



Features

- Available in a variety of pin-out configurations
- Virtually infinite electrical circuit isolation
- Metal or plastic shaft options
- RoHS compliant*

Model 91, 92, 93, 94 & 95 - 5/8 " Square Single-Turn Panel Control

Initial Electrical Characteristics ¹	Conductive Plastic Element	Cermet Element
Standard Resistance Range		
Linear Tapers (A, B, E, & H).....	(B & E) 1 K ohms to 1 megohm.....	(A & H) 100 ohms to 1 megohm
Audio Tapers (C, D, F, G, S, & T).....	(D,G,S, & T) 1 K ohms to 1 megohm.....	(C & F) 1 K ohms to 1 megohm
Total Resistance Tolerance.....	10 % or 20 %.....	5% or 10%
Independent Linearity.....	±5 %.....	±5 %
Absolute Minimum Resistance.....	2 ohms maximum.....	2 ohms maximum
Effective Electrical Angle.....	(Linear tapers) 240 ° ± 5 °.....	(Linear tapers) 240 ° ± 6 °
	(Audio tapers) 225 ° ± 5 °.....	(Audio tapers) 225 ° ± 6 °
Contact Resistance Variation.....	±1 %.....	±1 % or 3 ohms (whichever is greater)
Dielectric Withstanding Voltage (MIL-STD-202, Method 301)		
Sea Level.....	1,500 VAC minimum.....	1,500 VAC minimum
70,000 Feet.....	500 VAC minimum.....	500 VAC minimum
Insulation Resistance (500 VDC).....	1,000 megohms minimum.....	1,000 megohms minimum
Power Rating (Voltage Limited By Power Dissipation or 350 VAC, Whichever Is Less)		
+70 °C Single Section Assembly.....	(Linear tapers) 1 watt.....	(Linear tapers) 2 watts
	(Audio tapers) 0.5 watt.....	(Audio tapers) 1 watt
+70 °C Multiple Section Assembly.....	(Linear tapers) 0.5 watt/section.....	(Linear tapers) 1 watt/section
	(Audio tapers) 0.25 watt/section.....	(Audio tapers) 0.5 watt/section
+125 °C.....	0 watt.....	0 watt
Theoretical Resolution.....	Essentially infinite.....	Essentially infinite
Environmental Characteristics ¹		
Operating Temperature Range.....	-40 °C to +125 °C.....	-40 °C to +125 °C
Storage Temperature Range.....	-55 °C to +125 °C.....	-55 °C to +125 °C
Temperature Coefficient Over Storage		
Temperature Range.....	±1,000 ppm/°C.....	±150 ppm/°C
Vibration (Single Section).....		
Total Resistance Shift.....	±2 % maximum.....	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum.....	±5 % maximum
Shock (Single Section).....		
Total Resistance Shift.....	±2 % maximum.....	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum.....	±5 % maximum
Load Life.....		
Total Resistance Shift.....	±10 % maximum.....	±5 % maximum
Rotational Life (No Load).....	100,000 cycles.....	100,000 cycles
Total Resistance Shift.....	(Linear tapers) 10 ohms or ±15 % TRS max.	(All tapers) ±5 % TRS max.
	(whichever is greater)	
	(Audio tapers) ±20 % maximum	
Contact Resistance Variation		
@ 50,000 cycles.....	(Linear tapers) ±2 %.....	±2 %
	(Audio tapers) ±3 %.....	±3 %
Moisture Resistance (MIL-STD-202, Method 103, Condition B)		
Total Resistance Shift.....	(Linear tapers) ±10 % TRS maximum.....	(All tapers) ±5 % TRS maximum
	(Audio tapers) ±20 % TRS maximum	
Insulation Resistance (500 VDC).....	100 megohms minimum.....	100 megohms minimum
IP Rating.....	IP 40.....	IP 40

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.
Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.
Users should verify actual device performance in their specific applications.

