

KOLLMORGEN



SERVODISC™ CATALOG

A new dimension in performance

If you are involved with high performance servomotor applications, there is an important motor technology which you should know about. It's the technology found in ServoDisc motors from Kollmorgen.

What separates the ServoDisc motor from conventional DC servos is its ironless disc armature. As we shall see, this difference enables ServoDisc motors to deliver a level of performance, in both incremental motion and continuous speed applications, which is not attainable with conventional ironcore motor designs.

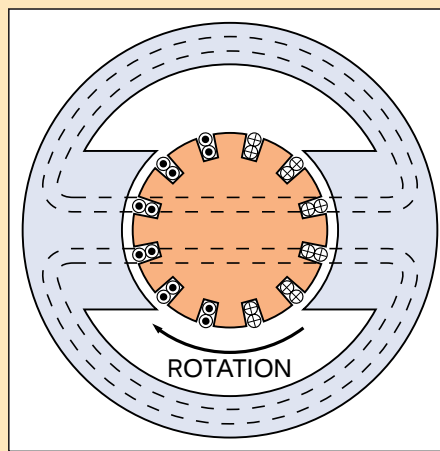
In addition to performance advantages, ServoDisc motors have a unique compact shape that can be an attractive alternative when solving tight packaging problems.

Unique ironless design

In a conventional slot-wound servomotor, the armature is constructed from a heavy, laminated ironcore wound with coils of wire. In a ServoDisc motor, the armature has no iron. Instead, it is constructed from several layers of copper conductors in a unique flat-disc configuration.

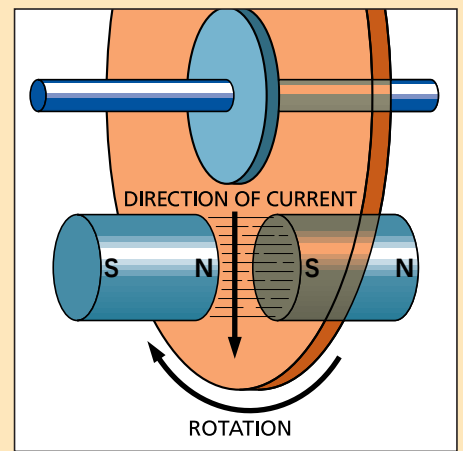
Not only are the armature designs completely different, so is the shape and internal construction. In a conventional servo, the permanent magnets are mounted on the motor shell creating a radial magnetic field, perpendicular to the shaft (Fig. 1). Because the magnet pairs are so far apart, the iron core of the armature is needed to contain and focus the lines of magnetic flux. Motors of this type are typically long, thin and heavy.

In a ServoDisc motor, the magnets are mounted on the end plates creating an axial magnetic field, parallel to the shaft.



Ironcore Motor

A conventional ironcore motor uses a radial design with magnets placed concentrically around the shaft in such a way as to produce a radial magnetic field. (Fig. 1) The armature consists of slotted steel laminations wound with coils of wire which interact with the magnetic field to produce torque. As the motor rotates a commutator automatically maintains the correct current flow. A ServoDisc motor uses entirely different physical construction. The motor is designed with the magnetic field aligned axially, parallel to the shaft. (Fig. 2) The conductors in the arma-



ServoDisc Motor

ture have a current flow which is perpendicular to the magnetic field (radial to the shaft). This produces a torque perpendicular to both the magnetic field and the current (the left-hand rule). This force rotates the shaft. This construction approach is much more efficient than the radial design of conventional ironcore motors and eliminates the heavy iron armature and the electrical losses associated with it. The large number of commutations possible with Kollmorgen's unique flat armature produce dramatically smoother torque output.

This leads to a very small air gap between the magnets, separated only by the thickness of the disc armature - a very clean and effective design approach. Torque is created when the current flowing radially through the copper conductors interacts directly with the field of the permanent magnets (Fig. 2). This configuration is a very efficient way of producing torque. These different approaches produce dramatically different motors (Fig. 3).

Outdistances other DC servos

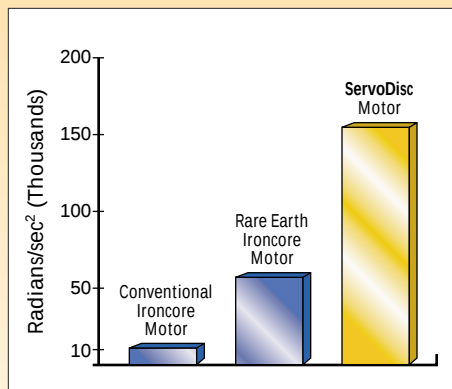
The iron-free ServoDisc armature provides some significant performance advantages for motion control applications.

COMPARISON OF PERFORMANCE FEATURES



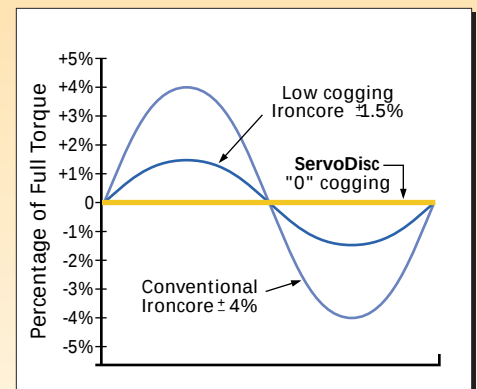
Size

The ServoDisc armature is much smaller and lighter than bulky ironcore designs of equivalent output.



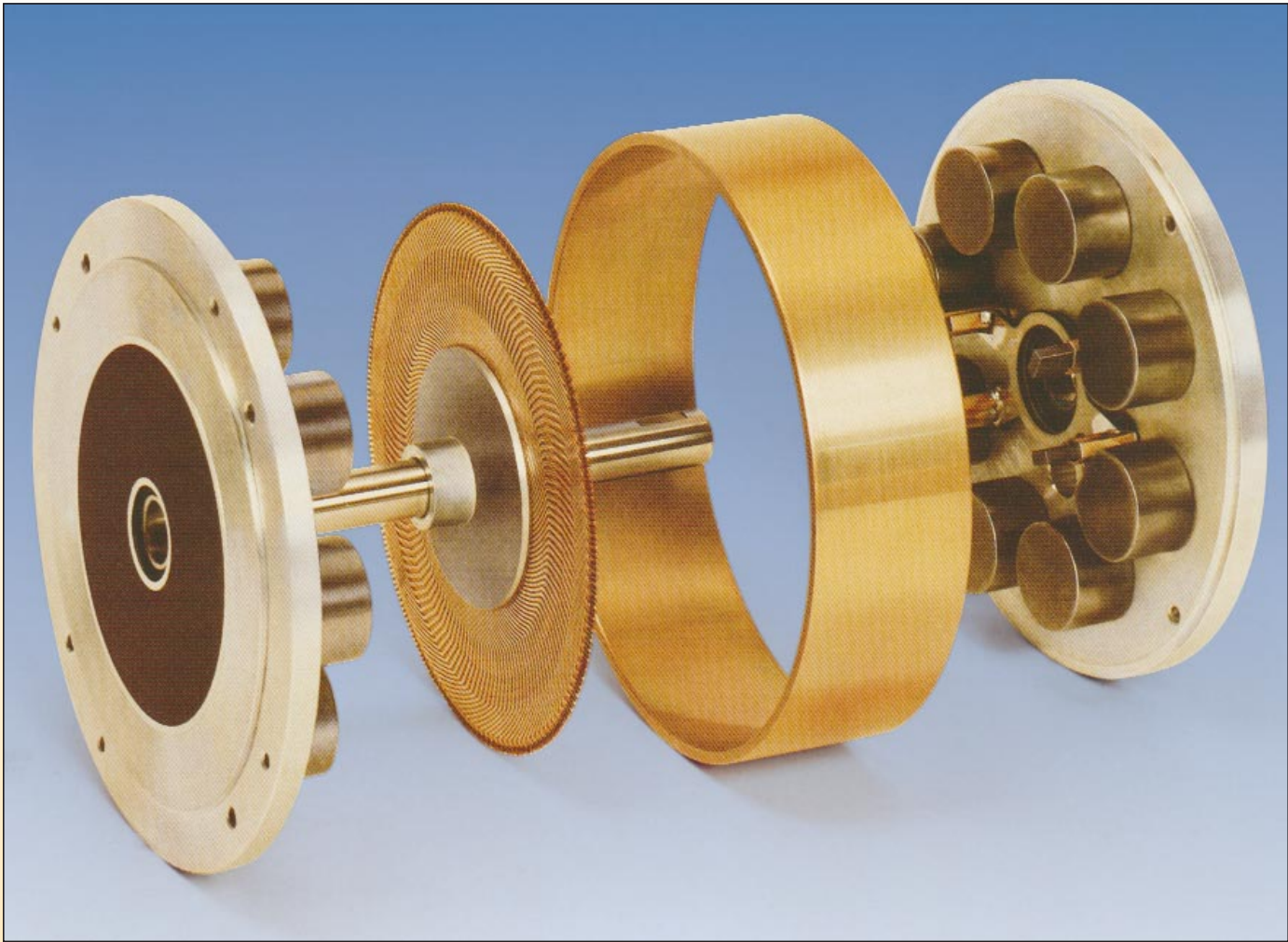
Acceleration

ServoDisc motors accelerate up to 10 times faster than conventional servo motors.



Cogging

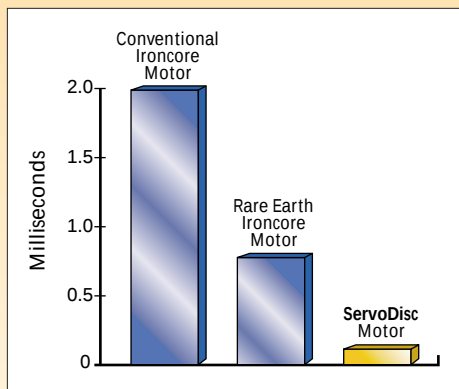
The ironless ServoDisc armature has absolutely no cogging at any speed of operation.



Faster acceleration

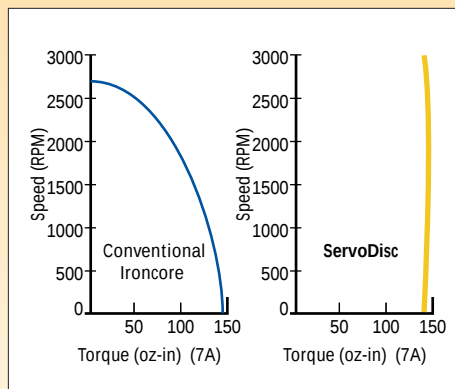
The thin, low-inertia armature design leads to exceptional torque-to-inertia ratios. This translates into blazing acceleration (Fig. 4). A typical ServoDisc motor can accelerate from 0 to 3000 rpm in only 60 degrees of rotation. In some applications,

the entire move can be performed in less than 10 milliseconds. This means shorter cycle times, more moves per second and higher throughput. For incremental motion applications, this translates into higher productivity and more profitability.



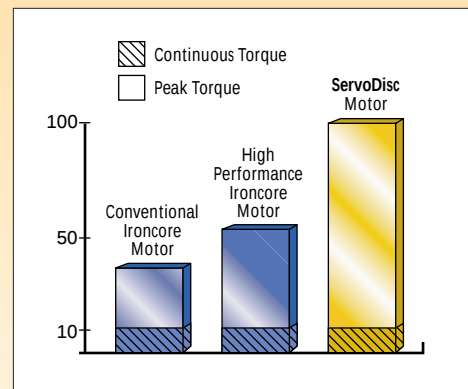
Electrical Time Constant

A very low electrical time constant results in torque much sooner than with conventional wire-wound motors.



Torque-Speed Curves

With full torque from 0 to full speed, ServoDisc motors solidly outperform conventional motors.



Peak Torque Capability

High peak torque capability means more throughput than is available from standard servos.

Perfectly smooth rotation

If you rotate a conventional motor when it is unpowered, you will notice that it pulls into certain preferred positions. This occurs when the iron laminations in the armature line up with the permanent magnets on the stator. This phenomenon is called “cogging.” It also occurs when the motor is powered and shows up as torque disturbances which can be a serious problem in critical applications. The ServoDisc armature, being ironless, is not attracted by the magnets and, consequently, has intrinsically zero cogging (Fig. 5). The result is ultra-smooth rotation at any speed.

Long brush life

Because there is no iron, there is nearly no inductance. The result is no arcing, because there is no stored energy in the armature to be dissipated during commutation. In an ironcore motor, a lot of energy is stored in the magnetic field of each coil. When this field collapses, the energy may be discharged by arcing to the brushes. Arcing, not friction, is the major cause of brush wear. The elimination of arcing leads to very long brush life in most applications. In fact, depending on the application, it is possible for the brushes to last as long as the bearings.

High speed capability

No arcing also means no commutation limits due to speed. In a conventional motor, arcing increases as speed increases and eventually causes motor operation to become erratic. ServoDisc motors do not suffer from this problem and can run to 4000 rpm and above.

Instantaneous torque

Low inductance provides another advantage...low electrical time constant. This is a measure of how long it takes for current to flow into the armature. For ServoDisc motors, this is much less than one millisecond (Fig. 6). This means full torque almost instantly; a key to fast moves and accurate tracking.

Full torque from 0 to 4000 rpm

In a conventional motor there are losses associated with rotating the iron armature in a magnetic field. These losses increase with speed, so as the motor goes faster, it uses more and more of its available torque just to keep itself turning. Consequently, less torque is left to deliver to the output shaft (Fig. 7A). ServoDisc motors do not have these iron-associated losses and, as a result, deliver more torque over their entire speed range. In fact, the torque is almost constant from 0 to 4000 rpm (Fig. 7B). Compare this performance with the torque-speed characteristics of a conventional motor.

When sizing a conventional motor, the torque drop-off with speed may require you to select the next higher size to get sufficient torque at high speed. You will never have this problem with a ServoDisc motor.

Extra torque on call

For rapid acceleration and deceleration, higher than normal torque is usually required. To produce this temporary peak torque, a peak current is applied to the motor. In an iron-core design, the magnetic field of the armature can interact with and demagnetize the permanent magnets. Because of this effect, peak current is generally limited to 2 or 3 times the continuous current rating. With the non-magnetic ServoDisc armature and axial magnetic field, this problem is virtually eliminated. Most ServoDisc motors are rated for peak current of 10 times the continuous rating (Fig. 8).

Sizes for every application

ServoDisc motors use a very “well behaved” technology. As a result, products have been developed which cover a wide range of package sizes and power levels. Motors are presently available with torques from 10 oz-in to 20 lb-ft and power outputs from 30 watts to 4.5 kilowatts. This means a product match for nearly every application.

Easy to design in

The disc armature design leads to a unique flat motor package. This is generally easier to design in than much longer conventional motors. From a performance standpoint, this shape provides closer physical coupling and better torsional stiffness. These key factors can optimize your mechanical design.

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- **85 to 390 oz-in (0.6 to 2.7 N-m)**
- **Speeds Up To 6000 RPM**
- **Motor Lengths Less Than 2 Inches**
- **Motor OD 4.4 to 7.4 Inches (11.1 to 18.7 cm)**

The PLATINUM XT is an exciting new 3 phase brushless DC servomotor that uses breakthrough brushless technology developed by Kollmorgen. Utilizing revolutionary new slotless armature technology, the PLATINUM XT produces absolutely zero cogging and pure sinusoidal BEMF and torque functions that result in almost zero torque and velocity ripple for ultra smooth performance.

FEATURES:

- Flat profile
- Absolutely zero cogging for smooth operation
- Pure sinusoidal BEMF characteristics
- Fast acceleration
- Slotless motor design provides for extremely low torque/velocity ripple
- Modular design
- All aluminum construction increases resistance to corrosive environments
- Low RFI and EMI

OPTIONS:

- Resolver or encoder feedback
- Molded ruggedized dust cover with CPC connectors
- Splash-tite strain relief with cable and free hanging connector
- Mating connectors
- IP-65 sealing
- Forced air cooling
- Compatible with existing Kollmorgen gear-reducers
- UL versions available

PERFORMANCE DATA

PLATINUM XT™ Brushless Series Motor Parameters

Performance Specifications	Symbol	Units	U9BL-C	U12BL-C	U16BL-D
Peak Torque	Tp	oz-in N-m	281 2.0	563 4.0	1246 8.8
Rated Speed	N	RPM	3000	3000	3000
Rated Continuous Torque @ 25°C	T	oz-in N-m	83 0.59	169 1.20	388 2.74
Rated Continuous Torque @ 40°C	T	oz-in N-m	77 0.54	156 1.10	357 2.52
Rated Power Output @ 25°C	P	Watts	185	376	859
Maximum Recommended Cont. Speed	Nmax	RPM	6000	6000	6000
Continous Stall Torque	TS	oz-in N-m	89 0.63	181 1.28	354 2.50
Cogging Torque	TC	oz-in	0.0	0.0	0.0

Electrical Specifications

Nominal Bus Voltage @ Rated Speed	Vbus	VDC	65	86	123
Rated Continuous Current	I	A RMS	9.6	10.5	12.3
Peak Current	IP	A RMS	28.9	31.4	37.0
Continous Stall Current	IS	A RMS	9.7	10.7	11.1

Winding Specifications

Resistance (L-L)	RA	ohms	0.66	0.81	0.76
Back EMF Constant (L-L)	KE	V RMS/KRPM	4.4	8.0	15.8
Torque Constant (to phase current)	KT	oz-in/Amp RMS N-m/Amp	10.30 0.073	18.70 0.132	37.00 0.261
Viscous Damping Constant	KD	oz-in/KRPM N-m/KRPM	1.6 0.011	2.5 0.018	3.0 0.021
Armature Phase Inductance (L-L)	L	μH	40	75	125
Temperature Coeff. of KE	C	%/°C Rise	-0.093	-0.093	-0.093

Mechanical Specifications

Moment of Inertia	JM	oz-in-Sec ² kg-cm ²	0.028 1.98	0.120 8.47	0.400 28.25
Average Static Friction Torque	T _f	oz-in N-m	4.0 0.028	5.5 0.039	15.0 0.106
Weight	W	lb kg	4.1 1.9	6.8 3.1	11.0 5.0
Diameter	D	inches mm	4.4 112	5.5 140	7.4 188
Length	LG	inches mm	1.94 49	2.20 56	2.50 64
Number of Poles	NP		8	8	8

Figures of Merit

Mechanical Time Constant	TM	ms	36.2	58.1	47.0
Electrical Time Constant	TE	ms	3.1	2.5	2.7

Thermal Specifications

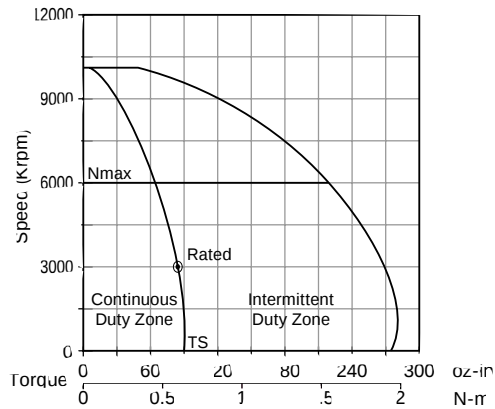
Rated Armature Temperature	Θ _{rt}	°C	150	150	150
Thermal Resistance at Rated Speed	RAAR	°C/Watt	0.80	0.55	0.40
Thermal Resistance at Stall	RAAS	°C/Watt	0.90	0.60	0.60

Notes:

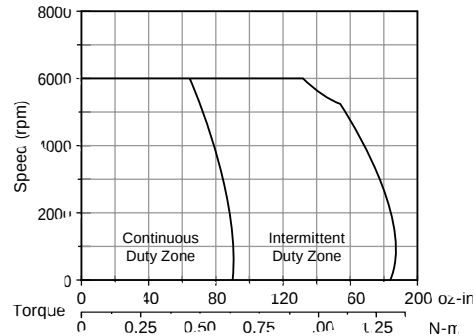
- (1) Peak Values and maximum speed are based upon the least of the demagnetization limit, the structural limit and the thermal limit
- (2) All values are based upon a 155 °C armature temperature when the motor is mounted on a 8x16x1/4 aluminum heatsink with no forced air cooling
- (3) L-L means line to line, RMS means Root Mean Square value

MOTOR / SYSTEM SUMMARY INFORMATION

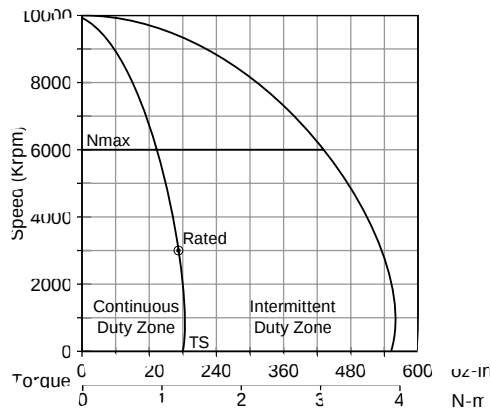
■ Motor U9BL-C Intrinsic Curve



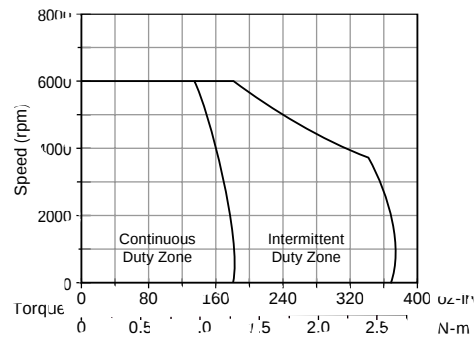
■ Motor U9BL-C ■ Amplifier SR10 ■ Bus Voltage 160 VDC



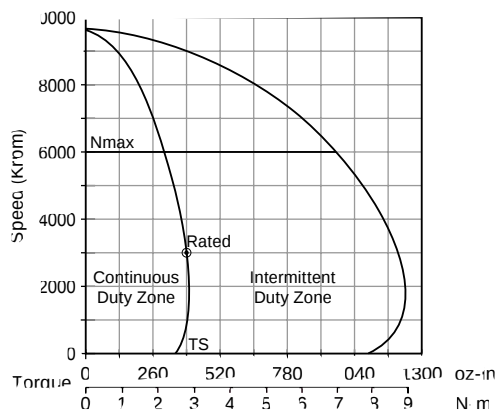
■ Motor U12BL-C Intrinsic Curve



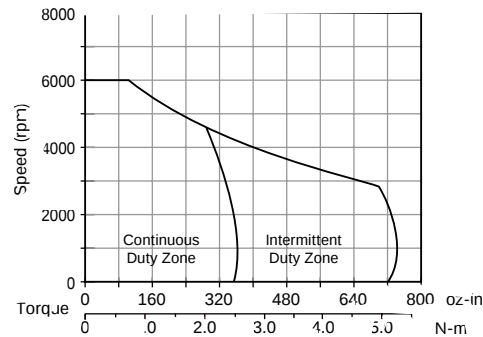
■ Motor U12BL-C ■ Amplifier SR10 ■ Bus Voltage 160 VDC



■ Motor U16BL-D Intrinsic Curve



■ Motor U16BL-D ■ Amplifier SR10 ■ Bus Voltage 160 VDC



Notes:

- (1) Peak Values and maximum speed are based upon the least of the demagnetization limit, the structural limit and the thermal limit
- (2) All values are based upon a 155 °C armature temperature when the motor is mounted on a 8x16x1/4 aluminum heatsink with no forced air cooling
- (3) L-L means line to line, RMS means Root Mean Square value

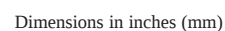
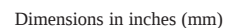
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Figure 2 is a mechanical drawing of the motor assembly, showing a side view on the left and a top view on the right. The side view shows a cylindrical motor body with a mounting flange. Dimensions include a 1.00 TYP (25) height for the mounting feature, a 1.125 (50) width for the base, and a 0.4 REF (111) diameter for the central shaft. The top view shows the motor's circular face with four mounting holes. Callouts identify the motor connector (CPC RCF14 1/4" SIZE AMP P/N 20604), the motor cable (AWG 24±1 LONG), the resolver connector (CPC IN-LINE 14 POS SIZE AMP P/N 20604), and the encoder resolver cable (22 24 AWG 24±1 LONG). A note indicates that the motor cable and resolver cable are to be placed as shown in the drawing.

Dimensions in inches (mm)



Encoder (Incremental)

Kollmorgen PLATINUM XT™

DIMENSIONS

U12BL-C Motor with Resolver/Encoder, Dust Cover, and Connector

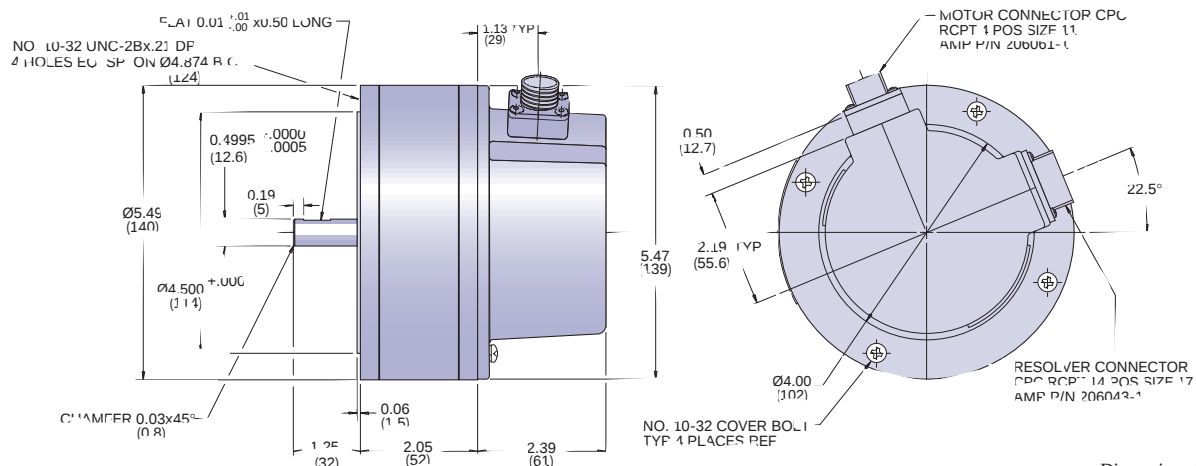


Fig. 4

Dimensions in inches (mm)

U12BL-C Motor with Resolver/Encoder, Dust Cover, and Free Hanging Connector

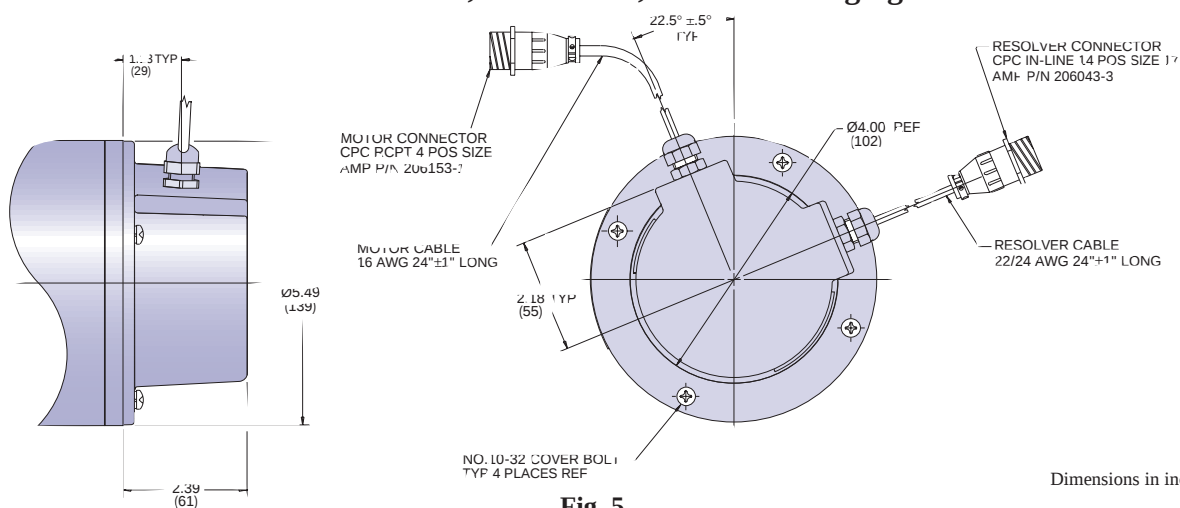


Fig. 5

Dimensions in inches (mm)

U12BL-C Motor with Encoder, Cable, and Free Hanging Connector

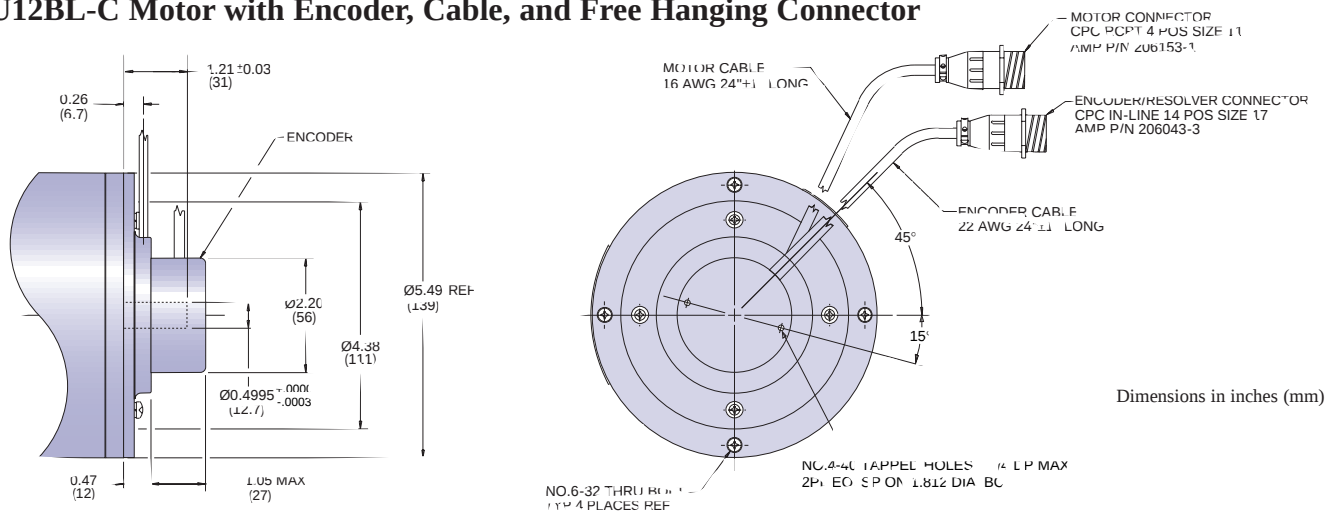


Fig. 6

Encoder (Incremental)

