

# MC GEARMOTORS

AC Hysteresis Synchronous and Induction Planetary Gearmotors



**general design specification:** MIL-M-7969

**torque rating:** Up to 1,250 oz. in. maximum  
continuous torque

**weight:** 9 to 12.5 ounces

**gears:** Planetary gearing system. All gears are heat-treated for consistently reliable performance and long life

**shaft:** Precision-ground 416 nitrided stainless steel.  
Options: length, smaller diameter, flats, pinions, gears, holes (through or tapped), threaded ends and tapers.  
Type of steel used may change depending upon variation selected

**backlash:** Varies with reduction but average unit will have less than 3°

**gear inertia:**  $5.1 \times 10^{-6}$  oz. in. sec.<sup>2</sup> @ input max

**bearings:** .250" dia. shaft uses double-shielded, life-lubricated ball bearings for -55°C to +85° C operation.  
.313" dia. shaft uses needle bearings. Special lubricants available for temperature extremes

**cables/leads:** 8" #26 AWG leads per MIL-W-16878/4

**mounting flange:** Die-cast aluminum

**gear train housing:** Stress-proof steel

**marking:** Per MIL-STD-130

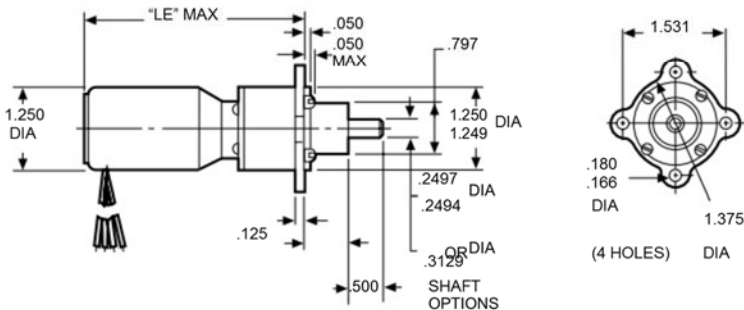
**life:** 200 to 1,000 hours continuous duty depending upon the voltage, frequency and number of poles and gear ratio selected

**options available:**

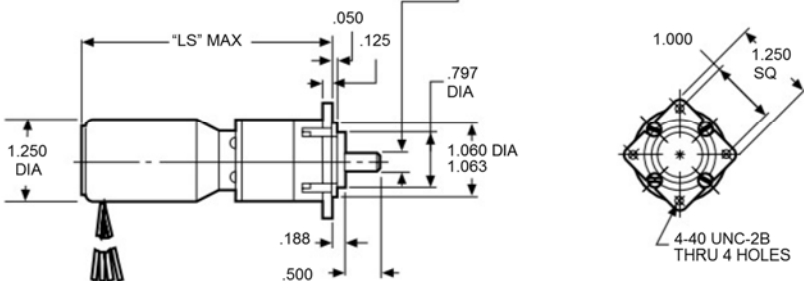
- Slip clutches

## Dimensions

### EARED FLANGE



### SQUARE FLANGE



# B-2030

## Basic Motor Data

### Hysteresis Synchronous

VOLT-AGE (VAC)	FRE-QUENCY (Hz)	P O L E S	P H A S E S	SCHE-MATIC	VARIABLE LEAD COLOR C	PHASING CAPACITOR (µF) (wvac)	MOTOR SYNC. SPEED (rpm)	NORMAL RATED LOAD @ SYNC. SPEED (oz. in.)	MOTOR MIN PULL UP TORQUE (oz. in.)	MAX POWER (watts)		STANDARD PART NUMBER PREFIX*					
										no load	normal rated load	EVEN RATIO			ODD RATIO		
												eared flange	square flange	eared flange	square flange	eared flange	square flange
115	60	2	1	C	WHT	1.00 200	3,600	.70	.50	12	12	33A603	33A613	33A648	33A513	33A643	33A638
115	60	4	1	C	BLK	1.00 200	1,800	.65	.50	12	12	33A604	33A614	33A649	33A514	33A644	33A639
115	60	6	1	C	RED	1.00 200	1,200	.50	.40	12	12	33A1214	33A1215	33A1217	33A1216	33A1219	33A1218

