

U-Series ServoDisc

INTRODUCTION



- Options:
 - Integral tachometers
 - External tachometers
 - Optical encoders
 - Fail-safe brakes

Compatible Products

- KXA Plus Amplifier
- EM19 Linear Amplifier

- 39 to 402 oz-in (27-284)N-cm continuous torque
- Motor Lengths Less Than 2"
- 4.37 to 7.37" OD Round Frame
- Optional Tachometer and Encoder Feedback

U-Series ServoDisc motors employ the unique Kollmorgen flat disc armature. The ironless, low inertia armature delivers high acceleration and zero cogging in an exceptionally compact package.

- Extremely good speed control with zero cogging and low RFI
- Long brush life
- Flat ServoDisc motors are ideal for many applications:
 - Save space and weight in applications requiring a low profile motor
 - Large torsional stiffness for precision control of speed and acceleration

U-Series ServoDisc

PERFORMANCE DATA

Performance Specifications	Symbol	Units	U9M4LR	U9M4	U9M4A	U9M4H	U9M4HA	U9M4HA-2
Peak Torque	T_p	oz-in	447	469	360	727	559	690
		N-cm	315	331	254	513	395	488
Rated Speed	N	RPM	3000	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T_{25}	oz-in	45	51	39	81	62	80
		N-cm	32	36	27	57	44	57
Rated Continuous Torque @ 40°C	T_{40}	oz-in	41	46	35	72	56	74
		N-cm	29	32	25	51	40	52
Rated Power Output	P	Watts	101	113	86	179	138	178
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000	6000
Continuous Stall Torque	T_s	oz-in	35	41	31	65	50	63
		N-cm	25	29	22	46	35	45
Cogging Torque	T_c	oz-in	0	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	12.6	24.1	26.8	31.9	34.7	40.0
Rated Continuous Current	I	Amps	15.6	8.7	6.8	8.6	6.8	6.8
Peak Current	I_p	Amps	137	72	56	72	56	56
Continuous Stall Current	I_s	Amps	12.0	6.8	5.3	6.8	5.3	5.3

Winding Specifications

Terminal Resistance ± 10%	R_t	Ohms	0.365	0.850	1.310	0.850	1.310	1.310
Armature Resistance ± 10%	R_a	Ohms	0.175	0.660	1.120	0.660	1.120	1.120
Back EMF Constant ± 10%	K_e	V/KRPM	2.43	4.85	4.85	7.50	7.50	9.24
Torque Constant ± 10%	K_t	oz-in/Amp	3.29	6.56	6.56	10.15	10.15	12.50
		N-cm/Amp	2.32	4.63	4.63	7.17	7.17	8.83
		oz-in/KRPM	0.8	0.8	0.7	1.1	0.9	1.0
Viscous Damping Constant	K_d	N-cm/KRPM	0.5	0.5	0.5	0.8	0.6	0.7
Armature Inductance	L	μH	<25	<100	<100	<100	<100	<100
Temperature Coefficient of KE	C	%/°C Rise	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Number of Commutator Bars	Z		117	117	117	117	117	117

Mechanical Specifications

Moment of Inertia	J_m	oz-in-sec ²	0.0056	0.0056	0.0028	0.0058	0.0029	0.0027
		kg-m ²	0.40	0.40	0.20	0.41	0.20	0.19
Static Friction Torque	T_f	oz-in	4.0	4.0	4.0	4.0	4.0	3.0
		N-cm	2.8	2.8	2.8	2.8	2.8	2.1
Weight	W	lbs	4.5	4.5	4.5	5.3	5.3	5.8
		kg	2.0	2.0	2.0	2.4	2.4	2.6
Diameter	D	in	4.37	4.37	4.37	4.37	4.37	4.37
		mm	111.0	111.0	111.0	111.0	111.0	111.0
Length	LG	in	1.84	1.84	1.84	2.39	2.39	2.39
		mm	46.7	46.7	46.7	60.7	60.7	60.7

Figure of Merit

Peak Acceleration	A_p	kRad/s ²	79.7	83.7	128.6	125.3	192.7	255.7
Mechanical Time Constant	T_m	ms	12.63	11.97	10.08	5.21	4.41	2.72
Electrical Time Constant	T_e	ms	<0.14	<0.15	<0.09	<0.15	<0.09	<0.09
Continuous Power Rate	P_c	kW/sec	2.6	3.3	3.8	7.9	9.4	16.8

Thermal Specifications

Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.30	1.30	1.30	1.30	1.30	1.30
Thermal Resistance at Stall	RAAS	°C/Watt	2.40	2.40	2.40	2.40	2.40	2.40
Forced Air Thermal Resistance: with 2.0 lbs/min Forced Air	RAA3	°C/Watt	0.28	0.28	0.28	0.32	0.32	0.32

Notes:

- 1) All values are based upon a 150°C armature temperature limit and with the motor mounted on an 8" x 16" x 3/8" aluminum heatsink with no forced air cooling. Other voltages, speeds, and torques, and duty cycles are achievable as long as the mxz armature temperature of 150°C is not exceeded.
- 2) Mass air flow (lbs/min) = air volume (CFM) x air density (lbs/ft³).
- 3) Terminal resistance is measured at 4.0 amps. RT varies as a function of applied current.

U-Series ServoDisc

PERFORMANCE DATA

Performance Specifications	Symbol	Units	U12M4LR	U12M4	U12M4A	U12M4H	U12M4HA	U16M4	U16M4H
Peak Torque	T _p	oz-in	1224	1316	1014	2076	1600	2981	5242
		N-cm	864	929	716	1465	1130	2105	3702
Rated Speed	N	RPM	3000	3000	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	oz-in	112	128	100	179	148	322	402
		N-cm	79	91	71	126	104	227	284
Rated Continuous Torque @ 40°C	T ₄₀	oz-in	102	114	90	158	133	287	341
		N-cm	72	81	64	112	94	203	241
Rated Power Output	P	Watts	249	284	223	396	329	704	890
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000	6000	6000
Continuous Stall Torque	T _s	oz-in	106	122	93	195	150	280	501
		N-cm	75	86	66	137	106	194	354
Cogging Torque	T _c	oz-in	0	0	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	22	43.4	46.0	62.7	65.6	82.7	125.7
Rated Continuous Current	I	Amps	15.8	8.8	7.0	7.9	6.5	11.0	8.5
Peak Current	I _p	Amps	160	85	65	84	65	95	101
Continuous Stall Current	I _s	Amps	14.4	8.1	6.3	8.1	6.3	9.2	9.8

