920, 930, 940 SERIES

Precision Motor Potentiometers

BI Motor Potentiometers use a precision potentiometer connected to a DC motor by a gear box and clutch. There are eight potentiometer types and 15 gear ratios available combined with a 10,700 RPM motor.

In addition, motor potentiometers with special features such as center-taps, multi-taps, special shafts, and special gear ratios, etc., can be provided on special orders. Several potentiometer sections can be ganged on a single rotor potentiometer shaft.

SPECIFICATIONS

Motor Potentiometer Model	922	927	929	931
Potentiometer Model	6671	8146	8211	A
# of Turns	1	10	1	10
Element Type	Conductive Plastic	Hybrid	Hybrid	Wirewound
Potentiometer Mounting Style	Bushing	Bushing	Bushing	Bushing
Resistance Range, Ohms	1K-300K	1K-100K	1K-25K	10-500K
Diameter	2”	7/8”	2”	1 -13/16”
Linearity	±0.25%	±0.25%	±0.5%	<300Ω: ±0.5% ≥300Ω: ±0.25%
No. of Gangs, Max.	3	2	3	3

Motor Potentiometer Model	933	936	937	949
Potentiometer Model	C	7283	7286	5611
# of Turns	3	10	10	1
Element Type	Wirewound	Wirewound	Wirewound	Wirewound
Potentiometer Mounting Style	Bushing	Servo	Bushing	Bushing
Resistance Range, Ohms	100-100K	100-100K	100-100K	1K - 50K
Diameter	1-13/16”	7/8”	7/8”	2”
Linearity	±0.5% ≥1KΩ:0.20%	≤75Ω:±0.50%	±0.25%	<50Ω: ±1.0% ≥50Ω: ±0.5%
No. of Gangs, Max.	3	2	2	3

Specifications subject to change without notice.
Refer to potentiometer data sheet for complete specifications.

MOTOR SPECIFICATIONS

Rotor Temperature, °C	22
Input Voltage Range, Vdc	Vis to 9.0
Input Voltage, Nominal, Vdc	6.0*
Power Input @ Stall (6 Vdc), Watts	1.8
No Load Current, mA	≤7
Armature Resistance, Ohms	20
No Load Speed @ Max. Volts, RPM	16,000
No Load Speed (6.0 Vdc, RPM)	10,700
Mechanical Time constant @ Max. Supply Voltage, Sec.	0.032
Starting Voltage, Vdc	0.3
Torque Constant, oz.-in.	0.749
Torque Stall (6.0 Vdc), oz.-in. Max.	0.22
Torque Continuous Duty (Gear Box), oz.-in. Max.	3
Moment of Inertia, oz.-in. /Sec^2	5.6 x 10^{-6}
Motor Pot Life Expectancy @ Rated Torque, Hours	5,000
Slip Friction Setting, oz.-in., Nominal	12
Life Reduction per Load Torque Beyond Rating, Estimated Hours	643 (T_L^{-3})