### Hysteresis Synchronous

VOLT-AGE (VAC)	FRE-QUENCY (Hz)	P O L E S	P H A S E S	SCHE-MATIC	VARIABLE LEAD COLOR C	PHASING CAPACITOR (µF) (wvac)	MOTOR SYNC. SPEED (rpm)	NORMAL RATED LOAD @ SYNC. SPEED (oz. in.)	MOTOR MIN PULL UP TORQUE (oz. in.)	MAX POWER (watts)		STANDARD PART NUMBER PREFIX* ALL RATIOS			
										no load	normal rated load	eared flange		square flange	
												.250" shaft	.313" shaft	.250" shaft	.313" shaft
115	400	2	1	A	BLK	.180 350	24,000	.80	.55	23	33	33A2008	33A2108	33A2208	33A2308
115	400	2	3	B	BLK	NOT REQ'D	24,000	.80	.80	20	30	33A2010	33A2110	33A2210	33A2310
115	400	4	1	A	GRN	.082 500	12,000	.65	.45	17	20	33A2012	33A2112	33A2212	33A2312
115	400	4	3	B	GRN	NOT REQ'D	12,000	.85	.85	16	21	33A2014	33A2114	33A2214	33A2314
115	400	6	1	B	ORG	.150 400	8,000	.45	.25	16	18	33A2016	33A2116	33A2216	33A2316
200	400	2	3	B	BLK	NOT REQ'D	24,000	.80	.80	20	30	33A2018	33A2118	33A2218	33A2318
200	400	4	3	B	GRN	NOT REQ'D	12,000	.75	.75	14	18	33A2020	33A2120	33A2220	33A2320

Note: All 3-phase voltages are line to line. MIL-STD-704 is 200V line to line

### Induction

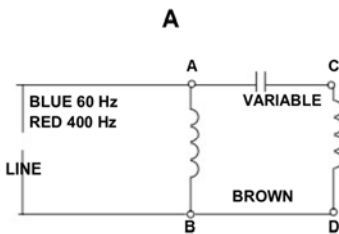
VOLT-AGE (VAC)	FRE-QUENCY (Hz)	P O L E S	P H A S E S	SCHE-MATIC	VARIABLE LEAD COLOR C	PHASING CAPACITOR (µF) (wvac)	MOTOR MIN SPEED @ RATED LOAD (rpm)	MOTOR RATED LOAD (oz. in.)	MOTOR MIN PULL UP TORQUE (oz. in.)	MAX POWER (watts)		STANDARD PART NUMBER PREFIX* ALL RATIOS			
										no load	normal rated load	eared flange		square flange	
												.250" shaft	.313" shaft	.250" shaft	.313" shaft
115	400	2	1	A	BLK	.180 350	21,000	1.00	.80	16	32	33A2007	33A2107	33A2207	33A2307
115	400	2	3	B	BLK	NOT REQ'D	22,000	1.50	1.50	16	40	33A2009	33A2109	33A2209	33A2309
115	400	4	1	A	GRN	.082 500	10,000	1.00	1.00	17	28	33A2011	33A2111	33A2211	33A2311
115	400	4	3	B	GRN	NOT REQ'D	10,500	1.50	1.50	14	28	33A2013	33A2113	33A2213	33A2313
200	400	2	3	B	BLK	NOT REQ'D	22,000	1.50	1.50	16	40	33A2017	33A2117	33A2217	33A2317
200	400	2	3	B	GRN	NOT REQ'D	10,500	1.50	1.50	14	28	33A2019	33A2119	33A2219	33A2319