Winding Specifications

Terminal Resistance ± 10%	R _t	Ohms	0.305	0.750	1.170	0.750	1.170	0.880	0.880
Armature Resistance ± 10%	R _a	Ohms	0.165	0.610	1.030	0.610	1.030	0.740	0.740
Back EMF Constant ± 10%	K _e	V/KRPM	5.77	11.55	11.55	18.50	18.50	23.30	39.00
Torque Constant ± 10%	K _t	oz-in/Amp	7.81	15.63	15.63	25.03	25.03	31.53	52.77
		N-cm/Amp	5.52	11.04	11.04	17.68	17.68	22.27	37.26
Viscous Damping Constant	K _d	oz-in/KRPM	1.7	1.8	1.3	5.0	3.26	6.0	15.3
		N-cm/KRPM	1.2	1.3	0.9	3.5	2.3	4.3	10.8
Armature Inductance	L	μH	<25	<100	<100	<100	<100	<100	<85
Temperature Coefficient of KE	C	%/°C Rise	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Number of Commutator Bars	Z		141	141	141	141	141	165	165

Mechanical Specifications

Moment of Inertia	J _m	oz-in-sec ²	0.021	0.0190	0.0080	0.0210	0.0100	0.0840	0.0840
		kg-m ²	1.45	1.34	0.56	1.48	0.71	5.93	5.93
Static Friction Torque	T _f	oz-in	5.5	5.5	5.5	5.5	5.5	10.5	10.5
		N-cm	3.9	3.9	3.9	3.9	3.9	7.4	7.4
Weight	W	lbs	8.0	8.0	8.0	11.0	11.0	18.5	18.7
		kg	3.6	3.6	3.6	5.0	5.0	8.4	8.5
Diameter	D	in	5.50	5.50	5.50	5.50	5.50	7.37	7.37
		mm	139.7	139.7	139.7	139.7	139.7	187.2	187.2
Length	LG	in	2.10	2.10	2.10	2.78	2.78	2.55	2.99
		mm	53.3	53.3	53.3	70.6	70.6	64.8	75.9

Figure of Merit

Peak Acceleration	A _p	kRad/s ²	59.4	69.2	126.7	98.9	160	35.5	62.4
Mechanical Time Constant	T _m	ms	7.85	6.68	4.75	2.88	2.31	8.81	3.15
Electrical Time Constant	T _e	ms	<0.15	<0.16	<0.10	<0.10	<0.10	<0.14	<0.11
Continuous Power Rate	P _c	kW/sec	4.33	6.1	8.9	10.7	15.5	8.7	13.6

Thermal Specifications

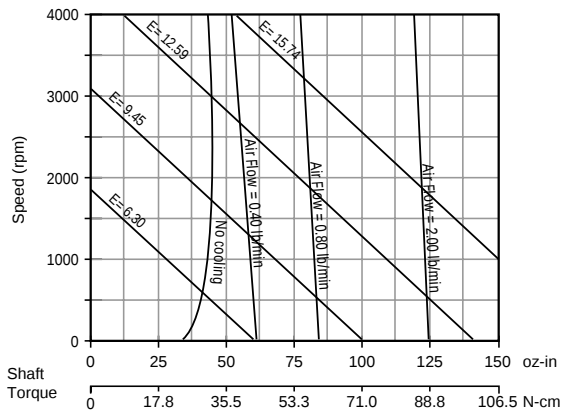
Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.27	1.27	1.27	1.27	1.27	0.65	0.70
Thermal Resistance at Stall	RAAS	°C/Watt	1.90	1.90	1.90	1.90	1.90	1.25	1.10
Forced Air Thermal Resistance: with 2.0 lbs/min Forced Air	RAA3	°C/Watt	0.23	0.23	0.23	0.23	0.23	0.18	0.18

- 4) Unless otherwise noted, all specifications above apply at 25°C.
- 5) Peak torque and current is calculated based on max pulse duration of 50 millisecond and a 1% duty cycle.
- 6) The operating current can be calculated as: $I = (\text{Shaft torque} + \text{TF} + \text{KD} \times \text{N}/1000) / \text{KT}$.
- 7) The operating voltage can be calculated as: $V = \text{KE} \times (\text{N}/1000) + \text{RT} \times I$.

