP, 30 VDC/60 VDC SLO-SYN MOTION CONTROL - SERIES CONNECTION

DIMENSIONS, M090 SERIES MOTORS

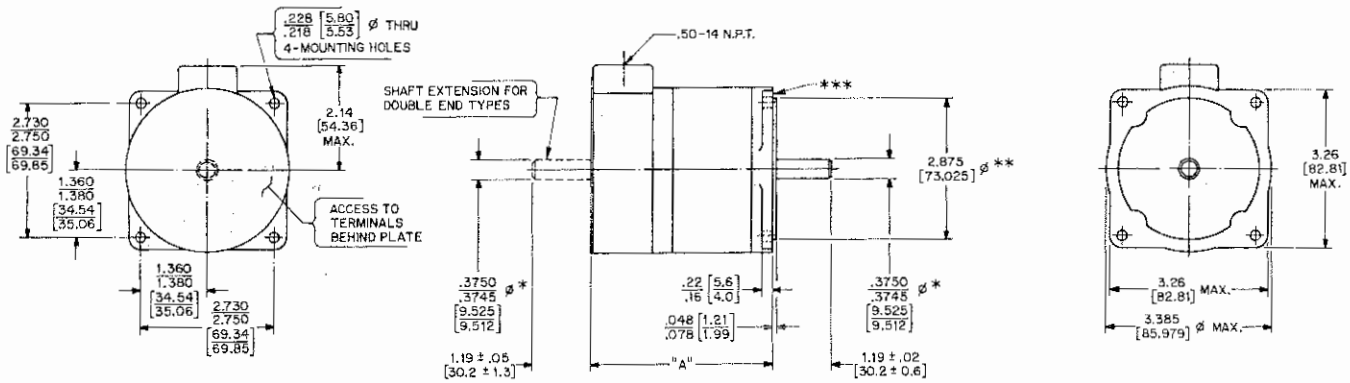


BASIC MOTOR TYPE	"A" MAX.	STANDARD MACHINING	OPTIONAL POST-MACHINING
M091	2.47 [62.74]	* SHAFT RUNOUT .002 [0.051] MAX. ** DIAMETER TOLERANCE ± .002 [0.051] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.	* SHAFT RUNOUT .001 [0.026] MAX. ** DIAMETER TOLERANCE ± .001 [0.026] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R.
M092	3.72 [94.49]		
M093	5.10 [129.54]		

NOTES:—
1.- All dimensions apply before painting/plating.
2.- Dimensions in brackets are millimeters.

† Double ended shafts only

MODELS WITH LEADS

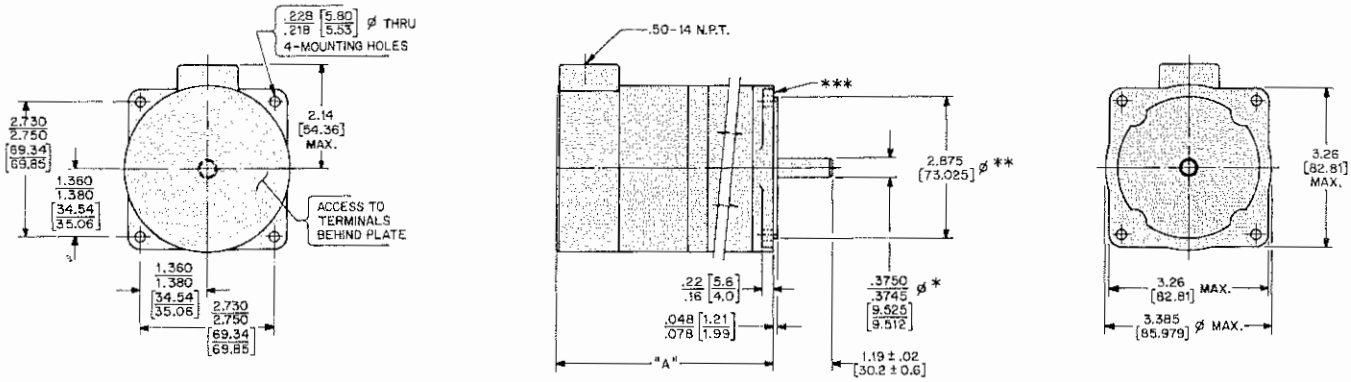


BASIC MOTOR TYPE	"A" MAX.	STANDARD MACHINING	OPTIONAL POST-MACHINING
M091	3.66 [93.47]	* SHAFT RUNOUT .002 [0.051] MAX. ** DIAMETER TOLERANCE ± .002 [0.051] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.	* SHAFT RUNOUT .001 [0.026] MAX. ** DIAMETER TOLERANCE ± .001 [0.026] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R.
M092	4.93 [125.22]		
M093	6.30 [160.02]		

NOTES:—
1.- All dimensions apply before painting/plating.
2.- Dimensions in brackets are millimeters.

MODELS WITH CAST TERMINAL ENCLOSURE

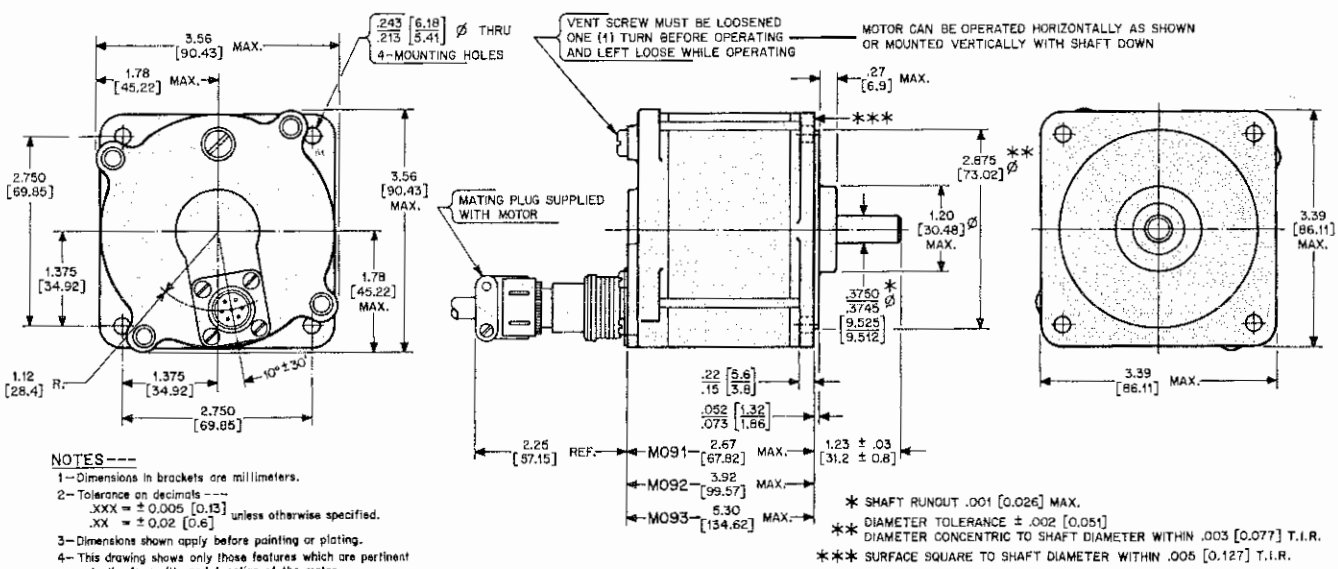
DIMENSIONS, M090 SERIES MOTORS



BASIC MOTOR TYPE	"A" MAX.	STANDARD MACHINING	OPTIONAL POST-MACHINING
M091	5.09 [129.29]	* SHAFT RUNOUT .002 [0.051] MAX. ** DIAMETER TOLERANCE ± .002 [0.051] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.	* SHAFT RUNOUT .001 [0.026] MAX. ** DIAMETER TOLERANCE ± .001 [0.026] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R. *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .001 [0.026] T.I.R.
M092	6.34 [161.04]		
M093	7.71 [195.83]		

NOTES:---
1.- All dimensions apply before painting/plating.
2.- Dimensions in brackets are millimeters.