DIMENSIONS

U16BL-D Motor with Resolver/Encoder, Dust Cover, and Connector

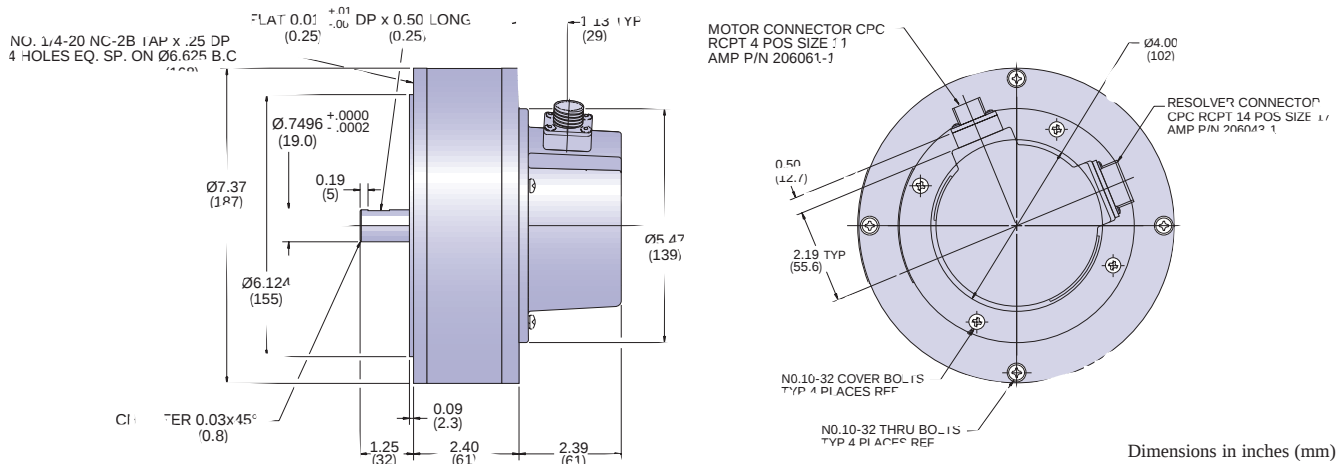


Fig. 7

U16BL-D Motor with Resolver/Encoder, Dust Cover, and Free Hanging Connector

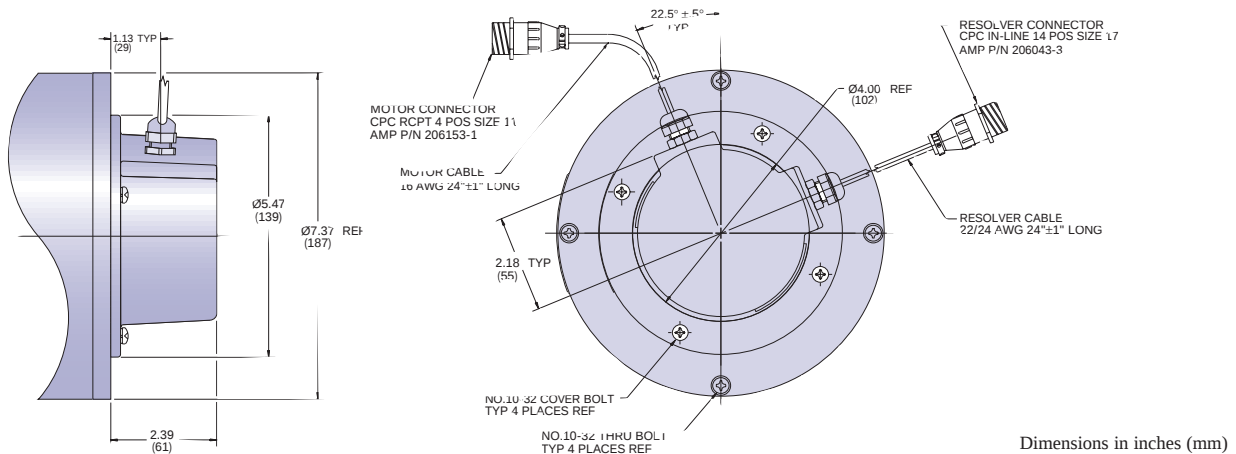


Fig. 8

U16BL-D Motor with Encoder, Cable, and Free Hanging Connector

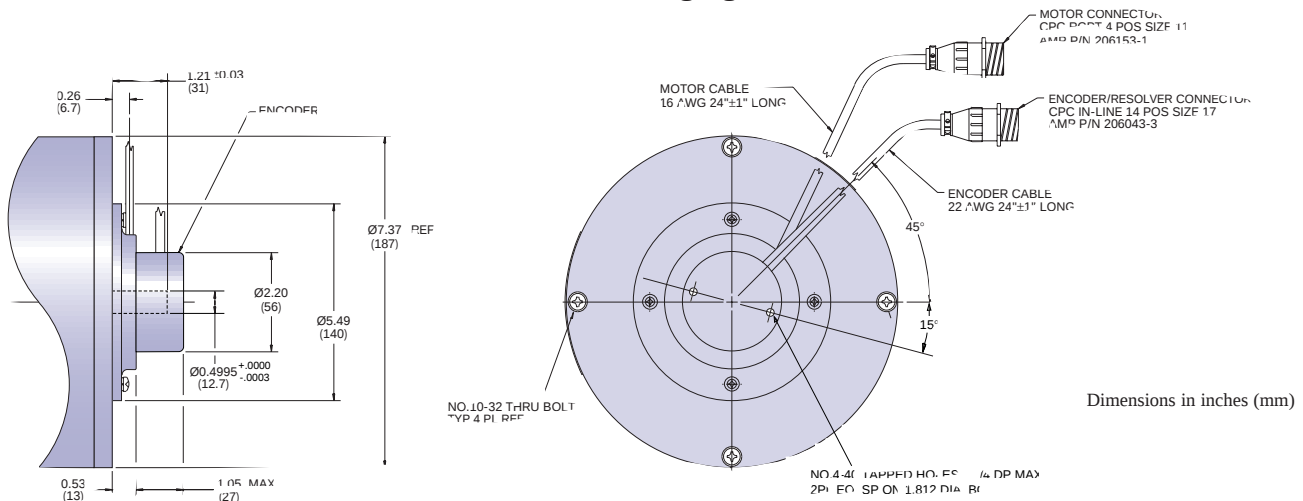


Fig. 9

Encoder (Incremental)

ORDERING INFORMATION

PLATINUM XT™ Brushless Series Motors

Type

Order Number

Type/Description Reference

9 cm Brushless Motors

U9BL-C/RES/CVR/CONN	see Fig 1	00-409C51-004
U9BL-C/RES/CVR/CBL	see Fig 2	00-409C51-005
U9BL-C/ENC/CVR/CONN	see Fig 1	00-409C69-004
U9BL-C/ENC/CVR/CBL	see Fig 2	00-409C69-005
U9BL-C/ENC/CBL	see Fig 3	00-409C09-006

12 cm Brushless Motors

U12BL-C/RES/CVR/CONN	see Fig 4	00-412C51-004
U12BL-C/RES/CVR/CBL	see Fig 5	00-412C51-005
U12BL-C/ENC/CVR/CONN	see Fig 4	00-412C69-004
U12BL-C/ENC/CVR/CBL	see Fig 5	00-412C69-005
U12BL-C/ENC/CBL	see Fig 6	00-412C09-006

16 cm Brushless Motors

U16BL-D/RES/CVR/CONN	see Fig 7	00-416D51-004
U16BL-D/RES/CVR/CBL	see Fig 8	00-416D51-005
U16BL-D/ENC/CVR/CONN	see Fig 7	00-416D69-004
U16BL-D/ENC/CVR/CBL	see Fig 8	00-416D69-005
U16BL-D/ENC/CBL	see Fig 9	00-416D09-006

Note: 1024 pulses per revolution with a 5 volt line driver encoder is recommended for use with SERVOSTAR Amplifier.

/RES/CVR/CONN

motor with resolver feedback, dust cover (CPC) circular plastic connector

/RES/CVR/CBL

motor with resolver feedback, dust cover, liquid tight strain relief bushing and cable terminated with free hanging connector

/ENC/CVR/CONN

motor with encoder feedback, dust cover (CPC) circular plastic connector

/ENC/CVR/CBL

motor with encoder feedback, dust cover, liquid tight strain relief bushing and cable terminated with free hanging connector

/ENC/CBL

motor with incremental encoder feedback, uncovered, and cable terminated with free hanging connector

Encoder Ordering Information

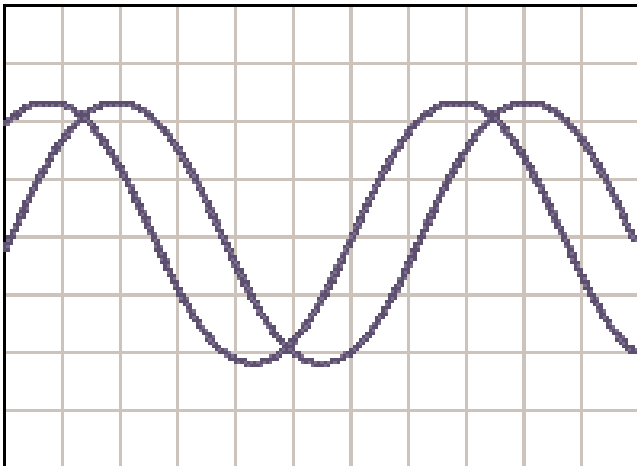
Model	M23	1000	ABI	5	S	P	3750
Pulses Per Revolution							Hub Size
50	256	600	2000				.2500 (1/4")
60	360	900	2500				.3750 (3/8")
100	400	1000	2450				.5000 (1/2")
180	416	1024					.3150 (8mm)
200	500	1200					.3937 (10mm)
250	512	1500					Leads
Number of Outputs							P – Pigtailed (18" min.)
AB – Channels A & B							C – Shielded Cable (18" min)
ABI – Channels A, B, & I							R – Ribbon
							Output Circuit
							S – Standard Squarewave
							O – Open Collector (5V model only)
							C – Complementary
							A – Amplified Sinewave**
							LD – Line Driver
							Voltage
							5 – 5 VDC
							12 – 12 VDC
							15 – 15 VDC

**Amplified Sinewave is limited to 180 and 200 PPR

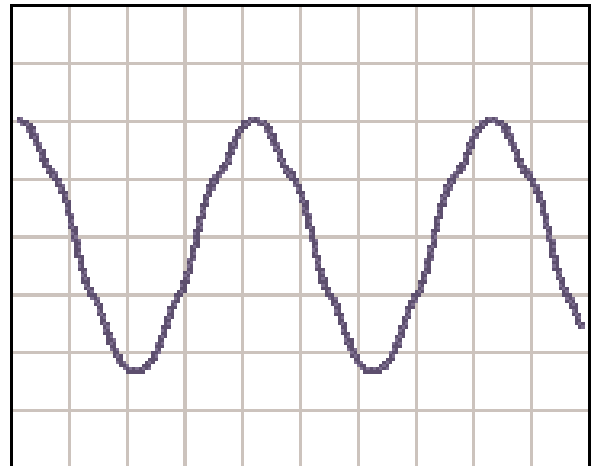
CONNECTOR INFORMATION AND WAVEFORMS

Encoder Wire Table			Resolver Wire Table			Motor Wire Table		
Function	Pin No.	Wire Color	Function	Pin No.	Wire Color	Function	Pin No.	Wire Color
Output A	1	White	SIN LO (S3)	1	Black	Phase A	1	Red
Output B	2	Blue	SIN HI (S1)	2	Red	Phase B	2	White
Index	3	Green	COS HI (S4)	7	Blue	Phase C	3	Black
V+	4	Red	REF HI (R1)	8	Red/White	Ground	4	Green/White
Common	7	Black	COS LO (S2)	11	Yellow			
Output A	8	Brown/White	REF LO (R2)	12	Yellow/White			
+15 V	9	Red/White						
-15 V	10	Black/White						
Output B	11	Blue/White						
Index	12	Orange						

Comparative BEMF Waveforms of PLATINUM XT™ Verses Conventional Iron Core Motor



PLATINUM XT™ BEMF Waveform



Conventional Ironcore Brushless Motor BEMF Waveform

The above comparison illustrates the Back EMF waveforms of the PLATINUM XT™ and a conventional iron core brushless motor. The pure sinusoidal BEMF and torque functions of the PLATINUM XT™, combined with its fundamental zero cogging, result in almost zero torque and velocity ripple for ultra smooth performance.



Compatible SERVOSTAR SR10 Amplifier

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

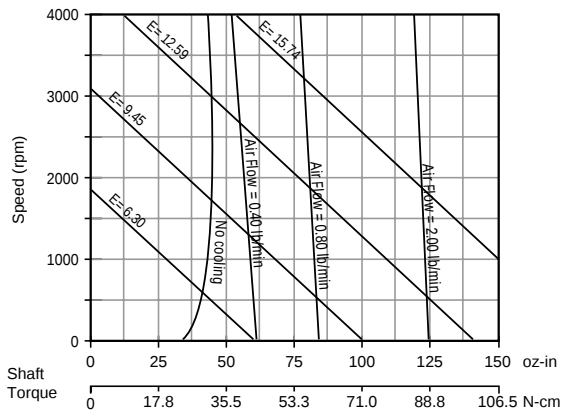
Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.27	1.27	1.27	1.27	1.27	0.65	0.70
Thermal Resistance at Stall	RAAS	°C/Watt	1.90	1.90	1.90	1.90	1.90	1.25	1.10
Forced Air Thermal Resistance: with 2.0 lbs/min Forced Air	RAA3	°C/Watt	0.23	0.23	0.23	0.23	0.23	0.18	0.18

- 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: $V = \text{KE} \times (\text{N}/1000) + \text{RT} \times I$.

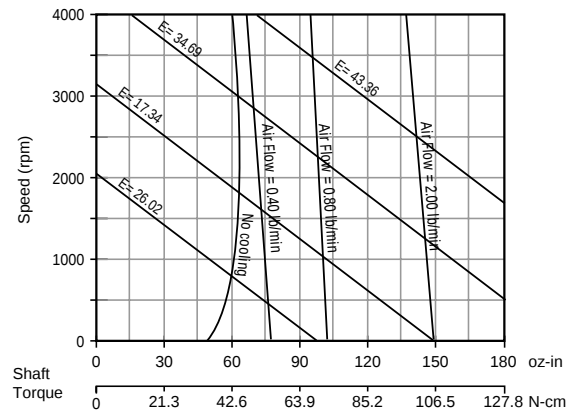
U-Series ServoDisc

PERFORMANCE DATA

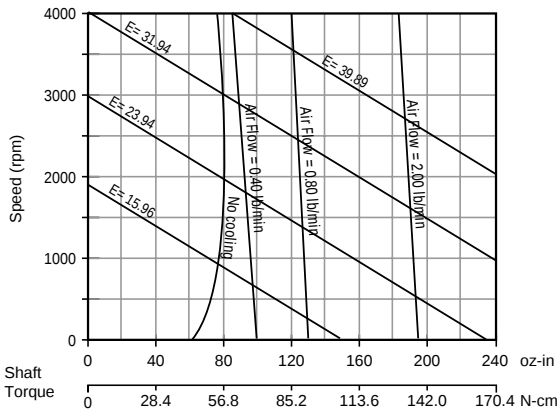
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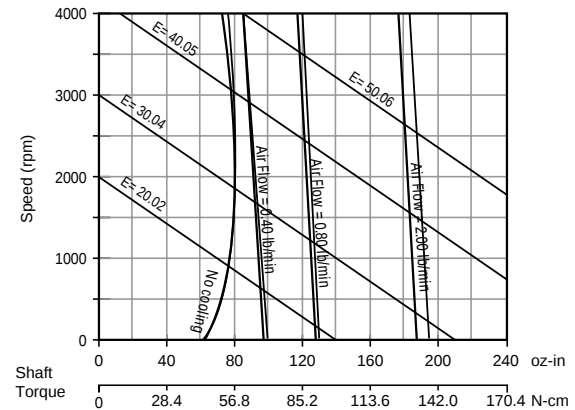
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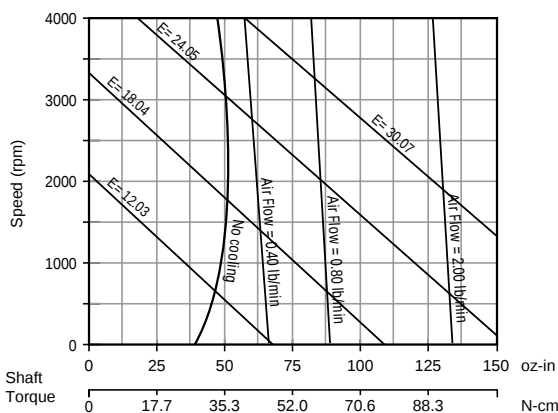
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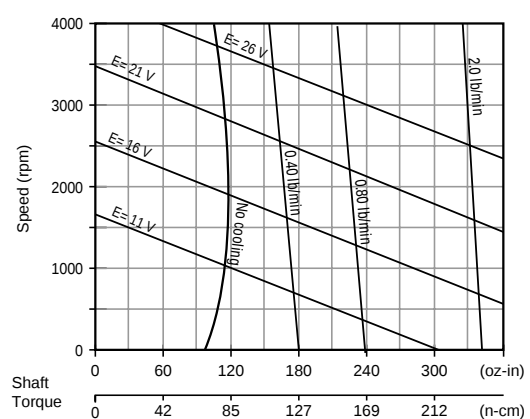
U9M4HA-2 STD



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:

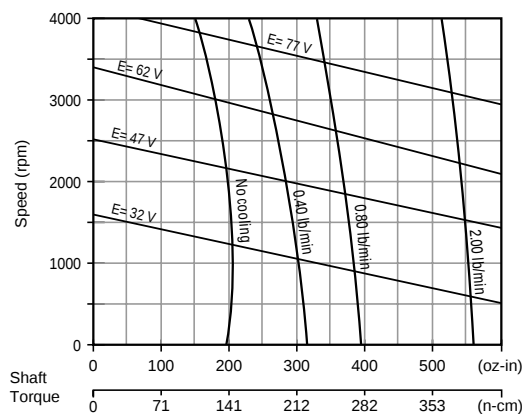
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT$$
- The operating voltage can be calculated as:

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

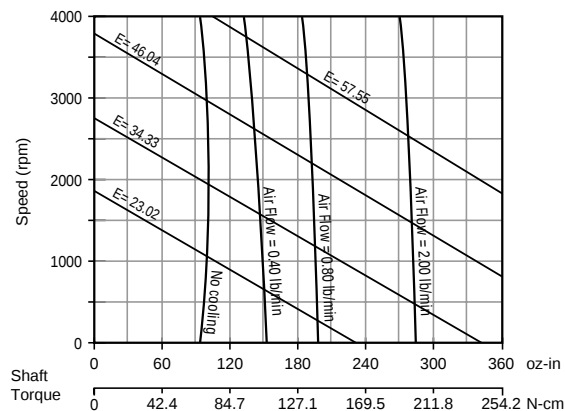
U-Series ServoDisc

PERFORMANCE DATA

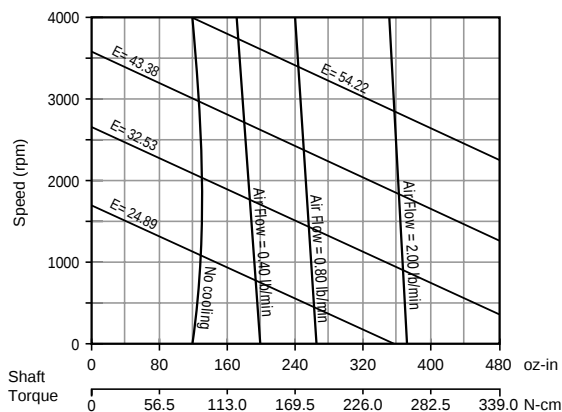
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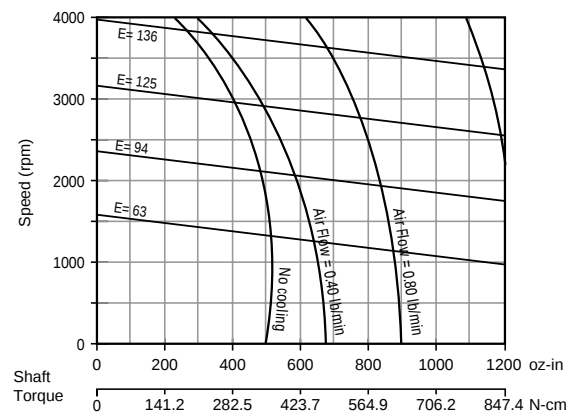
U12M4A



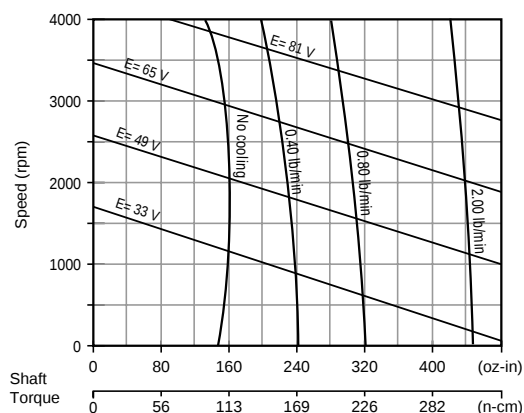
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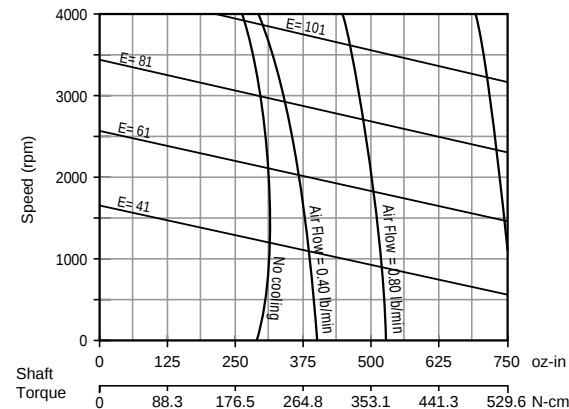
U16M4H



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:

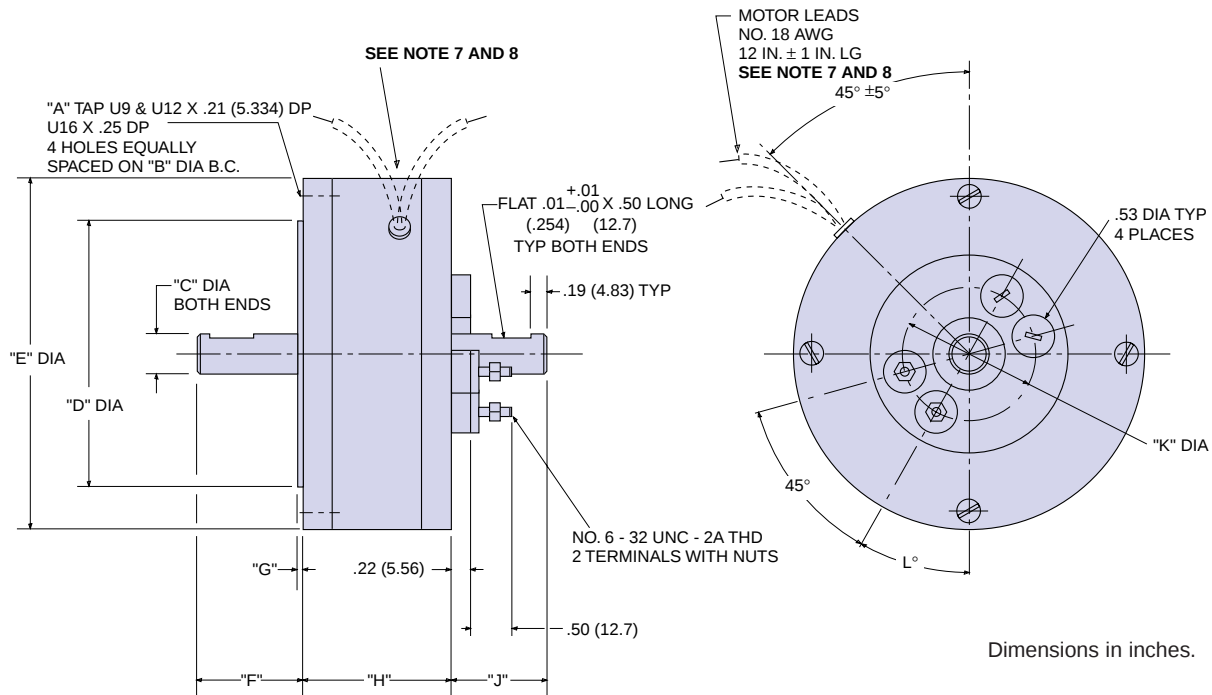
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT.$$
- The operating voltage can be calculated as:

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

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

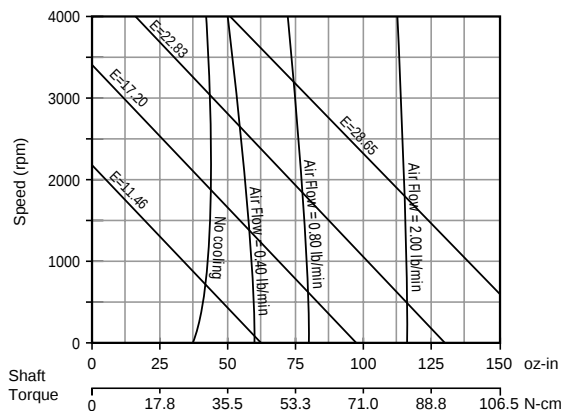
Notes:

- 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.

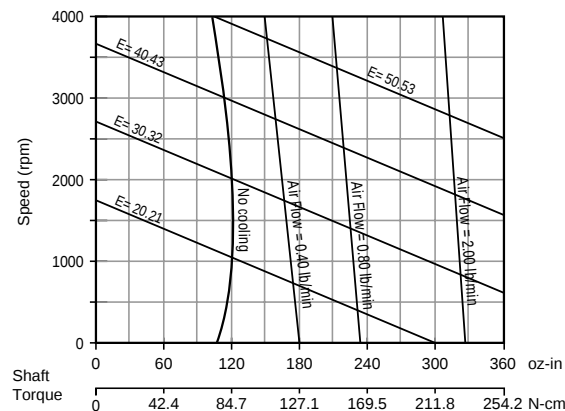
U-Series ServoDisc

PERFORMANCE DATA (with Integral Tachometer)

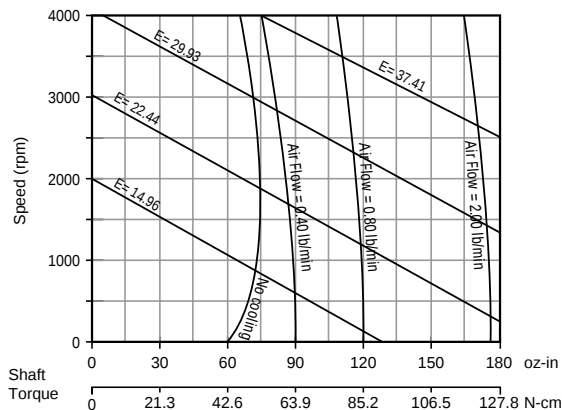
U9M4T



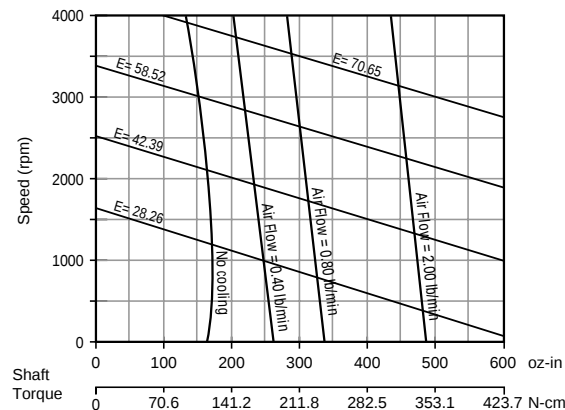
U12M4T



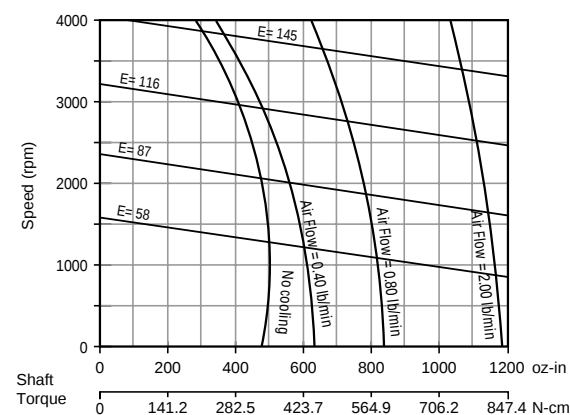
U9M4HT



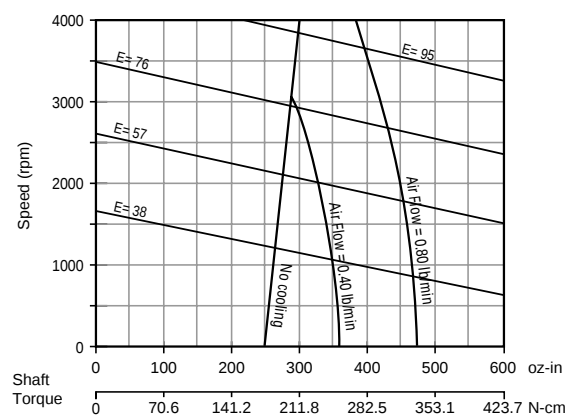
U12M4HT



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:

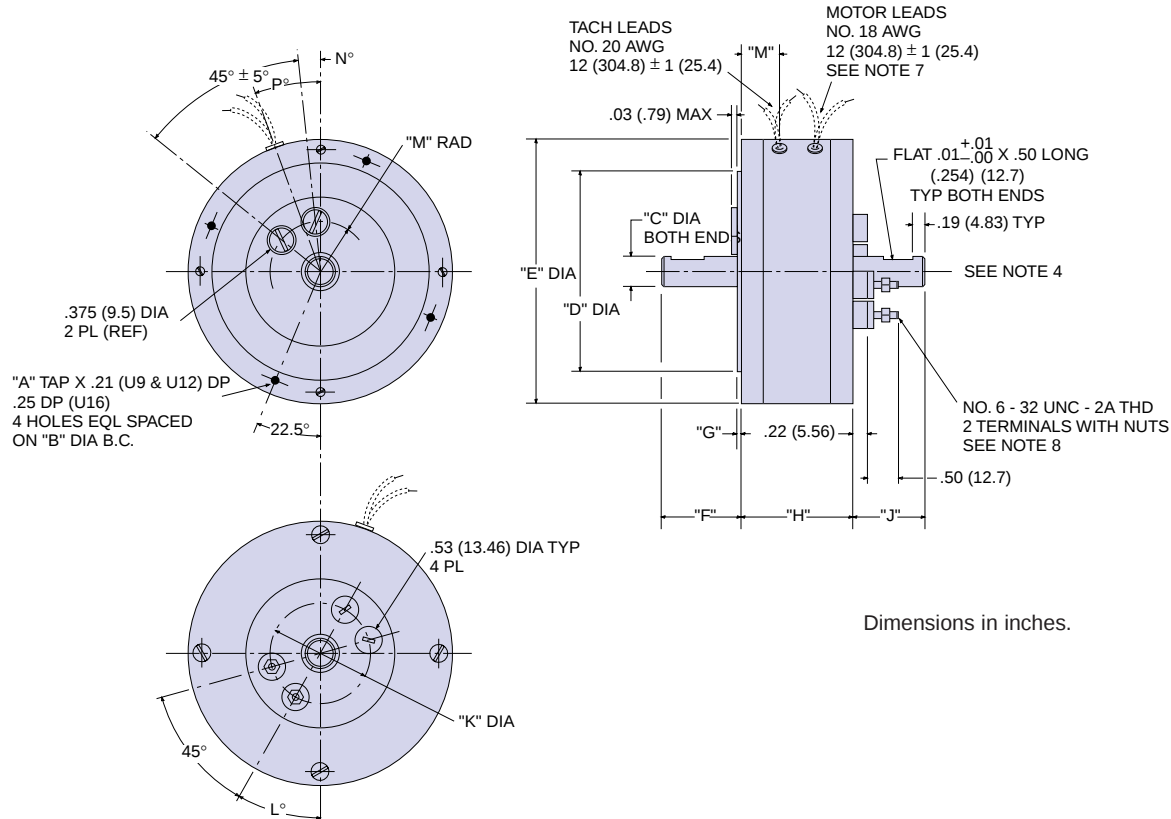
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT$$
- The operating voltage can be calculated as:

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

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

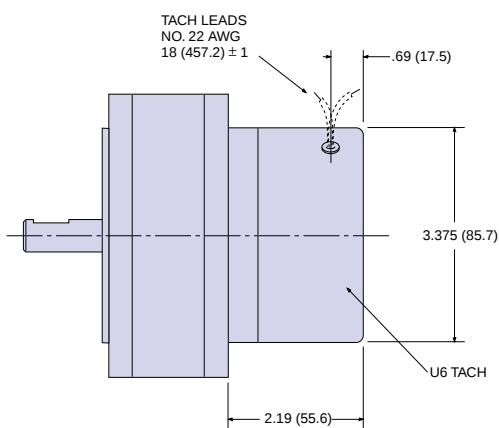
SYSTEM PERFORMANCE (with separate Integral Tachometer)

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

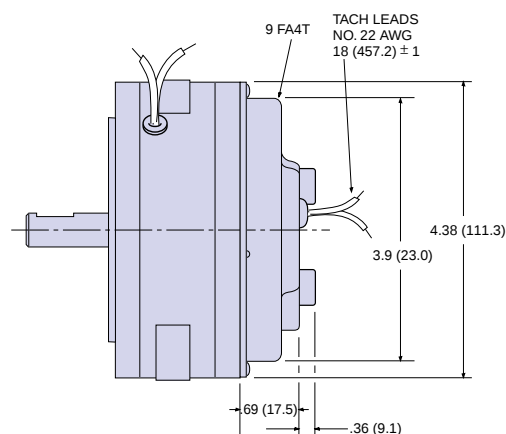
(Shown in typical mounting to U9M4 motor)



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

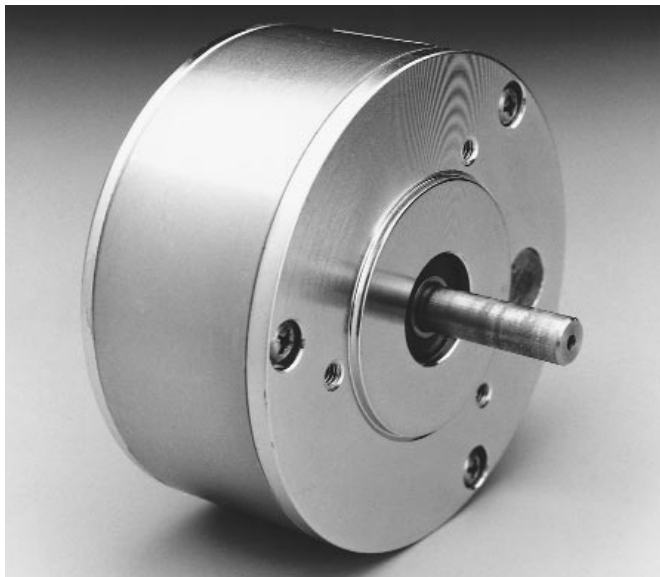
Motor Model Number	Equivalent PLATINUM Model Number	Standard Series Winding				Standard Parallel Winding			
		Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM	Torque (oz-in)	Ke (V/krpm)	V (Volts) @3KRPM	I (Amps) @3KRPM
U12M4	U12D-A	130	12.1	43.3	8.8	115	6.1	22.2	15.8
	U12D-B	140	13.2	46.0	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

S-Series ServoDisc

INTRODUCTION



- Options:
 - Tachometers
 - Optical encoders
 - Fail-Safe brakes
 - Rugged housing and mil-type connectors

Compatible Product

- KXA Plus Amplifier

- 21 to 85 oz-in (15-60 N-cm) Continuous Torque
- 3.39 to 4.37" OD Round Frame
- Motor Lengths Less Than 2"
- Optional Rugged Housing
- Optional Tachometer or Encoder Feedback and Fail-safe Brakes

S-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.

Rugged housings and mil-type connectors added to S-Series motors protect the motors and optional integral components such as encoders, tachometers and fail-safe brakes. They have been designed for harsh industrial environments where protection from damaging elements is essential.

- 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

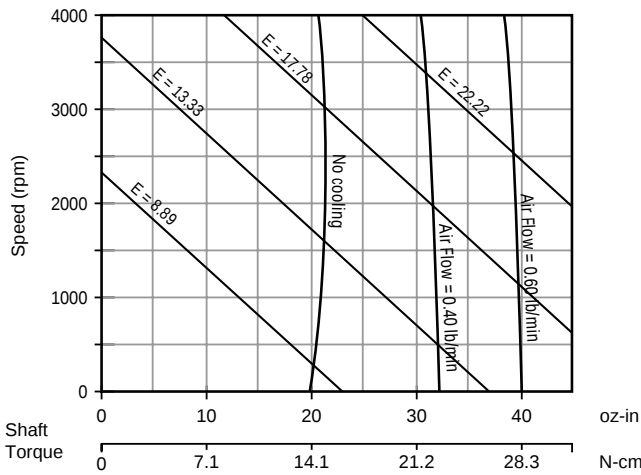
PERFORMANCE DATA

Performance Specifications	Symbol	Units	S6M4H (S6M4HI)	S9M4H (S9M4HI)
Peak Torque	T ^p	oz-in N-cm	214 151	921 650
Rated Speed	N	RPM	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	oz-in N-cm	21 15	85 60
Rated Continuous Torque @ 40°C	T ₄₀	oz-in N-cm	19 13	77 54
Rated Power Output	P	Watts	46	187
Maximum Recommended Speed	N _{max}	RPM	6000	6000
Continuous Stall Torque	T _s	oz-in N-cm	20 14	85 60
Cogging Torque	T _c	oz-in	0	0
Electrical Specifications				
Rated Terminal Voltage	E	Volts	17.7	34.0
Rated Continuous Current	I	Amps	5.20	7.79
Peak Current	I _p	Amps	51	79
Continuous Stall Current	I _s	Amps	4.8	7.5
Winding Specifications				
Terminal Resistance ± 10%	R _t	Ohms	1.207	0.850
Armature Resistance ± 10%	R _a	Ohms	0.940	0.660
Back EMF Constant ± 10%	K _e	V/KRPM	3.15	8.80
Torque Constant ± 10%	K _t	oz-in/Amp N-cm/Amp	4.26 3.01	11.91 8.41
Viscous Damping Constant	K _d	oz-in/KRPM N-cm/KRPM	0.2 0.1	1.3 0.9
Armature Inductance	L	μH	<100	<100
Temperature Coefficient of KE	C	%/°C Rise	-.020	-.020
Number of Commutator Bars	Z		82	117
Mechanical Specifications				
Moment of Inertia	J _m	oz-in-sec ² kg-cm ²	0.00085 0.060	0.00560 0.395
Static Friction Torque	T _f	oz-in N-cm	0.9 0.6	4.0 2.8
Weight	W	lbs kg	2.1, (2.73) 0.95, (1.24)	5.42, (6.7) 2.5, (3.84)
Diameter	D	in mm	3.39 86.1	4.37 111.0
Length	LG	in mm	1.61, (4.23) 40.9, (107.4)	2.28, (5.19) 57.9, (131.8)
Figures of Merit				
Peak Acceleration	A _p	kRad/s ²	251.9	164.5
Mechanical Time Constant	T _m	ms	6.16	3.66
Electrical Time Constant	T _e	ms	<0.11	<0.15
Continuous Power Rate	P _c	kW/sec	3.53	9.01
Thermal Specifications				
Thermal Resistance at Rated Speed	RAAR	°C/Watt	2.70	1.50
Thermal Resistance at Stall	RAAS	°C/Watt	3.32	2.00
Tachometer Specifications				
Output Voltage	V	Volts/KRPM	0.75	3.00
Maximum Ripple Peak to Peak	V _{rh}	%	1.5	1.5
Linearity of Output Voltage	LIN	%	0.06	0.06
Minimum Load Resistance	R _l	Ohms	1000	1180

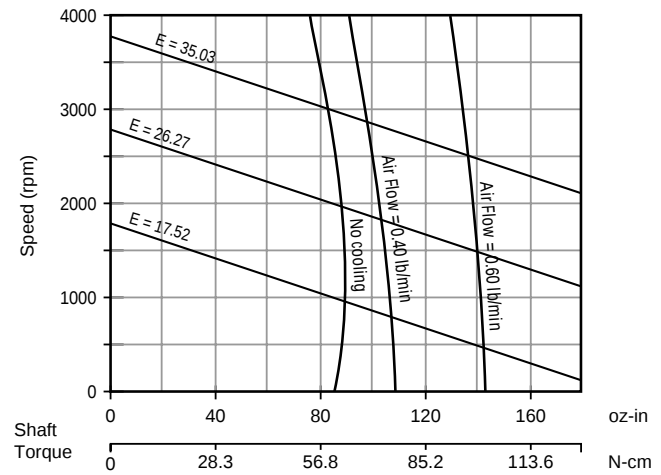
S-Series ServoDisc

PERFORMANCE DATA	
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S6M4H & S6M4HI



S9M4H & S9M4HI



Notes:

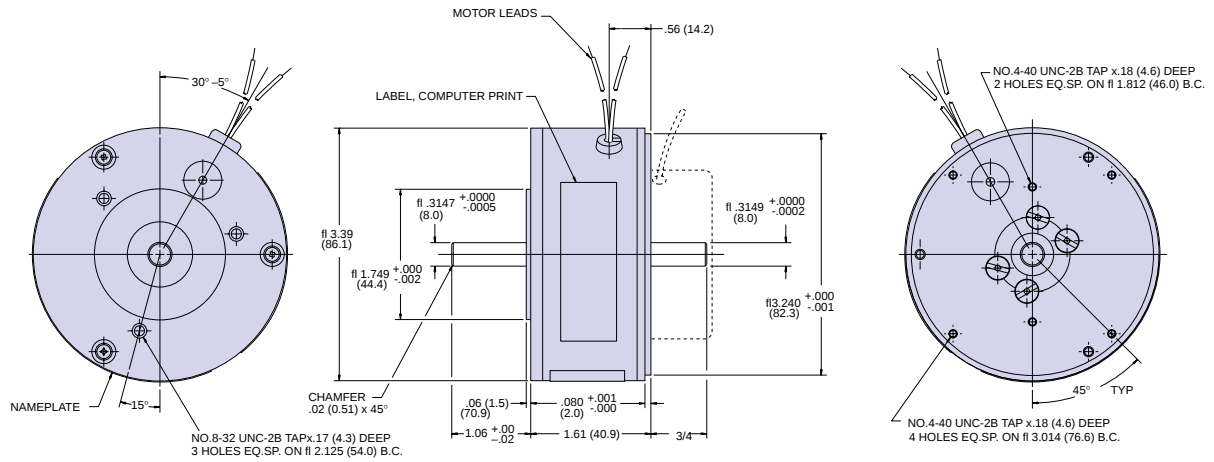
1. All curves are drawn for a fixed armature temperature of 150°C.
2. The motor can be operated at any point on the graph below 4000 RPM. Higher speeds are possible for some applications. Contact a Kollmorgen Sales Office for more details.
3. Determine voltage required for a desired combination of speed and torque by estimating it as a line parallel to one of the constant terminal voltage (E) lines.
4. The operating current can be calculated as:

$$I = (\text{Shaft torque} + \text{KD } 3 \text{ N/1000}) / \text{KT}.$$
5. The operating voltage can be calculated as:

$$V = \text{KE } 3 \text{ N/1000} + \text{RT } 3 \text{ I}.$$

DIMENSIONS

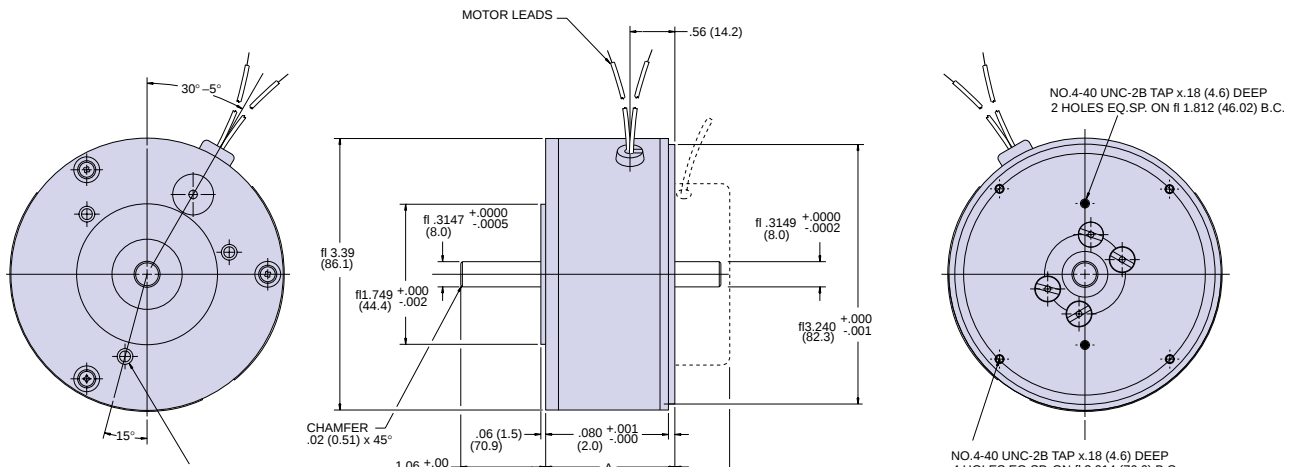
S6M4H



			Motor	Motor/ Tachometer	Motor/ Brake	Motor/Brake Tachometer
A	Without	inch	1.61	2.56	3.03	3.96
	Encoder	mm	40.9	65.1	77.0	101.0
B	With	inch	2.42	3.37	3.84	4.79
	Encoder	mm	61.5	85.6	97.5	122.0

Shaft Loading - S6M4H & S6M4HI - Radial 10 lbs @ 7/8 from $\phi 3.147$ - Axial 7.5 lbs any direction
4.5 kg 22.2 3.4 kg

S6M4HI



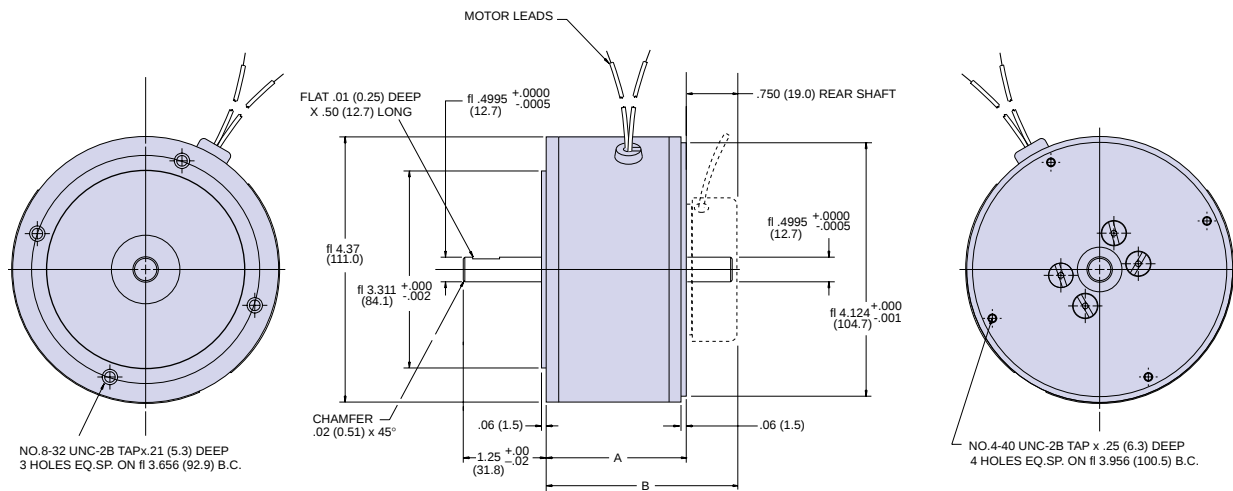
			Motor	Motor/ Tachometer	Motor/ Brake	Motor/Brake Tachometer
A	Without	inch	4.23	5.19	4.41	6.61
	Encoder	mm	107.4	131.8	112.0	167.9
A	With	inch	4.23	5.19	5.66	6.61
	Encoder	mm	107.4	131.8	143.7	167.9

Motor Connector - Amphenol/Bendix PT 02A-12-8P Encoder Connector - Amphenol/Bendix PT 02A-12-10P

S-Series ServoDisc

DIMENSIONS

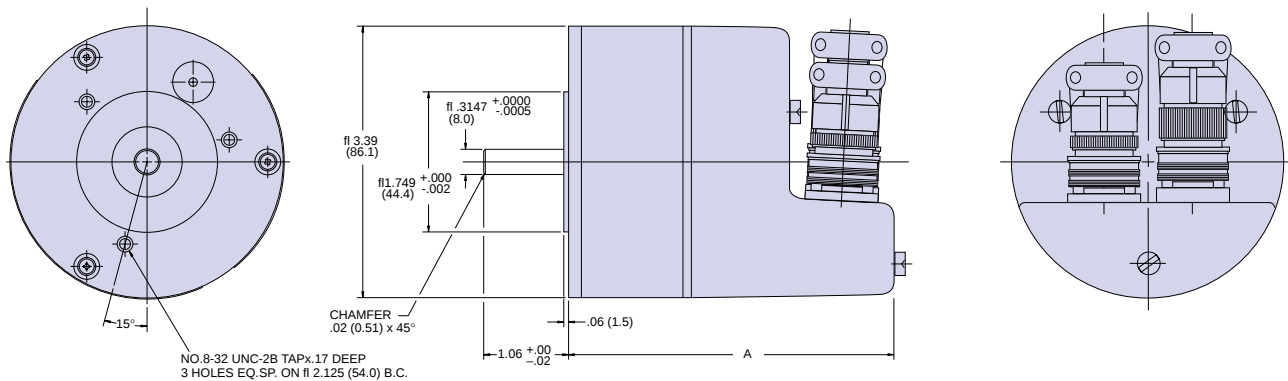
S9M4H



			Motor	Motor/ Tachometer	Motor/ Brake	Motor/Brake Tachometer
A	Without	inch	2.28	3.25	3.7	4.7
	Encoder	mm	57.9	82.6	94.0	119.0
B	With	inch	3.09	4.06	4.5	5.5
	Encoder	mm	78.5	103.0	114.0	140.0

Shaft Loading - S9M4H & S9M4HI - Radial 25 lbs @ 1 from -S- - Axial 25 lbs any direction
11.4 kg 25.4 11.4 kg

S9M4HI



			Motor	Motor/ Tachometer	Motor/ Brake	Motor/Brake Tachometer
A	Without	inch	5.19	6.17	5.44	6.42
	Encoder	mm	131.8	157.0	138.0	163.0
A	With	inch	5.19	6.17	6.6	7.6
	Encoder	mm	131.8	157.0	167.6	193.0

Motor Connector - MS3102A16S-1P Encoder Connector - MS3102A18-1P

INTRODUCTION



- Options:
 - Tachometers
 - Encoders
 - Fail-safe brakes

Compatible Products

- KXA Plus Amplifier
- EM19 Linear Amplifier

- **16 to 56 oz-in (11-40 N-cm) Continuous Torque**
- **4.0 to 5.1" OD Round Frame**
- **Ultrathin Pancake Motor**

Ferrite Series ServoDisc motors employ the unique Kollmorgen flat disc armature and ultraflat package to create a low cost ServoDisc motor.

- Extremely good speed control with zero cogging and low RFI
- Very 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
- Low inertia, DC servomotor
- Low axial profile
- High-pulse torque capability
- No cogging even at low operating speeds

Ferrite Series ServoDisc

PERFORMANCE DATA

Performance Specifications	Symbol	Units	9F/9FS	9FST	12FLR/12FLRB/ 12FLRS	12F/12FB/ 12FS	12FV/12FVB/ 12FVS
Peak Torque	T _p	oz-in N-cm	198 140	189 133	393 278	478 338	549 388
Rated Speed	N	RPM	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	oz-in	17	15	31	40	44
		N-cm	12	11	22	28	31
Rated Continuous Torque @ 40°C	T ₄₀	oz-in	15	13	29	36	39
		N-cm	10.6	9	20	26	27
Rated Power Output	P	Watts	37	33	68	88	96
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000
Continuous Stall Torque	T _s	oz-in	16	15	31	41	46
		N-cm	11	11	22	29	32
Cogging Torque	T _c	oz-in	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	14.6	14.4	11.7	21.6	16.5
Rated Continuous Current	I	Amps	6.8	6.60	12.10	7.5	10.3
Peak Current	I _p	Amps	70	70	136	81	116
Continuous Stall Current	I _s	Amps	6.3	6.2	11.9	7.4	10.3

Winding Specifications

Terminal Resistance ± 10%	R _t	Ohms	0.950	0.950	0.400	0.860	0.48
Armature Resistance ± 10%	R _a	Ohms	0.640	0.640	0.210	0.610	0.29
Back EMF Constant ± 10%	K _e	V/KRPM	2.39	2.30	2.45	5.00	4.00
Torque Constant ± 10%	K _t	oz-in/Amp	3.23	3.11	3.32	6.77	5.41
		N-cm/Amp	2.28	2.20	2.34	4.78	3.82
Viscous Damping Constant	K _d	oz-in/KRPM	0.3	0.3	0.6	0.7	1.0
		N-cm/KRPM	0.2	0.2	0.4	0.5	0.7
Armature Inductance	L	μH	<0.03	<0.10	<0.03	<0.05	<0.03
Temperature Coefficient of KE	C	%/°C Rise	-0.19	-0.19	-0.19	-0.19	-0.19
Number of Commutator Bars	Z		117	117	141	141	105

Mechanical Specifications

Moment of Inertia	J _m	oz-in-sec ²	0.0052	0.0080	0.0190	0.0190	0.0220
		kg-cm ²	0.37	0.56	1.34	1.34	1.62
Average Friction Torque	T _f	oz-in	2.5	2.5	3.5	3.0	3.5
		N-cm	1.8	1.8	2.5	2.1	2.5
Weight	W	lbs	1.2	1.2	2.2	2.2	2.2
		kg	0.5	0.5	1.0	1.0	1.0
Diameter	D	in	4.72	4.72	5.98	5.98	5.98
		mm	119.9	119.9	151.9	151.9	151.9
Length	LG	in	0.75	1.36	0.80	0.80	0.80
		mm	19.1	34.5	20.3	20.3	20.3

Figure of Merit

Peak Acceleration	A _p	kRad/s ²	38.1	23.6	21.0	25.1	25.0
Mechanical Time Constant	T _m	ms	44.00	72.80	50.70	35.40	30.4
Electrical Time Constant	T _e	ms	<0.05	<0.16	<0.12	<0.07	0.34
Continuous Power Rate	P _c	kW/sec	0.3	0.2	0.3	0.6	0.6

Thermal Specifications

Thermal Resistance at Rated Speed	RAAR	°C/Watt	2.00	2.00	1.70	1.70	1.70
Thermal Resistance at Stall	RAAS	°C/Watt	2.52	2.52	2.03	2.03	2.03

Tachometer Specifications

Output Voltage	V	Volts/KRPM	—	1.10	—	—	—
Maximum Ripple Peak to Peak	V _{rh}	%	—	5.0	—	—	—
Linearity of Output Voltage	LIN	%	—	0.14	—	—	—

Notes:

- 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.
- Mass air flow (lbs/min) = air volume (CFM) x air density (lbs/ft³).
- Terminal resistance is measured at 4.0 amps. RT varies as a function of applied current.
- Unless otherwise noted, all specifications above apply at 25°C.
- Peak torque and current is calculated based on max pulse duration of 50 milliseconds and a 1% duty cycle.
- The operating current can be calculated as: $I = (\text{Shaft torque} + T_f + K_d \times N/1000) / K_t$.
- The operating voltage can be calculated as: $V = K_e \times (N/1000) + R_t \times I$.
- Tachometer ripple measured with a resistive load of 1 kohm and a single low pass filter with 3db cut off at 500 Hz.
- Tachometer minimum measured with a resistance of 370 ohms.
- Bidirectional tolerance of tachometer will not exceed 3%.

Ferrite Series ServoDisc

PERFORMANCE DATA

Performance Specifications	Symbol	Units	9FHB-44
Peak Torque	T_p	oz-in N-cm	267 188
Rated Speed	N	RPM	3000
Rated Continuous Torque @ 25°C	T_{25}	oz-in N-cm	21 15
Rated Continuous Torque @ 40°C	T_{40}	oz-in N-cm	19 13
Rated Power Output	P	Watts	47
Maximum Recommended Speed	N _{max}	RPM	
Continuous Stall Torque	T_s	oz-in N-cm	21 15
Cogging Torque	T_c	oz-in	0
Electrical Specifications			
Rated Terminal Voltage	E	Volts	15.2
Rated Continuous Current	I	Amps	7.26
Peak Current	I_p	Amps	78
Continuous Stall Current	I_s	Amps	6.9
Winding Specifications			
Terminal Resistance ± 10%	R_t	Ohms	0.78
Armature Resistance ± 10%	R_a	Ohms	0.51
Back EMF Constant ± 10%	K_e	V/KRPM	2.9
Torque Constant ± 10%	K_t	oz-in/Amp N-cm/Amp	3.92 2.77
Viscous Damping Constant	K_d	oz-in/KRPM N-cm/KRPM	0.5 0.35
Armature Inductance	L	μH	<0.03
Temperature Coefficient of KE	C	%/°C Rise	-0.19
Number of Commutator Bars	Z		117
Mechanical Specifications			
Moment of Inertia	J_m	oz-in-sec ² kg-cm ²	0.0064 452
Average Friction Torque	T_f	oz-in N-cm	3.0 2.1
Weight	W	lbs kg	1.3 0.59
Diameter	OD	in mm	4.96 126
Length	LG	in mm	0.76 19
Figure of Merit			
Peak Acceleration	A_p	kRad/s ²	41.8
Mechanical Time Constant	T_m	ms	29.4
Electrical Time Constant	T_e	ms	<0.06
Continuous Power Rate	P_c	kW/sec	0.50
Thermal Specifications			
Thermal Resistance at Rated Speed	RAAR	°C/Watt	2.0
Thermal Resistance at Stall	RAAS	°C/Watt	2.52
Tachometer Specifications			
Output Voltage	V	Volts/KRPM	
Maximum Ripple Peak to Peak	V_{rh}	%	
Linearity of Output Voltage	LIN	%	

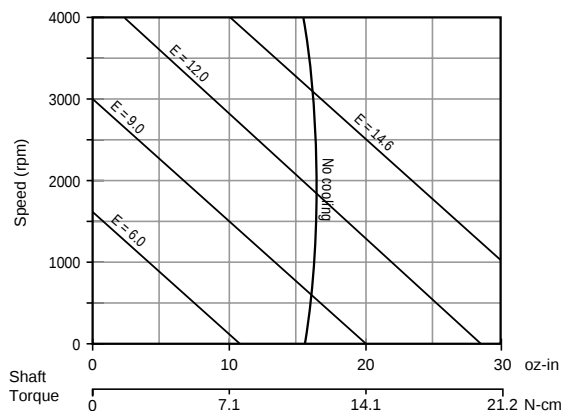
Notes:

- These are based upon the least of the demagnetization limit, the structural limit and the thermal limit. It is calculated for max. pulse duration of 50 millisecc and 1% duty cycle. (For thermal limit).
- All values are based upon 150°C armature temperature and with the motor mounted on an aluminum plate (8" x 16" x 3/8") with no forced cooling. Other voltages, speeds and torques are achievable as long as armature temp. is kept below 150°C. Continuous operation above 4000 RPM is possible for some applications. Contact a Kollmorgen Sales Office for more details.
- Measured at 4.0 Amps. It varies slightly with current due to variations in brush contact drop.
- Maximum Permissible Dissipation = (150 - Amb. Temp. °C)/RAA.
Total Motor Losses = $RT \times I^2 + 0.74 (TF + TD) \times N/1000$ where $TD = KD \times N/1000$.
- Peak Acceleration with Load = $(TP - \text{Reflected Load Frict.}) / (JM + \text{Reflected Load Inertia})$.
- 3000 RPM is for reference purposes only. Motor can be run at higher speeds.