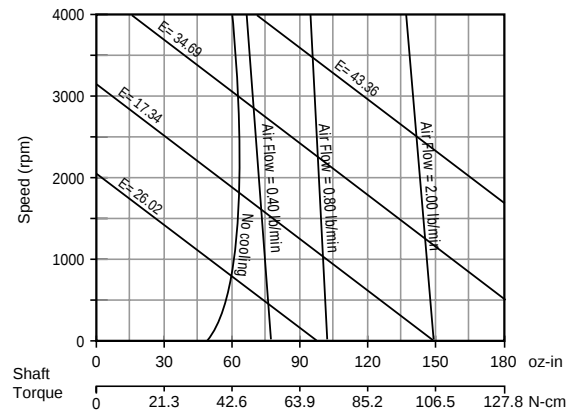
U-Series ServoDisc

PERFORMANCE DATA

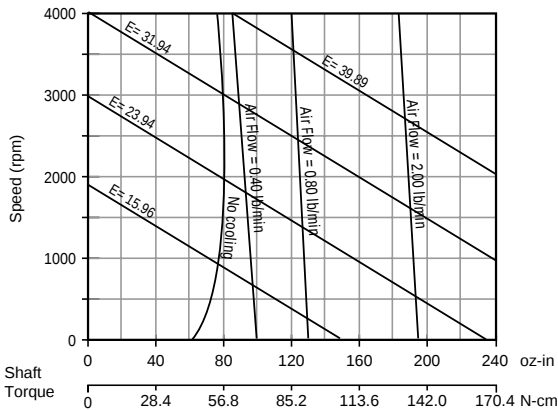
U9M4LR-STD



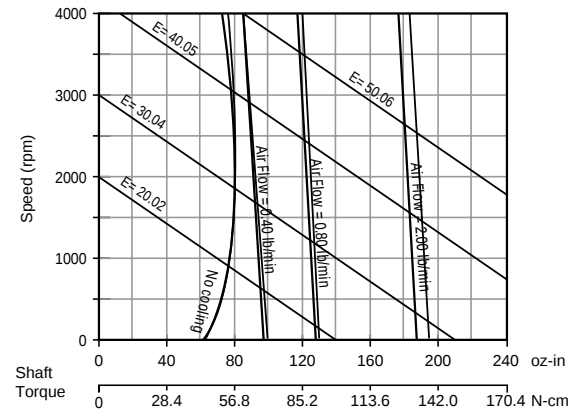
U9M4HA-STD



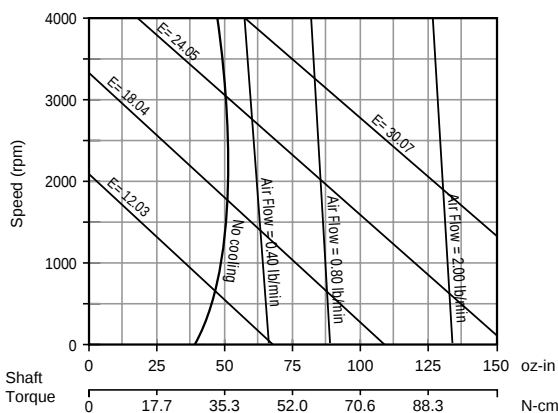
U9M4H-STD



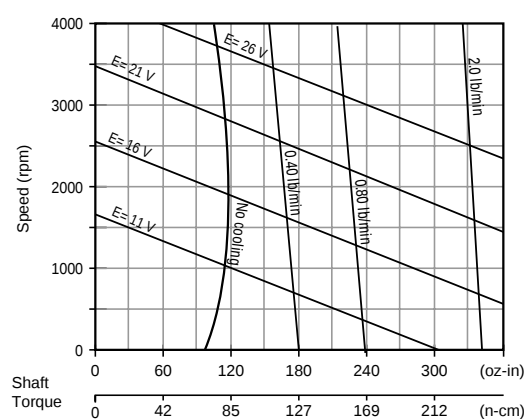
U9M4HA-2 STD



U9M4-STD



U12M4LR-STD



Notes:

- All curves are drawn for a fixed armature temperature of 150°C.
- The motor can be operated at any point on the graph below 4000 RPM. Higher speeds can be obtained for short periods of time. Contact a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by locating it on the appropriate 'Constant terminal-voltage curve.'

- Determine the required cooling by locating the desired operating point on the appropriate 'Constant cooling curve.'
- The operating current can be calculated as:

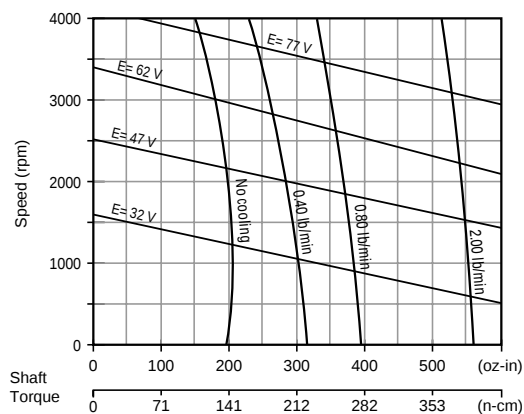
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT$$
- The operating voltage can be calculated as:

$$V = KE \times N/1000 + RT \times I$$

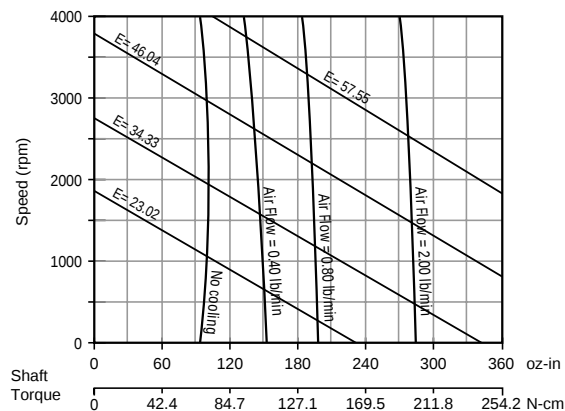
U-Series ServoDisc

PERFORMANCE DATA

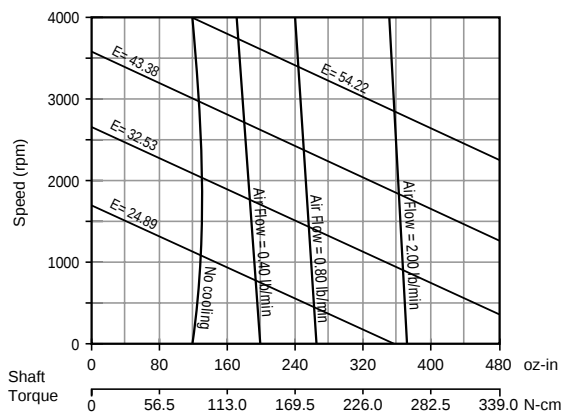
U12M4H-STD



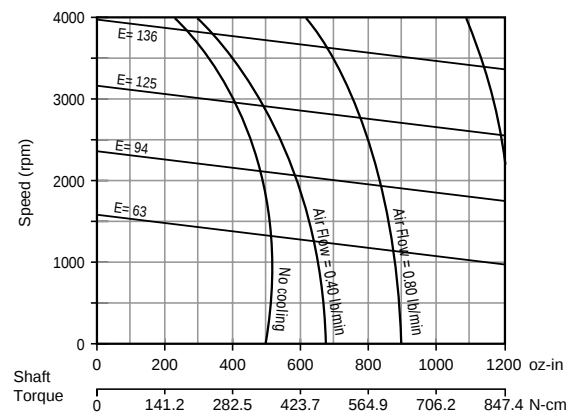
U12M4A



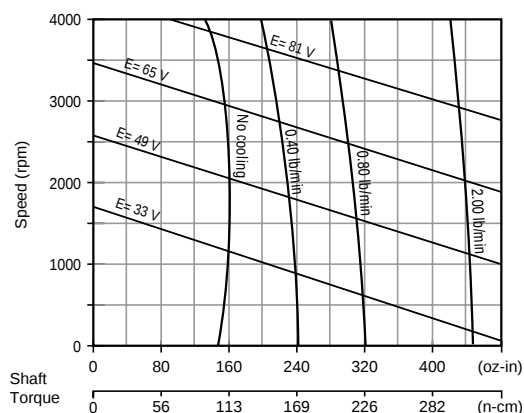
U12M4-STD



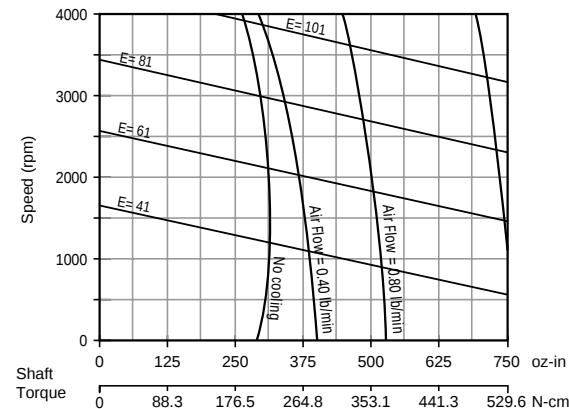
U16M4H



U12M4HA-STD



U16M4



Notes:

- All curves are drawn for a fixed armature temperature of 150°C.
- The motor can be operated at any point on the graph below 4000 RPM. Higher speeds can be obtained for short periods of time. Consult a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by locating it on the appropriate 'Constant terminal-voltage curve.'

- Determine the required cooling by locating the desired operating point on the appropriate 'Constant cooling curve.'
- The operating current can be calculated as:

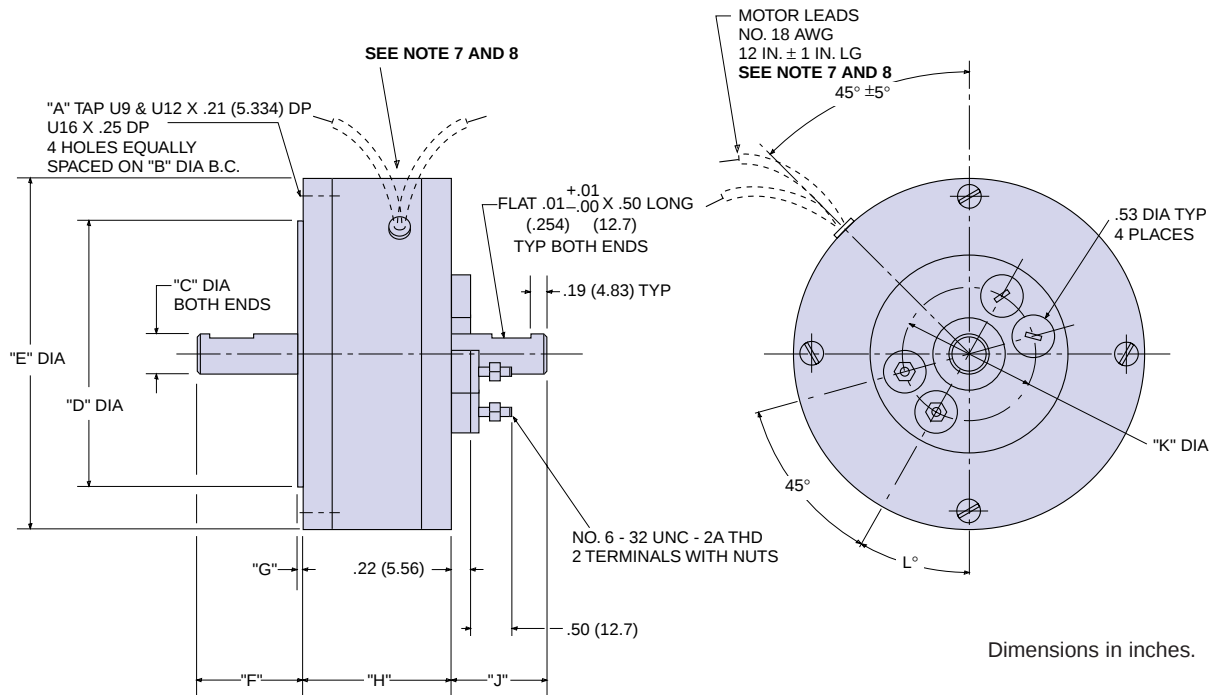
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT.$$
- The operating voltage can be calculated as:

$$V = KE \times N/1000 + RT \times I.$$

U-Series ServoDisc

DIMENSIONS

U9M4



Motors designed to English dimensions, note the metric equivalent.

Motor Types	"A" Tap	"B" Dia ± .005	C Dia + .0000 - .0005	D Dia + .000 - .0002	E Dia ± .01	F ± 1/32	G ± .01	H ± 1/32	J ± 1/32	K Dia Ref	L° ± 1/2°
U9M4LR	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	1 ²⁷ / ₃₂ (46.83)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	1 ²⁷ / ₃₂ (46.83)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4A	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	1 ²⁷ / ₃₂ (46.83)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4H	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ¹³ / ₃₂ (61.11)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4HA	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ¹³ / ₃₂ (61.11)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4HA-1	8-32	3.656 (92.86)	.3745 (9.51)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ²⁵ / ₆₄ (60.72)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U9M4HA-2	8-32	3.656 (92.86)	.3745 (9.51)	3.311 (84.09)	4.37 (110.99)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ²⁵ / ₆₄ (60.72)	1 ³ / ₁₆ (30.16)	1.660 (42.16)	26 ¹ / ₂
U12M4LR	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ⁷ / ₆₄ (53.57)	1 ³ / ₁₆ (30.16)	2.220 (56.38)	26
U12M4	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ⁷ / ₆₄ (53.57)	1 ³ / ₁₆ (30.16)	2.220 (56.38)	26
U12M4A	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ⁷ / ₆₄ (53.57)	1 ³ / ₁₆ (30.16)	2.220 (56.38)	26
U12M4H	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ²⁵ / ₃₂ (70.64)	1 ³ / ₁₆ (30.16)	2.220 (56.38)	26
U12M4HA	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ¹ / ₄ (31.75)	.06 (1.52)	2 ²⁵ / ₃₂ (70.64)	1 ³ / ₁₆ (30.16)	2.220 (56.38)	26
U16M4	1 ¹ / ₄ -20	6.625 (168.27)	.7496 (19.03)	6.124 (155.54)	7.37 (187.19)	1 ¹ / ₄ (31.75)	.09 (2.28)	2 ⁹ / ₁₆ (65.08)	1 ⁵ / ₃₂ (29.36)	2.830 (71.88)	24
U16M4H	1 ¹ / ₄ -20	6.625 (168.27)	.7496 (19.03)	6.124 (155.54)	7.37 (187.19)	1 ¹ / ₄ (31.75)	.09 (2.28)	3.81 (76.96)	1.150 (29.21)	2.830 (71.88)	24