ENCODER MODELS



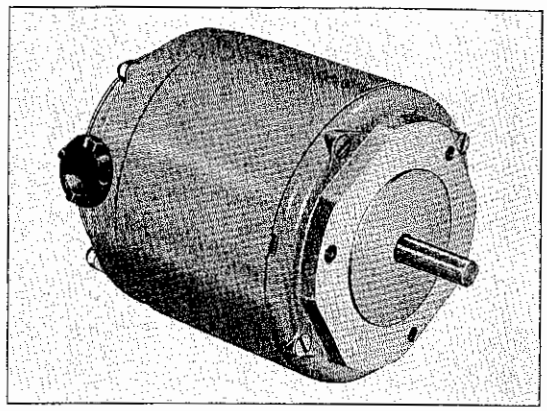
NOTES---
1—Dimensions in brackets are millimeters.
2—Tolerance on decimals ---
.XXX = ± 0.005 [0.13] unless otherwise specified.
.XX = ± 0.02 [0.6]
3—Dimensions shown apply before painting or plating.
4— This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .001 [0.026] MAX.
** DIAMETER TOLERANCE ± .002 [0.051] DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .005 [0.127] T.I.R.

VISCOUS DAMPED MODELS (see page DC-27)

110mm Frame Size Models (NEMA Size 42)
165mm Frame Size Models (NEMA Size 66)

- *For full-step (1.8°), half-step (0.9°) or microstep operation*
- *±5% step accuracy, noncumulative*
- *Enclosed terminals for external connections*
- *Can be supplied with 4, 6 or 8 connections*
- *Class B insulating materials*
- ***Can withstand up to 2-1/2 times rated current (instantaneous) without demagnetization***
- *Operate in ambient temperatures from -40°C to +65°C (-40°F to +149°F)*
- *100°C (212°F) maximum motor shell temperature*



- *Shafts have flats (M111 models) or keyways (M112 and M172 models)*
- *Constructed to provide long life with no regular maintenance*
- *No ratchets, detents or gears to wear out*

TYPE NUMBER DESIGNATIONS
M111, M112, M113 AND M172 MOTORS

M □ □ □ - F □ ****

Frame Diameter
11 = 4.2"
12 = 4.2"
17 = 6.5"

1 = Single Stack
2 = Double Stack
3 = Triple Stack

Identification Suffix (Coil Rating)

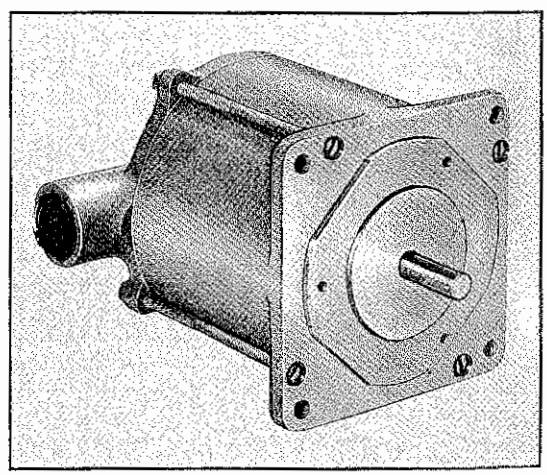
D = 6 or 8 connections, round flange
F = 4 connections, square flange+
J = 6 or 8 connections, square flange, sealed against ingress of liquids or dust

+ NOTE: Except the M111-FF401 which has a round flange.

Refer to page DC-27 for availble options.

Motors For "HAZARDOUS DUTY" Locations

The MX111-FF-401U, MX112-FF-401U and MX112-FF-401EU motors meet the specifications for motors operating in "Hazardous Duty" locations as defined by UL Class 1, Group D requirement. "Class 1" is designated as locations in which flammable gasses or vapors are, or may be, present in the air in quantities sufficient to cause explosions of ignitable mixtures. "Group D" includes atmospheres containing **gasoline, petroleum, naphtha, acetone, lacquer, solvent vapors or natural gas.**