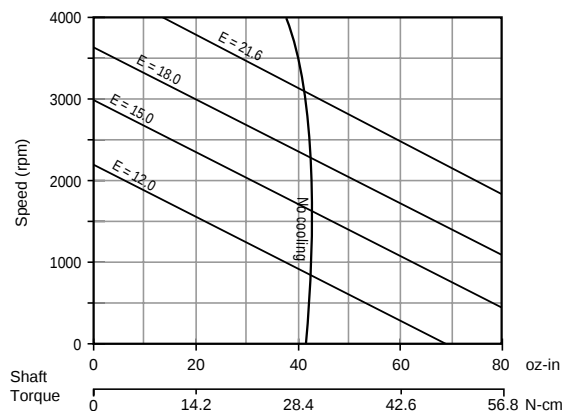
Ferrite Series

PERFORMANCE DATA

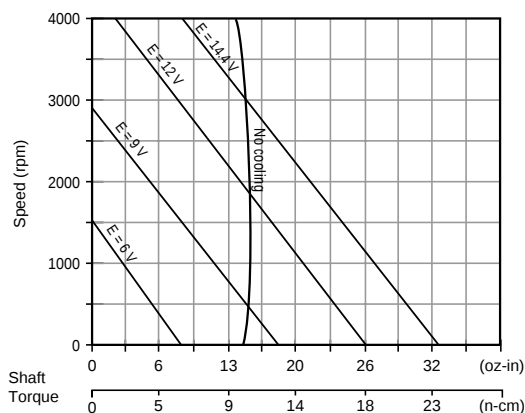
9F/9FS



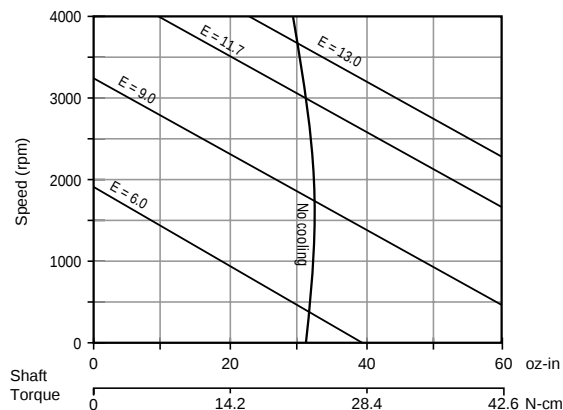
12F/12FB/12FS



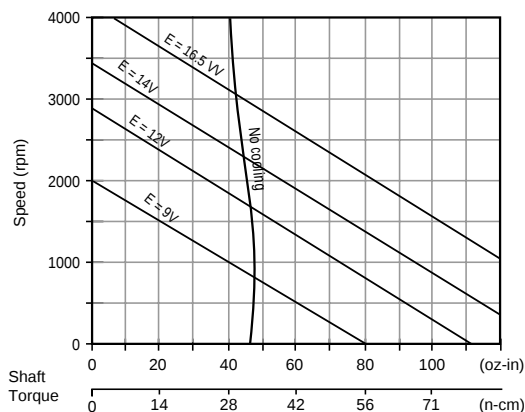
9FST/9FGT/9FGHDT



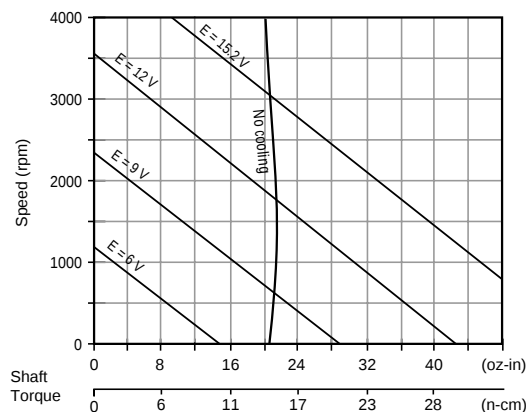
12FLR/12FLRB/12FLRS



12FV/12FVB/12FVS



9FHB-44



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 are possible for some applications. Contact a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by estimating it as a line parallel to one of the constant terminal voltage (E) lines.

- The operating current can be calculated as:

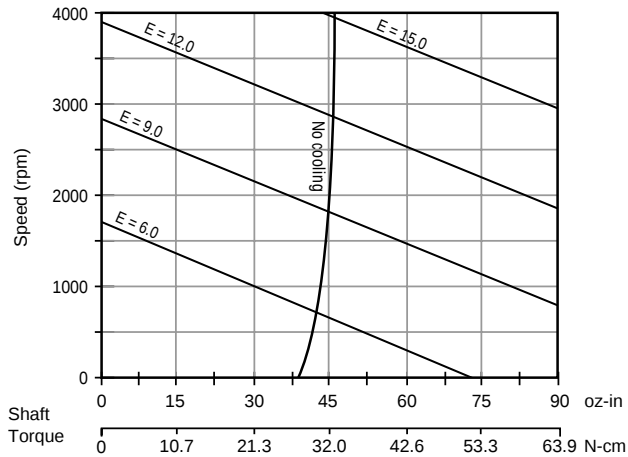
$$I = (\text{Shaft torque} + TF + KD \times N/1000)/KT.$$
- The operating voltage can be calculated as:

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

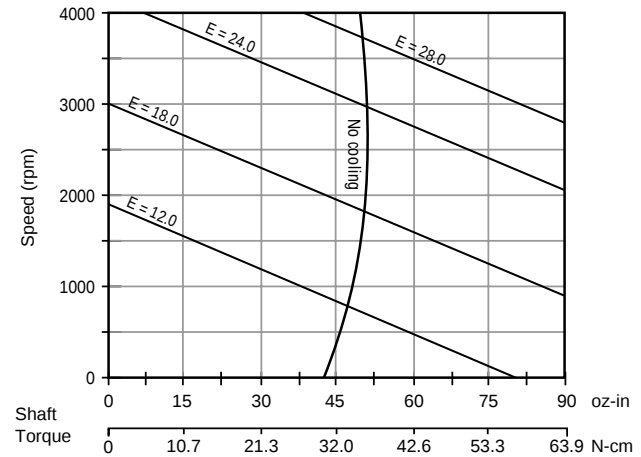
Ferrite Series ServoDisc

PERFORMANCE DATA

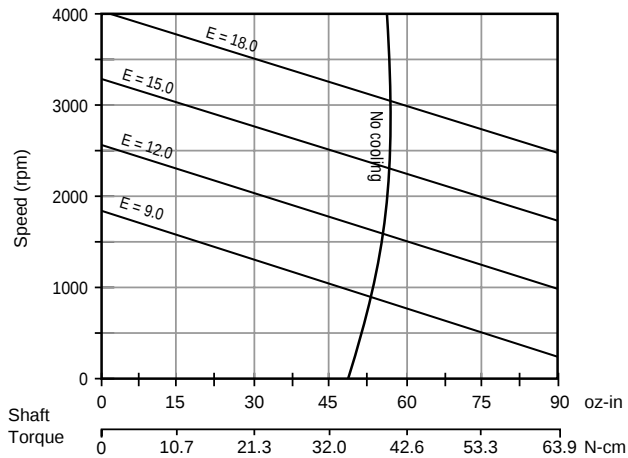
12FLRHS-2



12FHS-2



12FVHS-2



Notes:

- A. All curves are drawn for a fixed armature temperature of 150°C.
- B. The motor can be operated at any point on the graph below 4000 RPM. Higher speeds are possible for some applications. Contact a Kollmorgen Sales Office for more details.
- C. Determine voltage required for a desired combination of speed and torque by estimating it as a line parallel to one of the constant terminal voltage (E) lines.
- D. The operating current can be calculated as:

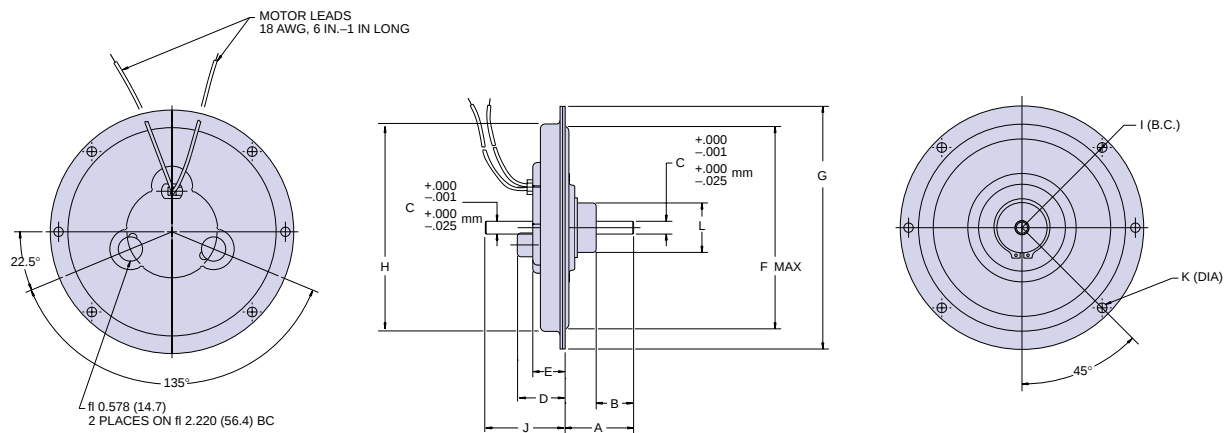
$$I = (\text{Shaft torque} + TF + KD \times N/1000)/KT.$$
- E. The operating voltage can be calculated as:

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

Ferrite Series ServoDisc

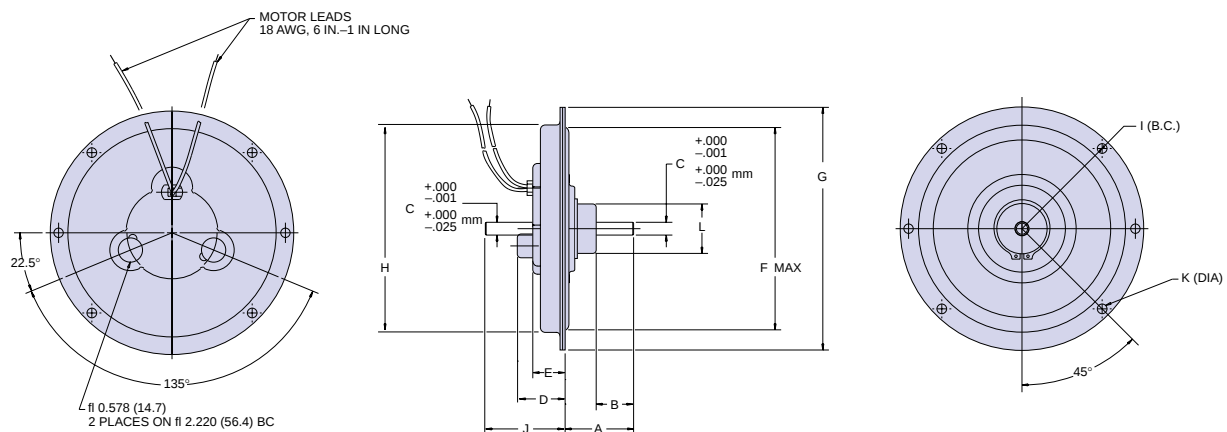
DIMENSIONS

Motor Types: 9F, 12F, 12 FLR, 12FV AND 12FB, 12FLRB, 12FVB



Motor Types	Units	A	B	C	D	E	F	G	H	I	J (optional)	K	L
9F	in	1.19	0.593	.3125	1.03	0.75	4.0	4.72	3.91	4.33	1.98	0.22	0.81
	mm	30.16	15.06	7.94	26.16	19.05	101.6	120.0	99.2	110.0	50.3	5.6	20.64
12F, 12FLR, 12FV, 12FLRB, 12FVB	in	1.69	0.92	0.315	1.17	0.80	5.08	5.98	5.11	5.59	2.12	0.22	1.22
	mm	42.9	23.4	8.00	29.8	20.2	129.0	151.9	129.8	142.0	53.8	5.6	31.0

Motor Types: 9FS, 12FS, 12FLRS, 12FVS

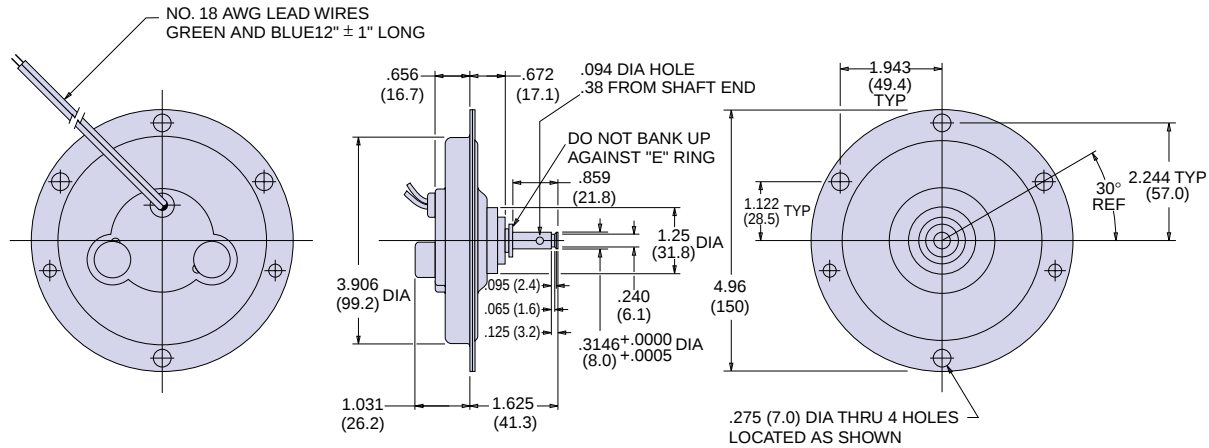


Motor Types	Units	A	B	C	D	E	F	G	H	I	J (optional)	K	L
9FS	in	1.0	0.75	0.250	1.03	0.75	4.0	4.72	3.91	4.33	1.98	0.22	.31
	mm	25.4	19.05	6.35	26.16	19.05	101.6	119.9	99.2	110.0	50.3	5.6	7.9
12FS, 12FLRS, 12FVS	in	1.0	0.75	0.315	1.39	0.80	5.08	5.98	5.11	5.59	2.12	0.22	
	mm	25.4	19.05	8.0	35.31	20.24	129.03	151.89	129.8	142.0	53.8	5.6	

Ferrite Series ServoDisc

DIMENSIONS

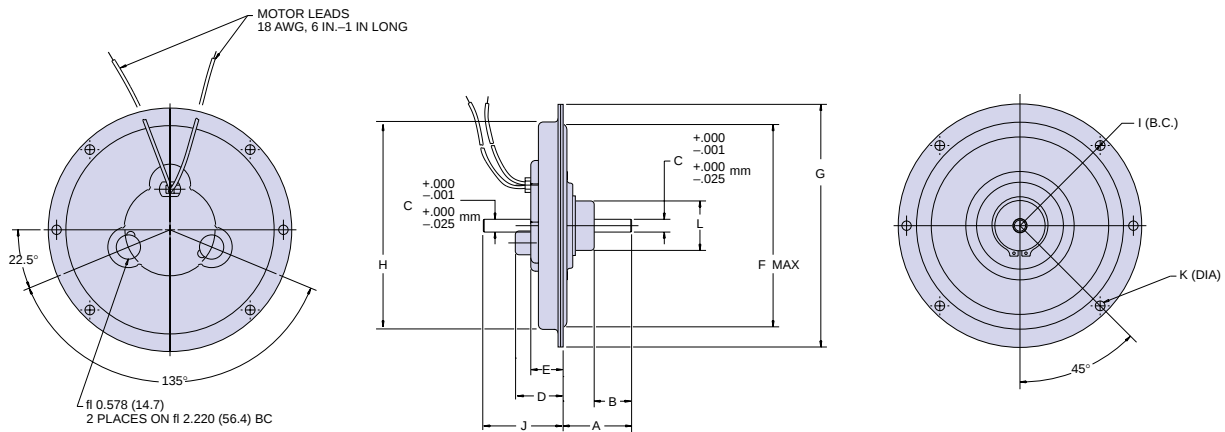
9FHB-44



Notes:

1. Shaft diameter "A" runout not to exceed .001 in. per in. of shaft length.
2. For CCW rotation as viewed from shaft end of motor green lead (+) positive, blue lead (-) negative.
3. Shaft loading information for either pure radial or pure thrust loads:
 - A. Maximum recommended radial shaft load 3 lbs. located 1/4" from shaft end.
 - B. Maximum recommended thrust load on shaft 3 lbs.

12F Series



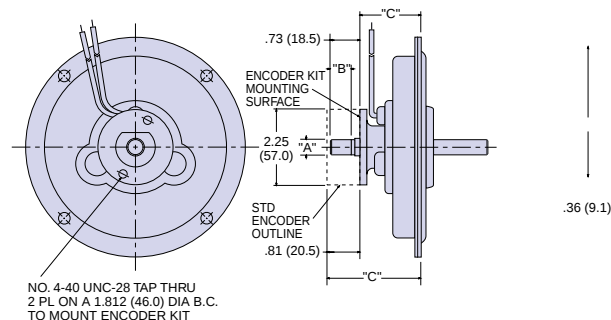
Notes:

1. Shaft runout .001 in. of shaft length A and B.
2. For CW rotation as viewed from MTG end of motor red lead (+) positive, black lead (-) negative.
3. Shaft loading for either pure radial or pure thrust
 - A. Diameter -A-, max recommended radial shaft load is 7 lbs. located 1 1/8 in. from surface "S".
 - B. Max recommended thrust load on shaft is 10 lbs.

Ferrite Series ServoDisc

DIMENSIONS

Motor with Encoder and Motor Prepared for Encoder



Motor Types	Units	A	B	C	D
9FS	in	0.2497 + 0.0000/-0.0005	0.67	1.26	2.07
	mm	6.342 + 0.000/-0.013	17.0	32.0	52.6
12FS, 12FLRS, 12FVS	in	0.3147 + 0.0000/-0.0005	0.65	1.38	2.20
	mm	7.994 + 0.000/-0.013	16.5	35.0	56.0

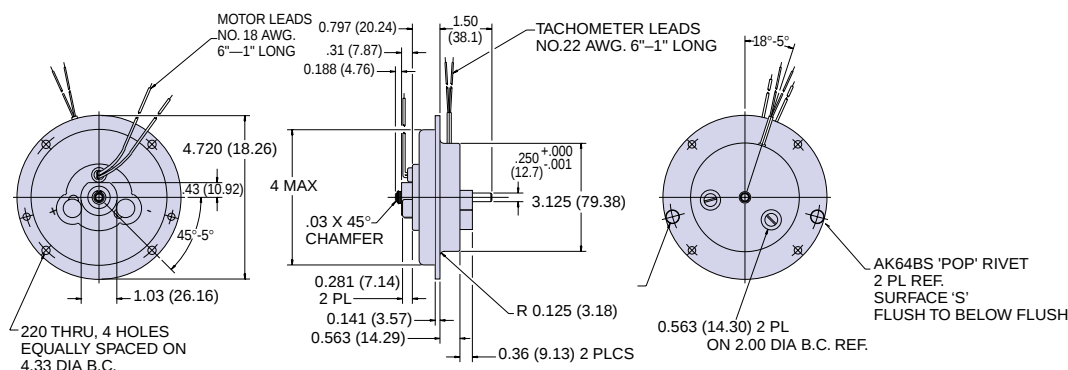
Note: Other Windings/Voltages available.

Motor Types	Radial Load		Axial Load		End Play Under Axial Load		Run Out in per in of Shaft Length
	lbs	kg	lbs	kg	in	mm	
9F	2.5	1.13	2.5	1.13	0.003	0.076	0.002
9FS	3	1.36	3	1.36	0.001	0.025	0.001
12F, 12FLR, 12FV	2.5	1.13	2.5	1.13	0.003	0.076	0.002
12FB, 12FLRB, 12FVB	7	3.18	10	4.54	0.001	0.025	0.001
12FS, 12FLRS, 12FVS	7	3.18	10	4.54	0.001	0.025	0.001

MOTOR SELECTION FOR FERRITE SERIES

Motor Types	Motor Alone	Motor with Rear Shaft	Motor Prep. for Encoder	Motor with Integral Optical Encoder Type M23 (500 lines Max)
9F, 12F, 12FLR, 12FV	Lowest cost	YES (option)	NO	NO
12FB, 12FLRB, 12FVB	Front spindle Ball bearings	YES (option)	NO	NO
9FS, 12FS, 12FLRS, 12FVS	Rear spindle Ball bearings	YES (option)	YES (option)	YES (option)

FERRITE MOTOR WITH INTEGRAL TACHOMETER



INTRODUCTION



- 17 to 103 oz-in (12-73 N-cm) Continuous Torque
- 4.72 to 8.47" OD Round Frame
- Direct Drive, No Coupling
- Space-Saving Design

Putting Together Your Own High-Performance DC Motor

Designers who want to save both time and cost can obtain all these advantages by assembling the kit motor. The inherent simplicity of design leads to a highly simple mechanical structure that the user can put together himself or build into his own drive system.

The motor consists of two components: the flat ServoDisc armature and the end bell with magnet and brushes. The armature is available in several types depending on the application. For example, armatures for low voltages or low inertia can be used when required.

The magnet in the stamped end bell is a ring of ceramic ferrite material which has been precharged to produce eight alternately polarized magnetic poles. Unlike Alnico permanent magnetic material, the ferrite is a type of permanent magnet that retains its magnetism even without a keeper or flux-return path.

Because of the use of the integral drive shaft rather than a separate motor shaft and bearings, there is no mechanical coupling and a minimum of torsional resonance. There is less bearing friction with increased efficiency and no problems due to shaft misalignment. In effect, the motor is assembled onto the drive system.

The designer of precision equipment has a low cost yet a technically smart solution to drive it. Coupling costs and alignment problems are eliminated. The total package is compact.

The applications of these motors are wide in range. One of the key advantages is the compact design, where in many cases, it is important where space is limited.

An encoder-mount is available for these motors to accept a kit encoder in order to close a digital control loop. Some typical applications are listed below:

- Use your own high-performance precision spindle
- A cost-effective solution to drive high-precision machines
- Zero cogging design, smooth rotation at low speeds
- Constant torque over a wide speed range

Compatible Products

- KXA Plus Amplifier
- EM19 Linear Amplifier

Ferrite Kit Series ServoDisc

MOTOR PERFORMANCE DATA

Performance Specifications	Symbol	Units	9FP	12FP	12FVP	12FLRP	16FP
Peak Torque	T_p	oz-in	198	478	549	393	1109
		N-cm	140	337	388	277	783
Rated Speed	N	RPM	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T_{25}	oz-in	17	40	44	31	103
		N-cm	12	28	31	22	73
Rated Continuous Torque @ 40°C	T_{40}	oz-in	15	36	39	29	92
		N-cm	10.6	26	27	20	65
Rated Power Output	P	Watts	37	90	106	68	228
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000
Continuous Stall Torque	T_s	oz-in	16	41	46	31	96
		N-cm	11	29	32	22	68
Cogging Torque	T_c	oz-in	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	14.6	21.6	16.5	11.7	38.6
Rated Continuous Current	I	Amps	6.82	7.5	10.3	12.05	9.70
Peak Current	I_p	Amps	70	81	116	136	94
Continuous Stall Current	I_s	Amps	6.3	7.4	10.3	11.9	8.9

Winding Specifications

Terminal Resistance ± 10%	R_t	Ohms	0.950	0.860	0.48	0.400	0.990
Armature Resistance ± 10%	R_a	Ohms	0.640	0.610	0.29	0.210	0.740
Back EMF Constant ± 10%	K_e	V/kRPM	2.39	5.00	4.00	2.45	10.00
Torque Constant ± 10%	K_t	oz-in/Amp	3.23	6.77	5.41	3.32	13.53
		N-cm/Amp	2.28	4.78	3.82	2.34	9.55
Viscous Damping Constant	K_d	oz-in/KRPM	0.3	0.7	1.0	0.6	1.3
		N-cm/KRPM	0.2	0.5	0.7	0.4	0.9
Armature Inductance	L	μH	<0.03	<0.05	<0.03	<0.03	<0.85
Temperature Coefficient of K_e	C	%/°C Rise	-0.19	-0.19	-0.19	-0.19	-0.19
Number of Commutator Bars	Z		117	141	105	141	165

Mechanical Specifications

Moment of Inertia	J_m	oz-in-sec ²	0.0052	0.0190	0.0220	0.0190	0.0890
		kg-cm ²	0.37	1.34	1.62	1.34	6.28
Average Friction Torque	T_f	oz-in	2.0	3.0	3.5	3.5	10.0
		N-cm	1.4	2.1	2.5	2.5	7.1
Weight	W	lbs	0.9	1.4	1.4	1.4	5.0
		kg	0.4	0.6	0.6	0.6	2.27
Diameter	D	in	4.72	5.98	5.98	5.98	8.47
		mm	119.9	151.9	151.9	151.9	215.1
Length	LG	in	1.00	1.20	1.20	1.20	1.30
		mm	25.4	30.5	30.5	30.5	33.0

Figure of Merit

Peak Acceleration	A_p	kRad/s ²	38.1	25.1	24.9	20.7	12.5
Mechanical Time Constant	T_m	ms	44.00	35.40	30.4	50.70	50.60
Electrical Time Constant	T_e	ms	<0.05	<0.07	.34	<0.12	<0.11
Continuous Power Rate	P_c	kW/sec	0.4	0.6	0.6	0.3	0.8

Thermal Specifications

Thermal Resistance at Rated Speed	RAAR	°C/Watt	2.00	1.70	1.70	1.70	0.85
Thermal Resistance at Stall	RAAS	°C/Watt	2.52	2.03	2.03	2.03	1.25

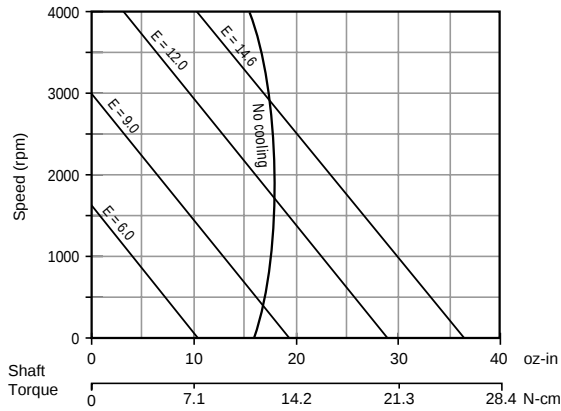
Notes:

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 voltage 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: $V = K_e \times (N/1000) + R_t \times I$.

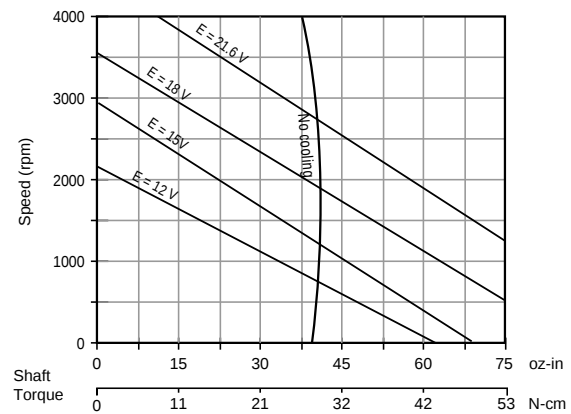
Ferrite Kit Series ServoDisc

MOTOR PERFORMANCE DATA

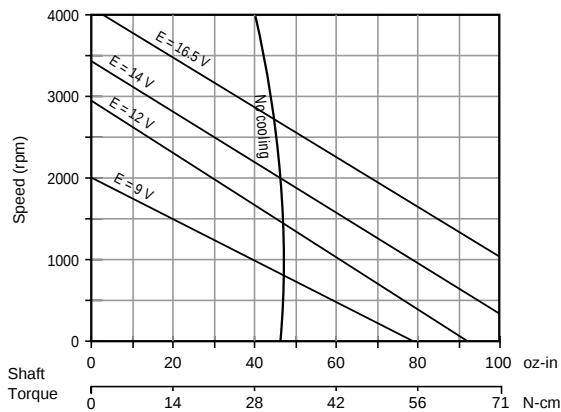
9FP



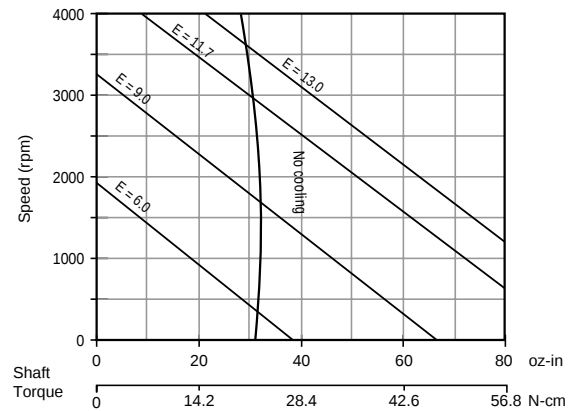
12FP



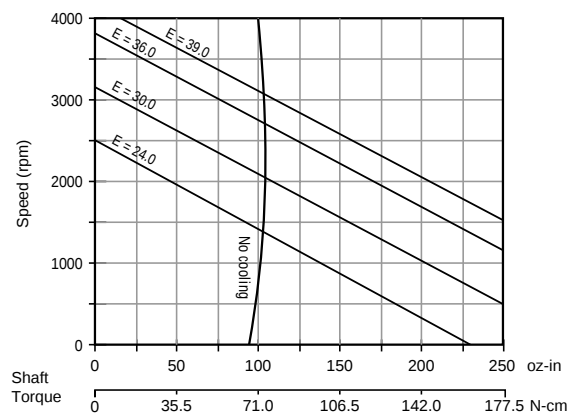
12FVP



12FLRP



16FP



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 are possible for some applications. Contact a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by estimating it as a line parallel to one of the constant terminal voltage (E) lines.

- The operating current can be calculated as:

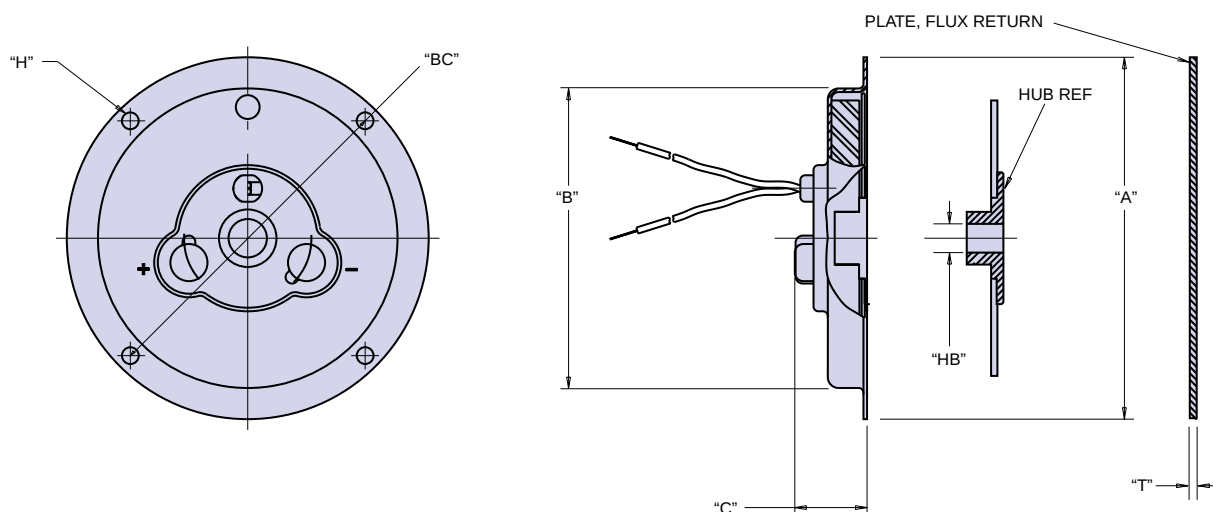
$$I = (\text{Shaft torque} + TF + KD \times N/1000)/KT.$$
- The operating voltage can be calculated as:

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

Ferrite Kit Series ServoDisc

MOTOR PERFORMANCE DATA

KIT MOTOR DIMENSIONS



Models	9FP	12F Series	16FP
A	4.72	5.98	8.46
B	3.90	5.11	6.74
C	1.0	1.25	1.26
BC	4.33	5.59	7.875
H	.219	.219	.287 (8 holes)
HB	.375	.375	.500
T	.090	.125	.125

Dimensions in inches

OPTION: Mounting Surface on End Bell for Optical Encoder

INTRODUCTION



- 69 to 143 oz-in (36-101 N-cm) Continuous Torque
- 4.37 to 5.5" OD Round Frame
- Optional Tachometer and Endcoder Feedback
- Ultrathin Compact Size for Easy Design Integration

N-Series ServoDisc motors employ the unique Kollmorgen flat disc armature and high-energy neodymium-iron-boron magnets resulting in an ultra-thin motor. The ironless, low inertia armature delivers high acceleration and zero cogging.