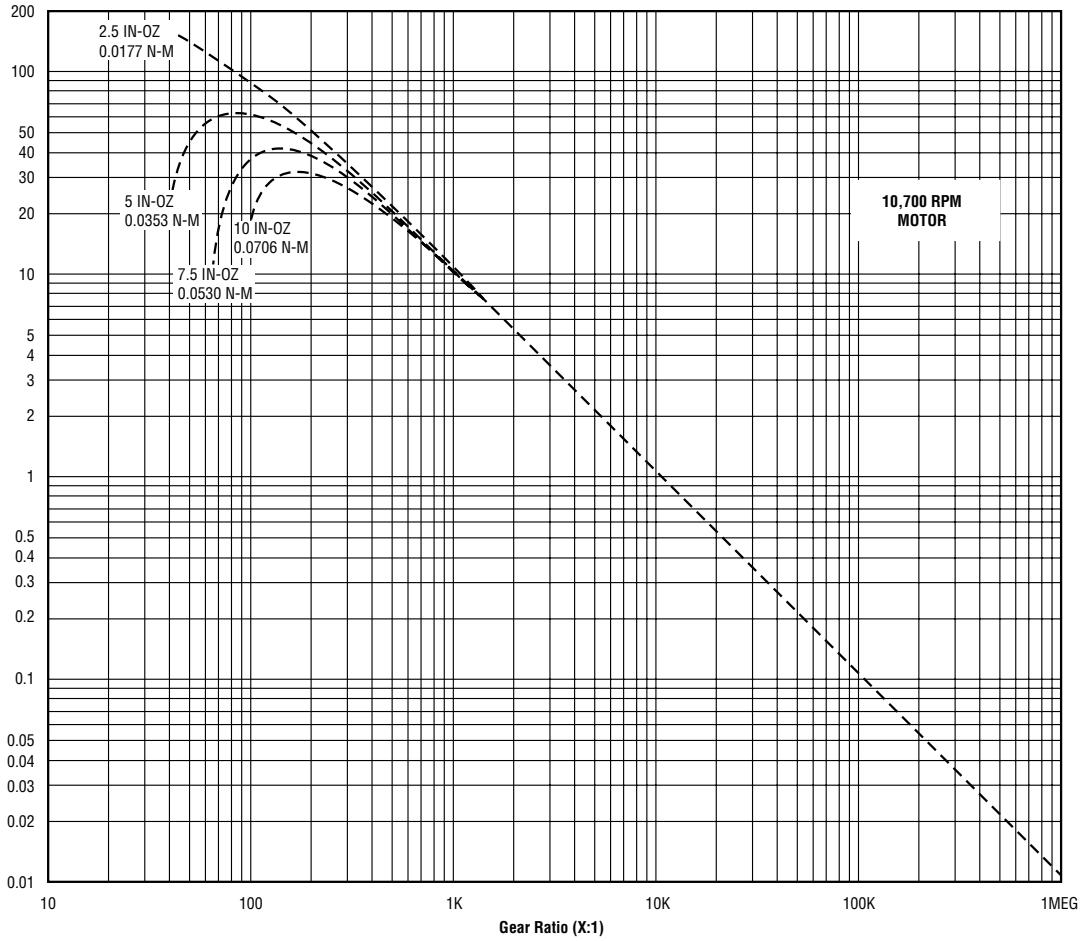
*Input voltage in continuous stall and 22°C ambient.

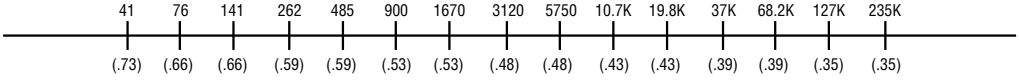
GEAR RATIO SPECIFICATIONS

Gear Ratio (N)	Output Speed (RPM)	Efficiency (e)	Backlash Max. (B)	Direction(D)**
41:1†	261	.73	4°	CW
76:1	141	.66	4°	CCW
141:1†	76	.66	4°	CCW
262:1†	41	.59	4°	CW
485:1	22	.59	4°	CW
900:1	12	.53	4°	CCW
1,670:1	6.4	.53	4°	CCW
3,101:1	3.5	.48	4°	CW
5,752:1	1.9	.48	4°	CW
10,683:1	1.0	.43	4°	CW
19,813:1	0.54	.43	4°	CCW
36,796:1	0.29	.39	4°	CW
68,245:1	0.17	.39	4°	CW
126,741:1	0.08	.35	4°	CCW
235,067:1	0.05	.35	4°	CCW

** Direction of shaft rotation with "+" voltage to red lead.
† Stocked ratios.

Output Speed vs. Gear Ration at various Load Torques

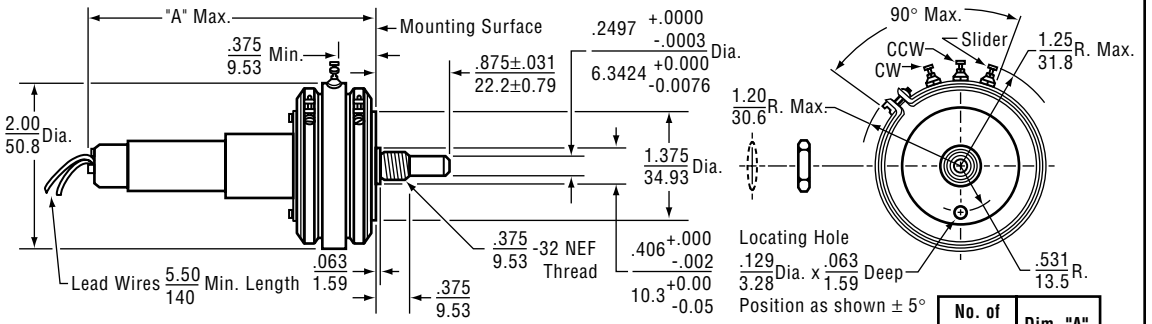




Specific Ratios (Efficiency)