MX111-FF-401U

110mm (NEMA Size 42) & 165mm (NEMA Size 66) RATINGS and SPECIFICATIONS

MOTOR TYPE 5% ACCURACY	CONNECTIONS NUMBER	CONNECTIONS TYPE	TYPICAL TIME FOR SINGLE STEP (mS) (1)	UNIPOLAR CONFIGURATION						BIPOLAR CONFIGURATION											
										SERIES CONNECTION						PARALLEL CONNECTION					
														MINIMUM HOLDING TORQUE OZ-IN (Ncm)						MINIMUM HOLDING TORQUE OZ-IN (Ncm)	
				NOMINAL DC VOLTS (3)	RATED AMPERES PER WINDING	NOMINAL RESISTANCE PER WINDING (25 C) OHMS (2)	NOMINAL INDUCTANCE PER PHASE (MILLI-HENRYS) (2) (4)	MINIMUM HOLDING TORQUE OZ-IN (Ncm)		VOLTS	AMPERES	R	L	2Ø ON	1Ø ON	VOLTS	AMPERES	R	L	2Ø ON	1Ø ON
								2Ø ON	1Ø ON												
M111-FD12	6	TERM.	4.4	2.26	6.1	0.37	2.3	625 (441)	375 (265)	3.2	4.3	0.74	9.2	850 (600)	500 (353)	—	—	—	—	—	—
M111-FD16*	6	TERM.	4.4	1.7	8	0.21	1.1	625 (441)	375 (265)	2.4	5.7	0.42	4.4	850 (600)	500 (353)	—	—	—	—	—	—
M111-FF-206	4	TERM.	—	—	—	—	—	—	—	3.5	5	0.7	9.2	760 (537)	—	—	—	—	—	—	—
M111-FD-327*	6	TERM.	7	4.1	3.5	1.17	7.2	625 (441)	375 (265)	5.85	2.5	2.34	28.8	850 (600)	500 (353)	—	—	—	—	—	—
M111-FF-401	4	TERM.	—	—	—	—	—	—	—	4	3.4	1.14	17.7	850 (600)	500 (353)	—	—	—	—	—	—
MX111-FF-401	4	TERM.	—	—	—	—	—	—	—	4	3.4	1.14	17.7	850 (600)	500 (353)	—	—	—	—	—	—
M111-FD-8003*	8	TERM.	—	6.93	1.55	4.47	26.2	625 (441)	375 (265)	9.8	1.1	8.94	105	850 (600)	500 (353)	4.9	2.2	2.24	26.2	850 (600)	500 (353)
M111-FD-8007*	8	TERM.	7	4.1	3.5	1.17	7.2	625 (441)	375 (265)	5.85	2.5	2.34	28.8	850 (600)	500 (353)	2.93	5	0.585	7.2	850 (600)	500 (353)
M111-FD-8012	8	TERM.	4.4	2.26	6.1	0.37	2.3	625 (441)	375 (265)	3.2	4.3	0.74	9.2	850 (600)	500 (353)	1.6	8.63	0.185	2.3	850 (600)	500 (353)
M111-FD-8016*	8	TERM.	4.4	1.7	8	0.21	1.1	625 (441)	375 (265)	2.4	5.7	0.42	4.4	850 (600)	500 (353)	1.2	11.3	0.105	1.1	850 (600)	500 (353)
M112-FD08*	6	TERM.	7	5.8	3.8	1.53	14	1125 (794)	675 (477)	8.25	2.7	3.06	56	1390(981)	830 (586)	—	—	—	—	—	—
M112-FD12	6	TERM.	5.5	3.66	6.1	0.6	5.3	1125 (794)	675 (477)	5.2	4.3	1.2	21.2	1390(981)	830 (586)	—	—	—	—	—	—
M112-FJ12	6	TERM.	5.5	3.66	6.1	0.6	5.3	1125 (794)	675 (477)	5.2	4.3	1.2	21.2	1300(981)	830 (586)	—	—	—	—	—	—
M111-FF-206	4	TERM.	—	—	—	—	—	—	—	2.95	6	0.49	8.8	1390(981)	—	—	—	—	—	—	—
M112-FF-401	4	TERM.	—	—	—	—	—	—	—	1.95	4	0.49	8.8	950 (671)	675 (477)	—	—	—	—	—	—
MX112-FF-401U	4	TERM.	—	—	—	—	—	—	—	1.95	4	0.49	8.8	950 (671)	675 (477)	—	—	—	—	—	—
M112-FJ-326*	6	TERM.	6	1.52	15.2	0.1	0.88	1125 (794)	675 (477)	2.15	10.75	0.2	3.52	1390 (981)	830 (586)	—	—	—	—	—	—
M112-FJ-327*	6	TERM.	6	2.26	9.2	0.246	2.2	1125 (794)	675 (477)	3.2	6.5	0.492	8.8	1390 (981)	830 (586)	—	—	—	—	—	—
M112-FJ-335(5)*	6	TERM.	6	2.26	9.2	0.246	2.2	1125 (794)	675 (477)	3.2	6.5	0.492	8.8	1390 (981)	830 (586)	—	—	—	—	—	—
M112-FJ-344(5)*	6	TERM.	6	1.52	15.2	0.1	0.88	1125 (794)	675 (477)	2.215	10.75	0.2	3.52	1390 (981)	830 (586)	—	—	—	—	—	—
M112-FJ-8008*	8	TERM.	7	5.8	3.8	1.53	14	1125 (794)	675 (477)	8.25	2.7	3.06	56	1390 (981)	830 (586)	4.1	5.4	0.765	14	1390 (981)	830 (586)
M112-FD-8012*	8	TERM.	5.5	3.66	6.1	0.6	5.3	1125 (794)	675 (477)	5.2	4.3	1.2	21.2	1390 (981)	830 (586)	2.6	8.6	0.3	5.3	1390 (981)	830 (586)
M112-FJ-8012	8	TERM.	5.5	3.66	6.1	0.6	5.3	1125 (794)	675 (477)	5.2	4.3	1.2	21.2	1390 (981)	830 (586)	2.6	8.6	0.3	5.3	1390 (981)	830 (586)
M112-FJ-8018*	8	TERM.	6	2.1	9.2	0.242	2.1	1125 (794)	675 (477)	3	6.5	0.483	8.4	1390 (981)	830 (586)	1.5	13	0.12	2.1	1390 (981)	830 (586)
M112-FJ-8025*	8	TERM.	6	1.75	12.7	0.137	1	1125 (794)	675 (477)	2.5	9	0.274	4	1390 (981)	830 (586)	1.25	18	0.069	1	1390 (981)	830 (586)
M112-FJ-8030*	8	TERM.	6	1.52	15.2	0.1	0.88	1125 (794)	675 (477)	2.15	10.75	0.2	3.52	1390 (981)	830 (586)	1.1	21.5	0.05	0.88	1390 (981)	830 (586)
M113-FF-401	4	TERM.	—	—	—	—	—	—	—	4.5	6	0.75	17	2150(1518)	1290 (911)	—	—	—	—	—	—
M172-FD-306*	6	TERM.	24	2.35	15	0.15	1.98	2700 (1906)	1600 (1130)	3.3	10.6	0.3	7.92	3300(2330)	1980(1398)	—	—	—	—	—	—
M172-FD-308*	6	TERM.	24	1.45	20	0.075	1.06	2700 (1906)	1600 (1130)	2.1	14.1	0.15	4.24	3300(2330)	1980(1398)	—	—	—	—	—	—
M172-FF-401	4	TERM.	—	—	—	—	—	—	—	2.6	4	0.65	14.6	2000(1412)	1200 (847)	—	—	—	—	—	—
M172-FD-8030	8	TERM.	24	2.35	15	0.15	2.50	2700 (1906)	1600 (1130)	3.3	10.6	0.3	10.0	3300(2330)	1980(1398)	1.7	21.5	0.075	2.50	3300(2330)	1980 (1398)
M172-FD-8040*	8	TERM.	24	1.45	20	0.075	1.06	2700 (1906)	1600 (1130)	2.1	14.1	0.15	4.24	3300(2330)	1980(1398)	1	28.3	0.0375	1.06	3300(2330)	1980 (1398)

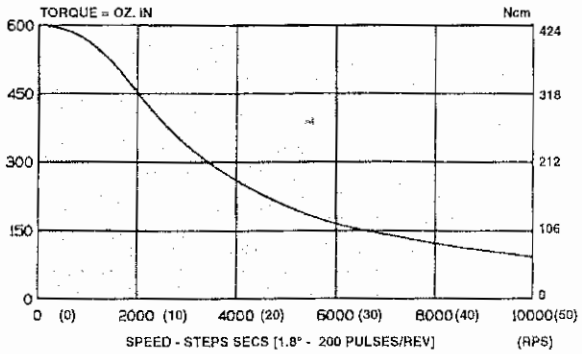
(1) With 24 volts drive.
(2) Values shown are for reference only and are correct to the best of our knowledge at the time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.
(3) Voltage shown is per phase at rated current at zero steps per second, with winding at 25°C. Resistance tolerance and winding temperature will influence voltage.
(4) Tolerance is ±20%. Measured at 1 kHz with a General Radio #1650B impedance bridge having a 1 volt rms open circuit sinusoidal signal. Rotor position preconditioned by energizing same phase, then deenergizing same phase during measurement without changing rotor position.
(5) Has double end shaft.
* These motors are obsolete and should not be used in a new application design. They can be provided to support existing systems.

MECHANICAL SPECIFICATIONS [1]

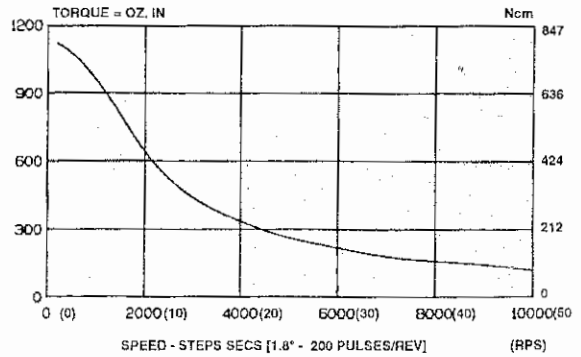
BASIC MOTOR SERIES	NOMINAL ROTOR INERTIA LB-IN² (kg-cm²)	MINIMUM RESIDUAL TORQUE OZ-IN (Ncm)	TYPICAL TORQUE TO INERTIA RATIO	MAXIMUM OVERHANG LOAD LBS (kg)	MAXIMUM THRUST LOAD LBS (kg)	APPROX. WEIGHT LBS. (kg)	
						NET	SHIPPING
M111	1.34 (3.93)	6 (4.24)	11.2×10^3 (11.2^3)	25 (11.3)	50 (22.7)	8 (3.63)	9.25 (4.2)
MX111	1.34 (3.93)	6 (4.24)	11.2×10^3 (11.2^3)	25 (11.3)	50 (22.7)	9 (4.08)	10.25 (4.65)
M112-FD M112-FJ	2.75 (8.06)	12 (8.47)	9.8×10^3 (9.8^3)	25 (11.3)	50 (22.7)	16.7 (7.57)	16.5 (7.4)
MX112	2.75 (8.06)	12 (8.47)	9.8 X 103 (9.83)	25 (11.3)	50 (22.7)	16 (7.26)	18 (8.16)
M113	4.1 (12.0)	20 (14.12)	9.1 X 103 (9.13)	25 (11.3)	50 (22.7)	22 (10)	25 (11.4)
M172	21 (61.5)	50 (35.31)	3.1 x 103 (3.13)	50 (22.7)	100 (45.4)	50 (22.7)	56 (25.4)

[1] Values shown are for reference information and are correct to the best of our knowledge at time of publication, but are subject to change without notice. Parameters to be used as part of a specification should be verified with the factory.