- Neodymium magnet technology
- Fast Acceleration for higher throughput
- Extremely good speed control, 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
- Options:
 - With or without integral tachometer
 - Optical encoder
 - Brake

Compatible Products

- KXA Plus Amplifier
- EM19 Linear Amplifier

N-Series ServoDisc

PERFORMANCE DATA

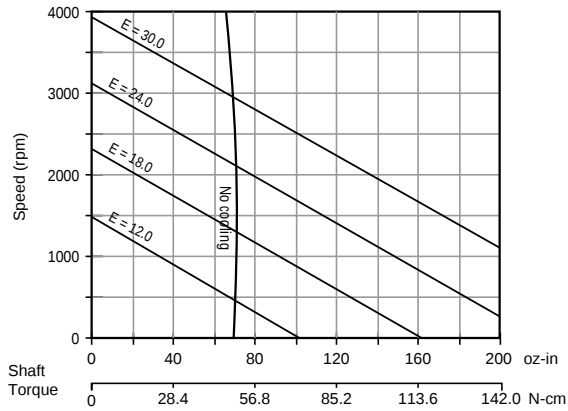
Performance Specifications	Symbol	Units	N9M4	N9M4T	N9M4LR	N9M4LRT	N12M4	N12M4T	N12M4LR	N12M4LRT
Peak Torque	T _p	oz-in N-cm	760 537	692 489	729 515	663 468	1598 1128	1386 979	1522 1075	1320 932
Rated Speed	N	RPM	3000	3000	3000	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	oz-in N-cm	69 49	57 40	63 44	51 36	143 101	126 89	131 93	115 81
Rated Continuous Torque @ 40°C	T ₄₀	oz-in N-cm	63 44	52 37	57 40	46 32	131 93	112 79	117 83	103 73
Rated Power Output	P	Watts	153	126	140	114	316	278	291	256
Maximum Recommended Speed	N _{max}	RPM	6000	6000	6000	6000	6000	6000	6000	6000
Continuous Stall Torque	T _s	oz-in N-cm	69 49	62 44	62 44	56 40	147 104	128 90	136 96	117 83
Cogging Torque	T _c	oz-in	0	0	0	0	0	0	0	0
Electrical Specifications										
Rated Terminal Voltage	E	Volts	30.0	28.0	16.0	14.0	51.0	45.0	26.0	23.0
Rated Continuous Current	I	Amps	7.80	7.10	14.00	12.90	8.00	8.10	14.80	15.00
Peak Current	I _p	Amps	79	77	151	147	83	83	159	159
Continuous Stall Current	I _s	Amps	7.5	7.3	13.7	13.3	8.0	8.0	14.7	14.7
Winding Specifications										
Terminal Resistance ± 10%	R _t	Ohms	0.850	0.850	0.370	0.370	0.750	0.750	0.310	0.310
Armature Resistance ± 10%	R _a	Ohms	0.660	0.660	0.180	0.180	0.610	0.610	0.170	0.170
Back EMF Constant ± 10%	K _e	V/KRPM	7.60	7.10	3.80	3.60	15.10	13.10	7.60	6.60
Torque Constant ± 10%	K _t	oz-in/Amp	10.30	9.60	5.10	4.80	20.40	17.80	10.20	8.90
		N-cm/Amp	7.27	6.78	3.60	3.39	14.41	12.57	7.20	6.28
Viscous Damping Constant	K _d	oz-in/KRPM	1.1	1.1	1.1	1.1	2.8	2.3	2.7	2.2
		N-cm/KRPM	0.8	0.8	0.8	0.8	2.0	1.6	1.9	1.5
Armature Inductance	L	μH	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Temperature Coefficient of KE	C	%/°C Rise	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
Number of Cummutator Bars	Z		117	117	117	117	141	141	141	141
Mechanical Specifications										
Moment of Inertia	J _m	oz-in-sec ²	0.0056	0.0083	0.0056	0.0083	0.0190	0.0260	0.0190	0.0260
		kg-cm ²	0.40	0.59	0.40	0.59	1.34	1.84	1.34	1.84
Static Friction Torque	T _f	oz-in	4.0	4.5	4.0	4.5	5.5	5.5	5.5	5.5
		N-cm	2.8	3.2	2.8	3.2	3.9	3.9	3.9	3.9
Weight	W	lbs	3.1	3.2	3.1	3.2	5.3	5.3	5.3	5.3
		kg	1.4	1.5	1.4	1.5	2.4	2.4	2.4	2.4
Diameter	D	in	4.37	4.37	4.37	4.37	5.50	5.50	5.50	5.50
		mm	111.0	111.0	111.0	111.0	139.7	139.7	139.7	139.7
Length	LG	in	0.94	0.95	0.94	0.95	1.07	1.10	1.07	1.10
		mm	23.9	24.1	23.9	24.1	27.2	27.9	27.2	27.9
Figure of Merit										
Peak Acceleration	A _p	kRad/s ²	135.7	83.3	130.1	79.9	84.1	53.3	80.1	50.8
Mechanical Time Constant	T _m	ms	4.90	8.30	5.20	8.80	3.90	7.10	4.20	7.70
Electrical Time Constant	T _e	ms	<0.05	<0.05	<0.17	<0.17	<0.07	<0.07	<0.27	<0.27
Continuous Power Rate	P _c	kW/sec	6.0	2.8	5.0	2.2	7.6	4.3	6.4	3.6
Thermal Specifications										
Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.50	1.70	1.50	1.70	1.40	1.40	1.40	1.40
Thermal Resistance at Stall	RAAS	°C/Watt	2.00	2.10	2.00	2.10	1.90	1.90	1.90	1.90
Tachometer Specifications										
Output Voltage	V	Volts/KRPM	—	3.50	—	3.50	—	5.90	—	5.90
Maximum Ripple Peak to Peak	V _{rh}	%	—	3.0	—	3.0	—	3.0	—	3.0
Linearity of Output Voltage	LIN	%	—	0.06	—	0.11	—	0.11	—	0.11
Minimum Load Resistance	R _l	Ohms	—	370	—	370	—	494	—	494

Notes:

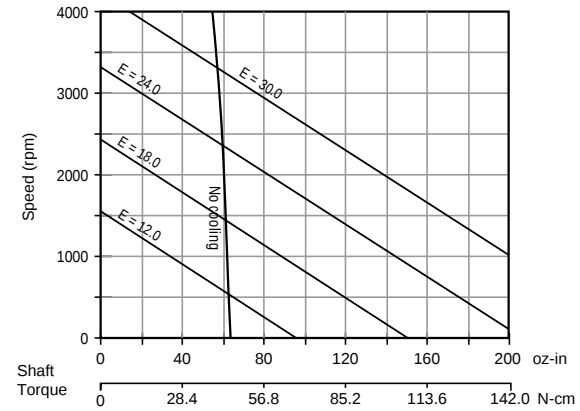
1. All values are based upon a 150°C armature temperature limit and with the motor mounted on an 8" x 16" x 3/8" aluminum heatsink with no forced air cooling. Other voltages, speeds, and torques, and duty cycles are achievable as long as the max armature temperature of 150°C is not exceeded.
2. Mass 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 voltage 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. Bidirectional tolerance of tachometer will not exceed 3%.

PERFORMANCE DATA

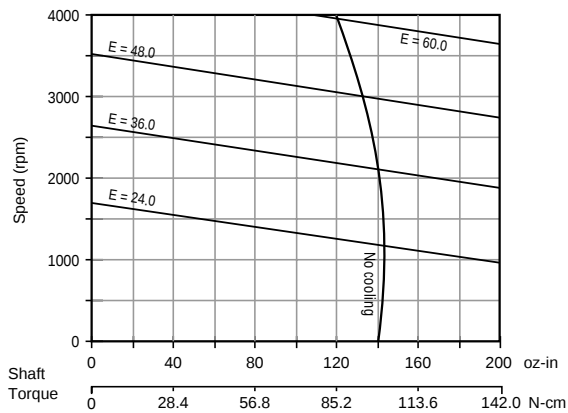
N9M4



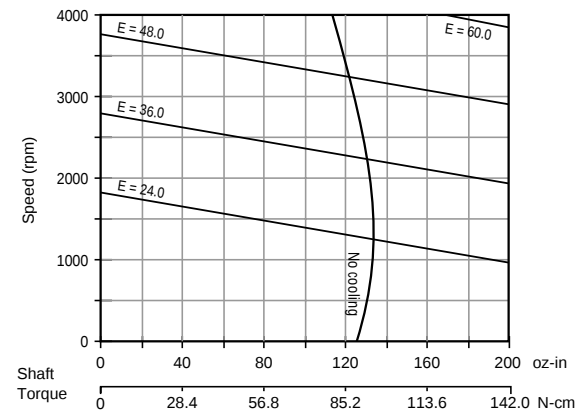
N9M4T



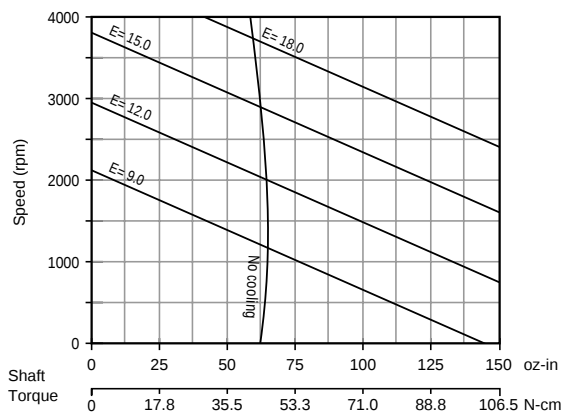
N12M4



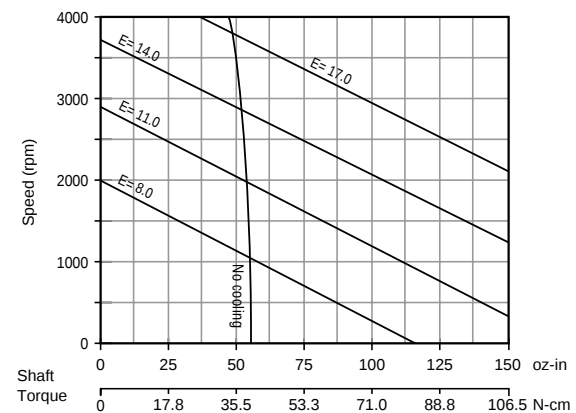
N12M4T



N9M4LR



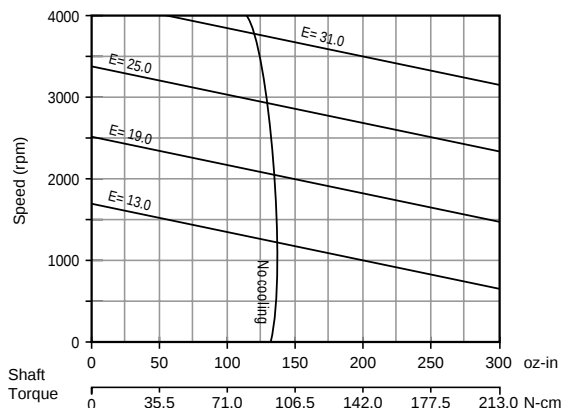
N9M4LRT



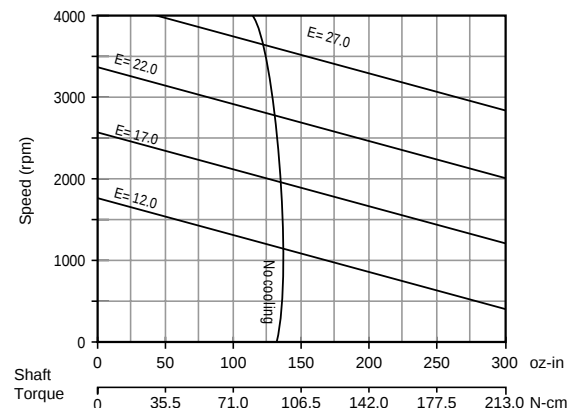
N-Series ServoDisc

DIMENSIONS

N12M4LR



N12M4LRT



Notes:

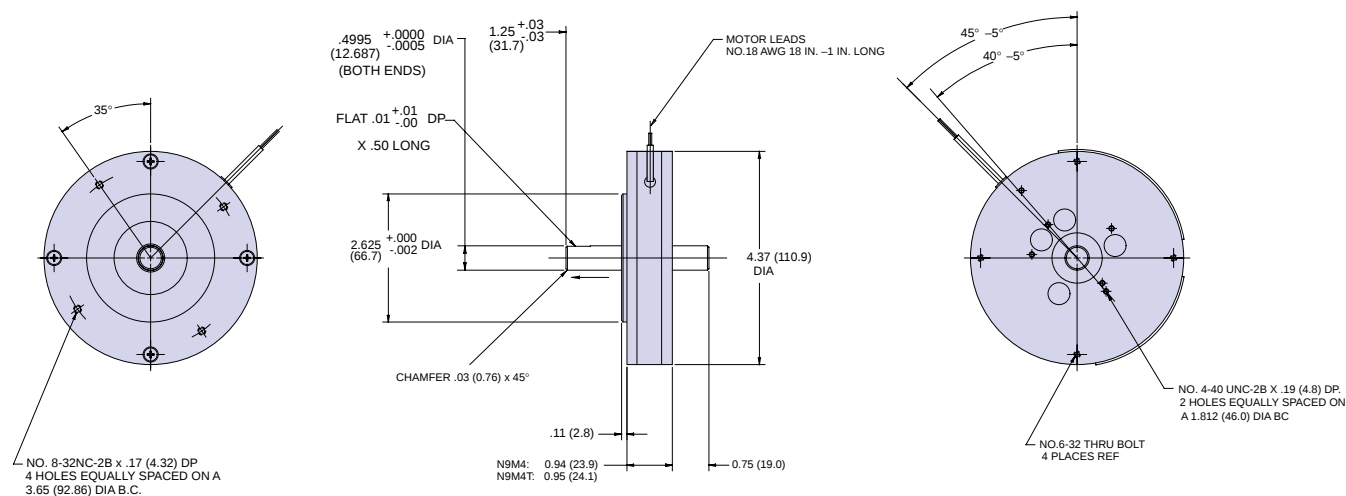
- All curves are drawn for a fixed armature temperature of 150°C.
- The motor can be operated at any point on the graph below 4000 RPM. Higher speeds are possible for some applications. Contact a Kollmorgen Sales Office for more details.
- Determine voltage required for a desired combination of speed and torque by estimating it as a line parallel to one of the constant terminal voltage (E) lines.

- The operating current can be calculated as:

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

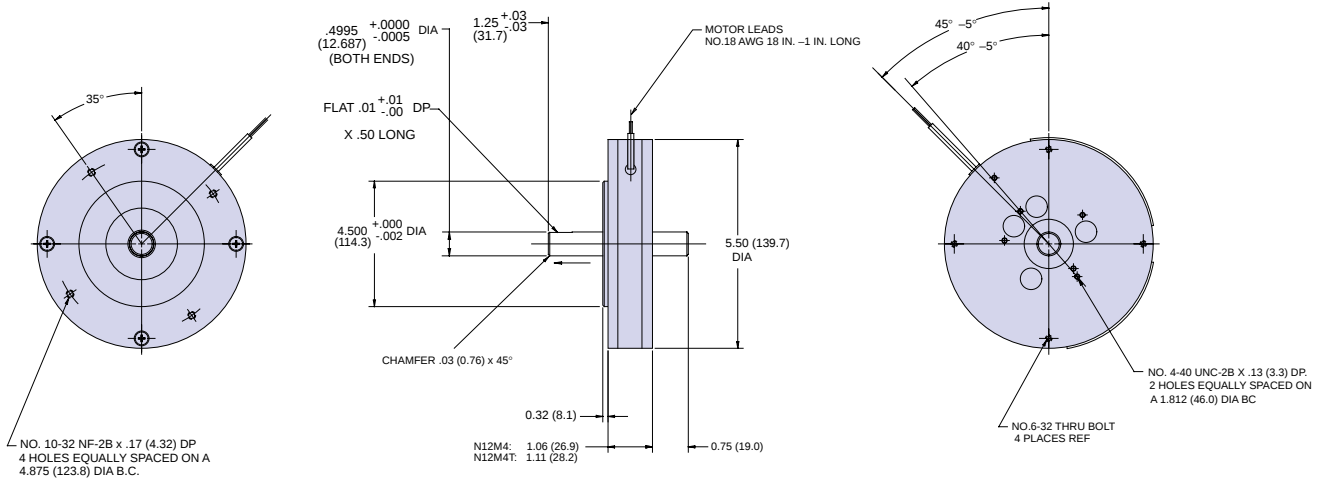
$$V = \text{KE} \times \text{N}/1000 + \text{RT} \times I$$

N9M4/N9M4T



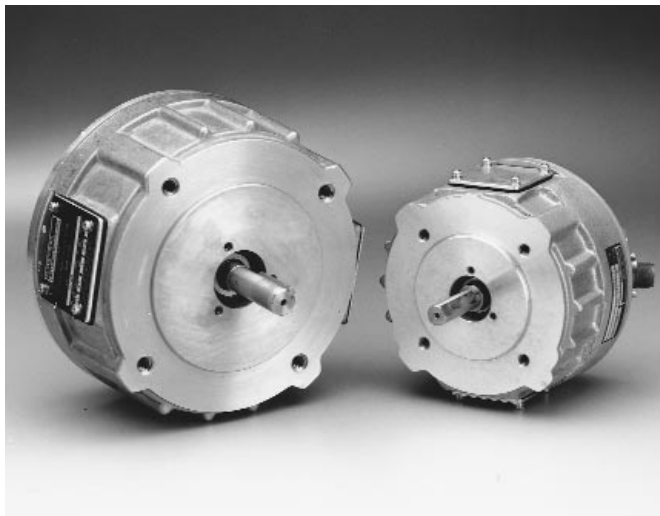
PERFORMANCE DATA

N12M4/N12M4T



JR-Series ServoDisc

INTRODUCTION



- Mechanical time constants as low as 3 ms
- NEMA and IEC mounting available
- UL recognized versions available

- Options:
 - Tachometers
 - Optical encoders
 - Fail-safe brakes
 - Resolvers
 - Gear reducers

Compatible Products

- KXA Plus Amplifier

- 12 to 298 lb-in (1.3-33.6 N-cm) Continuous Torque
- 5.5 to 16.25" OD Round Frame
- Optional Tachometer and Encoder Feedback
- Rugged Industrial Package

JR-Series ServoDisc™ motors employ the unique Kollmorgen flat disc armature in an industrial grade housing resulting in a low profile alternative to conventional servomotors.

- 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
 - Military style ms connectors

JR-Series ServoDisc

PERFORMANCE DATA

Performance Specifications	Symbol	Units	JR12M4CH	JR16M4CH	JR16M4CH-1	JR16M4CHLR-1	JR16M4CHLR-2	JR24M4CH	JR25M6CH	JR33M6CH
Peak Torque	T _p	lb-in N-cm	118 13.3	326 36.8	336 38.0	315 35.6	207 23.4	728 82.3	1015 114.7	4000 451.9
Rated Speed	N	RPM	3000	3000	3000	3000	3000	3000	3000	3000
Rated Continuous Torque @ 25°C	T ₂₅	lb-in N-cm	12 1.3	29 3.3	31 3.5	28 3.2	25 2.8	90 10.2	121 13.7	298 33.6
Rated Continuous Torque @ 40°C	T ₄₀	lb-in N-cm	11 1.2	26 2.9	28 3.2	25 2.8	22 2.5	81 9.1	108 12.1	266 30.0
Rated Power Output	P	Watts	414	1036	1114	993	887	3188	4268	10550
Horsepower		HP	0.55	1.39	1.49	1.33	1.19	4.27	5.72	14.14
Maximum Recommended Speed	N _{max}	RPM	5000	5000	5000	5000	5000	5000	5000	5000
Continuous Stall Torque	T _s	lb-in N-cm	11 1.2	31 3.5	32 3.6	28 3.2	28 3.2	78 8.8	111 12.5	254 28.7
Cogging Torque	T _c	oz-in	0	0	0	0	0	0	0	0

Electrical Specifications

Rated Terminal Voltage	E	Volts	63.0	127.0	166.0	84.2	23.0	138.2	150.0	246.0
Rated Continuous Current	I	Amps	8.4	9.5	7.8	13.9	46.6	26.0	31.6	47.6
Peak Current	I _p	Amps	80	100	79	148	350	200	250	600
Continuous Stall Current	I _s	Amps	7.5	9.6	7.6	13.5	50.0	21.2	28.0	38.7

Winding Specifications

Terminal Resistance ± 10%	R _t	Ohms	0.950	0.940	1.400	0.530	0.050	0.310	0.210	0.190
Armature Resistance ± 10%	R _a	Ohms	0.730	0.740	1.200	0.330	0.025	0.230	0.160	0.135
Back EMF Constant ± 10%	K _e	V/KRPM	17.80	39.00	51.00	25.50	7.00	43.00	48.00	80.00
Torque Constant ± 10%	K _t	oz-in/Amp	24.10	52.80	69.00	34.50	9.47	58.20	65.00	108.25
		N-cm/Amp	17.02	37.28	48.72	24.36	6.69	41.10	45.90	76.44
Viscous Damping Constant	K _d	oz-in/KRPM	2.8	9.1	7.8	7.2	8.3	17.0	33.0	125.0
		N-cm/KRPM	2.0	6.4	5.5	5.1	5.8	12.0	23.3	88.3
Armature Inductance	L	μH	<45	<85	<140	<40	<5	<45	<40	<75
Temperature Coefficient of KE	C	%/°C Rise	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Number of Commutator Bars	Z		141	165	205	205	183	193	193	185

Mechanical Specifications

Moment of Inertia	J _m	oz-in-sec ²	0.017	0.084	0.075	0.075	0.084	0.460	0.700	3.300
		kg-cm ²	1.20	5.93	5.30	5.30	5.93	32.48	49.43	233.03
Static Friction Torque	T _f	oz-in	6.0	11.0	11.0	11.0	18.0	20.0	25.0	75.0
		N-cm	4.2	7.8	7.8	7.8	12.7	14.1	17.7	53.0
Weight	W	lbs	8.0	17.5	17.5	17.5	17.5	50.0	70.0	195.0
		kg	3.6	7.9	7.9	7.9	7.9	22.7	31.8	88.5
Diameter	D	in	5.50	7.38	7.38	7.38	7.38	11.00	11.00	16.25
		mm	139.7	187.5	187.5	187.5	187.5	279.4	279.4	412.8
Length	LG	in	3.94	4.50	4.50	4.50	4.50	6.76	7.75	7.00
		mm	100.1	114.3	114.3	114.3	114.3	171.7	196.9	177.8

Figure of Merit

Peak Acceleration	A _p	kRad/s ²	111.3	62.2	71.7	67.3	44.2	25.3	23.0	19.4
Mechanical Time Constant	T _m	ms	3.02	3.15	2.99	3.29	3.31	4.42	3.80	5.38
Electrical Time Constant	T _e	ms	<0.14	<0.14	<0.08	<0.08	<0.20	<0.40	<0.31	<0.56
Continuous Power Rate	P _c	kW/sec	14.6	18.3	23.8	18.9	13.5	31.8	37.8	48.5

Thermal Specifications

Mounted on Aluminum Heatsink			8"x16"x3/8"	16"x16"x3/8"	16"x16"x3/8"	16"x16"x3/8"	16"x16"x3/8"	21"x21"x3/8"	21"x21"x3/8"	21"x21"x3/8"
Thermal Resistance at Rated Speed	RAAR	°C/Watt	1.10	0.70	0.70	0.70	0.70	0.31	0.27	0.11
Thermal Resistance at Stall	RAAS	°C/Watt	1.75	1.10	1.10	1.10	1.10	0.64	0.64	0.40
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	0.23	0.23

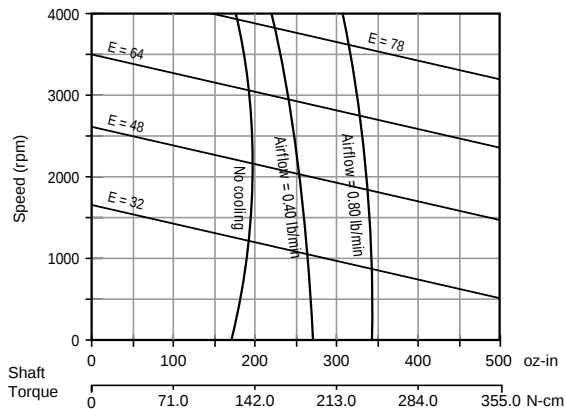
Notes:

- All values are based upon a 150°C armature temperature limit and with the motor mounted on an 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.
- Mass air flow (lbs/min) = air volume (CFM) x air density (lbs/ft³).
- Terminal resistance is measured at 4.0 amps. RT varies as a function of applied current.
- Unless otherwise noted, all specifications above apply at 25°C.
- Peak torque and current is calculated based on max pulse duration of 50 milliseconds and a 1% duty cycle.
- The operating current can be calculated as: $I = (\text{Shaft} + T_f + K_d \times N/1000) / K_T$.
- The operating voltage can be calculated as: $V = K_E \times (N/1000) + R_T \times I$.

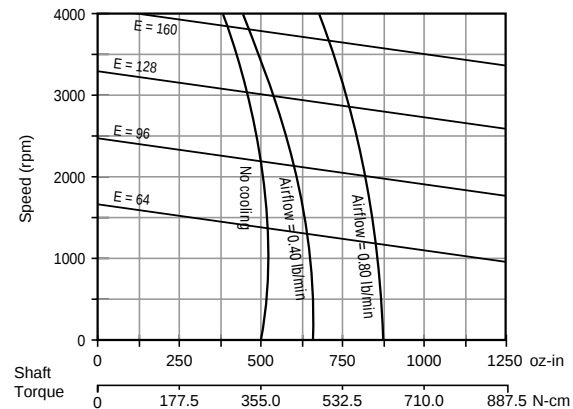
JR-Series ServoDisc

PERFORMANCE DATA

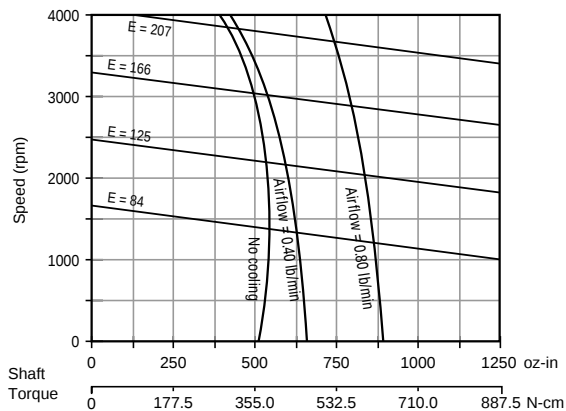
JR12M4CH



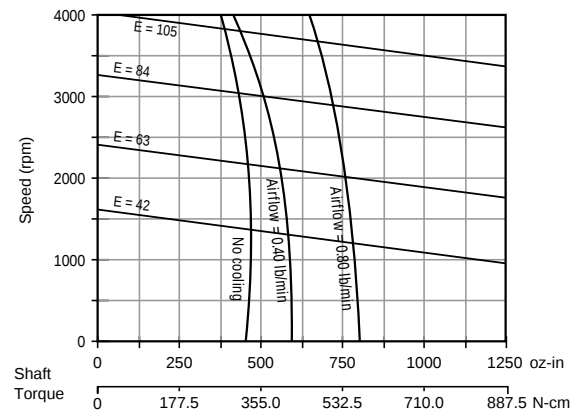
JR16M4CH



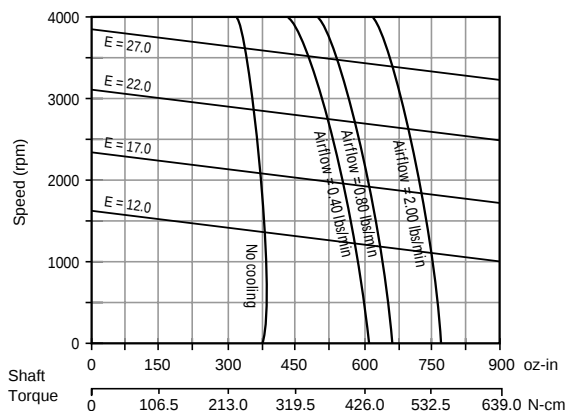
JR16M4CH-1



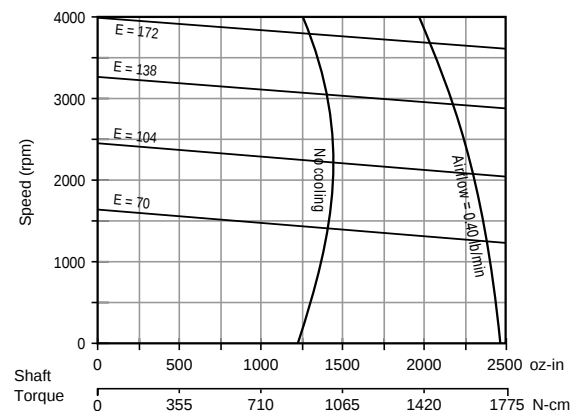
JR16M4CHLR-1



JR16M4CHLR-2

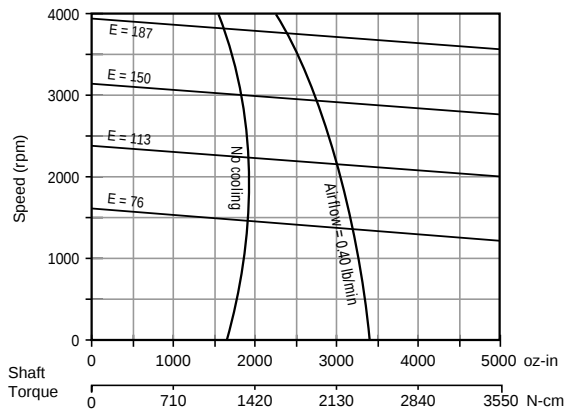


JR24M4CH

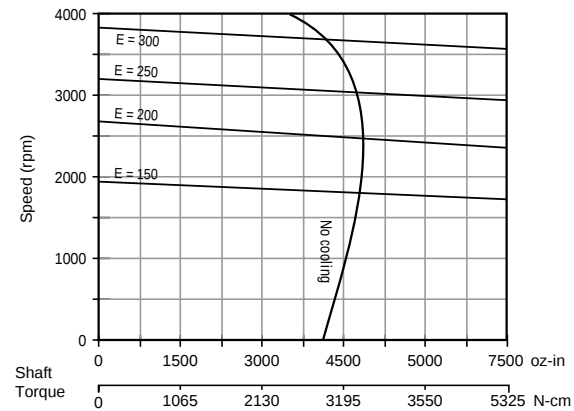


PERFORMANCE DATA

JR25M6CH



JR33M6CH



Notes:

- A. All curves are drawn for a fixed armature temperature of 150°C.
- B. 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.
- C. Determine voltage required for a desired combination of speed and torque by locating it on the appropriate 'constant terminal voltage curve.'

