

Moment of Inertia - WR² (GD²)

Note: B16 ~ B27 figures contain fan WR²

WR² at Reducer Input Shaft

unit = lb-in²

Ratio Frame	6	8	11	13	15	17	21	25	29	35	43	51	59	71	87	Fan WR ²
B07	0.055	0.044	0.045	0.035	0.034	0.042	0.032	0.031	0.039	0.039	0.038	0.030	0.038			
B08	0.058	0.046	0.047	0.037	0.035	0.043	0.033	0.032	0.040	0.039	0.039	0.030	0.038			
B09	0.350	0.235	0.224	0.194	0.188	0.204	0.119	0.115	0.133	0.108	0.106	0.063	0.083	0.062	0.062	
B10	0.261	0.157	0.130	0.094	0.065	0.098	0.066	0.058	0.077	0.073	0.070	0.047	0.067	0.045	0.065	
B11	1.192	0.748	0.659	0.468	0.436	0.536	0.360	0.325	0.434	0.419	0.405	0.275	0.393	0.266	0.383	
B12	1.192	0.748	0.659	0.468	0.436	0.536	0.360	0.325	0.434	0.419	0.405	0.275	0.393	0.266	0.383	
B13	3.000	2.151	1.656	1.444	1.333	1.232	1.071	1.020	0.957	0.931	0.889	0.880	0.880	0.860	0.855	
B14	3.000	2.151	1.656	1.444	1.333	1.232	1.071	1.020	0.957	0.931	0.889	0.880	0.880	0.860	0.855	
B15	3.000	2.151	1.656	1.444	1.333	1.232	1.071	1.020	0.957	0.931	0.889	0.880	0.880	0.860	0.855	
B16	17.57	14.85	12.93	12.52	12.32	11.51	11.41	11.21	10.91	10.81	10.71	10.71	10.71	10.61	10.61	7.72
B17	31.41	24.75	21.51	20.50	19.80	18.48	18.28	17.27	16.87	16.87	16.56	16.46	16.36	16.26	16.26	6.61
B18			28.28	26.97	25.25	23.63	23.33	21.82	21.31	21.11	20.91	20.71	20.40	20.30	20.20	5.86
B19			72.82	70.70	68.07	65.55	64.64	61.91	60.50	59.89	59.19	58.88	58.58	58.38	58.18	21.61
B20			81.61		74.54		70.50		67.47		65.55		64.74		64.24	21.41
B21			128.3		117.2		111.1		107.1		103.0		103.0		102.0	36.2
B22			166.7		150.5		141.4		133.3		129.3		127.3		127.3	51.7
B23			279.8		255.5		239.4		229.3		222.2		220.2		218.2	89.7
B24			426.2		387.8		363.6		348.5		339.4		334.3		332.3	89.7
B25			768.6		704.0		661.6		635.3		619.1		612.1		609.0	204.0
B26			1008.99		914.1		859.5		818.1		791.8		780.7		774.7	204.0
B27											2576		2555			823.2

Specifications subject to change without prior notice

GD² at Reducer Input Shaft

unit = 0.0001 kg-m²

Ratio Frame	6	8	11	13	15	17	21	25	29	35	43	51	59	71	87	Fan GD ²
B07	0.162	0.130	0.133	0.103	0.100	0.122	0.094	0.092	0.115	0.114	0.113	0.087	0.111			
B08	0.170	0.136	0.139	0.107	0.103	0.125	0.096	0.093	0.116	0.115	0.114	0.088	0.112			
B09	1.026	0.689	0.656	0.568	0.550	0.597	0.349	0.337	0.390	0.316	0.310	0.184	0.242	0.181	0.180	
B10	0.763	0.458	0.381	0.275	0.189	0.288	0.193	0.170	0.224	0.213	0.205	0.137	0.196	0.131	0.191	
B11	3.488	2.190	1.927	1.369	1.277	1.570	1.052	0.952	1.271	1.227	1.185	0.804	1.150	0.777	1.120	
B12	3.488	2.190	1.927	1.369	1.277	1.570	1.052	0.952	1.271	1.227	1.185	0.804	1.150	0.777	1.120	
B13	8.779	6.296	4.848	4.227	3.902	3.606	3.133	2.985	2.802	2.725	2.601	2.575	2.575	2.515	2.504	
B14	8.779	6.296	4.848	4.227	3.902	3.606	3.133	2.985	2.802	2.725	2.601	2.575	2.575	2.515	2.504	
B15	8.779	6.296	4.848	4.227	3.902	3.606	3.133	2.985	2.802	2.725	2.601	2.575	2.575	2.515	2.504	
B16	51.43	43.45	37.83	36.65	36.06	33.70	33.40	32.81	31.92	31.63	31.33	31.33	31.33	31.04	31.04	22.58
B17	91.93	72.42	62.96	60.00	57.93	54.09	53.50	50.54	49.36	49.36	48.48	48.18	47.88	47.59	47.59	19.33
B18			82.76	78.92	73.90	69.17	68.28	63.85	62.37	61.78	61.19	60.59	59.71	59.41	59.12	17.14
B19			213.1	206.9	199.2	191.8	189.2	181.2	177.1	175.3	173.2	172.3	171.4	170.8	170.3	63.25
B20			238.8		218.1		206.3		197.4		191.8		189.5		188.0	62.66
B21			375.4		342.9		325.1		313.3		301.5		301.5		298.5	105.8
B22			487.7		440.4		413.8		390.2		378.3		372.4		372.4	151.3
B23			818.8		747.8		700.5		671.0		650.3		644.4		638.5	262.5
B24			1247		1135		1064		1020		993		978		972	262.5
B25			2249		2060		1936		1859		1812		1791		1782	597.1
B26			2953		2675		2515		2394		2317		2285		2267	597.1
B27											7537		7478			2409