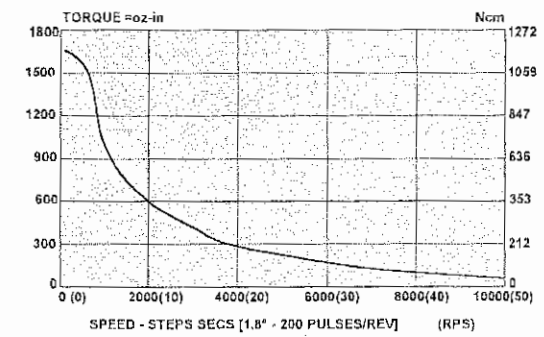
Typical Torque Versus Speed Characteristics



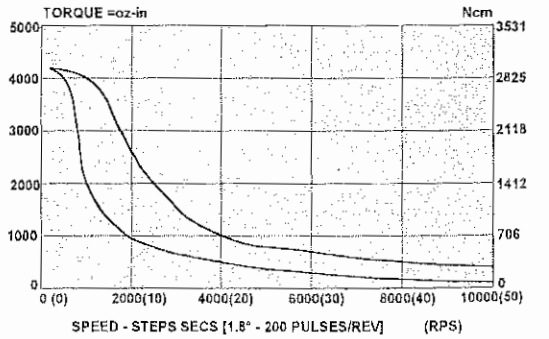
M111-FF206 MOTOR WITH SS2000D6
6 AMP, 180 VDC SLO-SYN MOTION CONTROL



M112-FF206 MOTOR WITH SS2000D6
6 AMP, 180 VDC SLO-SYN MOTION CONTROI

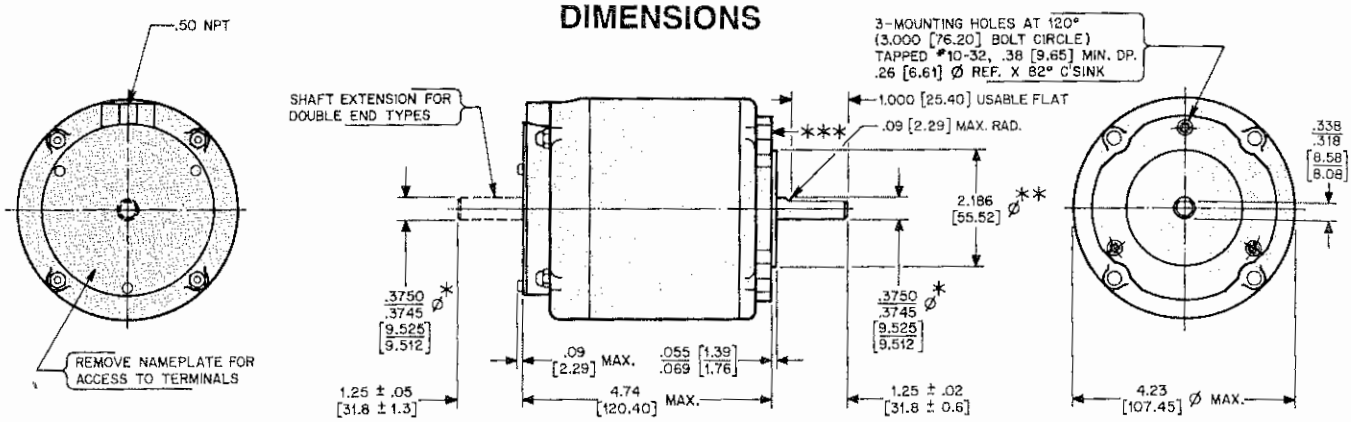


M113-FF-401 MOTOR WITH SS2000D6
6 AMP, 180 VDC SLO-SYN MOTION CONTROL



M172-FF-401 MOTOR WITH SS2000D12
8 AMP, 180 VDC SLO-SYN MOTION CONTRO

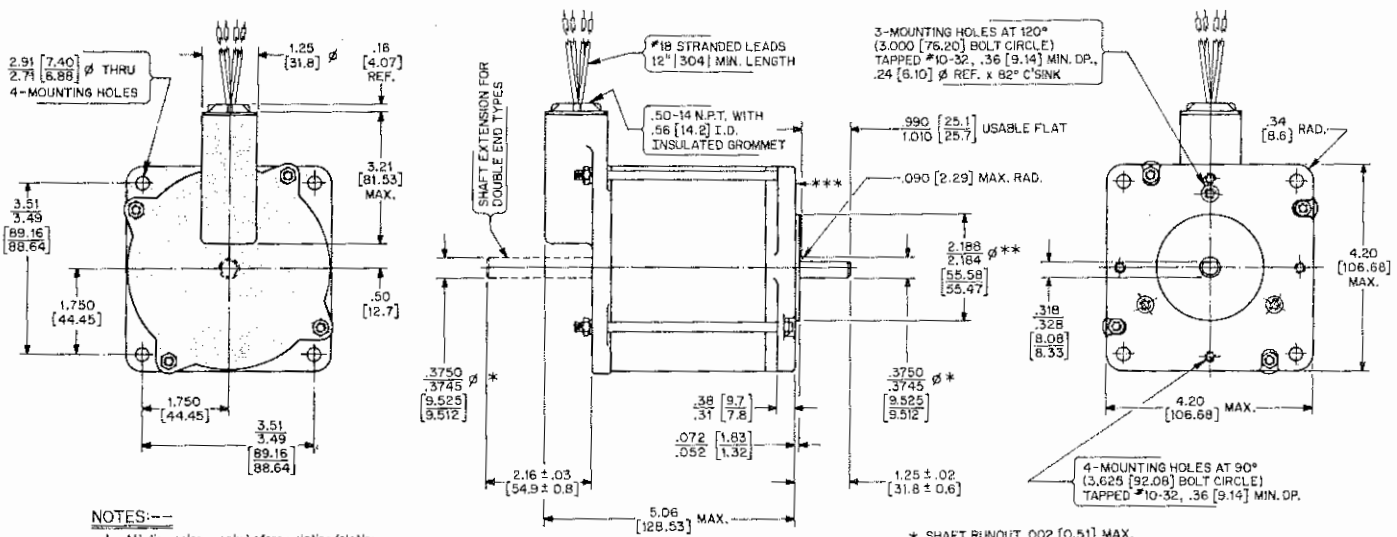
DIMENSIONS



NOTES ---
1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals ---
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER TOLERANCE ± .002 [0.051]
DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

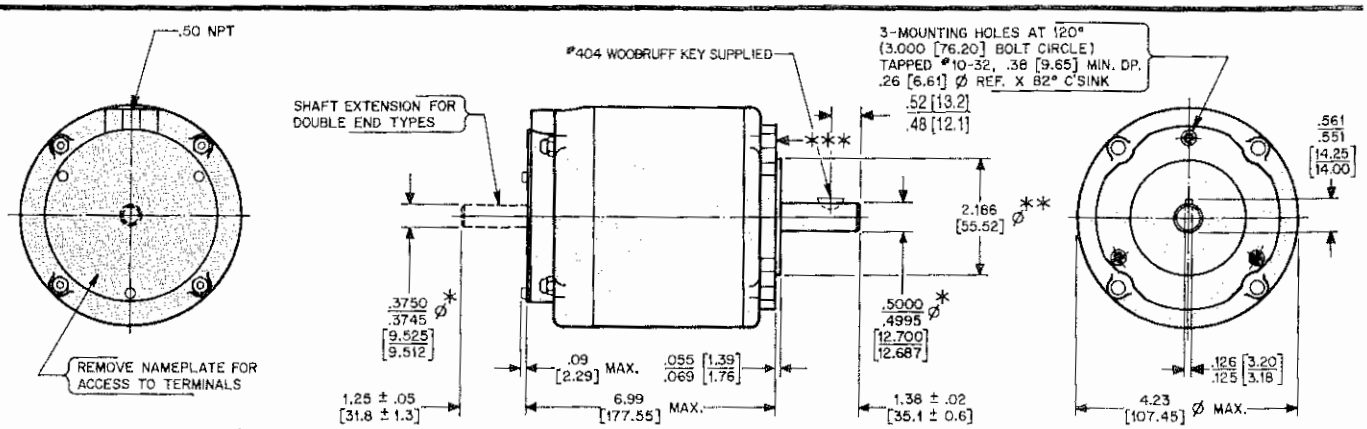
M111-FD MOTORS, STANDARD AND DOUBLE END



NOTES:---
1.– All dimensions apply before painting/plating.
2.– Dimensions in brackets are millimeters.