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

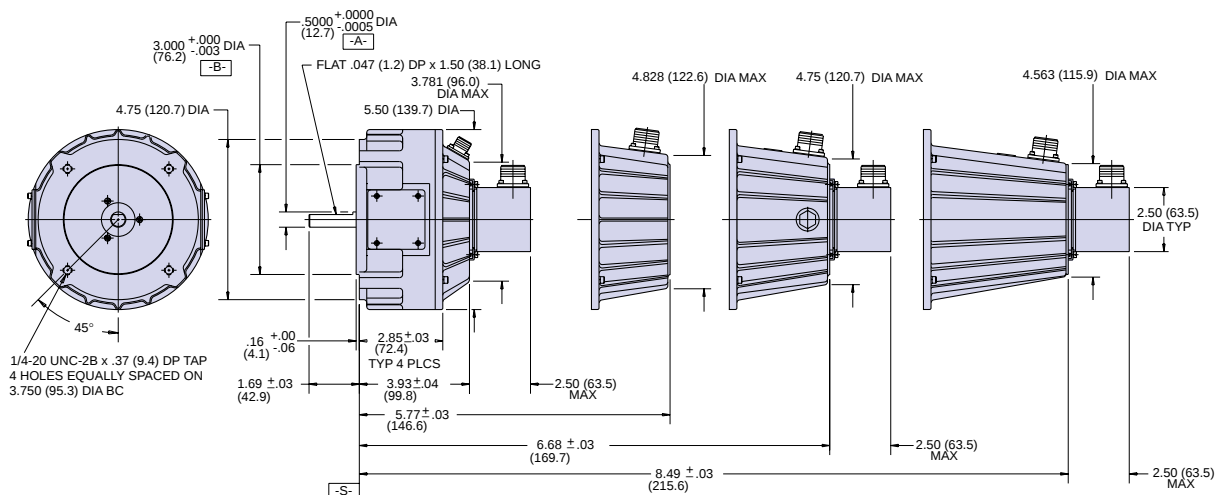
$$I = (\text{Shaft torque} + TF + KD \times N/1000) / KT.$$
- F. The operating voltage can be calculated as:

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

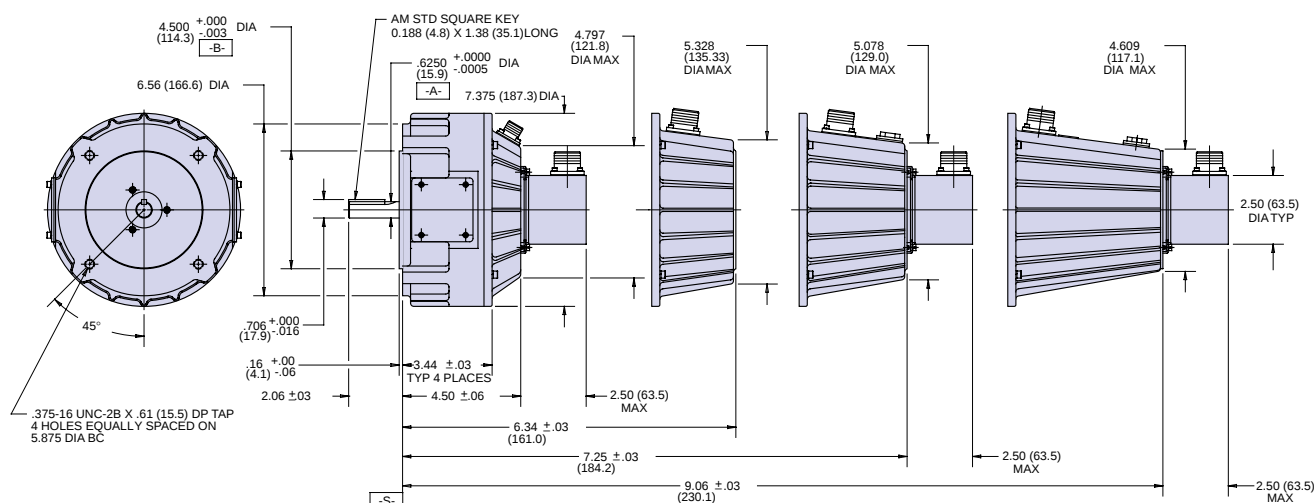
JR-Series ServoDisc

DIMENSIONS

JR12M4CH



JR16M4CH/CH-1/CHLR-1/CHLR-2



Notes:

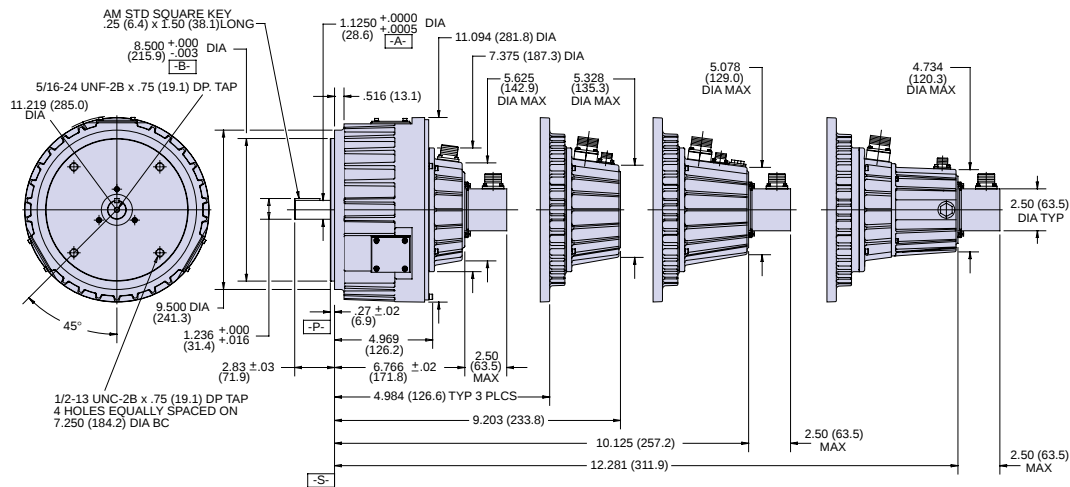
- 1a. For JR12M4CH Nema 48C Face Mount shown (Square Flange Mount and Face Mount per IEC-72 also available). Motor weight: 8.00 lbs.
- 1b. All others: Nema 56C Face Mount shown (Square Flange Mount and Face Mount per IEC-72 also available). Motor weight: 17.50 lbs.
2. Shaft diameter "A" runout not to exceed .001 in/in measured from surface "S".
3. Pilot diameter "B" runout to "A" within .003 in TIR.
4. Mounting surface "S" runout to "A" within .006 in TIR.
5. For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "C." Connector MS3102A-10SL-3P and Mating Connector MS3106A-10SL-3S supplied.
6. For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "G." Tachometer output: Pin "C" (+) positive, Pin "D" (-) negative. Brake output: Pin "E" (+) positive, Pin "F" (-) negative. Connector MS3102A-16S-1P and Mating Connector MS3106A-16S-1S supplied.
7. For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "C." Connector MS3102A-20-19P and Mating Connector MS3106A-20-19S supplied.

Encoder Connections	
Function	Pin
Output A	A
Output B	B
Index	C
V+	D
Common	F
Case Ground	G

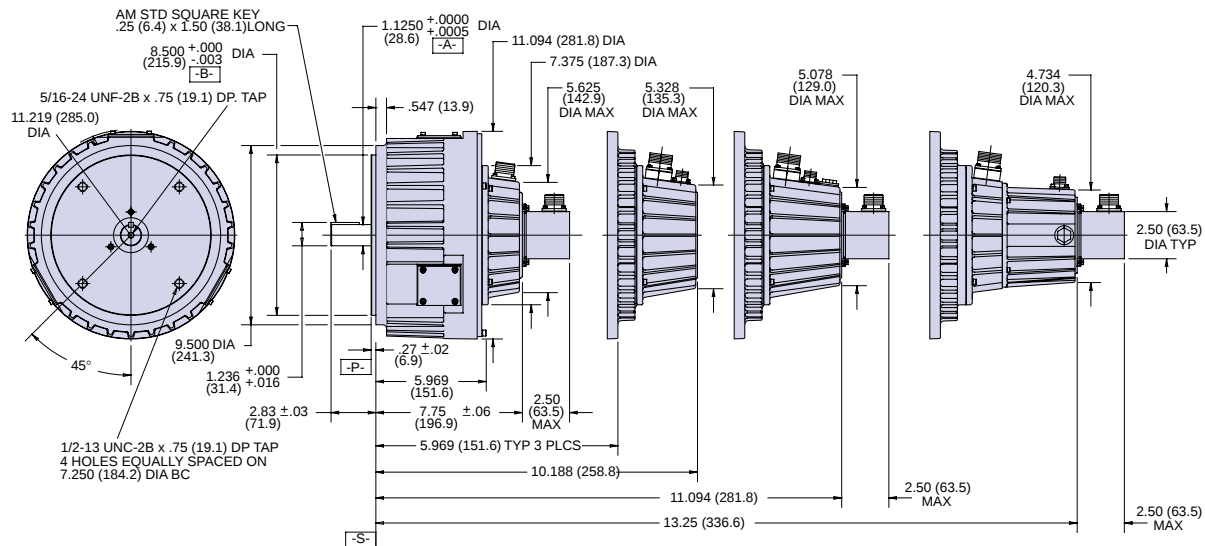
Connector MS3102A-18-1P
and Mating Connector
MS3106A-18-1S supplied.

DIMENSIONS

JR24M4CH



JR25M6CH



Notes:

- Nema 182ATC Face Mount shown (Square Flange Mount and Face Mount per IEC-72 also available).
- Shaft diameter "A" runout not to exceed .001 in/in measured from surface "S".
- Pilot diameter "B" runout to "A" within .003 in TIR.
- Mounting surfaces "P" and "S" runout to "A" within .006 in TIR.
- For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "C."
Connector MS3102A-16-10P and Mating Connector MS3106A-16-10S supplied.
- For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "C." Brake output: Pin "D" (+) positive, Pin "E" (-) negative. Connector MS3102A-18-11P and Mating Connector MS3106A-18-11S supplied. Tachometer output (separate connector): Pin "A" (+) positive, Pin "B" (-) negative. Connector MS3102A-10SL-3P (3S for JR24M4CH) and Mating Connector MS3106A-10SL-3S supplied.
- 7a. JR24M4CH motor weight: 50 lbs.
- 7b. JR25M6CH motor weight: 70 lbs.

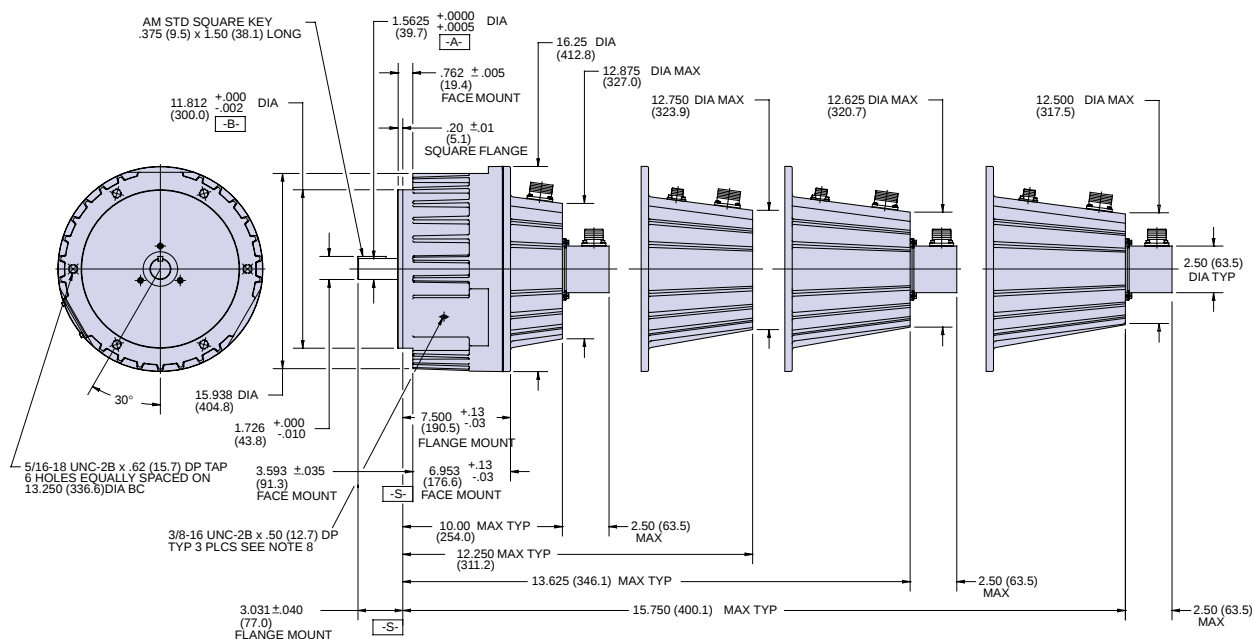
Encoder Connections	
Function	Pin
Output A	A
Output B	B
Index	C
V+	D
Common	F
Case Ground	G

Connector MS3102A-18-1P and Mating Connector MS3106A-18-1S supplied.

JR-Series ServoDisc

DIMENSIONS

JR33



Notes:

- Face Mount shown (Square Flange Mount also available).
- Shaft diameter "A" runout not to exceed .001 in/in measured from surface "S".
- Pilot diameter "B" runout to "A" within .003 in TIR.
- Mounting surface "S" runout to "A" within .010 in TIR.
- For clockwise rotation as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "C." Connector MS3106A-16-10P and Mating Connector MS3106A-16-10S supplied.
- For clockwise rotations as viewed from mounting end of motor: Pin "A" (+) positive, Pin "B" (-) negative, Case Ground: Pin "G." Brake output: Pin "D" (+) positive, Pin "E" (-) negative. Connector MS3102A-18-11P and Mating Connector MS3106A-18-11S supplied. Tachometer output (separate connector): Pin "A" (+) positive, Pin "B" (-) negative. Connector MS3102A-10SL-3P and Mating Connector MS3106A-10SL-3S supplied.
- Connectors are rotated 120° CW from true position as viewed from rear of motor.
- Lifting Eyes shipped loose (Eyes not shown) to be mounted in 3/8-16 tapped holes if required (Face Mount). On Square Flange Mount 4, Lifting Eyes also mounted on Flange (not shown).
- Motor weight: 195 lbs.

Encoder Connections	
Function	Pin
Output A	A
Output B	B
Index	C
V+	D
Common	F
Case Ground	G

Connector MS3102A-18-1P and Mating Connector MS3106A-18-1S supplied.

	Max Shaft Loads		
	Pure Axial Load (lb)	Pure Radial Load	
		(lb)	From Mounting Face (in)
JR12M4CH	50	52	1.25
JR16M4CH	100	95	1.63
JR24M4CH	100	150	1.875
JR25M4CH	100	170	1.875
J433	175	250	1.80

OPTIONS

F9T TACHOMETER

PARAMETER	JR12, JR16	JR24, JR25	
1.0 Emf/1000 RPM open circuit (KE) (V)	3+5%-0%	6.0*	*Measure with a resistive load of 1 kohm and a single-pole low pass filter with 3db cut off at 2 kHz. Optional voltage gradients available are: 7, 9, 10 and 19 Volts/kRPM. **Measured with the recommended purely resistive load.
2.0 Bi-directional tolerance (% KE)	± 1.5	± 1	
3.0 Residual ripple peak to peak (%)	4*	2**	
4.0 Linearity referred to 3600 RPM (% 3.6KE)	0.05	1	
5.0 Output impedance (ohm)	1	5.4	
6.0 Rotor moment of inertia (J) (oz-in-sec ²)	0.005	.009	
7.0 Friction (oz-in)	3.0	3.0	
8.0 Temperature range (°C)	-25 to +70	-25 to +70	
9.0 Max speed (RPM)	4000	5000	
10.0 Weight (lb)	2.2	2.5	

BRAKE

1.0 DC Voltage (V)	24	24	Note: 1. Brakes are electrically released. 2. Above brakes are intended to be used in emergency situations (loss of power supply) or to hold the motor shaft when the motor is at standstill. Other voltages available.
2.0 Input Power (W)	25 Max	27 Max	
3.0 Holding Torque (in-lbs)	70.8	180	
4.0 Inertia (oz-in-sec ²)	0.0055	.021	
6.0 Weight (lb)	2.5	5.0	

BA25I ENCODER

(See BA25I data sheet for more detailed information.)

1.0 Moment of Inertia (oz-in-sec ²)	3.0 x 10 ⁻⁴ Max	3.0 x 10 ⁻⁴ Max
2.0 Starting Torque (oz-in Max)	1.0	1.0
3.0 Max Speed (RPM)	4000	4000
4.0 Power Supply Required	5V±2% @ 150 ma	5V±2% @ 150 ma
5.0 Output TTL (CMOS also available)	Logic "0"<.7VDC Logic "1">2.4VDC	Logic "0"<.7VDC Logic "1">2.4VDC
6.0 Number of Outputs	Dual Channel A and B in phase quadrature with index channel.	Dual Channel A and B in phase quadrature with index channel.
7.0 Cycles Per Revolution	Standards available: 100, 125, 200, 250, 360, 500, 512 1000, 1024, 1200, 1800, 2000 2048, 2500.	Standards available: 100, 125, 200, 250, 360, 500, 512 1000, 1024, 1200, 1800, 2000 2048, 2500.
8.0 Max data rate (kHz)	100	100
9.0 Temperature range (°C)	-25 to +70	-25 to +70
10.0 Weight (lb)	1.3	1.3

RESOLVER

1.0 Size 11 Resolver			Notes: Resolver prepared with cover, MS connector, clamps and coupling. For details, contact a Kollmorgen Sales Office.
2.0 Weight (lb)	0.5	0.5	

Gearmotor Series ServoDisc

INTRODUCTION



- 8 to 2604 in-lb (.9 to 294 N-M) Continuous Stall Torque
- Virtually Zero to Medium Backlash Models
- Compact, Inline Packaging
- Powered by High-Performance DC ServoDisc Motors

Kollmorgen provides an assortment of gearmotors. Characteristics of all these products include high-torque-to-weight ratios, smooth constant torque and fast acceleration.

- The Accurex™ series, with virtually zero backlash, is designed with a minimum of moving parts for extremely reliable operation
- The Revex™ series uses proven spur gear technology to produce a wide range of exact gear ratios with a maximum of 5 arc minutes of backlash
- The Indurex™ series provides fully reversible helical gearing which results in an exceptional gearmotor actuator
- The low voltage Ferrite series is the flattest design, ideal for battery-powered applications

ACCUREX

- Virtually zero backlash for high-position accuracy
- Continuous output torque up to 500 in-lb
- Heavy duty bearing design
- Harmonic drive components for simplicity, high reliability and compact shape
- Exact reduction ratios: 60, 80, 100, 120 and 160:1
- High torque capacity in single-stage ratio
- IP55 environmental sealing and prep for resolver are available

REVEX

- Extremely low backlash; less than 5 arc-minutes
- High-torsional stiffness to ensure high accuracy and repeatability in positioning applications

- Exact reduction ratios: 10:1 up to 100:1 (other ratios optional)
- Continuous output torque up to 2604 in-lbs
- Compact and lightweight
- Gearhead can be sold separately (consult an Kollmorgen Sales Office)
- IP55 environmental sealing and prep for resolver are available

INDUREX

- Low backlash; less than 20 arc-minutes
- Compact ultraquiet design
- Industrial compact design
- Reduction ratios 3.67:1 up to 98.87:1
- Continuous output torque up to 2580 in-lbs
- IP55 environmental sealing and prep for resolver are available

FERRITE

- Flat shape and lightweight for easy design integration
 - Reduction ratios from 15:1 to 150:1
 - Continuous output torque up to 200 in-lbs
 - Suitable for battery operation: 12 or 24 Volts
 - Constant torque over the entire speed range
 - Zero cogging for smooth operation
 - Low inertia produces rapid, accurate response to command signals
- Options:
 - Tachometers or encoders
 - Fail-safe brakes

Compatible Products

- KXA Plus Amplifier
- EM19 Linear Amplifier

Accurex Gearmotor Series ServoDisc

PERFORMANCE DATA

Gearmotor Types		Rated Speed (RPM)	Continuous Torque (in-lb/N-m)	Peak Torque (in-lb/N-m)	Gear Ratio	Motor Voltage (Volts)	Motor Current (amps)
1.0	S6M4H/H6D60	50.0	52/6	300/34	60:1	17.5	5.0
2.0	S9M4H/H9D60	50.0	274/31	570/64	60:1	35.0	7.5
3.0	S6M4H/H6D80	37.5	70/8	300/34	80:1	17.5	5.0
4.0	S9M4H/H9D80	37.5	345/39	570/64	80:1	35.0	7.5
5.0	S6M4H/H6D100	30.0	87/10	400/45	100:1	17.5	5.0
6.0	S9M4H/H9D100	30.0	431/49	770/87	100:1	35.0	7.5
7.0	S6M4H/H6D120	25.0	105/12	400/45	120:1	17.5	5.0
8.0	S6M4H/H6D160	18.8	140/16	400/45	160:1	17.5	5.0
9.0	S9M4H/H9D120	17.0	500/57	990/112	120:1	26.0	7.5

		Units	S6M4H/H6D (all ratios)	S9M4H/H9D (all ratios)
1.0	Max Inertia (2)	oz-in-sec ²	0.0033	0.0125
		g-cm ²	233	883
2.0	Radial Load	lbs	200	465
2.1	Distance from Mounting Surface	in	1 1/8	1 1/2
3.0	Axial Load	lbs	500	500
4.0	Basic Weight (3)	lbs	5.15	10.80
5.0	Basic Length (3)	in	5.4	6.8

Motor electrical and mechanical specifications are subject to change without notice. Please consult a Kollmorgen Sales Office.

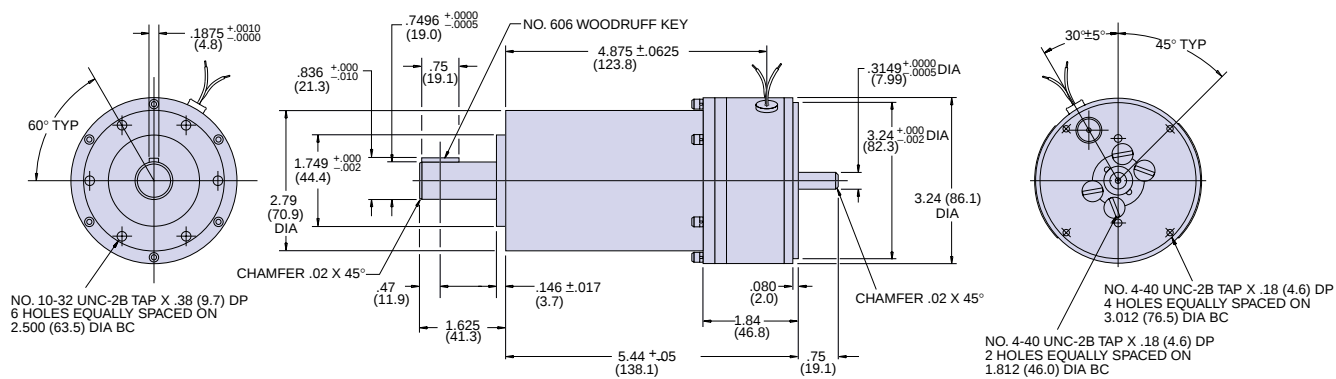
Notes:

1. Mounted on 8" x 16" x 3/8" aluminum heatsink.
2. Motor plus gearhead, measured at motor shaft.
3. Weights and lengths will vary with options.
4. For vertical orientation, a grease cartridge is recommended.
5. Gearmotors can be mounted in any position.

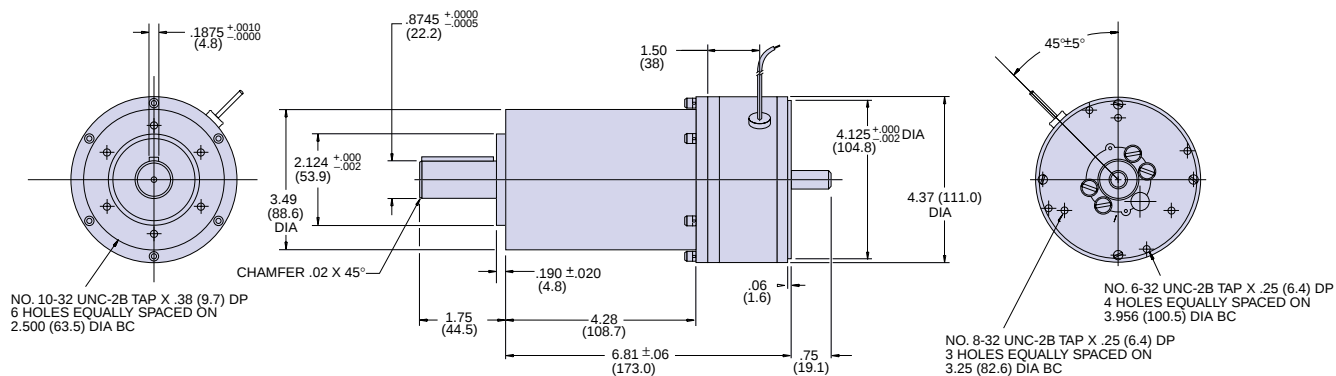
Accurex Gearmotor Series ServoDisc

DIMENSIONS

S6M4H/H6D



S9M4H/H9D



Notes:

1. Illustrations show basic motor lengths only. Lengths will vary with options.
2. Mating connectors are supplied with "Industrial" versions.

Accurex Gearmotor Series ServoDisc

OPTIONS

TACHOMETER SPECIFICATIONS

Tachometer/Motor Types	S6T/S6M4H	S9A4T/S9M4H
1.0 Output Voltage (Volts/kRPM)	0.75	3.0
2.0 Max Ripple Peak to Peak (%)*	1.5	1.5
3.0 Linearity Referred to 3600 RPM (%)	0.05	0.06
4.0 Bi-directional Tolerance (%)	1.5	1.5
5.0 Output Impedance (ohm)	<5	<5
6.0 Moment of Inertia (oz-in-sec ²)	0.00025	0.0024
7.0 Temperature Coefficient (%/°C Rise)	-0.02	-0.02
8.0 Recommended Load Resistance (ohms)	1000	1000
9.0 Friction Torque (oz-in)	0.75	1.0
10.0 Weight (lb)	1.13	2.0

*With 500 Hz low pass filter.

BRAKE SPECIFICATIONS

Motor Types	S6M4H	S9M4H
1.0 DC Voltage (Volts)	24	24
2.0 Input Power @ 20°C Nominal (Watts)	8	9
3.0 Holding Torque (in-lbs)	3 Min.	8 Min.
4.0 Inertia (oz-in-sec ²)	0.00028	0.00096
5.0 Weight (lb)	0.65	1.0

Notes:

1. Brakes are electrically released.
2. Brakes are intended for power loss situations or to hold motor when at a standstill.

M23 ENCODER SPECIFICATIONS

(for all motors) (See Encoder Section for more detailed information.)

1.0 Resolution	Up to 2540 Cycles Per Revolution (500 for sinewave)
2.0 Frequency Response (kHz)	100
3.0 Output Format	Quadrature Channels and Index
4.0 Phasing	90° ± 20° Max
5.0 Output Levels (5, 12 and 15 Volts)	TTL and CMOS Compatible
6.0 Input Power	5, 12 and 15 Volts 150 ma Max
7.0 Moment of Inertia (oz-in-sec ²)	0.0001
8.0 Weight	2.0 oz Typical

CONNECTION SPECIFICATIONS

(circular MS style mating connector available as industrial version)

Encoder M23 S6M4HI/S9M4HI

**Motor/Tach or
Motor/Tach/Brake**
(for clockwise rotation)
S6M4HI/S9M4HI

Lead	Pin
(+) Motor Lead	A
(-) Motor Lead	B
(+) Tach Lead	C
(-) Tach Lead	D
(+) Brake Lead	E
(-) Brake Lead	F
Case Ground	G

Function	Pin
Channel A	A
Channel B	B
Channel I	C
V+	D
Common	F
Case Ground	G
Channel A*	H
Channel B*	I/K (1)
Channel I*	J
+15V**	H
-15V**	I/K (1)

Notes:

S6M4HI uses Pin K. S9M4HI uses Pin I.

*Additional outputs for complementary models.