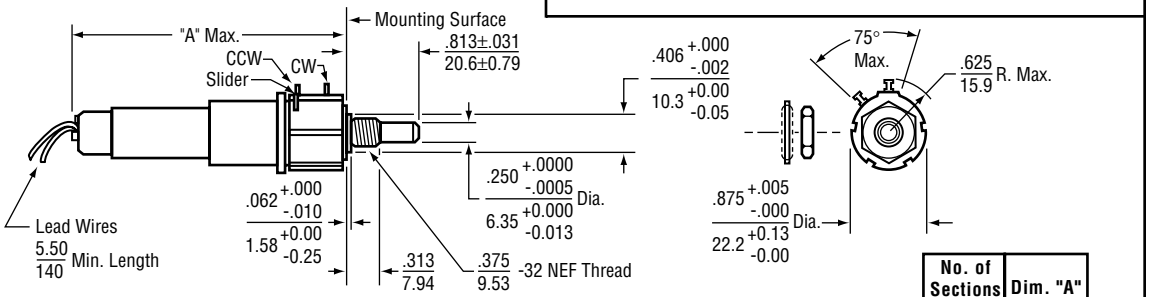
OUTLINE DIMENSIONS (Inch/mm)

Models 922, 929 & 949
(Potentiometer Models 6671 & 5611)



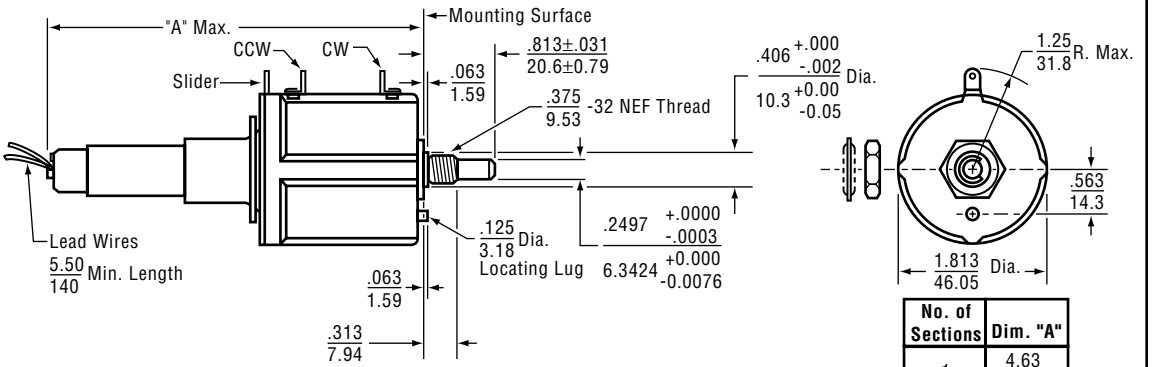
No. of Sections	Dim. "A"
1	3.55 / 90.2
2	4.11 / 104
3	4.68 / 119

Models 927 & 937
(Potentiometer Models 8146 & 7286)



No. of Sections	Dim. "A"
1	3.55 / 90.2
2	4.11 / 104

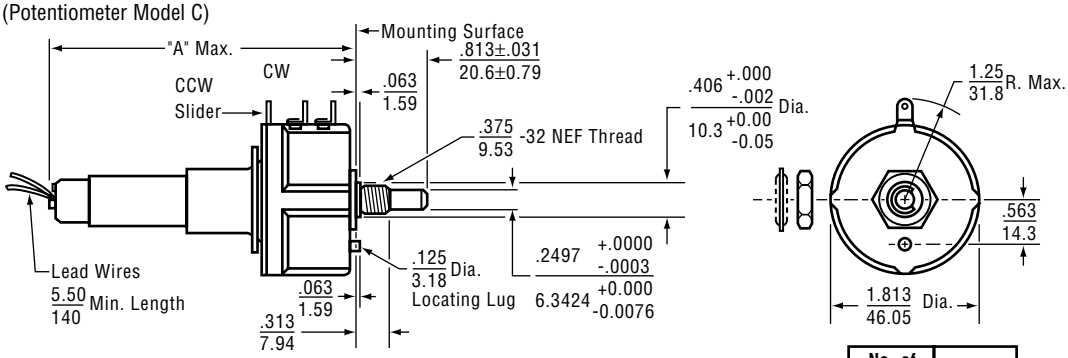
Model 931
(Potentiometer Model A)