Model 91, 92, 93, 94 & 95 - 5/8 " Square Single-Turn Panel Control

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Mechanical Characteristics¹

Stop Strength (1/4 " D shaft)	45.19 N-cm (4 lb.-in.)
(1/8 " D shaft)	33.89 N-cm (3 lb.-in.)
Mechanical Angle.....	300 ° ±5 °
Torque	
Starting	0.3 max. above average running torque
Running Torque	
Single or Dual Section (A & R Bushings)	0.21 to 1.06 N-cm (0.3 to 1.5 oz.-in.)
Single or Dual Section (C & U Bushings)	0.14 to 1.06 N-cm (0.2 to 1.5 oz.-in.)
Mounting	1.7-2.0 N-m (15-18 lb.-in.) maximum
Variation.....	0.35 N-cm (0.5 oz.-in.) maximum in 45 ° shaft travel
Weight (Single Section, Metal Bushing).....	12.7 grams nominal
(Each Additional Section)	4 grams nominal
Terminals	Printed circuit terminals, J-Hooks or solder lugs
Soldering Condition	Recommended hand soldering using Sn95/Ag5 no clean solder, 0.025 " wire diameter.
	Maximum temperature 399 °C (750 °F) for 3 seconds. No wash process to be used with no clean flux.
Marking	Manufacturer's trademark, date code, resistance, manufacturer's part number
Ganging (Multiple Section Potentiometers).....	2 cups maximum
Hardware.....	One lockwasher and one mounting nut is shipped with each potentiometer, except where noted in the part number.

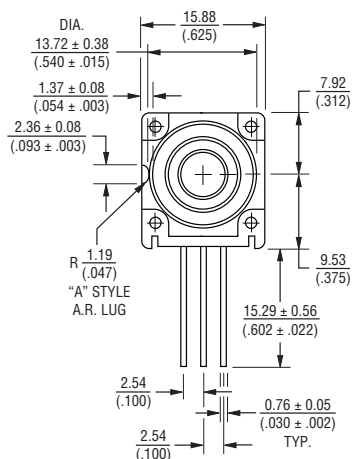
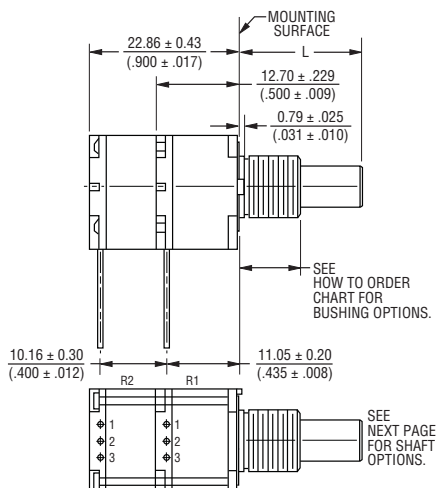
NOTE: Performance specifications do not apply to units subjected to printed circuit board cleaning procedures.

¹At room ambient: +25 °C nominal and 50 % relative humidity nominal, except as noted.

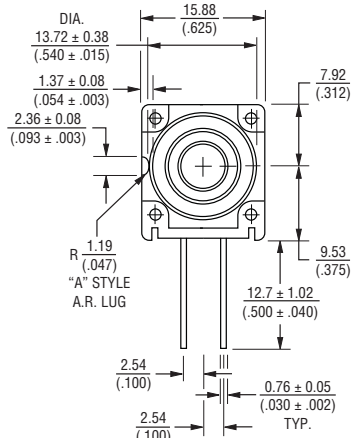
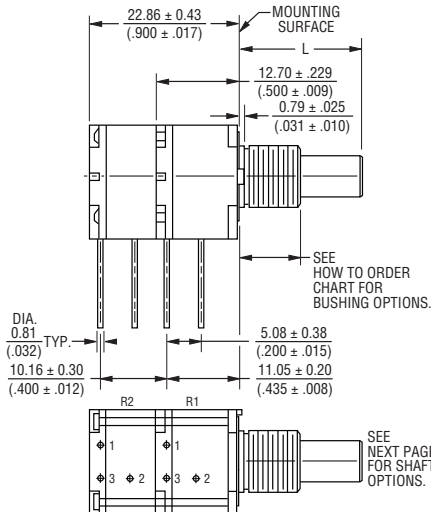
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Product Dimensions

