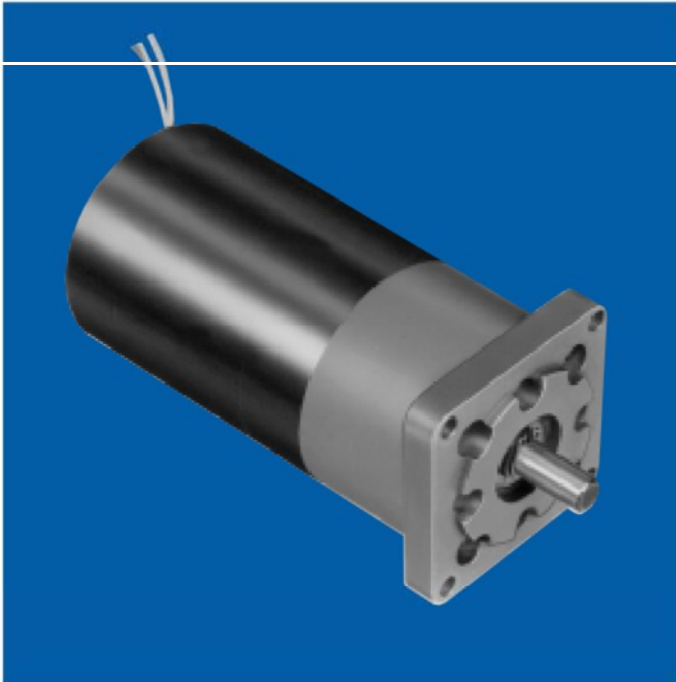
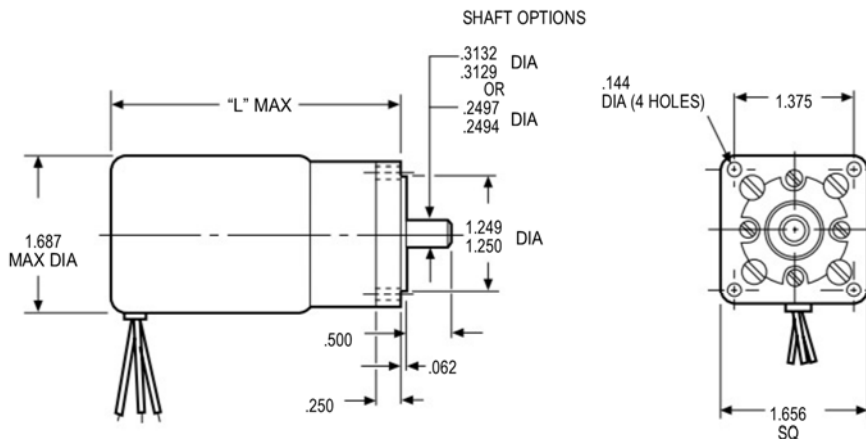


FC GEARMOTORS

AC Hysteresis Synchronous and Induction Planetary Gearmotors



Dimensions



general design specification: MIL-M-7969

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

weight: 16.5 to 20 ounces

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

shaft: Precision-ground No. 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: 5.1×10^{-6} oz. in. sec.² @ input max

bearings: .250" dia. shaft uses double-shielded, life-lubricated ball bearings for -55°C to +85°C operation. A .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, number of poles and gear ratio selected

options available:

- Electromechanical brakes
- Slip clutches

B-2730

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		PHASING CAPACITOR		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*		
					B	C	(µF)	(wvac)				no load	normal rated load	EVEN RATIO		ODD RATIO
														.250" shaft	.250" shaft	.313" shaft
115	60	2	1 or 3	D	WHT	YLW	3.00	200	3,600	1.0	1.0	20	20	83A138	83A510	83A116
115	60	4	1 or 3	D	WHT	GRN	2.00	200	1,800	1.0	1.0	11	12	83A137	83A509	83A115
115	60	6	1	C	WHT	GRY	1.50	200	1,200	.8	.8	20	20	83A136	83A508	83A114