* SHAFT RUNOUT .002 [0.51] MAX.
** DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

MX111-FF-401U MOTORS, STANDARD AND DOUBLE END

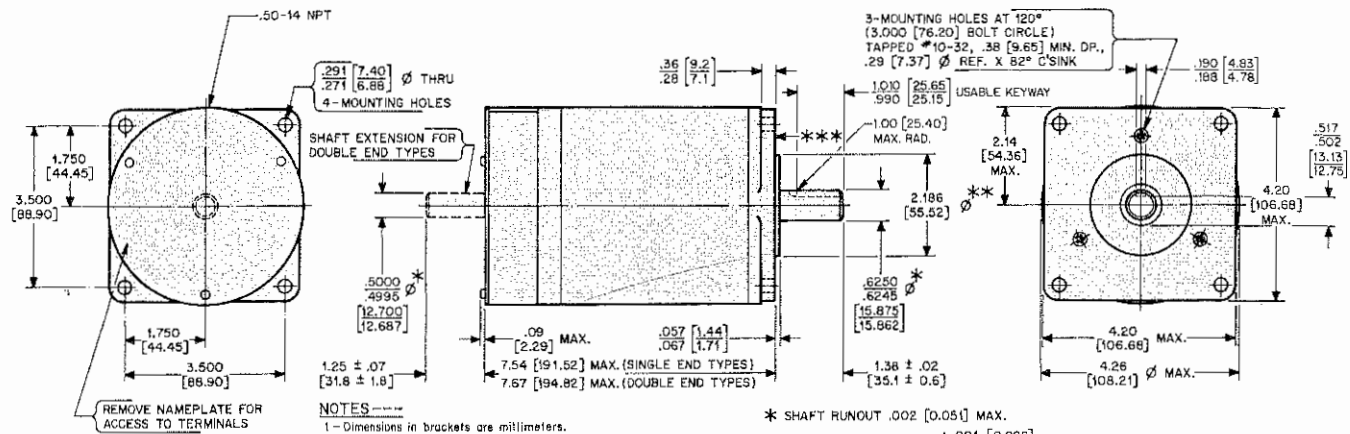


NOTES ---
1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals ---
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER TOLERANCE ± .002 [0.051]
DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

M112-FD MOTORS, STANDARD AND DOUBLE END MODELS

DIMENSIONS

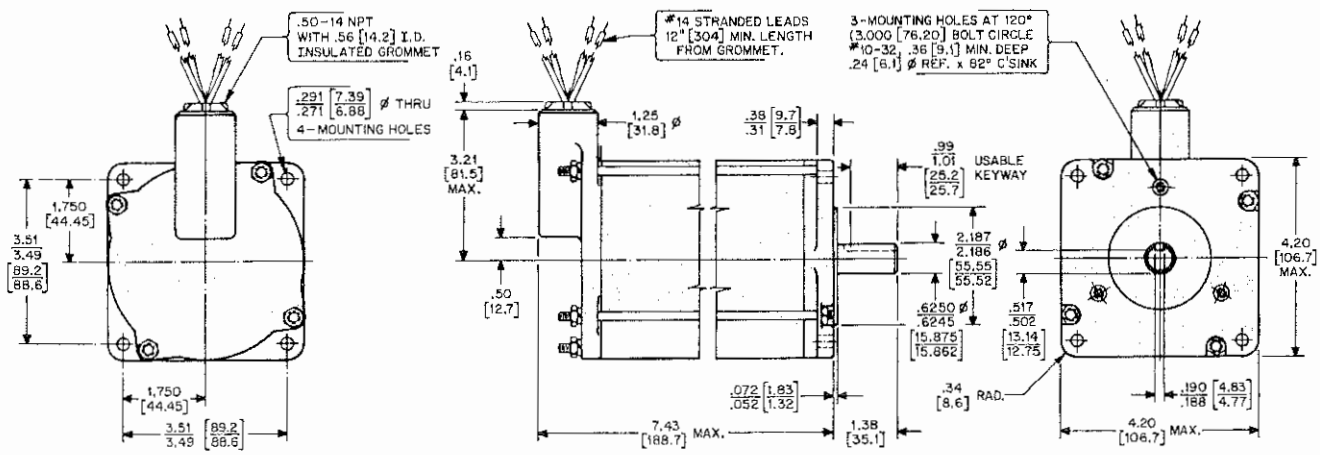


NOTES —

1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals —
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER TOLERANCE +.001 [0.026] / −.000 [0.000]
DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