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◆ To calculate WR² (GD²) at **reducer output shaft**, multiply WR² (GD²) of reducer input by the square of ratio.

$$WR^2_{\text{output}} = WR^2_{\text{input}} \times (\text{Ratio})^2$$

EXAMPLE: Find WR² at output shaft of B11-87-XHH

$$WR^2_{\text{output}} = 0.383 \times (87)^2 = 2899 \text{ lb-in}^2$$

* By knowing torque, WR² can be used to calculate estimated time required to reach a given velocity.

◆ To calculate WR² (GD²) of **double reduction models**,

$$WR^2_{\text{double stage}} = WR^2_{\text{first stage}} + \frac{WR^2_{\text{second stage}} - WR^2_{\text{second stage fan}}}{\text{Ratio}_{\text{first stage}}^2}$$

EXAMPLE: Find WR² of B1813-255-XHH

First Stage: B13-17:1, WR² = 1.232 lb-in²

Second Stage: B18-15:1, WR² = 25.25 lb-in²

B18 Fan, WR² = 5.86 lb-in²

$$WR^2 = 1.232 + \frac{-5.86}{2} = 1.299 \text{ - }^2$$

Moment of Inertia - WR² (GD²)

WR² of Integral Gearmotor (excluding motor)

unit = lb-in²

Ratio Frame	6	8	11	13	15	17	21	25	29	35	43	51	59	71	87
B07	0.064	0.052	0.037	0.044	0.043	0.033	0.040	0.040	0.031	0.031	0.030	0.038	0.030		
B08	0.067	0.055	0.039	0.045	0.044	0.034	0.041	0.040	0.031	0.031	0.030	0.038	0.030		
B09	0.330	0.255	0.204	0.215	0.209	0.183	0.139	0.135	0.112	0.087	0.086	0.084	0.062	0.082	0.061
B10	0.265	0.192	0.117	0.121	0.110	0.077	0.089	0.081	0.056	0.052	0.049	0.068	0.046	0.066	0.044
B11	1.070	0.871	0.538	0.588	0.557	0.416	0.480	0.446	0.313	0.299	0.285	0.395	0.272	0.387	0.262
B12	1.070	0.871	0.538	0.588	0.557	0.416	0.480	0.446	0.313	0.299	0.285	0.395	0.272	0.387	0.262
B13	2.959	2.028	1.493	1.268	1.139	1.044	0.866	0.810	0.745	0.719	0.676	0.665	0.659	0.643	0.638
B14	3.253	2.118	1.531	1.268	1.143	1.031	0.867	0.811	0.745	0.719	0.676	0.663	0.659	0.643	0.638
B15	3.253	2.209	1.570	1.268	1.148	1.018	0.868	0.812	0.745	0.720	0.676	0.660	0.659	0.643	0.638
B16	9.034	6.134	4.271	3.796	3.417	2.882	2.640	2.468	2.191	2.105	2.019	1.984	1.993	1.907	1.881
B17	28.29	19.21	13.37	12.17	10.78	10.35	9.663	9.318	8.800	8.714	8.438	8.352	8.248	8.214	8.171
B18			19.84	17.95	15.96	15.19	14.49	13.46	12.94	12.77	12.42	12.08	11.91	11.91	11.82
B19			47.02	43.40	41.24	39.69	36.93	35.81	34.68	33.91	33.39	33.04	32.79	32.61	32.44
B20			55.74		48.75		44.61		41.59		39.69		38.91		38.48
B21			85.42		74.55		68.07		63.42		60.40		59.19		58.50
B22			105.3		88.87		79.98		72.47		67.99		66.09		64.97
B23			171.7		147.5		132.0		121.7		115.6		112.2		111.3
B24			311.5		273.5		249.3		234.7		224.3		220.0		218.3
B25			506.5		441.7		399.5		372.7		357.2		350.3		346.0
B26			741.1		643.6		586.7		546.1		520.3		509.0		502.1
B27											1631		1605		