Hysteresis Synchronous

VOLT-AGE (VAC)	FREQUENCY (Hz)	P O L E S	P H A S E S	SCHEMATIC	VARIABLE LEAD COLOR		PHASING CAPACITOR		MOTOR SYNC SPEED (rpm)	NORMAL RATED LOAD @ SYNC (oz. in.)	MOTOR MOTOR MIN PULL UP TORQUE (oz. in.)	MAX POWER (watts)		STANDARD PART NUMBER PREFIX*	
					C	(µF)	(wvac)	no load				normal rated load	ALL RATIOS		
													.250" shaft	.313" shaft	
115	400	2	1	A	BLK	.22	400	24,000	1.0	1.0	28	40	83A1008	83A1108	
115	400	2	3	B	BLK	NOT REQ'D		24,000	1.0	1.0	23	37	83A1010	83A1110	
115	400	4	1	A	GRN	.12	500	12,000	1.0	1.0	19	24	83A1012	83A1112	
115	400	4	3	B	GRN	NOT REQ'D		12,000	1.2	1.2	21	26	83A1014	83A1114	
115	400	6	1	B	ORG	1.30	200	8,000	.8	.8	35	45	83A1016	83A1116	
200	400	2	3	B	BLK	NOT REQ'D		24,000	1.0	1.0	24	38	83A1018	83A1118	
200	400	4	3	B	GRN	NOT REQ'D		12,000	1.2	1.2	21	28	83A1020	83A1120	

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

Induction

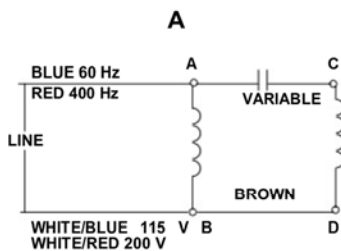
VOLT-AGE (VAC)	FREQUENCY (Hz)	P O L E S	P H A S E S	SCHEMATIC	VARIABLE LEAD COLOR		PHASING CAPACITOR		MOTOR MIN SPEED @ RATED LOAD (rpm)	RATED LOAD (oz. in.)	MIN PULL UP TORQUE (oz. in.)	MAX POWER (watts)		STANDARD PART NUMBER PREFIX*	
					C	(µF)	(wvac)	no load				normal rated load	ALL RATIOS		
													.250" shaft	.313" shaft	
115	400	2	1	A	BLK	.22	400	21,500	1.5	.8	19	50	83A1007	83A1107	
115	400	2	3	B	BLK	NOT REQ'D		22,500	2.5	2.5	10	65	83A1009	83A1109	
115	400	4	1	A	GRN	.12	500	10,000	1.5	1.5	15	31	83A1011	83A1111	
115	400	4	3	B	GRN	NOT REQ'D		11,000	2.5	2.5	12	40	83A1013	83A1113	
200	400	2	3	B	BLK	NOT REQ'D		22,500	2.5	2.5	10	65	83A1017	83A1117	
200	400	4	3	B	GRN	NOT REQ'D		11,000	2.5	2.0	12	40	83A1019	83A1119	

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

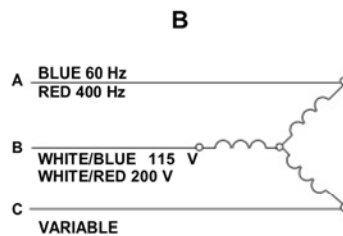
*When You Order

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: 83A1012-20 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 a .250" output shaft

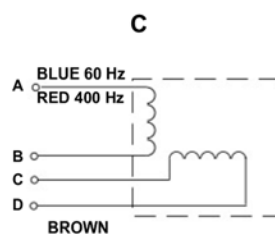
Schematic Wiring



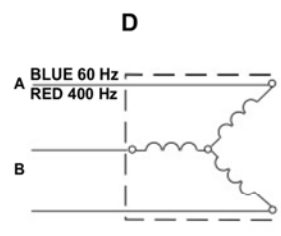
CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE C & D.



ABC PHASE SEQUENCE FOR CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE ANY TWO LEADS.



SINGLE-PHASE OPERATION CW ROTATION. LINE TO C AND D; A AND C COMMON; AND CAPACITOR BETWEEN B AND D. CCW ROTATION. LINE TO C AND D; B AND C COMMON; AND CAPACITOR BETWEEN A AND D.