M112-FJ MOTORS, STANDARD AND DOUBLE END MODELS

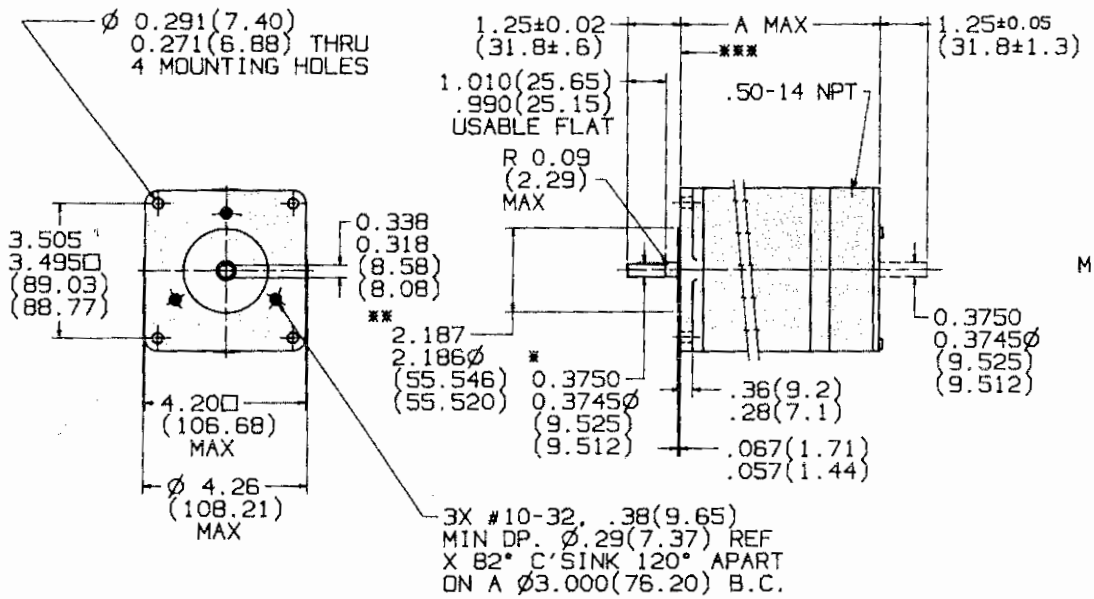


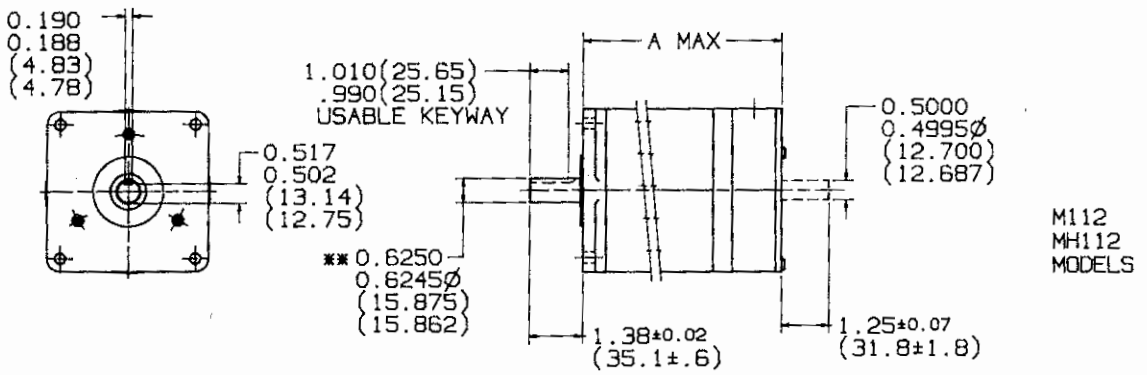
NOTES —

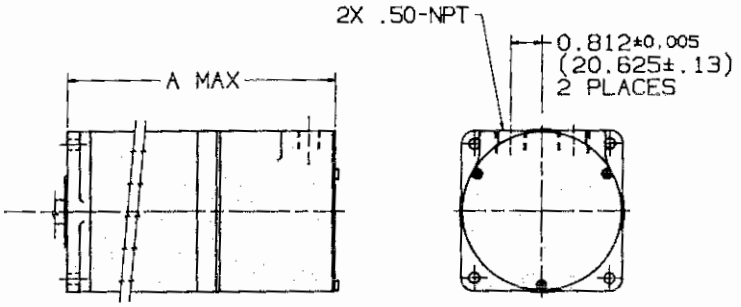
1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals —
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

MX112-FF MOTORS, STANDARD AND DOUBLE END MODELS

DIMENSIONS







MODEL	A MAX
M111,E	5.29 (134.37)
M112	7.54 (191.52)
M112E	7.67 (194.82)
MH112E	8.29 (210.57)
M111C	7.10 (180.34)
M112C	9.35 (237.49)
MH112C	10.16 (256.54)

ENCODER MODELS

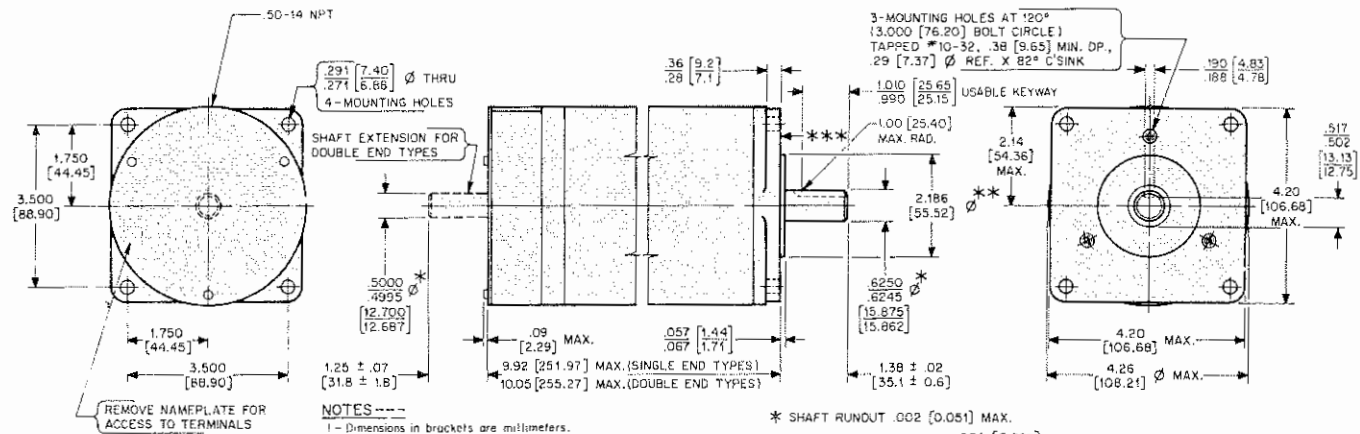
NOTES:

1. OTHER THAN THE DIMENSIONS SHOWN, THE PARAMETERS FOR M112 & MH112 MODELS ARE THE SAME AS THE M111 MODELS.
2. DIMENSIONS IN BRACKETS ARE IN MILLIMETERS.
3. TOLERANCES:

   * SHAFT RUNOUT .002(.051) MAX.
   ** DIAMETER CONCENTRIC TO SHAFT DIA WITHIN .003(.077) T.I.R.
   *** SURFACE SQUARE TO SHAFT DIA. WITHIN .003(.077) T.I.R.

M111-FF206 AND M112-FF206 MOTORS; STANDARD, DOUBLE END AND ENCODER MODELS

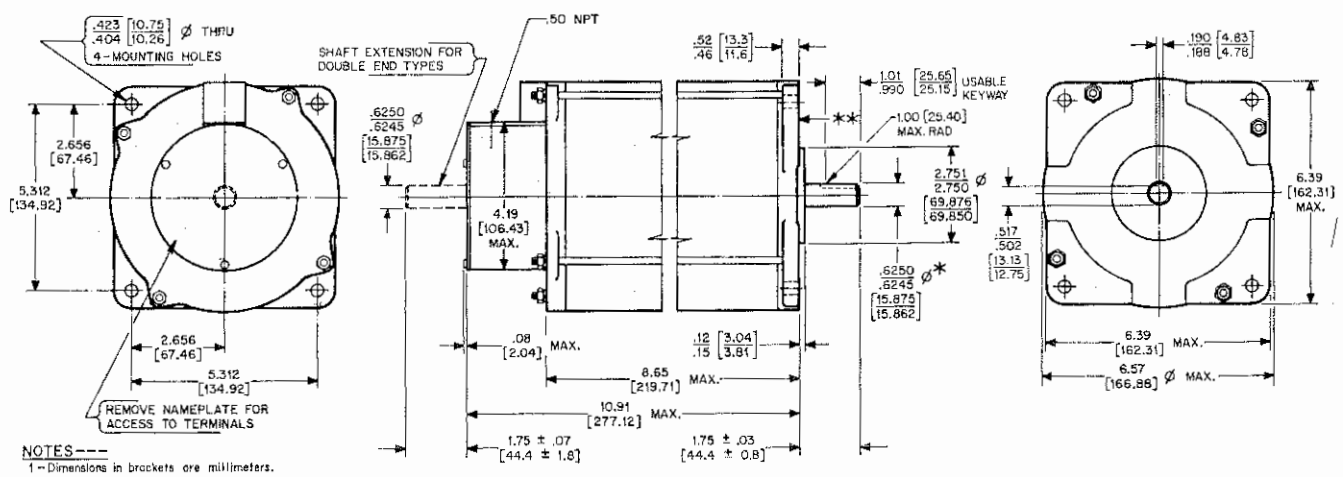
DIMENSIONS



NOTES---
1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals ---
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER TOLERANCE + .001 [0.026] / - .000 [0.000]
DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

M113-FF MOTORS, STANDARD AND DOUBLE END MODELS

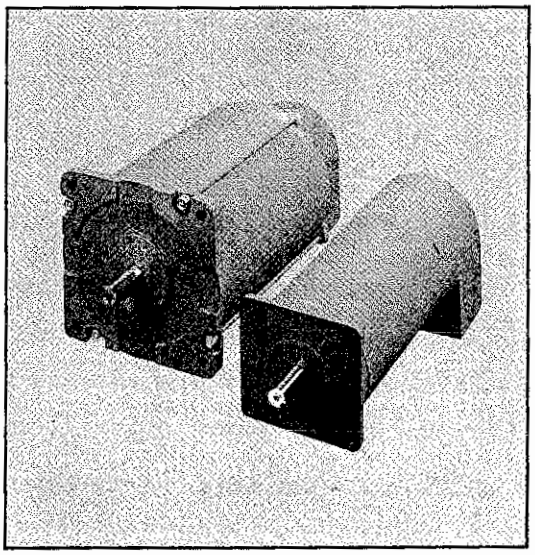


NOTES---
1 – Dimensions in brackets are millimeters.
2 – Tolerance on decimals ---
.XXX = ± 0.005 [0.13] unless otherwise specified.
3 – Dimensions shown apply before painting or plating.
4 – This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .006 [0.127] T.I.R.