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GD² of Integral Gearmotor (excluding motor)

unit = 0.0001 kg-m²

Ratio Frame	6	8	11	13	15	17	21	25	29	35	43	51	59	71	87
B07	0.186	0.153	0.109	0.128	0.124	0.098	0.118	0.116	0.091	0.089	0.088	0.112	0.087		
B08	0.195	0.160	0.114	0.132	0.128	0.100	0.120	0.117	0.091	0.090	0.089	0.113	0.087		
B09	0.965	0.747	0.598	0.629	0.611	0.535	0.407	0.394	0.328	0.255	0.251	0.244	0.183	0.241	0.180
B10	0.775	0.561	0.343	0.354	0.323	0.226	0.260	0.238	0.164	0.153	0.145	0.199	0.133	0.194	0.129
B11	3.131	2.550	1.576	1.722	1.631	1.217	1.404	1.305	0.917	0.874	0.833	1.156	0.795	1.131	0.768
B12	3.131	2.550	1.576	1.722	1.631	1.217	1.404	1.305	0.917	0.874	0.833	1.156	0.795	1.131	0.768
B13	8.661	5.934	4.368	3.712	3.333	3.055	2.535	2.371	2.179	2.103	1.980	1.947	1.929	1.881	1.869
B14	9.519	6.199	4.482	3.712	3.346	3.017	2.538	2.374	2.179	2.105	1.980	1.939	1.929	1.881	1.869
B15	9.519	6.464	4.596	3.712	3.358	2.980	2.540	2.376	2.179	2.106	1.980	1.932	1.929	1.881	1.869
B16	26.44	17.95	12.50	11.11	10.00	8.434	7.727	7.222	6.414	6.161	5.909	5.808	5.833	5.580	5.505
B17	82.79	56.22	39.14	35.60	31.56	30.30	28.28	27.27	25.76	25.50	24.69	24.44	24.14	24.04	23.91
B18			58.08	52.52	46.71	44.44	42.42	39.39	37.88	37.37	36.36	35.35	34.85	34.85	34.59
B19			137.6	127.0	120.7	116.2	108.1	104.8	101.5	99.23	97.72	96.71	95.95	95.45	94.94
B20			163.1		142.7		130.5		121.7		116.2		113.9		112.6
B21			250.0		218.2		199.2		185.6		176.8		173.2		171.2
B22			308.1		260.1		234.1		212.1		199.0		193.4		190.1
B23			502.5		431.8		386.3		356.0		338.4		328.3		325.7
B24			911.5		800.4		729.7		686.8		656.5		643.9		638.8
B25			1482		1293		1169		1091		1045		1025		1013
B26			2169		1884		1717		1598		1523		1490		1470
B27											4772		4697		

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The WR² of motors can be found on page 47

◆ To calculate WR² (GD²) of **single reduction integral gearmotor**:

$$WR^2 = WR^2_{\text{motor}} + WR^2_{\text{reducer}}$$

EXAMPLE: Find WR² of B11-87-1MHH

Motor = 1 hp, WR² = 30.8 lb-in²
 Reducer = B11-87:1, WR² = 0.262 lb-in²

$$WR^2 = 30.8 + 0.262 = 31.062 \text{ lb-in}^2$$

◆ To calculate WR² (GD²) of **double reduction integral gearmotor**:

$$WR^2 = WR^2_{\text{motor}} + WR^2_{\text{first stage}} + \frac{WR^2_{\text{second stage}}}{\text{Ratio}_{\text{first stage}}^2}$$

EXAMPLE: Find WR² of B1711-195-3MHH, (13:1 x 15:1)

Motor = 3 hp, WR² = 113 lb-in²
 First Stage = B11-13:1, WR² = 0.588 lb-in²
 Second Stage = B17-15:1, WR² = 10.78 lb-in²

$$WR^2 = 113 + 0.588 + \frac{10.78}{2} = 113.294$$