SINGLE-PHASE OPERATION CW ROTATION. LINE TO A AND C; CAPACITOR BETWEEN B AND C. CCW ROTATION. LINE TO A AND C; CAPACITOR BETWEEN A AND B

FC GEARMOTORS

AC Hysteresis Synchronous and Induction Planetary Gearmotors

B-2730

Ratios and Performance

Odd Ratios

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	FINAL OUTPUT SPEED (HYST.)			MIN SPEED @ RATED LOAD (IND.)				DIM. "L" (in.)
			400 Hz			400 Hz				
			24,000 rpm input	12,000 rpm input	8,000 rpm input	22,500 rpm input	21,500 rpm input	11,000 rpm input	10,000 rpm input	
4.33:1	3.2	5.4	5,542.725	2,771.362	1,847.575	5,196	4,965	2,540	2,309	3.190
5.28:1	4.0	6.8	4,536.862	2,268.431	1,512.287	4,261	4,072	2,083	1,894	3.190
18.78:1	12.0	20.0	1,277.955	638.977	425.985	1,198	1,145	586	532	3.190
27.94:1	17.0	29.0	858.984	429.491	286.327	805	769	394	358	3.190
81.37:1	41.0	70.0	294.949	147.474	98.316	276	264	135	123	3.325
121.1:1	62.0	105.0	198.183	99.091	666.061	186	177	91	83	3.325
147.7:1	75.0	128.0	162.491	81.250	54.163	152	145	74	68	3.325
352.6:1	145.0	247.0	68.066	34.032	22.688	63	61	31	28	3.594
524.6:1	215.0	366.0	45.749	22.874	15.249	42	41	21	19	3.594
639.9:1	262.0	445.0	37.506	18.752	12.501	35	34	17	16	3.594
780.6:1	320.0	544.0	30.745	15.372	10.248	29	28	14	13	3.594
1,528:1	500.0	850.0*	15.706	7.853	5.235	15	14	7.2	6.5	3.964
2,273:1	740.0	1,250*	10.558	5.279	3.519	9.9	9.4	4.8	4.4	3.964
3,382:1	1,100	1,250*	7.096	3.548	2.365	6.6	6.4	3.3	3.3	3.964
4,126:1	1,350	1,250*	5.816	2.908	1.938	5.4	5.2	2.7	2.4	3.964
6,621:1	1,730	1,250*	3.624	1.812	1.208	3.4	3.2	1.7	1.5	4.099
9,851:1	2,580	1,250*	2.436	1.218	.812	2.3	2.2	1.1	1.0	4.099
12,016:1	3,150	1,250*	1.997	.998	.665	1.9	1.8	.92	.83	4.099
17,879:1	4,700	1,250*	1.342	.671	.447	1.2	1.2	.62	.56	4.099
21,808:1	5,700	1,250*	1.100	.550	.366	1.0	.98	.50	.46	4.099

Even Ratios

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	FINAL OUTPUT SPEED (HYST.)			MIN SPEED @ RATED LOAD (IND.)				DIM. "L" (in.)
			400 Hz			400 Hz				
			24,000 rpm input	12,000 rpm input	8,000 rpm input	22,500 rpm input	21,500 rpm input	11,000 rpm input	10,000 rpm input	
4:1	3.0	5.1	6,000.000	3,000.000	2,000.000	5,625.00	5,375.00	2,750.00	2,500.00	3.190
5:1	3.8	6.5	4,800.000	2,400.000	1,600.000	4,500.00	4,300.00	2,200.00	2,000.00	3.190
6:1	4.5	7.7	4,000.000	2,000.000	1,333.300	3,750.00	3,583.00	1,585.00	1,667.00	3.190
16:1	10.0	17.0	1,500.000	750.000	500.000	1,406.00	1,344.00	688.00	625.00	3.190
20:1	13.0	22.0	1,200.000	600.000	400.000	1,125.00	1,075.00	550.00	500.00	3.190
24:1	15.0	26.0	1,000.000	500.000	333.300	938.00	896.00	448.00	417.00	3.190
25:1	16.0	27.0	960.000	480.000	320.000	900.00	860.00	420.00	400.00	3.190
30:1	19.0	32.0	800.000	400.000	266.600	750.00	717.00	350.00	333.00	3.190
36:1	23.0	39.0	666.600	333.300	222.200	625.00	597.00	292.00	278.00	3.190
64:1	33.0	56.0	375.000	187.500	125.000	352.00	336.00	164.00	156.00	3.325
80:1	41.0	70.0	300.000	150.000	100.000	281.00	269.00	138.00	125.00	3.325
96:1	49.0	83.0	250.000	125.000	83.300	234.00	224.00	115.00	104.00	3.325
100:1	51.0	87.0	240.000	120.000	80.000	225.00	215.00	110.00	100.00	3.325
120:1	61.0	104.0	200.000	100.000	66.600	188.00	179.00	91.00	83.00	3.325
125:1	64.0	109.0	192.000	96.000	64.000	180.00	172.00	88.00	80.00	3.325
144:1	74.0	126.0	166.600	83.300	55.550	156.00	149.00	69.00	69.00	3.325
150:1	77.0	131.0	160.000	80.000	53.330	150.00	143.00	73.00	67.00	3.325
180:1	92.0	156.0	133.300	66.660	44.440	125.00	119.00	61.00	56.00	3.325
216:1	110.0	187.0	111.100	55.550	37.030	104.00	100.00	51.00	46.00	3.325
256:1	105.0	179.0	93.700	46.870	31.250	88.00	84.00	43.00	39.00	3.594