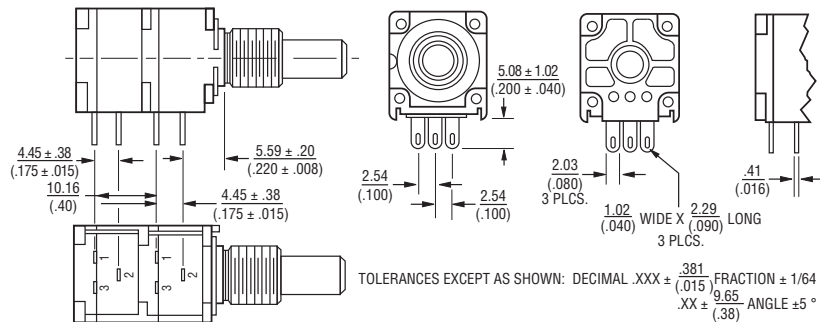
Model 91 PC Pin Terminals, In-Line



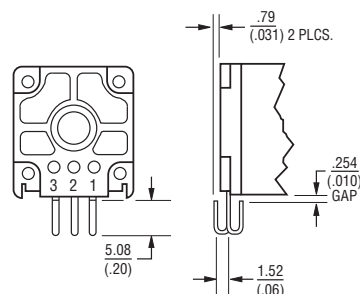
Model 93 PC Pin Terminals, "L" Pattern



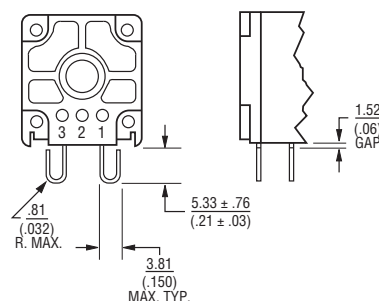
Model 95 Solder Lug Terminals, "Triangular" Pattern



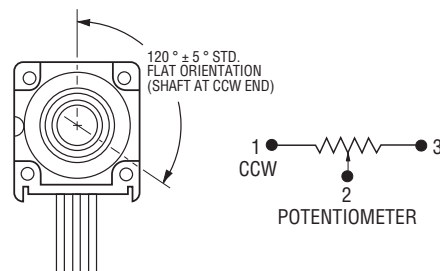
Model 92 J-Hooked Terminals, In-Line



Model 94 J-Hooked Terminals, "L" Pattern



Shaft Flat Orientation



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Product Dimensions

Plastic Shaft Styles

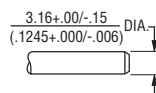
SHAFT TYPE "B" (USES BUSHING A)



STD. LENGTHS:

12.70 (.500)	15.88 (.625)	19.05 (.750)	22.23 (.875)
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SHAFT TYPE "D" (USES BUSHING C)



STD. LENGTHS:

12.70 (.500)	15.88 (.625)	19.05 (.750)
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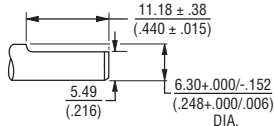
SHAFT TYPE "T" (USES BUSHING U)



STD. LENGTHS:

16.0 (.630)	22.0 (.866)
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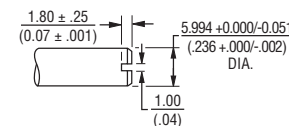
SHAFT TYPE "C" (USES BUSHING A)



STD. LENGTHS:

19.05 (.750)	22.23 (.875)
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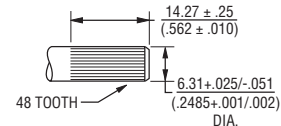
SHAFT TYPE "R" (USES BUSHING R)



STD. LENGTHS:

16.0 (.630)	22.0 (.866)
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SHAFT TYPE "W" (USES BUSHING A)

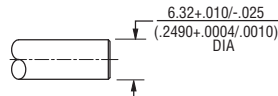


STD. LENGTHS:

25.40 (1.00)

Metal Shaft Styles

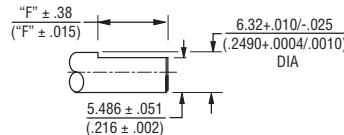
SHAFT TYPE "A" (USES BUSHING A)



STD. LENGTHS:

12.70 (.500)	15.88 (.625)	19.05 (.750)	22.23 (.875)	25.4 (1.000)
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SHAFT TYPE "H" (USES BUSHING A)



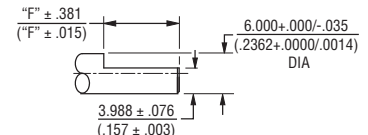
STD. LENGTHS:

19.05 (.750)	22.23 (.875)
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FLAT LENGTH "F":

7.95 (.313)	11.13 (.438)
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SHAFT TYPE "S" (USES BUSHING R)



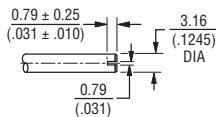
STD. LENGTHS:

16.0 (.630)	22.0 (.866)
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FLAT LENGTH "F":

6.99 (.275)	12.98 (.511)
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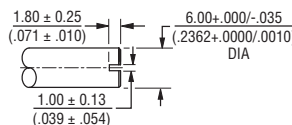
SHAFT TYPE "E" (USES BUSHING C)



STD. LENGTHS:

12.0 (.500)	16.0 (.625)	19.0 (.750)
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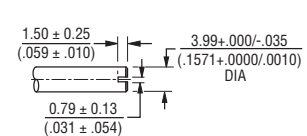
SHAFT TYPE "J" (USES BUSHING R)



STD. LENGTHS:

16.0 (.630)	22.0 (.866)
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SHAFT TYPE "V" (USES BUSHING U)