No. of Sections	Dim. "A"
1	4.63 / 118
2	6.83 / 174
3	8.73 / 222

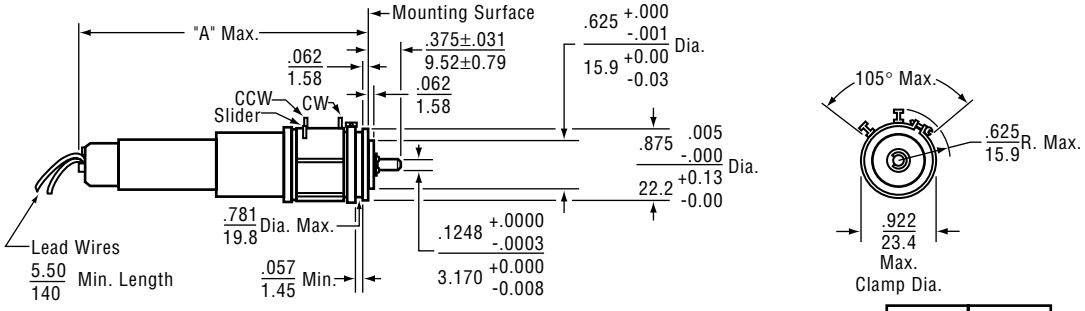
OUTLINE DIMENSIONS (Inch/mm)

Model 933
(Potentiometer Model C)



No. of Sections	Dim. "A"
1	3.70 / 95.8
2	5.05 / 129
3	6.09 / 155

Model 936
(Potentiometer Model 7283)



No. of Sections	Dim. "A"
1	3.50 / 88.9
2	4.19 / 106

MOTOR POT AND LOAD PERFORMANCE CALCULATIONS

e	=	Gear ratio Efficiency
J_l	=	Load inertia (oz. in.-sec^2)
J_m	=	Motor inertia (oz. in.-sec^2)
J_t	=	Total inertia at motor shaft (oz. in.-sec^2)
K_t	=	Motor torque constant (oz. in./A)
N	=	Gear ratio (N:1)
R_a	=	Armature d-c resistance (ohms)
S_{ni}	=	No load motor speed at rated voltage (RPM)
S_o	=	Slew velocity (RPM)
t	=	Travel time (seconds)
T_l	=	Load torque (oz. in.) Must include pot
t_m	=	Mechanical time constant (seconds)
T_s	=	Motor stall torque at rated voltage (oz. in.)
V_s	=	Motor no load starting voltage (Vdc)
V_{ls}	=	Start torque of motor and load Vdc)
V_t	=	Terminal voltage (Vdc)
θ	=	Degrees traveled

1. To determine motor and load starting voltage:

$$V_{is} = V_s + \frac{6T_l}{eNT_s}$$

2. To determine slew velocity at terminal voltage:

$$S_o = \frac{SnlVt}{6\mathrm{Ts}\mathrm{N}}\left(Ts - \frac{T_1}{eN}\right)$$

3. To determine gear ratio:

$$N = \frac{Snl}{2\mathrm{So}}\left(1 + \sqrt{1 - \frac{4TISo}{TsSnl}}\right)$$

4. To determine degrees traveled:

$$\theta = 6So[t - tm(1 + 2.72^{-t/tm})]$$

5. To determine mechanical time constant:

$$tm = \frac{RaJt}{7X10^{-3}\mathrm{Kt}^2}$$

Where:

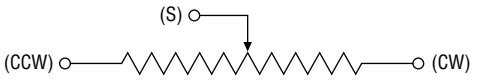
$$Jt = Jm + \frac{JI}{N^2}$$

ORDERING INFORMATION

927 R5K T 5 L.25 G485

- 927 — Model Series
- R5K — Resistance Value
- T 5 — Optional Non-Standard Tolerance
- L.25 — Linearity
- G485 — Gear Ratio

CIRCUIT DIAGRAM



NOTES

Metric equivalents, based on 1 inch = 25.4mm are rounded to the same number of significant figures as in the original English units and are provided for general information only.

Tolerances unless otherwise specified:
Linear = ± .01 inches
(.25mm)
Angular = ± 2 degrees