*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. continuous duty torque. Use .313" dia. shaft if torque requirements exceed this value

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Ratios and Performance

Even Ratios (con't.)

SPEED REDUCTION RATIO	TORQUE MULTIPLIER RATIO	*GEAR TRAIN MAX CONT. RATING (oz. in.)	FINAL OUTPUT SPEED (HYST)			MIN SPEED @ RATED LOAD (IND.)				DIM. "L" (in.)
			400 Hz			400 Hz				
			24,000 rpm input	12,000 rpm input	8,000 rpm input	22,500 rpm input	21,500 rpm input	11,000 rpm input	10,000 rpm input	
320:1	130.0	221.0	75.000	37.500	25.000	70.00	67.00	34.00	31.00	3.594
384:1	157.0	267.0	62.500	31.250	20.830	59.00	56.00	29.00	26.00	3.594
400:1	164.0	279.0	60.000	30.000	20.000	56.00	54.00	28.00	25.00	3.594
480:1	197.0	335.0	50.000	25.000	16.660	47.00	45.00	23.00	21.00	3.594
500:1	205.0	349.0	48.000	24.000	16.000	45.00	43.00	22.00	20.00	3.594
576:1	235.0	401.0	41.600	20.830	13.888	39.00	37.00	19.00	17.00	3.594
600:1	246.0	418.0	40.000	20.000	13.333	38.00	36.00	18.00	17.00	3.594
625:1	256.0	435.0	38.400	19.200	12.800	36.00	34.00	18.00	16.00	3.594
720:1	295.0	502.0	33.300	16.600	11.111	30.00	30.00	15.00	14.00	3.594
750:1	306.0	520.0	32.000	16.000	10.666	30.00	29.00	15.00	13.00	3.594
864:1	352.0	598.0	27.777	13.888	9.259	26.00	25.00	13.00	12.00	3.594
900:1	370.0	629.0*	26.666	13.333	8.888	25.00	24.00	11.00	11.00	3.594
1,024:1	334.0	568.0*	23.437	11.718	7.812	22.00	21.00	11.00	9.70	3.964
1,080:1	442.0	751.0*	22.222	11.111	7.407	21.00	20.00	10.00	9.30	3.594
1,280:1	416.0	707.0*	18.750	9.375	6.250	18.00	17.00	8.50	7.80	3.964
1,296:1	530.0	901.0*	18.518	9.259	6.172	17.00	17.00	8.50	7.70	3.594
1,536:1	500.0	850.0*	15.625	7.812	5.208	15.00	14.00	7.20	6.50	3.964
1,600:1	522.0	887.0*	15.000	7.500	5.000	14.00	13.00	6.90	6.30	3.964
1,920:1	625.0	1,063*	12.500	6.250	4.166	12.00	11.00	5.70	5.20	3.964
2,000:1	652.0	1,108*	12.000	6.000	4.000	11.00	11.00	5.50	5.00	3.964
2,304:1	750.0	1,250*	10.416	5.208	3.472	9.80	9.30	4.80	4.30	3.964
2,400:1	780.0	1,250*	10.000	5.000	3.333	9.40	9.00	4.60	4.20	3.964
2,500:1	815.0	1,250*	9.600	4.800	3.200	9.00	8.60	4.40	4.00	3.964
2,880:1	940.0	1,250*	8.333	4.166	2.777	7.80	7.50	3.80	3.50	3.964
3,000:1	980.0	1,250*	8.000	4.000	2.666	7.50	7.20	3.70	3.30	3.964
3,125:1	1,020	1,250*	7.680	3.840	2.560	7.20	6.90	3.50	3.20	3.964