Note: All 3-phase voltages are line to line. MIL-STD-704 is 200V line to line

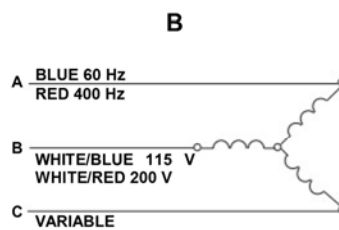
### \*When You Order

The standard Part Number Prefix can be used with any of the Speed Reduction Ratios listed on the following two pages. The complete part number consists of the Standard Part Number Prefix plus the Speed Reduction Ratio desired. EXAMPLE: 33A2012-20 is a 4 pole, 12,000 rpm, 115 vac, 400 Hz hysteresis synchronous motor, coupled to a 20:1 even ratio gear train with a final output speed of 600 rpm. The unit has an eared flange and a .250" dia. output shaft

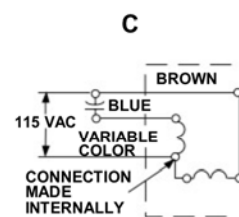
### Schematic Wiring



WHITE/BLUE 115 V  
CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE C & D



WHITE/BLUE 115 V  
WHITE/RED 200 V  
ABC PHASE SEQUENCE FOR CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE ANY TWO LEADS



CONNECTION MADE INTERNALLY  
CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION CONNECT LINE TO BLUE INSTEAD OF BROWN

# MC GEARMOTORS

AC Hysteresis Synchronous and Induction Planetary Gearmotors

# B-2030

## Ratios and Performance

### Odd Ratios

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	GEAR TRAIN EFFICIENCY (%)	FINAL OUTPUT SPEED (HYST.)			MIN SPEED @ RATED LOAD (IND.)				DIMENSION	
				400 cycles			400 cycles				LE (in.)	LS (in.)
				24,000 input	12,000 input	8,000 input	22,000 input	21,000 input	10,500 input	10,000 input		
4.33:1	3.2	5.4	75	5,538.462	2,769.231	1,846.231	2,309.00	2,425.00	4,850.00	5,081.00	2.87	3.28
5.28:1	4.0	6.8	75	4,545.455	2,272.727	1,515.152	1,894.00	1,989.00	3,977.00	4,167.00	2.87	3.28
18.78:1	12.0	20.0	64	1,277.955	638.977	425.985	532.00	559.00	1,118.00	1,171.00	2.87	3.28
27.94:1	17.0	29.0	64	858.984	429.491	286.327	358.00	376.00	752.00	787.00	2.87	3.28
81.37:1	41.0	70.0	51	294.949	147.474	98.316	123.00	129.00	258.00	270.00	3.02	3.42
121.1:1	62.0	105.0	51	198.183	99.091	66.061	83.00	87.00	173.00	182.00	3.02	3.42
147.7:1	75.0	128.0	51	162.491	81.250	54.163	68.00	71.00	142.00	149.00	3.02	3.42
352.6:1	145.0	247.0	41	68.066	34.032	22.688	28.00	30.00	60.00	62.00	3.28	3.68
524.6:1	215.0	366.0	41	45.749	22.874	15.249	19.00	20.00	40.00	42.00	3.28	3.68
639.9:1	262.0	445.0	41	37.506	18.752	12.501	16.00	16.00	33.00	34.00	3.28	3.68
780.6:1	320.0	544.0	41	30.745	15.372	10.248	13.00	13.00	27.00	28.00	3.28	3.68
1,528:1	500.0	850.0*	33	15.706	7.853	5.235	6.50	6.90	13.00	14.00	3.66	4.06
2,273:1	740.0	1,250*	33	10.558	5.279	3.519	4.40	4.60	9.20	9.60	3.66	4.06
3,382:1	1,100	1,250*	33	7.096	3.548	2.365	3.00	3.10	6.20	6.50	3.66	4.06
4,126:1	1,350	1,250*	33	5.816	2.908	1.938	2.40	2.50	5.10	5.30	3.66	4.06
6,621:1	1,730	1,250*	26	3.624	1.812	1.208	1.50	1.60	3.20	3.30	3.78	4.18
9,851:1	2,580	1,250*	26	2.436	1.218	.812	1.00	1.10	2.10	2.20	3.78	4.18
12,016:1	3,150	1,250*	26	1.997	.998	.665	.83	.87	1.70	1.80	3.78	4.18
17,879:1	4,700	1,250*	26	1.342	.671	.447	.56	.59	1.10	1.20	3.78	4.18
21,808:1	5,700	1,250*	26	1.100	.550	.366	.26	.46	.48	.96	3.78	4.18