MECHANICAL SPECIFICATIONS

Notes:

1. Shaft Dia **-A-** runout not to exceed 0.001 in per in.
2. Pilot Dia **-B-** concentric to **-A-** within 0.003 in T.I.R.
3. Mounting surface **-S-** perpendicular to **-A-** within:
0.005" for U9M Series
0.007" for U12M Series
0.010" for U16M4.
4. Shaft end play 0.001" Max under a thrust in the direction shown of:
10 lbs for U9M and U12 Series
15 lbs for U16M4.
5. Max pure radial load, 1" from surface "S":
18 lbs for U9HA-1 and -2, 25 lbs for U9M and U12M,
60 lbs for U12H and HA and 85 lbs for U16M @ rated speed.
6. Max pure axial load is 8 lbs for U9HA-1 and -2,
11 lbs for U9M and U12M, 55 lbs for U12H and HA and 75 lbs
for U16M.
7. Radial lead termination optional.
8. For U12M4H and U12M4HA, radial termination is standard.

U-Series ServoDisc

PERFORMANCE DATA (with Integral Tachometer)

Performance Specifications	Symbol	Units	U9M4T	U9M4HT	U12M4T	U12M4HT	U16M4T	U16M4HT
Peak Torque	T _p	oz-in	434	665	1206	1846	2748	4811
		N-cm	306	470	852	1304	1941	3397
Rated Speed	N	RPM	3000	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	oz-in	46	72	115	158	288	393
		N-cm	32	51	81	111	203	278
Rated Continuous Torque @ 40°C	T ₄₀	oz-in	41	64	104	139	256	340
		N-cm	29	45	73	99	181	240
Rated Power Output	P	Watts	102	159	254	350	639	872
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000	6000
Continuous Stall Torque	T _s	oz-in	37	59	111	171	257	459
		N-cm	26	42	78	121	181	324
Cogging Torque	T _c	oz-in	0	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	22.9	29.9	40.4	56.5	77.1	116.7
Rated Continuous Current	I	Amps	8.63	8.51	8.71	7.93	10.78	8.99
Peak Current	I _p	Amps	72	72	85	85	95	101
Continuous Stall Current	I _s	Amps	6.8	6.8	8.1	8.1	9.2	9.8

Winding Specifications

Terminal Resistance ± 10%	R _t	Ohms	0.850	0.850	0.750	0.750	0.880	0.880
Armature Resistance ± 10%	R _a	Ohms	0.660	0.660	0.610	0.610	0.740	0.740
Back EMF Constant ± 10%	K _e	V/KRPM	4.50	6.87	10.60	16.20	21.50	35.80
Torque Constant ± 10%	K _t	oz-in/Amp	6.09	9.30	14.34	21.92	29.09	48.44
		N-cm/Amp	4.30	6.57	10.13	15.48	20.54	34.21
Viscous Damping Constant	K _d	oz-in/KRPM	0.8	1.3	2.0	4.1	6.5	13.0
		N-cm/kRPM	0.6	0.9	1.4	2.9	4.6	9.2
Armature Inductance	L	μH	<100	<100	<100	<100	<100	<85
Temperature Coefficient of KE	C	%/°C Rise	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Number of Commutator Bars	Z		117	117	141	141	165	165

Mechanical Specifications

Moment of Inertia	J _m	oz-in-sec ²	0.0083	0.0083	0.0260	0.0270	0.1120	0.1120
		kg-cm ²	0.59	0.59	1.84	1.91	7.91	7.91
Average Friction Torque	T _f	oz-in	4.5	4.5	6.0	7.0	11.5	10.5
		N-cm	3.2	3.2	4.2	4.9	8.1	7.4
Weight	W	lbs	4.5	5.3	8.0	11.0	18.5	18.7
		kg	2.0	2.4	3.6	5.0	8.4	8.5
Diameter	D	in	4.37	4.37	5.50	5.50	7.37	7.37
		mm	111.0	111.0	139.7	139.7	187.2	187.2
Length	LG	in	1.86	2.41	2.11	2.82	2.59	3.03
		mm	47.2	61.2	53.6	71.6	65.8	77.0

Figure of Merit

Peak Acceleration	A _p	kRad/s ²	52.3	80.1	46.4	68.4	24.5	43.0
Mechanical Time Constant	T _m	ms	20.52	8.86	10.84	4.82	13.77	4.98
Electrical Time Constant	T _e	ms	<0.15	<0.15	<0.16	<0.16	<0.14	<0.11
Continuous Power Rate	P _c	kW/sec	1.8	4.4	3.6	6.5	5.2	9.7

Thermal Specifications

Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.30	1.30	1.27	1.27	0.65	0.70
Thermal Resistance at Stall	RAAS	°C/Watt	2.40	2.40	1.90	1.90	1.25	1.10
Forced Air Thermal Resistance: with 2.0 lbs/min Forced Air	RAA3	°C/Watt	0.3	0.32	0.25	0.27	0.19	0.18

Tachometer Specifications

Output Voltage	V	Volts/KRPM	2.25	3.43	5.30	8.10	10.50	17.90
Maximum Ripple Peak to Peak	V _{rh}	%	3.0	3.0	3.0	3.0	3.0	3.0
Linearity of Output Voltage	LIN	%	0.06	0.06	0.11	0.11	0.11	0.11