3,456:1	1,130	1,250*	6.944	3.472	2.314	6.50	6.20	3.20	2.90	3.964
3,600:1	1,170	1,250*	6.666	3.333	2.222	6.30	6.00	3.10	2.80	3.964
3,750:1	1,220	1,250*	6.400	3.200	2.133	6.00	5.70	2.90	2.70	3.964
4,096:1	1,070	1,250*	5.859	2.929	1.953	5.50	5.20	2.70	2.40	4.099
4,320:1	1,410	1,250*	5.555	2.777	1.851	5.20	5.00	2.50	2.30	3.964
4,500:1	1,470	1,250*	5.333	2.666	1.777	5.00	4.80	2.40	2.20	3.964
5,120:1	1,340	1,250*	4.687	2.343	1.562	4.40	4.20	2.10	2.00	4.099
5,184:1	1,690	1,250*	4.629	2.314	1.543	4.30	4.10	2.10	1.90	3.964
5,400:1	1,760	1,250*	4.444	2.222	1.481	4.20	4.00	2.00	1.90	3.964
6,144:1	1,610	1,250*	3.906	1.953	1.302	3.70	3.50	1.80	1.60	4.099
6,400:1	1,680	1,250*	3.750	1.872	1.250	3.50	3.40	1.70	1.60	4.099
6,480:1	2,110	1,250*	3.703	1.851	1.234	3.50	3.30	1.70	1.60	3.964
7,680:1	2,010	1,250*	3.125	1.562	1.041	2.90	2.80	1.40	1.30	4.099
7,776:1	2,530	1,250*	3.086	1.543	1.028	2.90	2.80	1.40	1.30	3.964
8,000:1	2,100	1,250*	3.000	1.500	1.000	2.80	2.70	1.40	1.30	4.099
9,216:1	2,390	1,250*	2.604	1.302	.868	2.40	2.30	1.20	1.00	4.099
9,600:1	2,520	1,250*	2.500	1.250	.833	2.30	2.20	1.10	1.00	4.099
10,000:1	2,620	1,250*	2.400	1.200	.800	2.30	2.20	1.10	1.00	4.099
11,520:1	3,010	1,250*	2.083	1.041	.694	2.00	1.90	.95	.87	4.099
12,000:1	3,140	1,250*	2.000	1.000	.666	1.90	1.80	.90	.83	4.099
12,500:1	3,280	1,250*	1.920	.960	.640	1.80	1.70	.88	.80	4.099
13,824:1	3,620	1,250*	1.736	.868	.578	1.60	1.60	.80	.72	4.099
14,400:1	3,780	1,250*	1.666	.833	.555	1.60	1.50	.76	.69	4.099
15,000:1	3,940	1,250*	1.600	.800	.533	1.50	1.40	.73	.67	4.099
15,625:1	4,100	1,250*	1.536	.768	.512	1.40	1.40	.70	.64	4.099
17,280:1	4,520	1,250*	1.388	.694	.462	1.30	1.20	.64	.58	4.099
18,000:1	4,710	1,250*	1.333	.666	.444	1.30	1.20	.61	.56	4.099
18,750:1	4,910	1,250*	1.280	.640	.426	1.20	1.10	.59	.53	4.099
20,736:1	5,430	1,250*	1.157	.578	.385	1.10	1.00	.53	.48	4.099
21,600:1	5,660	1,250*	1.111	.555	.370	1.00	1.00	.51	.46	4.099
22,500:1	5,900	1,250*	1.066	.533	.355	1.00	.96	.49	.44	4.099
25,920:1	6,790	1,250*	.926	.463	.308	.87	.83	.42	.39	4.099
27,000:1	7,070	1,250*	.888	.444	.296	.83	.80	.41	.37	4.099
31,104:1	8,150	1,250*	.771	.385	.257	.72	.69	.35	.32	4.099
32,400:1	8,500	1,250*	.740	.370	.246	.69	.66	.34	.30	4.099
38,880:1	10,200	1,250*	.617	.308	.205	.58	.55	.28	.26	4.099
46,656:1	12,200	1,250*	.514	.257	.171	.48	.46	.24	.21	4.099