M172 MOTORS, STANDARD AND DOUBLE END MODELS

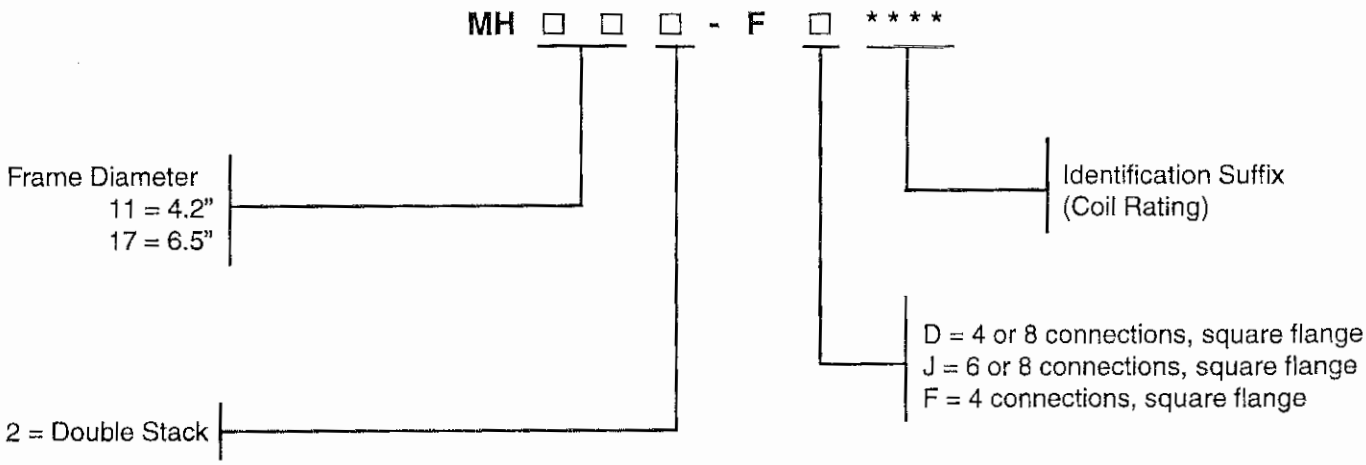
MH112 (NEMA Size 42) and MH172 (NEMA Size 66) Motors



- *Can be used for full step (1.8°), half step (0.9°) and microstep operation*

- *±5% step accuracy, noncumulative*
- *High power for machine tool and similar applications*
- *Offered with 4 or 8 connections for use with unipolar or bipolar chopper drives*
- *Have cast terminal enclosure*
- *Optimized magnetic structure gives motor torque 10% to 100% higher than competitive motors*
- *Have Class F insulation for higher allowable duty cycles*
- ***Can withstand up to 2-1/2 times rated current (instantaneous) without demagnetization***
- *Large diameter improves shaft stiffness*
- *Shaft has keyway for square key*
- *Have provisions for 4-hole mounting*

TYPE NUMBER EXPLANATION - MH SERIES MOTORS



Refer to page DC-27 for list of available options.

Specifications, MH112 and MH172 Motors

Motor Type 5% Accuracy	Connections		Thermal Resistance (°C/Watt)						Series Connection						Parallel Connection					
													Minimum Holding Torque OZ-IN (Ncm)						Minimum Holding Torque OZ-IN (Ncm)	
	Number	Type	Typical Time For Single Step(mS) (1)	Winding to Frame	Frame To Air	Frame To Heat Sink	Temperature Winding	Limit (°C) Frame	Volts	Ampere	R(ohms)	L(mH)	1Ø ON	2Ø ON	Volts	Amperes	R(ohms)	L(mH)	1Ø ON	2Ø ON
MH112-FJ8020	8	TERM.	3	0.8	1.87	4.1	155	125	3.8	7.1	0.532	11.92	1760 (1243)	2400 (1695)	1.9	14.1	0.133	2.98	1760 (1243)	2400 (1695)
MH112-FJ8030	8	TERM.	2.8	0.8	1.87	4.1	155	125	2.5	10.6	0.232	4.12	1760 (1243)	2400 (1695)	1.25	21.1	0.058	1.03	1760 (1243)	2400 (1695)
MH112-FJ4201	4	TERM.	—	0.8	1.87	4.1	155	125	3.2	4	0.8	16.8	1500 (1059)	2100 (1483)	—	—	—	—	—	—
MH112-FF206	4	TERM.	—	—	—	—	130	100	4.8	6	0.8	16.8	2000 (1412)	—	—	—	—	—	—	—
MH172-FD8030	8	TERM.	4.2	0.47	1.06	1.4	155	125	3.25	10.614	0.306	8.48	5330 (3764)	6800 (4801)	1.6	21.2	0.0765	2.12	5330 (3764)	6800 (4801)
MH172-FD8040*	8	TERM.	4	0.47	1.06	1.4	155	125	2.25	14.4	0.156	4.76	5330 (3764)	6800 (4801)	1.15	28.8	0.039	1.19	5330 (3764)	6800 (4801)
MH172-FD4201	4	TERM.	—	0.47	1.06	1.4	155	125	2.64	4	0.66	15.6	3000 (2118)	4200 (2966)	—	—	—	—	—	—

(1)

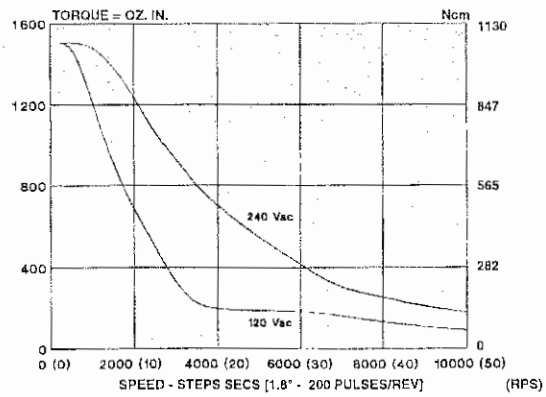
* These motors are obsolete and should not be used in a new application design. They can be provided to support existing systems.

MECHANICAL SPECIFICATIONS (1)

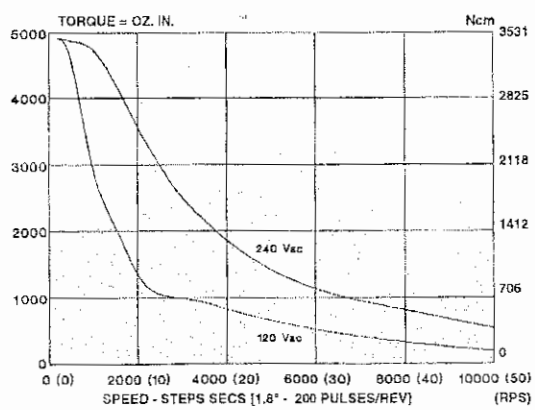
BASIC MOTOR SERIES	NOMINAL ROTOR INERTIA LB-IN² (kg-cm²)	MINIMUM RESIDUAL TORQUE OZ-IN (Ncm)	TYPICAL TORQUE TO INERTIA RATIO	MAXIMUM OVERHANG LOAD LBS (kg)	MAXIMUM THRUST LOAD LBS (kg)	APPROX. WEIGHT LBS. (kg)	
						NET	SHIPPING
MH112-8XXX	3.22 (9.42)	85 (60.02)	13.1 x 10^3	50 (22.7)	100 (45.4)	20.5 (9.3)	24 (10.9)
MH112-4XXX	3.22 (9.42)	85 (60.02)	11.2 x 10^3	50 (22.7)	100 (45.4)	20.5 (9.3)	24 (10.9)
MH172-8XXX	21.0 (61.5)	50 (35.31)	6.1 x 10^3	100 (45.4)	150 (68)	53 (24.1)	62 (28.1)
MH172-4XXX	21.0 (61.5)	50 (35.31)	3.4 X 10^3	100 (45.4)	150 (68)	53 (24.1)	62 (28.1)

(1) Values shown are for reference information and are correct to the best of our knowledge at time of publication, but are subject to change withou notice. Parameters to be used as part of a specification should be verified with the factory.