### Even Ratios

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	GEAR TRAIN EFFICIENCY (%)	FINAL OUTPUT SPEED (HYST.)			MIN SPEED @ RATED LOAD (IND.)				DIMENSION	
				400 cycles			400 cycles				LE (in.)	LS (in.)
				24,000 input	12,000 input	8,000 input	22,000 input	21,000 input	10,500 input	10,000 input		
4:1	3.0	5.1	75	6,000.00	3,000.00	2,000.000	5,500	5,250	2,625	2,500	2.87	3.28
5:1	3.8	6.5	75	4,800.00	2,400.00	1,600.000	4,400	4,200	2,100	2,000	2.87	3.28
6:1	4.5	7.7	75	4,000.00	2,000.00	1,333.300	3,300	3,500	1,750	1,667	2.87	3.28
16:1	10.0	17.0	63	1,500.00	750.00	500.000	1,375	1,313	656	625	2.87	3.28
20:1	13.0	22.0	63	1,200.00	600.00	400.000	1,100	1,050	525	500	2.87	3.28
24:1	15.0	26.0	63	1,000.00	500.00	333.300	917	875	438	417	2.87	3.28
25:1	16.0	27.0	63	960.00	480.00	320.000	880	840	420	400	2.87	3.28
30:1	19.0	32.0	63	800.00	400.00	266.600	733	700	350	333	2.87	3.28
36:1	23.0	39.0	63	666.60	333.30	222.200	611	583	292	278	2.87	3.28
64:1	33.0	56.0	52	375.00	187.50	125.000	344	328	164	156	3.02	3.42
80:1	41.0	70.0	52	300.00	150.00	100.000	275	263	131	125	3.02	3.42
96:1	49.0	83.0	52	250.00	125.00	83.300	229	219	109	104	3.02	3.42
100:1	51.0	87.0	52	240.00	120.00	80.000	220	210	105	100	3.02	3.42
120:1	61.0	104.0	52	200.00	100.00	66.600	183	175	88	80	3.02	3.42
125:1	64.0	109.0	51	192.00	96.00	64.000	176	168	84	80	3.02	3.42
144:1	74.0	126.0	51	166.60	83.30	55.555	153	146	80	69	3.02	3.42
150:1	77.0	131.0	51	160.00	80.00	53.333	147	140	70	67	3.02	3.42
180:1	92.0	156.0	51	133.33	66.66	44.444	122	117	58	56	3.02	3.42
216:1	110.0	187.0	51	111.11	55.55	37.037	102	97	49	46	3.02	3.42
256:1	105.0	179.0	41	93.75	46.87	31.250	86	82	41	39	3.28	3.68

\*Max Cont. Torque: The values in this column are based upon gear train strength and capability for 1,000 hrs. minimum life. Max rated torque of motor selected x torque multiplier ratio must not exceed these values

Max Intermittent Torque = 2 x Max Cont. Torque

Momentary Stall Torque = 5 x Max Cont. Torque (2,000 oz. in. max)

Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ratio x 100

.250" dia. shafts are limited to 600 oz. in. cont. duty torque. Use .313" dia. shaft if torque requirements exceed this value