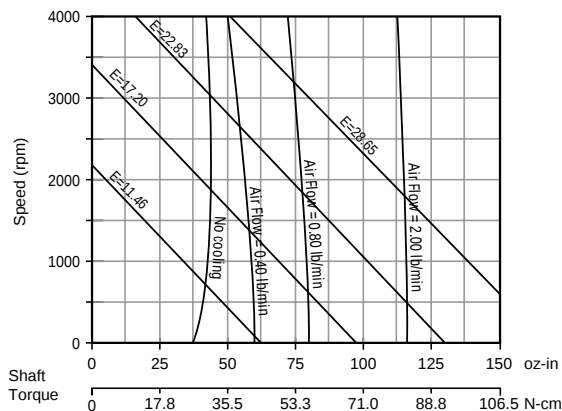
Notes:

- 1) All values are based upon a 150°C armature temperature limit and with the motor mounted on an 8" x 16" x 3/8" aluminum heatsink with no forced air cooling. Other voltages, speeds, and torques, and duty cycles are achievable as long as the max armature temperature of 150°C is not exceeded.
- 2) Mass air flow (lbs/min) = air volume (CFM) x air density (lbs/ft³).
- 3) Terminal resistance is measured at 4.0 amps. RT varies as a function of applied current.
- 4) Unless otherwise noted, all specifications above apply at 25°C.
- 5) Peak torque and current is calculated based on max pulse duration of 50 milliseconds and a 1% duty cycle.
- 6) The operating current can be calculated as: $I = (\text{Shaft torque} + T_f + K_D \times N/1000) / K_T$.
- 7) The operating voltage can be calculated as: $V = K_E \times (N/1000) + R_T \times I$.
- 8) Tachometer ripple measured with a resistive load of 1 kohm and a single low pass filter with 3db cut off at 500 Hz.
- 9) Tachometer minimum load resistance of 500 ohms.

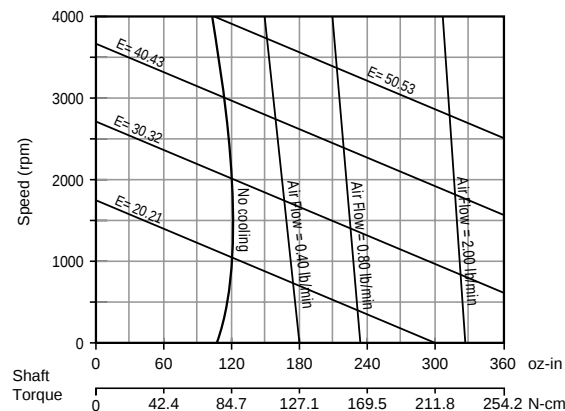
U-Series ServoDisc

PERFORMANCE DATA (with Integral Tachometer)

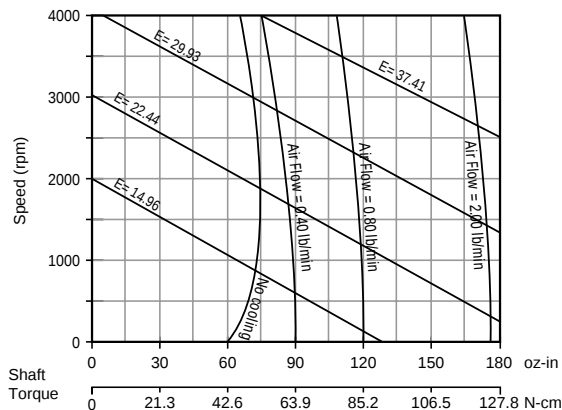
U9M4T



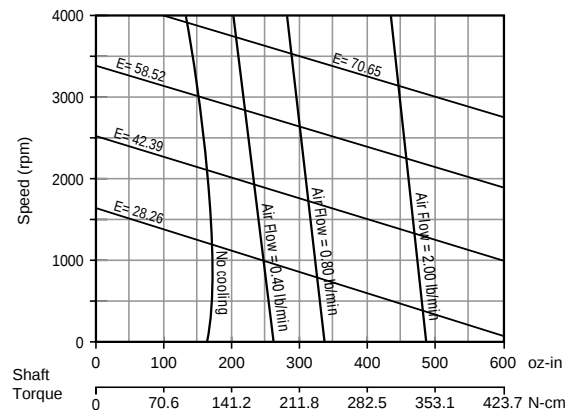
U12M4T



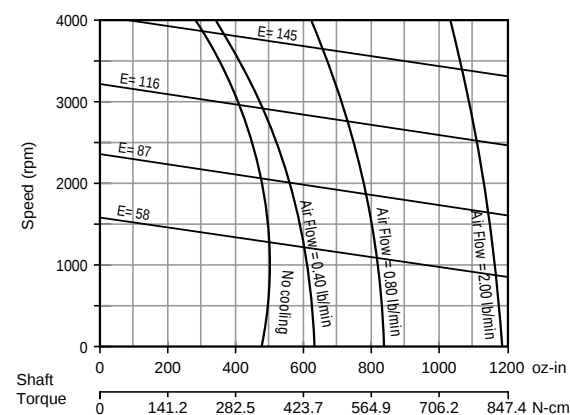
U9M4HT



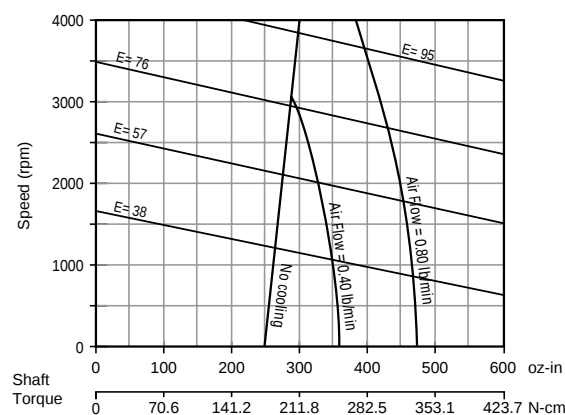
U12M4HT



U16M4HT



U16M4T



Notes:

- All curves are drawn for a fixed armature temperature of 150°C.
- The motor can be operated at any point on the graph below 4000 RPM. Higher speeds can be obtained for short periods of time. Consult a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by locating it on the appropriate 'Constant terminal-voltage curve.'
- Determine the required cooling by locating the desired operating point on the appropriate 'Constant cooling curve.'
- The operating current can be calculated as:

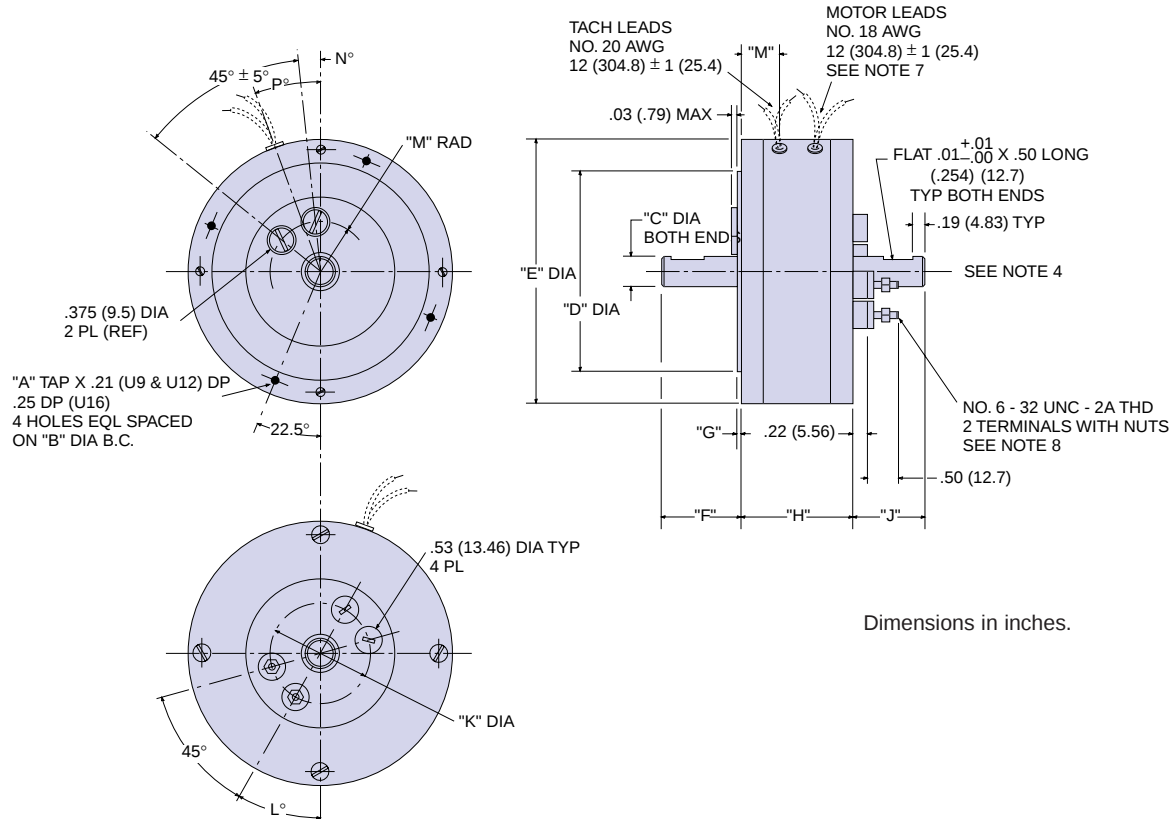
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT$$
- The operating voltage can be calculated as:

$$V = KE \times N/1000 + RT \times I$$

U-Series ServoDisc

DIMENSIONS (with Integral Tachometer)

U9M4T



Dimensions in inches.

Motors designed to English dimensions, note the metric equivalent.

Motor Types	"A" Tap	"B" Dia ± .005	C Dia + .0000 - .0005	D Dia + .000 - .002	E Dia ± .01	F ± 1/32	G ± .01	H ± 1/32	J ± 1/32	K Dia Ref	L° ± 1/2°
U9M4T	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1.220 (30.98)	.06 (1.52)	1 ⁵⁵ /64 (47.22)	1.200 (30.48)	1.660 (42.16)	26 ¹ / ₂
U9M44HT	8-32	3.656 (92.86)	.4995 (12.68)	3.311 (84.09)	4.37 (110.99)	1/	.06 (1.52)	2 ¹³ /32 (61.11)	1 ³ /16 (46.03)	1.660 (42.16)	26 ¹ / ₂
U12M4T	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1.230 (31.24)	.06 (1.52)	2 ⁷ /64 (56.35)	1.195 (30.35)	2.220 (56.38)	26
U12M4HT	10-32	4.875 (123.82)	.4995 (12.68)	4.500 (114.3)	5.50 (139.7)	1 ⁷ /32 (30.95)	.06 (1.52)	2 ¹³ /16 (71.43)	1 ¹³ /16 (46.03)	2.220 (56.38)	26
U16M4T	1/-20	6.625 (168.27)	.7496 (19.03)	6.124 (155.54)	7.37 (187.19)	1.230 (31.24)	.09 (2.28)	2.98 (78.74)	1.150 (29.21)	2.830 (71.88)	24
U16M4HT	1/-20	6.625 (168.27)	.7496 (19.03)	6.124 (155.54)	7.37 (187.19)	1.230 (31.24)	.09 (2.28)	2.98 (78.74)	1.170 (29.21)	2.830 (71.88)	24

Notes:

1. Shaft Dia [-A-] runout not to exceed 0.001 in per in.
2. Pilot Dia [-B-] concentric to [-A-] within 0.003 in T.I.R.
3. Mounting surface [-S-] perpendicular to [-A-] within:
0.005" for U9M Series
0.007" for U12M Series
0.010" for U16M4.
4. Shaft end play 0.001" Max under a thrust in the direction shown of:
10 lbs for U9M4 and U12M4 Series, and 15 lbs for U16M4.
5. Max pure radial load, 1" from surface "S":
25 lbs for U9 and U12M4T Series, 60 lbs for U12HT
and 85 lbs for U16M4T at rated speed.
6. Max pure axial load is 11 lbs for U9 and U12MT,
55 lbs for U12HT and 75 lbs for U16MT.
7. Radial lead termination optional.
8. For U12M4HT, radial termination is standard. Screw terminals are optional.