**Split supply for amplified sinewave.

Revex Gearmotor Series ServoDisc

PERFORMANCE DATA

	Gearmotor Types	Rated Speed (RPM)	Continuous Torque (in-lb/N-m)	Peak Torque** (in-lb/N-m)	Gear Ratio	Motor Voltage (Volts)	Motor Current (amps)
1.0	S6M4H/GH6-10	300	12.6/1.4	50/59.6	10:1	17.8	5.2
1.1	U9M4T/GH9-10*	300	27/3.1	103/11.7	10:1	22.9	8.6
1.2	U9M4/GH9-10	300	30/3.4	115/13	10:1	24.1	8.7
1.3	N9M4/GH9-10	300	41/4.6	163/18.4	10:1	30.2	7.8
1.4	U9M4HT/GH9-10*	300	45/5.1	179/20.2	10:1	29.9	8.5
1.5	S9M4H/GH9-10	300	49.4/5.6	296/33.5	10:1	35.0	7.8
1.6	U12M4T/GH12-10*	300	64/7.3	258/29.1	10:1	40.4	8.7
1.7	U12M4/GH12-10	300	75.2/8.5	301/34	10:1	43.4	8.8
1.8	U12M4HT/GH12-10*	300	93/10.5	372/42	10:1	56.5	7.9
1.9	U12M4H/GH12-10	300	103/11.6	417/47.2	10:1	67.7	7.8
1.10	JR12M4CH/GH12-10	300	105/11.9	420/47.5	10:1	61	8.4
1.11	JR16M4CH/GH16-10	300	263/31.4	650/73.4	10:1	129	9.6
2.0	S6M4H/GH6-20	150	24.7/3.1	100/11.3	20:1	17.8	5.2
2.1	U9M4T/GH9-20*	150	52/5.8	207/23.3	20:1	22.9	8.6
2.2	U9M4/GH9-20	150	60/6.8	240/27.1	20:1	24.1	8.7
2.3	N9M4/GH9-20	150	81/9.2	325/36.7	20:1	30.2	7.8
2.4	U9M4HT/GH9-20*	150	90/10.1	358/40.4	20:1	29.9	8.5
2.5	S9M4H/GH9-20	150	99/11.2	495/56	20:1	35.0	7.8
2.6	U12M4T/GH12-20*	150	129/14.6	515/58.2	20:1	40.4	8.7
2.7	U12M4/GH12-20	150	150/17	602/68	20:1	43.4	8.8
2.8	U12M4HT/GH12-20*	150	185/20.9	740/87.6	20:1	56.5	7.9
2.9	U12M4H/GH12-20	150	205/23.2	836/94.5	20:1	62.7	7.8
2.10	JR12M4CH/GH12-20	150	211/23.8	844/95	20:1	61	8.4
2.11	JR16M4CH/GH16-20	150	545/61.5	2603/294	20:1	129	9.6
3.0	S6M4H/GH6-40	75	48.3/5.5	159/18	40:1	17.8	5.2
3.1	U9M4T/GH9-40*	75	108/12.2	413/46.7	40:1	22.9	8.6
3.2	U9M4/GH9-40	75	117/13.2	468/93	40:1	24.1	8.7
3.3	N9M4/GH9-40	75	158/18	636/71.8	40:1	30.2	7.8
3.4	U9M4HT/GH9-40*	75	165/18.6	681/77	40:1	29.9	8.5
3.5	S9M4H/GH9-40	75	194/21.9	681/77	40:1	35.0	7.8
3.6	U12M4T/GH12-40*	75	252/28.5	1030/116.4	40:1	40.4	8.7
3.7	U12M4/GH12-40	75	294/33.3	1178/133	40:1	43.4	8.8
3.8	U12M4HT/GH12-40*	75	363/41.0	1434/162	40:1	56.5	7.9
3.9	U12M4H/GH12-40	75	411/46.4	1433/162	40:1	67.7	7.8
3.10	JR12M4CH/GH12-40	75	421/47.6	1534/516.5	40:1	61	8.4
3.11	JR16M4CH/GH16-40	75	1089/123	2603/294	40:1	129	9.6
4.0	S6M4H/GH6-60	50	72.5/8.2	177/20	60:1	17.8	5.2
4.1	U9M4T/GH9-60*	50	161/18.2	620/70	60:1	22.9	8.6
4.2	U9M4/GH9-60	50	176/19.9	726/82	60:1	24.1	8.7
4.3	N9M4/GH9-60	50	239/27	726/82	60:1	30.2	7.8
4.4	U9M4HT/GH9-60*	50	248/28	725/82	60:1	29.9	8.5
4.5	S9M4H/GH9-60	50	292/33	725/82	60:1	35.0	7.8
4.6	U12M4T/GH12-60*	50	378/42.7	1548/174.6	60:1	40.4	8.7
4.7	U12M4/GH12-60	50	442/50	1548/175	60:1	43.4	8.8
4.8	U12M4HT/GH12-60*	50	544/61.5	1548/175	60:1	56.5	7.9
4.9	U12M4H/GH12-60	50	602	1548/175	60:1	62.7	7.8
4.10	JR12M4CH/GH12-60	50	632/71.4	1548/175	60:1	61	8.4
4.11	JR16M4CH/GH16-60	50	1634/185	2603/184	60:1	129	9.6
5.0	S6M4H/GH6-100	30	79/9	195/22	100:1	15.4	3.6
5.1	U9M4T/GH9-100*	30	258/29.2	796/90	100:1	22.9	8.6
5.2	U9M4/GH9-100	30	293/33.2	796/90	100:1	24.1	8.7
5.3	N9M4/GH9-100	30	318/36	796/90	100:1	29.0	5.7
5.4	U9M4HT/GH9-100*	30	318/36	796/90	100:1	27.8	7.4
5.5	S9M4H/GH9-100	30	318/36	796/90	100:1	33	5.5
5.6	U12M4T/GH12-100*	30	630/71.2	1699/192	100:1	40.4	8.7
5.7	U12M4/GH12-100	30	681/77	1699/192	100:1	42.4	8.6
5.8	U12M4HT/GH12-100*	30	681/77	1699/192	100:1	54.3	6.6
5.9	U12M4H/GH12-100	30	681/77	1699/192	100:1	60.7	5.7
5.10	JR12M4CH/GH12-100	30	681/77	1699/192	100:1	57.5	5.8
5.11	JR16M4CH/GH16-100	30	2604/294	3905/441	100:1	125	9.0

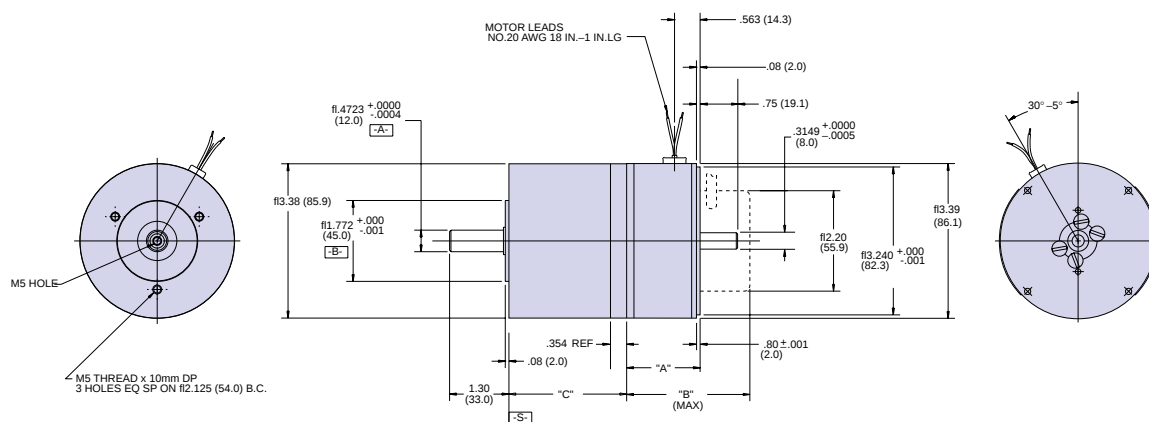
*Smallest axial length for gearmotor with tachometer.

**For short duration only.

Revex Gearmotor Series ServoDisc

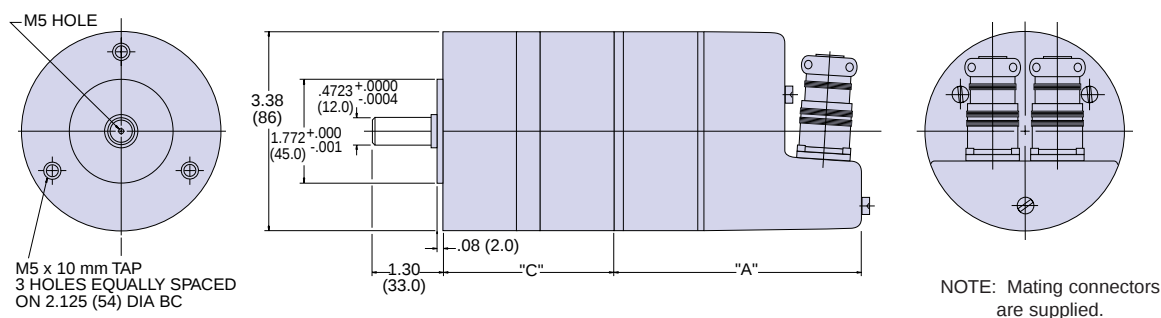
DIMENSIONS

S-SERIES (S6)



S6M4H/GH6			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	1.61	2.56	2.91	3.94
		mm	40.9	65.1	73.9	100.0
B (max)	With Encoder	in	2.66	3.61	3.96	4.99
		mm	67.6	91.7	100.0	126.7

S6M4H/GH6 and S6M4HI/GH6		10:1 20:1	40:1 60:1	100:1
C	in	2.68	2.93	3.19
	mm	68.0	74.5	81



S6M4HI/GH9			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	4.23	5.26	4.23	5.26
		mm	107.4	133.6	107.4	133.6
A	With Encoder	in	4.23	5.26	5.61	6.56
		mm	107.4	133.6	142.5	166.6

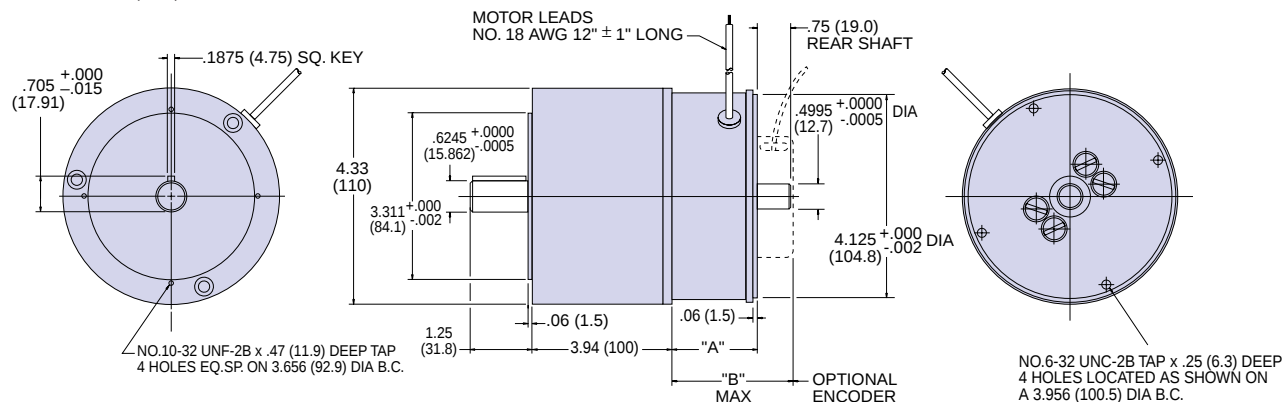
Motor Connector - Amphenol/Bendix PT 02A-12-8P

Encoder Connector - Amphenol/Bendix PT 02A-12-10P

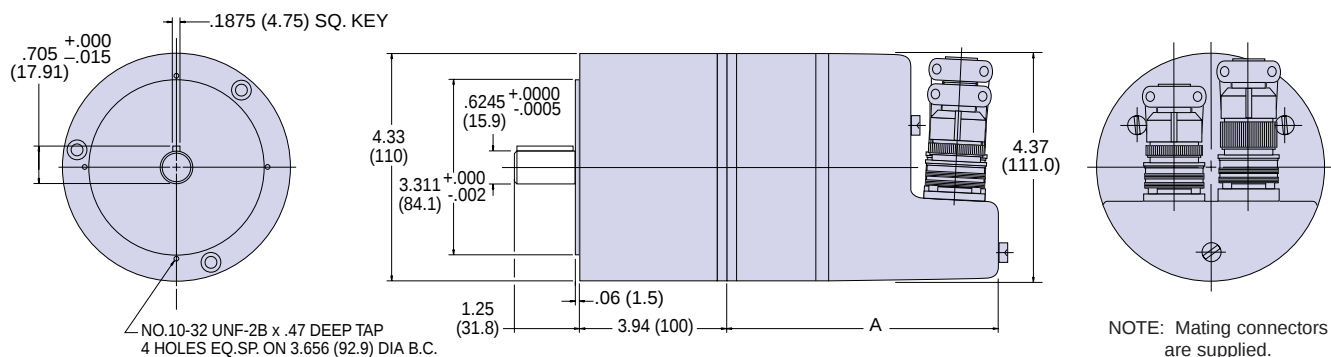
Revex Gearmotor Series ServoDisc

DIMENSIONS

S-SERIES (S9)



S9M4H/GH9			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	2.28	3.25	3.70	4.66
		mm	57.9	82.6	94.0	118.4
B (max)	With Encoder	in	3.33	4.30	4.75	5.71
		mm	84.6	109.0	120.7	145.0



S9M4HI/GH9			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	5.19	6.17	6.67	7.61
		mm	131.8	157.0	169.4	193.3
A	With Encoder	in	5.19	6.17	6.67	7.61
		mm	131.8	157.0	169.4	193.3

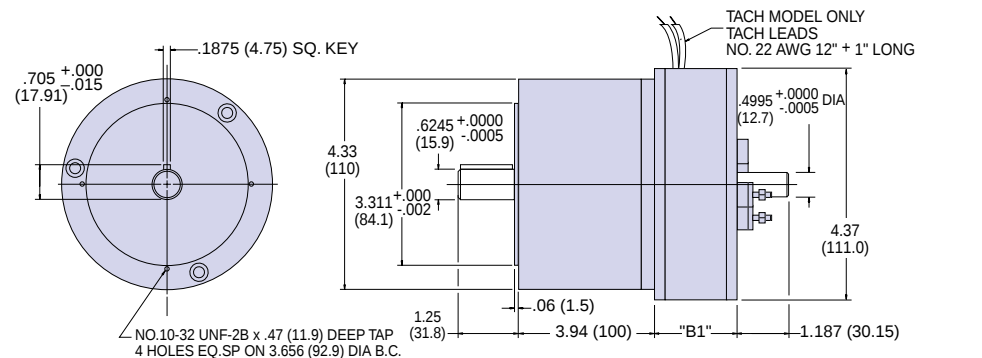
Motor Connector - MS3102A16S-IP

Encoder Connector - MS3102A18-IP

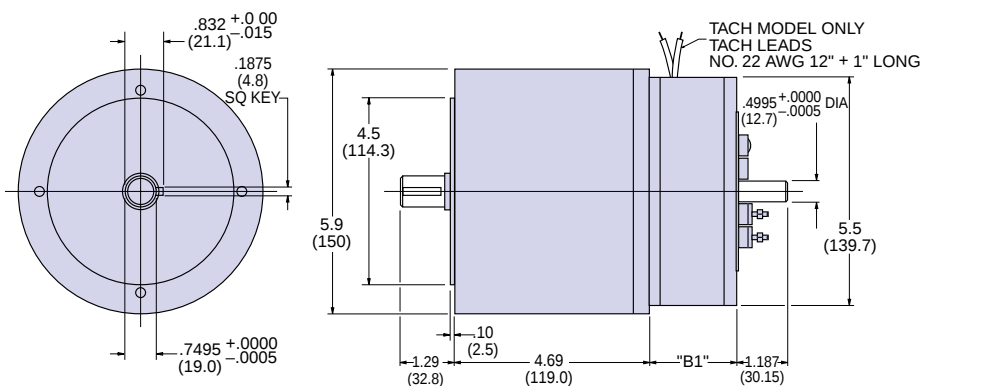
Revex Gearmotor Series ServoDisc

DIMENSIONS

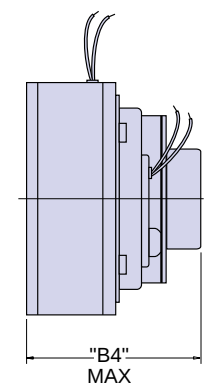
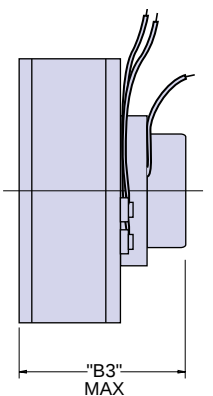
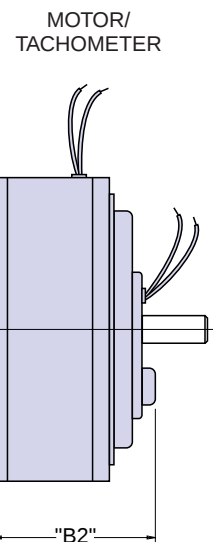
U-SERIES



Gearmotor		B1	B2	B3	B4
U9M4/GH9	in	1.84	2.78	3.32	3.98
	mm	46.74	70.6	84.4	101.1
U9M4T/GH9	in	1.86	—	3.34	—
	mm	47.20	—	84.8	—
U9M4HT/GH9	in	2.41	—	3.89	—
	mm	61.12	—	98.8	—



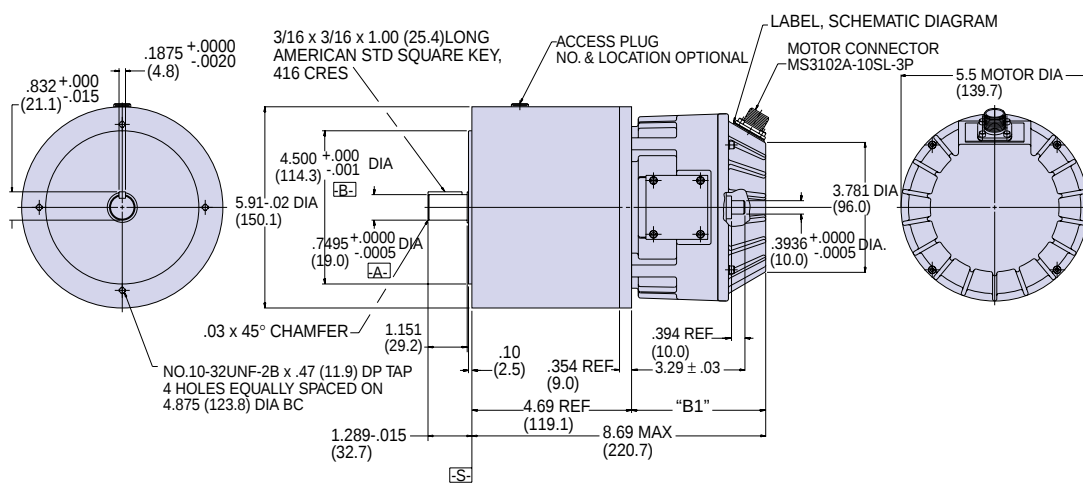
Gearmotor		B1	B2	B3	B4
U12M4/GH12	in	2.11	3.05	3.59	4.25
	mm	53.59	77.5	91.2	108
U12M4H/GH12	in	2.78	3.72	4.26	4.92
	mm	70.61	94.5	108.25	125
U12M4T/GH12	in	2.11	—	3.59	—
	mm	53.6	—	91.2	—
U12M4HT/GH12	in	2.81	—	4.28	—
	mm	71.4	—	108.7	—



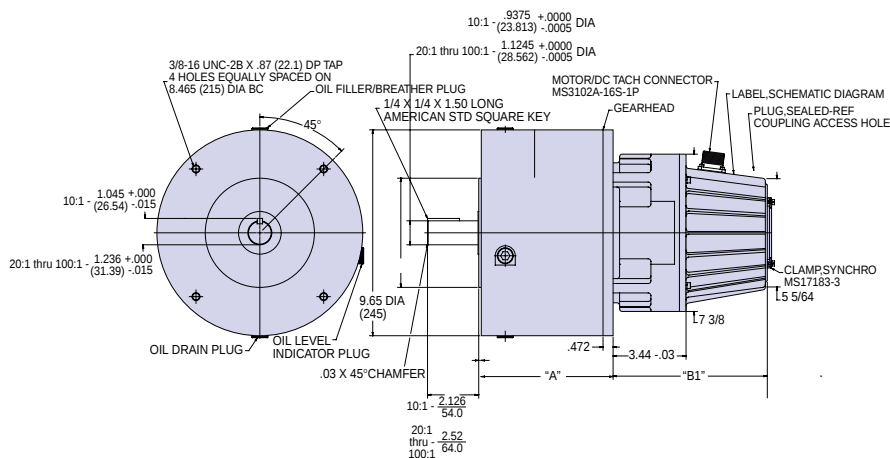
Revex Gearmotor Series ServoDisc

DIMENSIONS

JR12/GH12



JR16/GH16



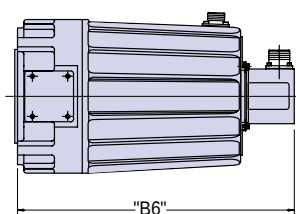
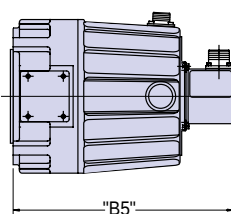
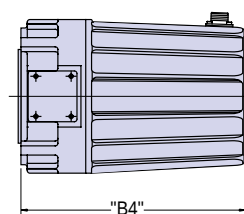
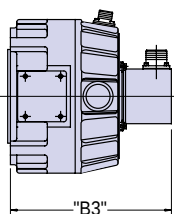
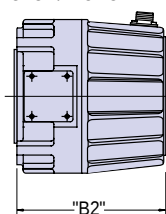
MOTOR/BRAKE
OR
MOTOR/TACHOMETER

MOTOR/ENCODER

MOTOR/TACHOMETER/BRAKE

MOTOR/TACHOMETER/ENCODER
OR
MOTOR/ENCODER/BRAKE

MOTOR/TACHOMETER/BRAKE/ENCODER

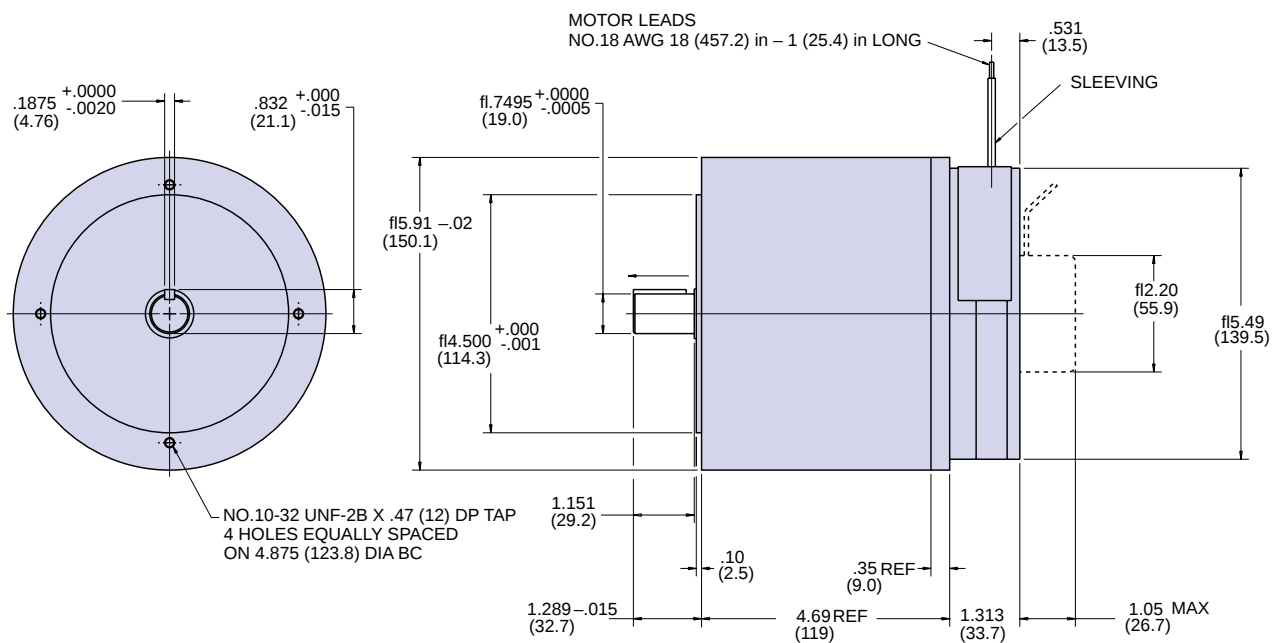


Gearmotor		A					B					
		10:1	20:1	40:1	60:1	100:1	1	2	3	4	5	6
JR12M4CH/GH12	in	4.685	4.685	4.685	4.685	4.685	3.94	5.77	7.20	8.49	9.26	11.07
	mm	119.0	119.0	119.0	119.0	119.0	100.1	146.6	182.9	215.6	235.2	281.2
JR16M4CH/GH16	in	5.20	6.20	6.20	6.20	6.20	4.50	6.34	7.77	9.06	9.81	11.62
	mm	132.1	157.5	157.5	157.5	157.5	114.3	161.0	197.4	230.1	249.1	295.1

Revex Gearmotor Series ServoDisc

DIMENSIONS

N-SERIES (N9)

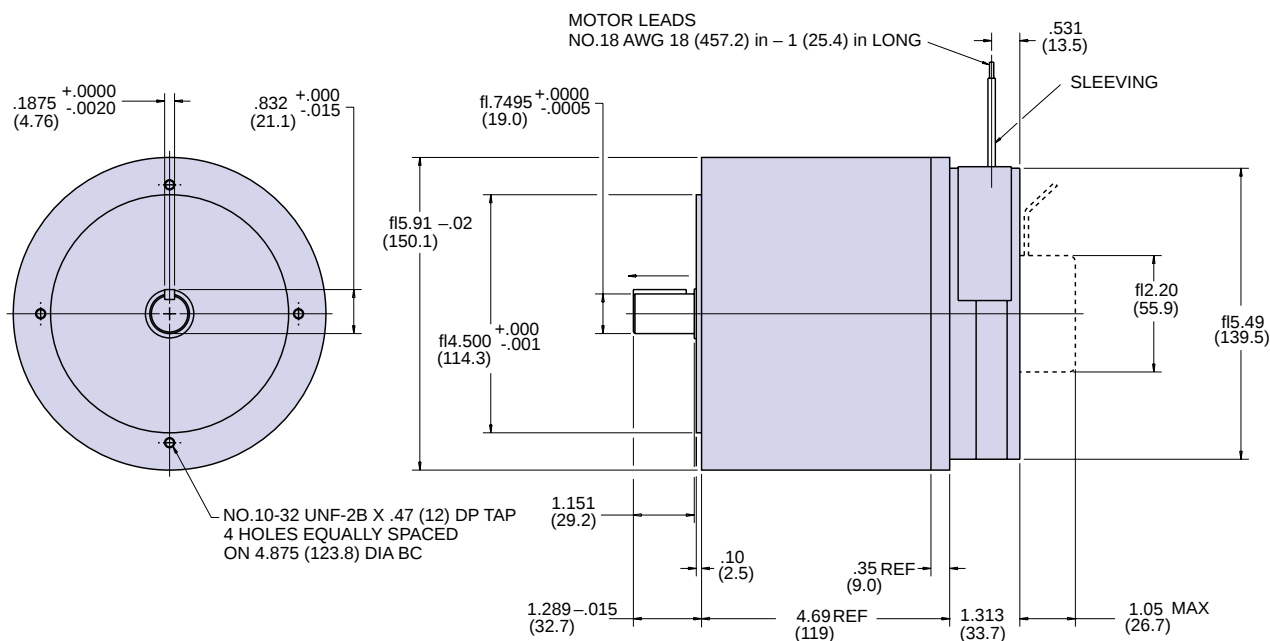


N9M4/GH9/M23			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	0.93	0.95	2.43	2.45
		mm	23.6	24.1	61.7	62.2
B (max)	With Encoder	in	1.98	2.00	3.48	3.50
		mm	50.3	50.8	88.4	88.9

Revex Gearmotor Series ServoDisc

DIMENSIONS

N-SERIES (N12)



N12M4/GH12/M23			Motor	Motor/Tachometer	Motor/Brake	Motor/Brake Tachometer
A	Without Encoder	in	1.06	1.09	2.87	2.90
		mm	26.9	27.7	72.9	73.7
B (max)	With Encoder	in	2.11	2.14	3.92	3.95
		mm	53.6	54.4	99.6	100.3

		Units	GH6	GH9	GH12	GH16
1.0	Max Inertia (2)	oz-in-sec ²	10.9x10 ⁻⁴	5.90x10 ⁻³	22.46x10 ⁻³	86.5x10 ⁻³
		g-cm ²	77	417	1586	6108
2.0	Radial Load	lbs	47	135	134	430
2.1	Distance from Mounting Surface	in	.71	.69	.93	1.7
3.0	Axial Load	lbs	52	126	253	762
4.0	Basic Weight (3)	lbs	4.3-5.0	8.2-12.7	18.5-24.7	50.5-67.5
5.0	Basic Length (3)	in	2.3-2.8	3.94	4.68	5.2-6.5

Notes:

1. Mounted on 8" x 16" x 3/8" aluminum heatsink.
2. Motor plus gearhead, measured at motor shaft.
3. Weights and lengths will vary with options.
4. Gearmotors can be mounted in any position.

Revex Gearmotor Series ServoDisc

OPTIONS

TACHOMETER SPECIFICATIONS

Tachometer/Motor Types	9FA4T/U-Series	F9T/JR-Series
1.0 Output voltage (Volts/kRPM)	2.5	3.0
2.0 Max ripple peak to peak (%)*	5.0	4.0
3.0 Linearity referred to 3600 RPM (%)	0.06	0.05
4.0 Bi-directional tolerance (%)	3.0%	1.5
5.0 Output impedance (ohm)	1.18	1.0
6.0 Moment of inertia (oz-in-sec ²)	0.0024	0.005
7.0 Temperature coefficient (%/°C Rise)	-0.19	-0.02
8.0 Recommended load resistance (ohms)	2500 Min.	2000 Min.

*With 500 Hz low pass filter.

BRAKE SPECIFICATIONS

Brake Types/Motor Types	BRK/JR-Series
1.0 DC voltage (Volts) (90V in option)	24
2.0 Input power @ 20°C nominal (Watts)	25 Max
3.0 Holding torque (in-lb)	70.8
4.0 Additional inertia (oz-in-sec ²)	0.0064

Notes:

1. Brakes are electrically released.
2. Brakes are intended for power loss situations or to hold motor when at a standstill.

ENCODER SPECIFICATIONS

(For U-Series, use Model #M23 for JR-Series; use Model #BA251.) (See Feedback Section for more detailed information.)