# B-2030

## Ratios and Performance Even Ratios (con't.)

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	GEAR TRAIN EFFICIENCY (%)	FINAL OUTPUT SPEED (HYST.)			MIN SPEED @ RATED LOAD (IND.)				DIMENSION LE (in.)    LS (in.)	
				400 cycles			400 cycles					
				24,000 input	12,000 input	8,000 input	22,000 input	21,000 input	10,500 input	10,000 input		
320:1	130.0	221.0	41	75.00	37.50	25.000	69	66	33	31	3.28	3.68
384:1	157.0	267.0	41	62.50	31.25	20.833	57	55	27	26	3.28	3.68
400:1	164.0	279.0	41	60.00	30.00	20.000	55	53	26	25	3.28	3.68
480:1	197.0	335.0	41	50.00	25.00	16.666	46	44	21	20	3.28	3.68
500:1	205.0	349.0	41	48.00	24.00	16.000	44	42	21	20	3.28	3.68
576:1	236.0	401.0	41	41.66	20.83	13.888	38	36	18	17	3.28	3.68
600:1	246.0	418.0	41	40.00	20.00	13.333	37	34	18	17	3.28	3.68
625:1	256.0	435.0	41	38.40	19.20	12.800	35	34	17	16	3.28	3.68
720:1	295.0	502.0	41	33.33	16.66	11.111	31	29	15	14	3.28	3.68
750:1	306.0	520.0	41	32.00	16.00	10.666	29	28	14	13	3.28	3.68
864:1	352	598	41	27.770	13.888	9.259	25.0	24.0	12.0	12.0	3.28	3.68
900:1	370	629*	41	26.660	13.333	8.888	24.0	23.0	12.0	11.0	3.28	3.68
1,024:1	334	568*	33	23.430	11.718	7.812	21.0	21.0	10.0	9.7	3.65	4.06
1,080:1	442	751*	41	22.220	11.111	7.407	20.0	19.0	9.7	9.3	3.28	3.68
1,280:1	416	707*	33	18.750	9.375	6.250	17.0	16.0	8.2	7.8	3.65	4.06
1,296:1	530	901*	41	18.510	9.259	6.172	17.0	16.0	8.1	7.7	3.28	3.68
1,536:1	500	850*	33	15.620	7.812	5.208	14.0	14.0	6.8	6.5	3.65	4.06
1,600:1	522	887*	33	15.000	7.500	5.000	14.0	13.0	6.6	6.3	3.65	4.06
1,920:1	625	1,063*	33	12.500	6.250	4.166	11.0	11.0	5.5	5.2	3.65	4.06
2,000:1	652	1,108*	33	12.000	6.000	4.000	11.0	11.0	5.3	5.0	3.65	4.06
2,304:1	750	1,250*	33	10.410	5.208	3.472	9.5	9.1	4.6	4.3	3.65	4.06
2,400:1	780	1,250*	33	10.000	5.000	3.333	9.2	8.7	4.4	4.2	3.65	4.06
2,500:1	815	1,250*	33	9.600	4.800	3.200	8.8	8.4	4.2	4.0	3.65	4.06
2,880:1	940	1,250*	33	8.333	4.166	2.777	7.6	7.3	3.6	3.5	3.65	4.06
3,000:1	980	1,250*	33	8.000	4.000	2.666	7.3	7.0	3.5	3.3	3.65	4.06
3,125:1	1,020	1,250*	33	7.680	3.840	2.560	7.0	6.7	3.4	3.2	3.65	4.06
3,456:1	1,130	1,250*	33	6.944	3.472	2.314	6.4	6.1	3.0	2.9	3.65	4.06
3,600:1	1,170	1,250*	33	6.666	3.333	2.222	6.1	5.8	2.9	2.8	3.65	4.06
3,750:1	1,220	1,250*	33	6.400	3.200	2.133	5.9	5.6	2.8	2.7	3.65	4.06