STD. LENGTHS:

16.0 (.630)	22.0 (.866)
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SHAFT TYPE "G" (USES BUSHING A)



STD. LENGTHS:

12.70 (.500)	15.88 (.625)	19.05 (.750)	22.23 (.875)
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TOLERANCES EXCEPT AS SHOWN: .XX = ± .02
 .XXX = ± .005
 .XXXX = ± .0005
 .0127

DIMENSIONS: $\frac{\text{MM}}{\text{(INCHES)}}$

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How to Order Model 91, 92, 93, 94 & 95 Panel Controls

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91 A 2 A - A 28 - A 15 / A15 L

Part number for multiple section potentiometers must have a taper and resistance value for each section.

ANTI-ROTATION LUG

A	Single .305 " (7.8 mm) R, 90 °CW
D	No Lug

SECTIONS

1	Single
2	Dual

BUSHING

A	Metal Plain 3/8 " (9.53 mm) D x 3/8 " (9.53 mm) L
C	Metal Plain 1/4 " (6.35 mm) D x 1/4 " (6.35 mm) L
R	Metal Plain 10 mm D x 9 mm L
U	Metal Plain 7 mm D x 9 mm L

MODEL

91	Single-Turn, In-Line PC Pins
92	Single-Turn, In-Line J-Hooks
93	Single-Turn, L-Pattern PC Pins
94	Single-Turn, L-Pattern J-Hooks
95	Single-Turn, Triangle-Pattern Solder Lugs

SHAFT LENGTH (FMS)

Code	Description	AVAILABLE ONLY IN BUSHING Code
16	1/2 "L	A, C
20	5/8 "L	A, C
24	3/4 "L	A, C
28	7/8 "L	A
32	1 "L	A

METRIC

16	16 mmL	R, U
22	22 mmL	R, U

SHAFT TYPE

		AVAILABLE ONLY IN	
		LENGTHS (CODE)	BUSHINGS (CODE)
B	Plastic Single Slotted 1/4 " (6.35 mm) D	16, 20, 24, 28	A
C	Plastic Single Flatted 1/4" (6.35 mm) D	24, 28	A
D	Plastic Single Plain 1/8" (3.18 mm) D	16, 20, 24	C
R	Plastic Single Slotted 6 mm D	Metric 16, 22	R
T	Plastic Single Slotted 4 mm D	Metric 16, 22	U
W	Plastic Single Knurled 1/4" (6.35 mm) D	32	A
A	Metal Single Plain 1/4" (6.35 mm) D	16, 20, 24	A
E	Metal Single Slotted 1/8" (3.18 mm) D	16, 20, 24	C
G	Metal Single Slotted 1/4" (6.35 mm) D	16, 20, 24, 28	A
H	Metal Single Flatted 1/4" (6.35 mm) D	24, 28	A
J	Metal Single Slotted 6 mm D	Metric 16, 22	R
S	Metal Single Flatted 6 mm D	Metric 16, 22	R
V	Metal Single Slotted 4 mm D	Metric 16, 22	U

ELEMENT TAPER TYPE/TOLERANCE

(A)	Linear Cermet ±10 %
(H)	Linear Cermet ±5 %
(B)	Linear C-P ±20 %
(E)	Linear C-P ±10 %
(C)	CW Audio Cermet ±10 %
(D)	CW Audio C-P ±20 %
(F)	CCW Audio Cermet ±10 %
(G)	CCW Audio C-P ±20 %
(S)	CW Audio C-P ±10 %
(T)	CCW Audio C-P ± 10 %

RESISTANCE CODE VALUE IN OHMS

(05) - 100	(30) - 15 K
(28) - 150	(16) - 20 K
(06) - 200	(17) - 25 K
(07) - 250	(18) - 50 K
(08) - 500	(20) - 100 K
(10) - 1 K	(21) - 200 K
(11) - 2 K	(22) - 250 K
(12) - 2.5 K	(23) - 500 K
(13) - 5 K	(25) - 1 M
(15) - 10 K	
(10) - 1 K	(18) - 50 K
(12) - 2.5 K	(20) - 100 K
(13) - 5 K	(22) - 250 K
(15) - 10 K	(23) - 500 K
(16) - 20 K	(25) - 1 M
(17) - 25 K	
(10) - 1 K	(18) - 50 K
(12) - 2.5 K	(20) - 100 K
(13) - 5 K	(22) - 250 K
(15) - 10 K	(23) - 500 K
(17) - 25 K	(25) - 1 M

RoHS IDENTIFIER

L	Compliant
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Boldface features are Bourns standard options. All others are available with higher minimum order quantities.