1.0 Resolution	Up to 2540 cycles per revolution
2.0 Frequency response (kHz)	100
3.0 Output format	Quadrature channels and index
4.0 Phasing	90° ± 20° max
5.0 Output levels (5, 12 and 15 Volts)	TTL and CMOS compatible
6.0 Input power	5, 12, and 15 volts 150 ma max
7.0 Moment of inertia (oz-in-sec ²)	
M23	0.0001
BA251	0.00045

Indurex Gearmotor Series ServoDisc

PERFORMANCE DATA

Gearmotor Types		Rated Speed (RPM)	Continuous Torque (in-lb/N-m)	Peak Torque (in-lb./N-m)	Gear Ratio	Motor Voltage (Volts)	Motor Current (amps)
1.0	JR24M4CH/KR16-4	818	281/31.7	842/95	3.67:1	139.7	26.0
2.0	JR24M4CH/KR16-5	605	379/42.8	1138/128	4.96:1	139.7	26.0
3.0	JR24M4CH/KR16-6	467	491/55.4	1473/166	6.42:1	139.7	26.0
4.0	JR24M4CH/KR16-7	435	528/59.7	1583/178	6.90:1	139.7	26.0
5.0	JR16M4CH/KR16-10	301	269/30.4	806/91.1	9.96:1	127.4	9.6
6.0	JR24M4CH/KR16-10	301	762/86.1	2286/258	9.96:1	139.7	26.0
7.0	JR24M4CH/KR16-20	153	1498/169	3700/418	19.58:1	139.7	26.0
8.0	JR16M4CH/KR16-20	150	528/59.7	1614/182	19.58:1	129.4	9.6
9.0	JR16M4CH/KR16-40	77	1022	3067/346	39.17:1	129.4	9.6
10.0	JR16M4CH/KR16-60	53	1488/168	4464/504	57.01:1	129.4	9.6
11.0	JR16M4CH/KR16-80	38	2055/232	6000/678	78.76:1	129.4	9.6
12.0	JR16M4CH/KR16-100	30	2580/291	6180/698	98.87:1	129.4	9.6

		Units	JR16M4CH/KR16	JR24M4CH/KR16
1.0	Max Inertia (2)	oz-in-sec ²	0.097	0.535
		kg-cm ²	6.849	37.78
2.0	Radial Load	lb	500	272
2.1	Distance from Mounting Surface	in	1	1
3.0	Axial Load (5)	lb	114	71
4.0	Basic Weight (3)	lb	42	84
5.0	Basic Length (3)	in	10.7	13

Notes:

- Mounted on 16" x 16" x 3/8" (JR16), 21" x 21" x 1/2" (JR24) aluminum heatsink.
- Motor plus gearhead, measured at motor shaft.
- Weights and lengths will vary with options.
- Gearmotors can be mounted in any position.
- Axial Load combined with specified Radial Load.

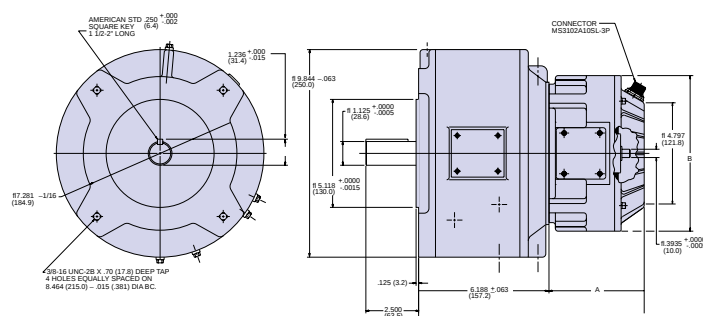
Indurex Gearmotor Series ServoDisc

OPTIONS

JR16M4CH/JR24M4CH

Gearmotor		A*	B
JR16M4CH	in	5.00	7.38
	mm	127.0	187.4
JR24M4CH	in	6.78	11.09
	mm	172.2	281.7

*Dimension will change depending on options chosen.



TACHOMETER SPECIFICATIONS

Tachometer Types	F9T	W6T6	W6T19
1.0 Output voltage (Volts/kRPM)	3	6	19
2.0 Max ripple peak to peak (%)	4	3	2
3.0 Linearity referred to 3600 RPM (%)	0.05	1	1
4.0 Bi-directional tolerance (%)	±1.5	±1	±1
5.0 Output impedance (ohms)	1.0	5.4	26.0
6.0 Moment of inertia (oz-in-sec ²)	0.005	0.008	0.008
7.0 Temperature coefficient (%/°C Rise)	-0.020	-0.045	-0.045
8.0 Recommended load resistance (ohms)	2000 Min.	350 Min.	2600 Min.
9.0 Friction torque (oz-in)	3	3	3
10.0 Weight (lb)	2.2	1.5	1.5

*With 500 Hz low pass filter.

BRAKE SPECIFICATIONS

Motor Types	JR16M4CH	JR24M4CH
1.0 DC voltage (Volts) (90V in option)	24	24
2.0 Input power @ 20°C nominal (Watts)	25 Max	27 Max
3.0 Holding torque (in-lb)	70.8	180.0
4.0 Additional inertia (oz-in-sec ²)	0.0064	0.0210
5.0 Disengagement time (millisec)	70	70
6.0 Engagement time (millisec)	30	30
7.0 Weight (lb)	2.5	5.0

Notes:

1. Brakes are electrically released.
2. Brakes are intended for power loss situations or to hold motor when at a standstill.

BA251 ENCODER SPECIFICATIONS

(See Feedback Section for more detailed information.)

1.0 Resolution	Up to 2540 cycles per revolution (500 for sinewave)
2.0 Frequency response (kHz)	100
3.0 Output format	Quadrature channels and index
4.0 Phasing	90° ± 20° max
5.0 Output levels (5, 12 and 15 Volts)	TTL and CMOS compatible
6.0 Input power	5, 12, and 15 volts 150 ma max
7.0 Moment of inertia (oz-in-sec ²)	0.00045
8.0 Weight	17 oz (max)

Ferrite Series ServoDisc

PERFORMANCE DATA

Gearmotor Types		Rated Speed (RPM)	Continuous Torque (in-lb/N-m)	Peak Torque (in-lb/N-m)	Gear Ratio	Motor Voltage (Volts)	Motor Current (amps)
10:1	9FGCHD/10:1	315	8.0/0.9	32	9.53:1	13.8	6.2
10:1	9FGCHDT/10:1	315	7.5/0.8	32/3.6	9.53:1	13.8	6.2
15:1	9FGT/15:1	208	8.0/0.9	16/1.8	14.4:1	11.4	5.2
	9FG/15:1	208	9.9/1.1	16/1.8	14.4:1	12.4	5.2
	9FGHDT/15:1	200	12/1.4	36/4.1	15.1:1	14.4	6.6
	9FGHD/15:1	200	13.6/1.5	36/4.1	15.1:1	14.6	6.7
	9FGCHD/15:1	200	12.8/1.4	38/4.3	15.1:1	13.8	6.2
	9FGCHDT/15:1	199	12/1.4	38/4.3	15.11:1	13.8	6.2
	12FGT/15:1	189	27.9/3.2	68/7.7	16.06:1	19.4	7.4
	12FG/15:1	189	31.2/3.5	68/7.7	16.06:1	21.2	6.9
25:1	9FGT/25:1	125	13.4/1.5	26/2.9	24:1	11.4	5.2
	9FG/25:1	125	16.5/1.9	26/2.9	24:1	12.4	5.2
	9FGHDT/25:1	116	19.2/2.2	62/7	25.85:1	14.4	6.6
	9FGHD/25:1	116	22/2.5	62/7	25.85:1	14.6	6.7
	9FGCHD/25:1	116	20.6/2.3	69/7.3	25.85:1	13.8	6.2
	9FGCHDT/25:1	116	19.2/2.2	65/7.3	25.85:1	13.8	6.2
	12FGT/25:1	123	42.8/4.8	103/11.6	24.48:1	19.4	7.4
	12FG/25:1	123	47.2/5.3	103/11.6	24.48:1	21.2	6.9
37:1	12FGT/37:1	81	64.5/7.3	156/17.6	36.99:1	19.4	7.4
	12FG/37:1	81	72/8.1	156/17.6	36.99:1	21.2	6.9
50:1	9FGHDT/50:1	61	36/4.1	116/13.1	48.96:1	14.4	6.6
	9FGHD/50:1	61	42/4.7	116/13.1	48.96:1	14.6	6.7
	9FGT/50:1	60	27.5/3.1	49/5.6	48.95:1	11.4	5.2
	9FG/50:1	60	33.7/3.8	49/5.5	48.95:1	12.4	5.2
	9FGCHD/50:1	61	39/4.4	124/14	48.96:1	13.8	6.2
	9FGCHDT/50:1	61	36.4/4.1	124/14	48.96:1	13.8	6.2
	12FGT/50:1	60	87/9.8	210/23.7	49.96:1	19.4	7.4
	12FG/50:1	60	97/11	210/23.7	49.96:1	21.2	6.9
80:1	9FGT/80:1	38	44.3/5	59/6.7	77.29:1	11.4	5.2
	9FGHDT/80:1	38	56.8/6.4	149/16.8	79.2:1	14.4	6.6
	9FG/80:1	38	53.2/6	59/6.7	77.29:1	12.4	5.2
	9FGHD/80:1	38	65/7.3	149/16.8	79.2:1	14.6	6.7
	9FGCHD/80:1	38	60/6.8	120	79.2:1	13.0	6.2
	9FGCHDT/80:1	38	56.8/6.4	120/13.6	79.20:1	13.0	16.2
	12FGT/80:1	36	139/15.7	229/25.9	82.73:1	19.4	7.4
	12FG/80:1	36	155/17.5	229/25.9	82.73:1	21.2	6.9
100:1	9FGT/100:1	31	50/5.6	94/10.6	95.93:1	11.4	5.2
	9FG/100:1	31	59/6.7	94/10.6	95.93:1	12.2	5.0
	9FGHDT/100:1	30	71/8.0	151/17.1	99:1	14.6	6.6
	9FGHD/100:1	30	81.2/9.2	151/17.1	99:1	14.5	6.7
	9FGCHD/100:1	30	60/6.8	121	99.0:1	12.0	5.1
	9FGCHDT/100:1	30	60/6.8	120/13.6	99.0:1	12.0	5.1
	12FGT/100:1	30	169/19.1	237/26.8	99.77:1	19.4	7.4
	12FG/100:1	30	187/21.1	237/26.8	99.77:1	21.2	6.9
150:1	9FG/150:1	21	59/6.7	94/10.6	148.54:1	10.9	3.7
	9FGT/150:1	21	59/6.7	94/10.6	148.54:1	10.5	4.3
	9FGHD/150:1	20	92/10.4	152/17.2	148.51:1	12.9	5.2
	9FGHDT/150:1	20	92/10.4	152/17.2	148.51:1	13.6	6.0
	9FGCHD/150:1	20	60/6.8	125	148.5:1	10.8	3.8
	9FGCHDT/150:1	20	60/6.8	120/13.6	148.5:1	10.8	3.8
	12FG/150:1	21	200/22.6	243/27.5	153:1	19.2	5.2
	12FGT/150:1	21	200/22.6	243/27.5	153:1	17.8	6.0

Legend: FG - Gearmotor
 FGHD - Gearmotor, Heavy Duty
 GFCHD - Gearmotor, Compact Heavy Duty

FGT - Gearmotor, Integral Tachometer
 FGHDT - Gearmotor, Heavy Duty, Integral Tachometer

Ferrite Series ServoDisc

PERFORMANCE DATA

		Units	9FG	9FGT	9FGHD	9FGCHD	9FGHDT	12FG	12FGT
1.0	Maximum Inertia (2)	oz-in-sec ²	0.0052	0.0082	0.0052	0.0053	0.0082	0.0192	0.0252
		g-cm ²	367	579	367	374	579	1356	1780
2.0	Radial Load @	lb	25	25	70	30 to 50	70	125	125
	Distance from Mounting Surf.	in	0.75	0.75	0.75	0.75	0.75	1.00	1.00
3.0	Axial Load	lb	5	5	80	45 to 55	80	150	150
4.0	Basic Weight (3)	lb	3.30	3.50	3.20	3.2	3.40	5.85	6.20
5.0	Basic Length (3)	in	1.92	2.00	2.81	2.29	2.88	3.75	3.80

Motor electrical and mechanical specifications are subject to change without notice. Please consult a Kollmorgen Sales Office.

Notes:

1. Mounted on 8" x 16" x 3/8" aluminum heatsink. Office.
2. Motor plus gearhead, measured at motor shaft.
3. Weights and lengths will vary with options. Please consult a Kollmorgen Sales Office.
4. Gearmotors can be mounted in any position.

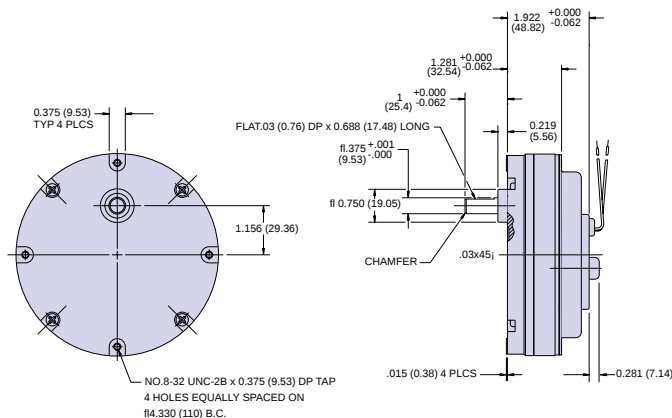
FERRITE GEARMOTOR OPTIONS

- Rear Shaft Extension
- Prepared for Encoder
- M23 Optical Encoder (See Options Section for details)
- Intergal Analog Tachometer
- Brake

Ferrite Series ServoDisc

DIMENSIONS

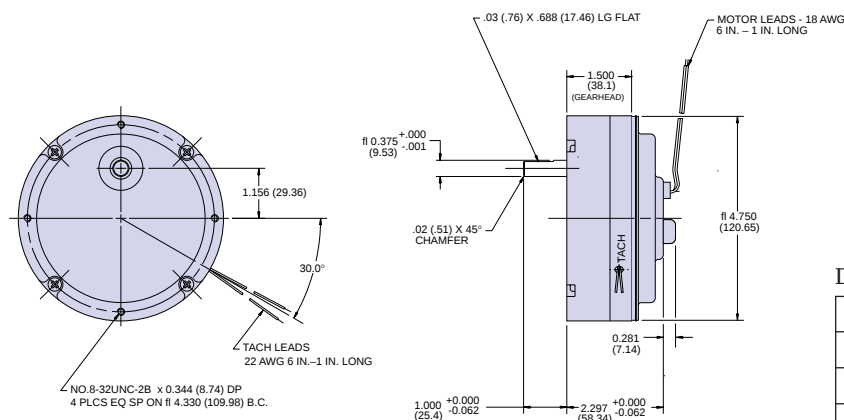
9FG, 9FGT



Dimensions in inches.

Models	9FG	9FGT
A	1.92 ± 0.06	2.00 ± 0.06
B	1.28 ± 0.06	1.34 ± 0.06

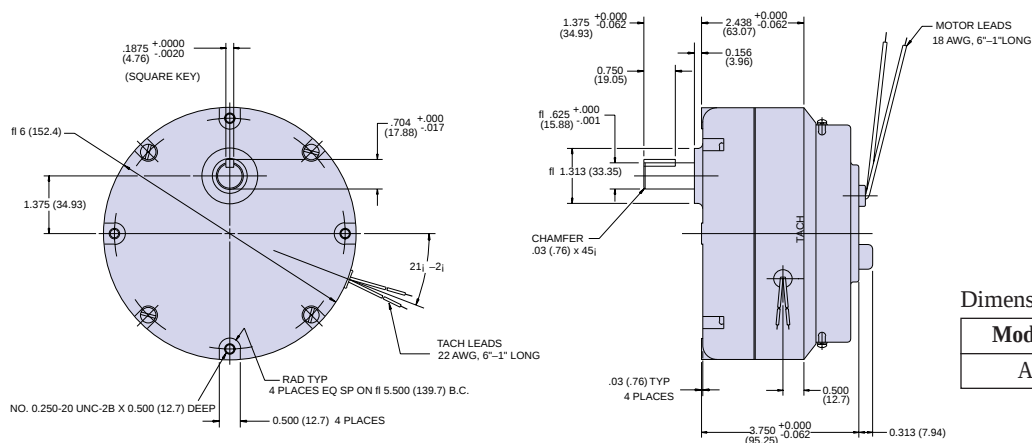
9FGHD, 9FGCHD, 9FGHDT (Heavy Duty and Compact Models)



Dimensions in inches.

Models	9FGHD	9FGCHD	9FGHDT
A	2.81 ± 0.06	2.29 ± 0.06	2.88 ± 0.06
B	2.19 ± 0.06	1.65 ± 0.06	2.25 ± 0.06
C (DIA)	.500	.375	.500

12FG, 12FGT

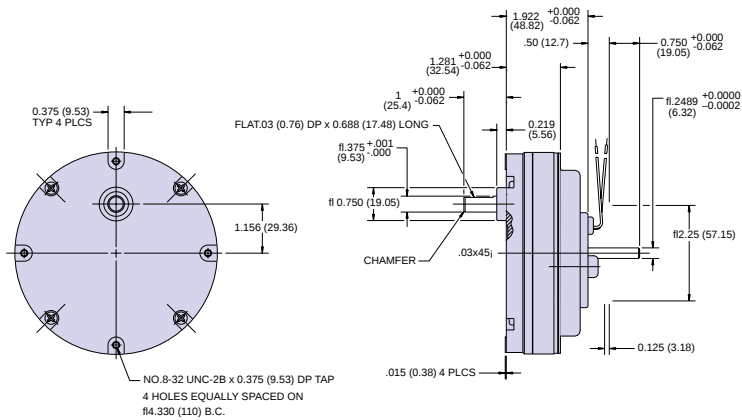


Dimensions in inches.

Models	12FG	12FGT
A	3.75 ± 0.06	3.80 ± 0.06

DIMENSIONS - Rear Shaft Extension

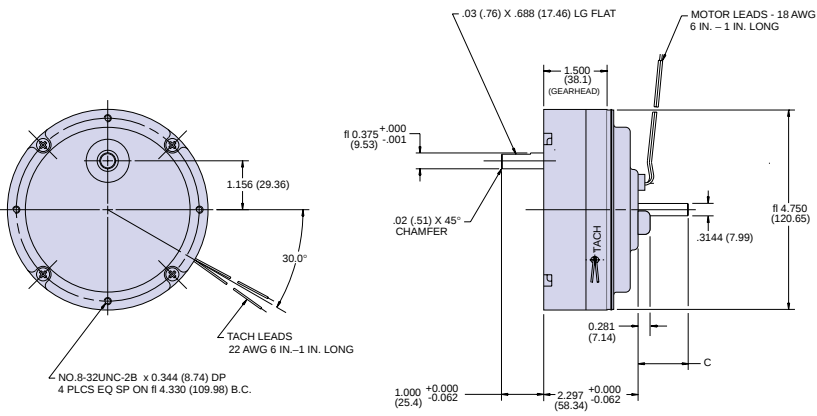
9FG, 9FGT



Dimensions in inches.

Models	9FG	9FGT
A	1.92 $\pm$.06	2.00 $\pm$.06
B	1.28 $\pm$.06	1.34 $\pm$.06
C	1.06 $\pm$.06	1.25 $\pm$.06

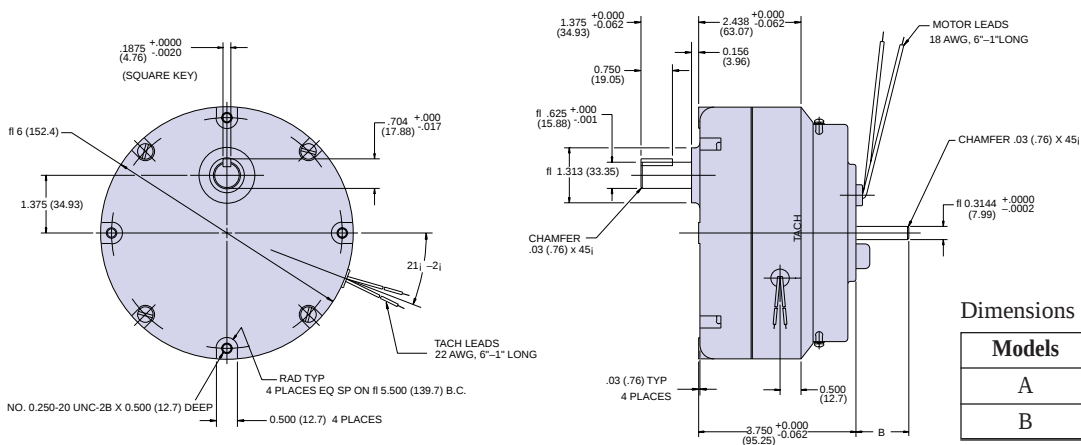
9FGHD, 9FGHDT, 9FGCHD (Heavy Duty and Compact Models)



Dimensions in inches.

Models	9FGHD	9FGHDT	9FGCHD	9FGCHDT
A	2.81 $\pm$.06	2.88 $\pm$.06	2.29	2.31
B	2.19 $\pm$.06	2.25 $\pm$.06	1.65	1.67
C	1.23 $\pm$.03	1.20 $\pm$.03	1.23	1.20
D (DIA)	.500	.500	.375	.375

12FG, 12FGT



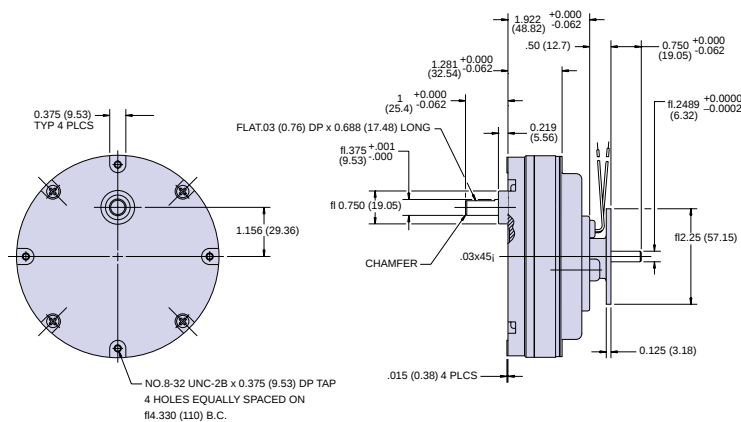
Dimensions in inches.

Models	12FG	12FGT
A	3.75 $\pm$.06	3.80 $\pm$.06
B	1.06 $\pm$.06	1.50 $\pm$.06

Ferrite Series SeroDisc

DIMENSIONS - Prepared for Encoder

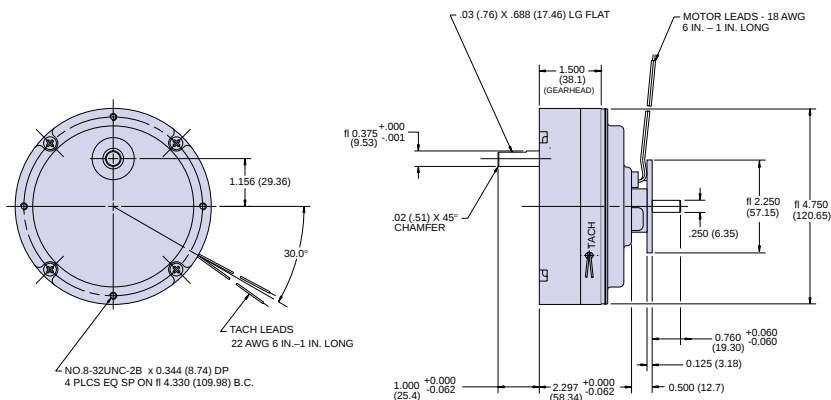
9FG, 9FGT



Dimensions in inches.

Models	9FG	9FGT
A	1.92 $\pm$.06	2.00 $\pm$.06
B	1.28 $\pm$.06	1.34 $\pm$.06

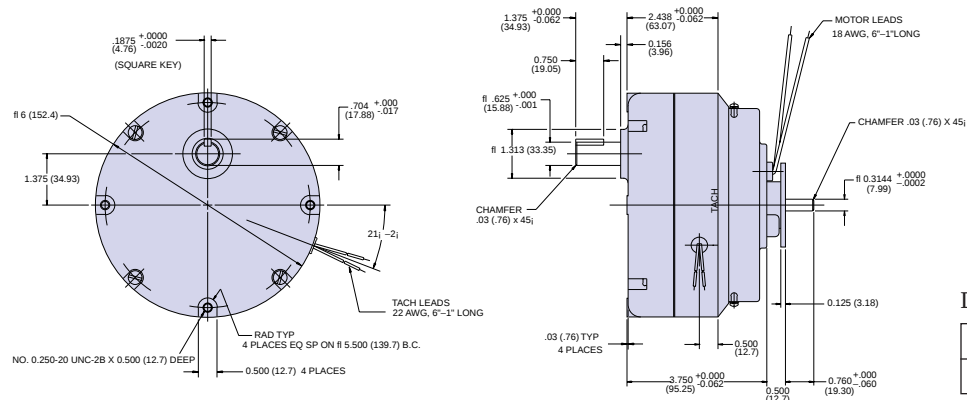
9FGHD, 9FGCHD, 9FGHDT, 9FGCHDT (Heavy Duty and Compact Models)



Dimensions in inches.

Models	9FGHD	9FGCHD	9FGHDT	9FGCHDT
A	2.81 $\pm$.06	2.29 $\pm$.06	2.88 $\pm$.06	2.31
B	2.19 $\pm$.06	1.65 $\pm$.06	2.25 $\pm$.06	1.67
C (DIA)	.500	.375	.500	.375

12FG, 12FGT



Dimensions in inches.

Models	12FG	12FGT
A	3.75 ± 0.06	3.80 ± 0.06

DIMENSIONS - with Encoder

0.375 (9.53)
TYP 4 PLCS

1.156 (29.36)

FLAT.03 (0.76) DP x 0.688 (17.48) LONG

1.281 +0.000
(32.54) -0.062

1 +0.000
(25.4) -0.062

0.219 (5.56)

1.05 (26.67)

0.125 (3.18)

0.03x45

CHAMFER

0.015 (0.38) 4 PLCS

1.922 +0.000
(48.82) -0.062

0.50 (12.7)

1.375 +0.001
(9.53) -0.000

1.750 (19.05)

NO.8-32 UNC-2B x 0.375 (9.53) DP TAP
4 HOLES EQUALLY SPACED ON
1#4.330 (110) B.C.

Models	9FG	9FGT
A	1.92 $\pm$.06	2.00 $\pm$.06
B	1.28 $\pm$.06	1.34 $\pm$.06

Technical drawings of the motor assembly showing front and side views with dimensions and callouts.

Front View Dimensions:

- Overall diameter: 1.156 (29.36)
- Inner diameter: 0.375 (+0.000 / -9.53)
- Outer diameter: 0.3 (76) X .688 (17.46) LG FLAT
- Inner diameter: 0.2 (51) X .45 CHAMFER
- Inner diameter: 1.000 (+0.000 / -25.4)
- Inner diameter: 2.287 (+0.000 / -56.34)
- Inner diameter: 0.950 (24.13) MAX
- Inner diameter: 0.130 (3.30)
- Inner diameter: 0.500 (12.7)

Side View Dimensions:

- Overall length: 6 IN. - 1 IN. LONG
- Encoder leads: ENCODER LEADS-24 AWG 18 IN. - 1 IN. LONG
- Motor leads: MOTOR LEADS - 18 AWG 6 IN. - 1 IN. LONG
- Gearhead length: 1.500 (38.1) (GEARHEAD)
- Shaft diameter: 0.200 (50.8)
- Shaft diameter: 0.475 (120.65)
- Shaft diameter: 0.950 (24.13) MAX
- Shaft diameter: 0.130 (3.30)
- Shaft diameter: 0.500 (12.7)

Callouts:

- TACH LEADS 22 AWG 6 IN.-1 IN. LONG
- 4 NO.8-32UNC-2B x 0.344 (8.74) DP
- 4 PLCS EQ SP ON # 4.330 (109.98) B.C.

Models	9FGHD	9FGHDT	9FGCHD	9FGCHDT
A	2.81 $\pm$.06	2.88 $\pm$.06	2.29	2.31
B	2.19 $\pm$.06	2.25 $\pm$.06	1.65	1.67
C (DIA)	.500	.500	.375	.375

[illegible]

Models	12FG	12FGT
A	$3.75 \pm .06$	$3.80 \pm .06$

Disk armature technology brings new dimensions of performance to dc servo motor applications

Where it works best

Certain types of applications are naturals for ServoDisc technology. Let's look at the categories where the benefits are the greatest.

a) Fast moves

Incremental motion (rapid, repetitive moves) is a natural for the outstanding acceleration of these products. If you need to make many moves a second, this is the right technology. If you must get to speed quickly or stop quickly, ServoDisc will do it best.

b) Smooth Rotation

ServoDisc products are perfect when precise and smooth speed control is required. Applications such as tape or film handling or recording, machining, rotating mirrors or scanners. The total lack of cogging and the rapid response of these motors gives near perfect rotation.

c) Operation over a wide speed range

If you need 1 rpm, then 1000, then 4000, no other product can deliver the precise rotation, constant torque and trouble-free commutation which are characteristic of ServoDisc products. Low speed is not limited by cogging and high speed is not limited by arcing and commutation problems.

d) Compact Size

When space is at a premium, the unique ServoDisc package may be the answer. Its flat profile and high power output make it easier to design in than conventional motors. This may be just the edge you need to put your design ahead of the competition.

A Track Record of Success

The unique technology and superior performance of the ServoDisc motor make it the best choice for a tremendous range of servo applications. Increased throughput, better accuracy, improved packaging, longer life; these are just a few of the benefits that can be realized with this exciting technology.

a) Automation and robotics

Speed and acceleration capabilities separate ServoDisc motors from the conventional motor pack. Apply these products to packaging, sorting, labeling, component insertion, precision winding...any application where throughput is critical. Compact size and high torque make these motors ideal for robot axis drives. Compact ServoDisc precision gearmotors combine exceptional performance with innovative packaging. The same features make them great for robotic positioning tables.

b) Instrumentation

Superior technology is called for when performance and accuracy are critical. Inspection equipment, x-y stages,

chromatography equipment, ultrasonic and optical scanners, plotters, shutter actuation...all of these applications can benefit from the rapid response and precise motion which is characteristic of ServoDisc products.

c) Process control

Extraordinary responsiveness and cog-free rotation have earned ServoDisc products an important niche in process control applications. They can deliver fast, accurate metering of chemicals or fluids. The unparalleled smoothness is perfect for handling continuous materials such as tape, film, paper, textiles or optical fibers. In fact any application involving continuous webs is a natural for this technology. Which accounts for its extensive use in the film, paper, printing and textile industries. Textile applications also include fabric cutting and stitching equipment.

d) Information handling

No cogging and the ability to maintain precise speed and phase lock are perfect features for audio, video, analog and digital recording. ServoDisc motors have an impressive track record in tape mastering and duplication equipment, instrumentation recorders and studio-grade recording equipment. They have also made their mark in the growing video disk industry.

e) Biomedical equipment

Portability, reliability and superior performance have made a name for ServoDisc motors in many medical life-support analysis applications. Blood pumps, blood analyzers, kidney dialysis, respirators and ultrasonic scanners are all candidates for this advanced technology.

f) Semiconductor manufacturing

ServoDisc motors are an excellent match for the demanding performance requirements of the semiconductor manufacturing industry. For die and wire bonding, wafer handling, cleaning, testing and dicing, and laser trimming, the high throughput, perfectly smooth rotation and precision of these motors can really crank up productivity.

g) Business automation

Demand is increasing in the business community for increased performance and productivity from office automation equipment. The application of ServoDisc technology to check sorters, im printers, document readers, high speed printers and collating equipment has answered the call.

h) Military applications

Rugged design, reliability, long life, compact packaging and outstanding performance have put ServoDisc products in the front lines. Gun turrets, gun loaders, fire control drives, smoke generators and antenna rotation drives are just some of the applications where we serve.