4,096:1	1,070	1,250*	26	5.859	2.929	1.953	5.4	5.1	2.6	2.4	3.78	4.18
4,320:1	1,410	1,250*	33	5.555	2.777	1.851	5.1	5.1	2.4	2.3	3.65	4.06
4,500:1	1,470	1,250*	33	5.333	2.666	1.777	4.9	4.7	2.3	2.2	3.65	4.06
5,120:1	1,340	1,250*	26	4.687	2.343	1.562	4.3	4.1	2.1	2.0	3.78	4.18
5,184:1	1,690	1,250*	33	4.629	2.314	1.543	4.2	4.1	2.0	1.9	3.65	4.06
5,400:1	1,760	1,250*	33	4.444	2.222	1.481	4.1	3.9	1.9	1.9	3.65	4.06
6,144:1	1,610	1,250*	26	3.906	1.953	1.302	3.6	3.4	1.7	1.6	3.78	4.18
6,400:1	1,680	1,250*	26	3.750	1.875	1.250	3.4	3.3	1.6	1.6	3.78	4.18
6,480:1	2,110	1,250*	33	3.703	1.851	1.234	3.4	3.2	1.6	1.6	3.65	4.06
7,680:1	2,010	1,250*	26	3.125	1.562	1.041	2.9	2.7	1.4	1.3	3.78	4.18
7,776:1	2,530	1,250*	33	3.086	1.543	1.028	2.8	2.7	1.4	1.3	3.65	4.06
8,000:1	2,100	1,250*	26	3.000	1.500	1.000	2.80	2.60	1.30	1.30	3.78	4.18
9,216:1	2,390	1,250*	26	2.604	1.302	.868	2.40	2.30	1.10	1.00	3.78	4.18
9,600:1	2,520	1,250*	26	2.500	1.250	.833	2.30	2.20	1.10	1.00	3.78	4.18
10,000:1	2,620	1,250*	26	2.400	1.200	.800	2.20	2.10	1.10	1.00	3.78	4.18
11,520:1	3,010	1,250*	26	2.083	1.041	.694	1.90	1.80	.91	.87	3.78	4.18
12,000:1	3,140	1,250*	26	2.000	1.000	.666	1.80	1.80	.88	.83	3.78	4.18
12,500:1	3,280	1,250*	26	1.920	.960	.640	1.80	1.70	.84	.80	3.78	4.18
13,824:1	3,620	1,250*	26	1.736	.868	.578	1.60	1.50	.76	.72	3.78	4.18
14,400:1	3,780	1,250*	26	1.666	.833	.555	1.50	1.50	.73	.69	3.78	4.18
15,000:1	3,940	1,250*	26	1.600	.800	.533	1.50	1.40	.70	.67	3.78	4.18
15,625:1	4,100	1,250*	26	1.536	.768	.512	1.40	1.30	.67	.64	3.78	4.18
17,280:1	4,520	1,250*	26	1.388	.694	.462	1.30	1.20	.61	.58	3.78	4.18
18,000:1	4,710	1,250*	26	1.333	.666	.444	1.20	1.20	.58	.56	3.78	4.18
18,750:1	4,910	1,250*	26	1.280	.640	.426	1.20	1.10	.56	.53	3.78	4.18
20,736:1	5,430	1,250*	26	1.157	.578	.385	1.10	1.00	.51	.48	3.78	4.18
21,600:1	5,660	1,250*	26	1.111	.555	.370	1.00	.97	.49	.46	3.78	4.18
22,500:1	5,900	1,250*	26	1.066	.533	.355	.98	.93	.47	.44	3.78	4.18
25,920:1	6,790	1,250*	26	.926	.463	.308	.85	.81	.41	.39	3.78	4.18
27,000:1	7,070	1,250*	26	.888	.444	.296	.81	.78	.39	.37	3.78	4.18
31,104:1	8,150	1,250*	26	.771	.385	.257	.71	.68	.34	.32	3.78	4.18
32,400:1	8,500	1,250*	26	.740	.370	.246	.68	.65	.32	.30	3.78	4.18
38,800:1	10,200	1,250*	26	.617	.308	.205	.57	.54	.27	.26	3.78	4.18
46,656:1	12,200	1,250*	26	.514	.257	.171	.47	.45	.23	.21	3.78	4.18