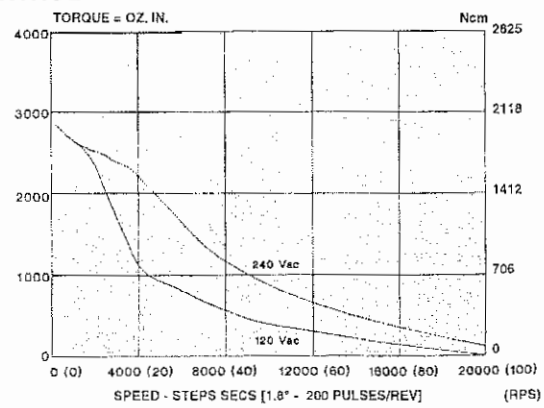
Typical Torque Versus Speed Characteristics



MH112-FJ-4201 OR MH112-FF206 MOTOR WITH SS2000D12 6 AMP, 180 VDC SLO-SYN MOTION CONTROL



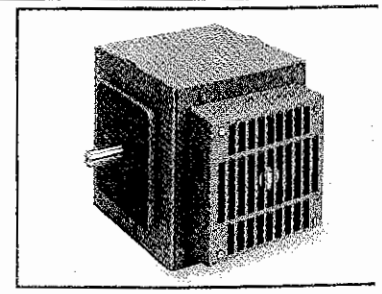
MH172-FD-8030 Motor with SS2000D12 12 AMP, 180 VDC SLO-SYN MOTION CONTROL - SERIES CONNECTION



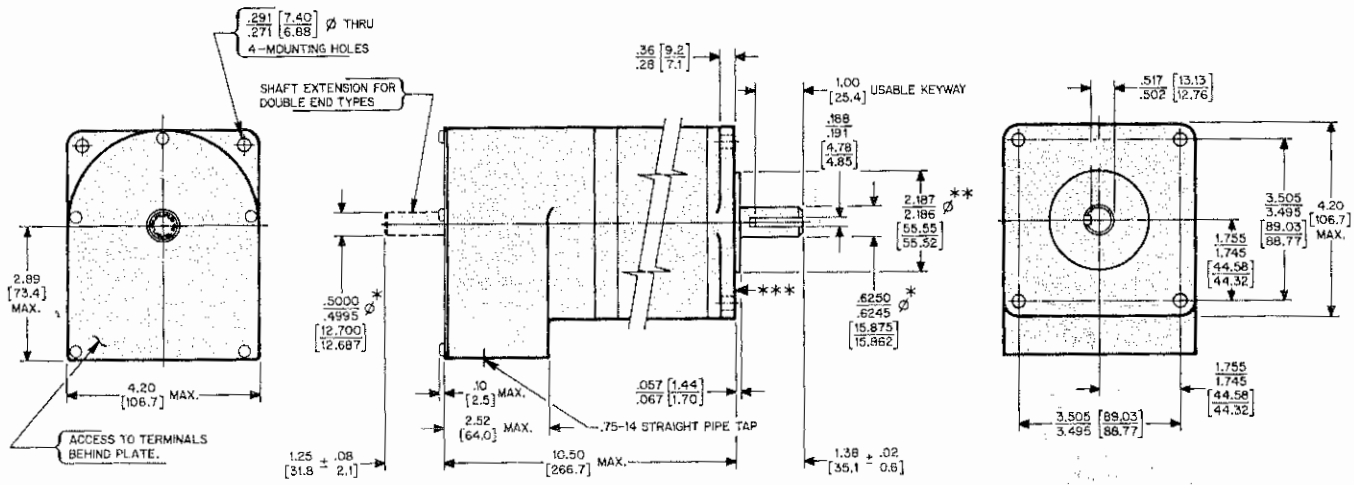
MH172-FD-8030 Motor with SS2000D12 12 AMP, 180 VD SLO-SYN MOTION CONTROL - PARALLEL CONNECTIO

Fan Kits

Motors of the MH Series can usually be operated at duty cycles up to 35% to 45% without exceeding their maximum temperature rating. If the duty cycle is greater than 45% or if the motor loading is too high, some additional means of cooling the motor may be required. Fan Kits FAN212, FAN112 and FAN172 are offered for this purpose. These two-piece kits bolt to the shells of the motors and can be installed in the field. Motors tested with these kits have exhibited operating temperatures of 130°F (55°C) or less after 900 hours of operation. This is well below the maximum motor shell temperature rating of 257°F (125°C). Order type FAN212 for an M112 motor, FAN112 for an MH112 motor or FAN172 for and MH172 motor.



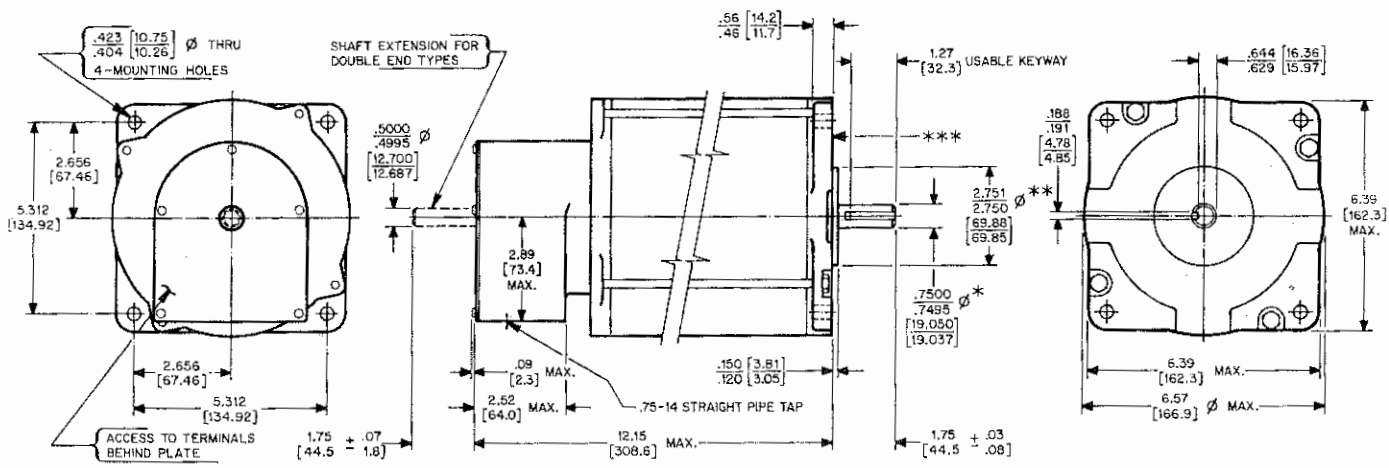
DIMENSIONS, MH112 AND MH172 SERIES MOTORS



Dimensions in brackets are millimeters.
Dimensions shown apply before painting.
This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

MH112 MOTORS, STANDARD AND DOUBLE END MODELS



Dimensions in brackets are millimeters.
Tolerance on decimals ---
.XXX = ± .005 [0.13] unless otherwise specified.
.XX = ± .02 [0.6]
Dimensions shown apply before painting.
This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

* SHAFT RUNOUT .002 [0.051] MAX.
** DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .005 [0.127] T.I.R.
*** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .005 [0.127] T.I.R.

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