U-Series ServoDisc

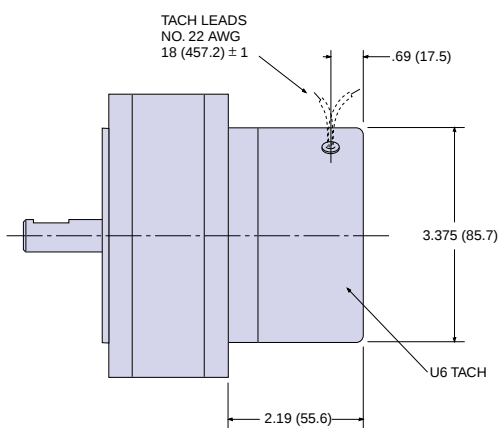
SYSTEM PERFORMANCE (with separate Integral Tachometer)

Add-on tachometers are available mounted directly to the motor shaft to provide velocity without magnetic coupling between motor and tachometer.

Type U6T

High Precision Analog Tachometer

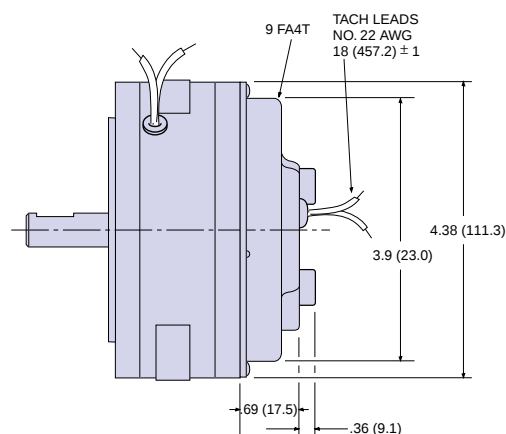
(Shown in typical mounting to U9M4 motor)



Type 9FA4T

Low Cost Analog Tachometer

(Shown in typical mounting to U9M4 motor)



Dimensions in inches

Characteristics (at 25°C)	Units	Type U6T	Type 9FA4T
Output Voltage	Volts/kRPM	1.00	2.50
Ripple Voltage Max (P-P) (1)			
at 1000 RPM	%	1.5	5.0
at 500 RPM	%	1.5	5.0
at 100 RPM	%	1.5	5.0
Linearity of Output Voltage (rated at 3600 RPM)	%	.05	.06
Bi-directional Tol (diff. in output Volts/kRPM)	%	1.5	3.0
Output Impedance (resistive)	ohms	2.61	1.18
Temperature Coefficient Output Voltage	%/°C Rise	-.02	-.19
Load Resistance (recommended Min)	ohms	2610	1180
Tachometer Inertia	oz-in-sec ²	.00025	.0024
No of Commutator Bars		97	117

Measured with a resistive load of 1 kohm and a single-pole low pass filter with 3db cut off at 500 Hz. Calculated ripple frequency = $ZT \times N/60$. For encoder specifications (M23 only), please reference feedback section.

PLATINUM REFERENCE GUIDE

Kollmorgen also offers the PLATINUM™ Series motors, a new generation of ServoDisc motors. These motors offer increased life, reliability and performance, and may be used as a direct replacement for the U-Series motors. This reference guide shows suggested equivalent PLATINUM and U-Series, S-Series, and N-Series motors currently offered by Kollmorgen.

PLATINUM Series U9D

Motors

Motor Model Number	Equivalent PLATINUM Model Number	Standard Series Winding				Standard Parallel Winding			
		Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM	Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM
U9M4	U9D-A	50	5.0	23.9	8.7	45	2.5	12.5	15.5
	U9D-B	60	6.0	26.7	8.6	55	3.0	13.9	15.5
	U9D-C	65	6.4	27.8	8.6	60	3.2	14.5	15.5
U9M4H	U9D-D	80	8.0	32.2	8.6	75	4.0	16.7	15.4
S9M4H	U9D-E	90	8.8	34.6	8.5	85	4.4	17.8	15.3
N9M4	U9D-F	75	7.6	31.2	8.6	70	3.8	16.1	15.4

Motors with Integral Tachometers

Motor Model Number	Equivalent PLATINUM Model Number	Standard Series Winding				Standard Parallel Winding			
		Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM	Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM
U9M4T	U9DT-A	45	4.6	22.7	8.6	40	2.3	11.9	15.4
	U9DT-B	55	5.6	25.3	8.6	50	2.8	13.2	15.3
	U9DT-C	60	5.8	25.9	8.5	55	2.9	13.5	15.3
U9M4HT	U9DT-D	75	7.4	30.5	8.5	70	3.7	15.8	15.2
S9M4HT	U9DT-E	85	8.4	33.4	8.4	80	4.2	17.3	15.1
N9M4T	U9DT-F	70	7.2	30.0	8.5	65	3.6	15.5	15.2

PLATINUM Series U12D

Motors

Motor Model Number	Equivalent PLATINUM Model Number	Standard Series Winding				Standard Parallel Winding			
		Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM	Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM
U12M4	U12D-A	130	12.1	43.3	8.8	115	6.1	22.2	15.8
	U12D-B	140	13.2	46.0	8.7	125	6.6	23.7	15.5
N12M4	U12D-C	150	14.5	50.0	8.6	135	7.2	25.5	15.5
	U12D-D	165	16.4	55.2	8.5	150	8.2	28.2	15.3
JR12	U12D-E	180	18.5	61.1	8.2	160	9.3	31.0	14.7
U12M4H	U12D-F	185	19.1	62.6	8.1	170	9.5	31.8	14.6

Motors with Integral Tachometers

Motor Model Number	Equivalent PLATINUM Model Number	Standard Series Winding				Standard Parallel Winding			
		Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM	Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM
U12M4T	U12DT-A	115	11.1	40.3	8.7	105	5.5	20.7	15.8
	U12DT-B	125	12.3	43.7	8.6	115	6.1	22.4	15.6
U12M4HT	U12DT-C	135	13.5	47.0	8.5	125	6.7	24.1	15.5
	U12DT-D	150	15.5	52.7	8.3	140	7.8	26.9	15.3
U12M4HT	U12DT-E	160	17.2	57.1	7.9	150	8.6	29.0	14.8
	U12DT-F	170	18.2	60.0	7.8	160	9.1	30.6	14.6