

Features

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

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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 Characteristics¹		
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)	15 G	15 G
Total Resistance Shift.....	±2 % maximum	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum	±5 % maximum
Shock (Single Section).....	30 G.....	30 G
Total Resistance Shift.....	±2 % maximum	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum	±5 % maximum
Load Life.....	1,000 hours	1,000 hours
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
Moisture Sensitivity Level	1.....	1
ESD Classification (HBM).....	N/A.....	N/A



WARNING
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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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 (Bushing A: H-37-2 & H-38-2; Bushing C: H-37-1 & H-38-1; Bushing R: H-37-4 & H-38-9; Bushing U: H-37-3 & H-38-8)

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

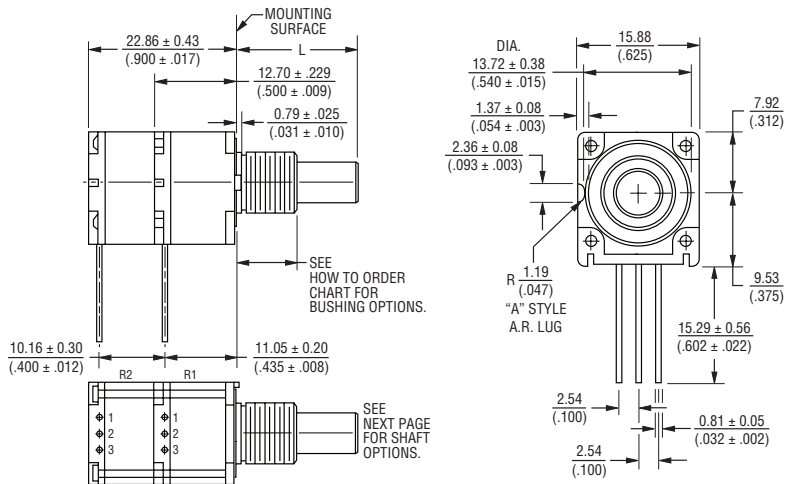
¹Electrical specifications tested at 200 RPM, at room ambient: +25 °C nominal.

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

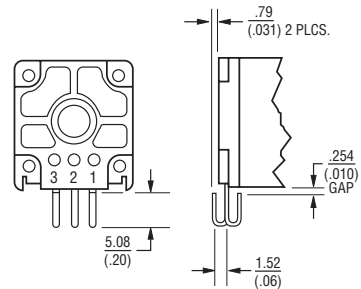
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Product Dimensions

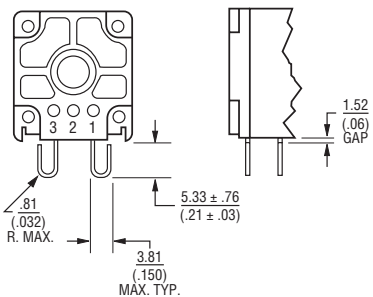
Model 91 PC Pin Terminals, In-Line



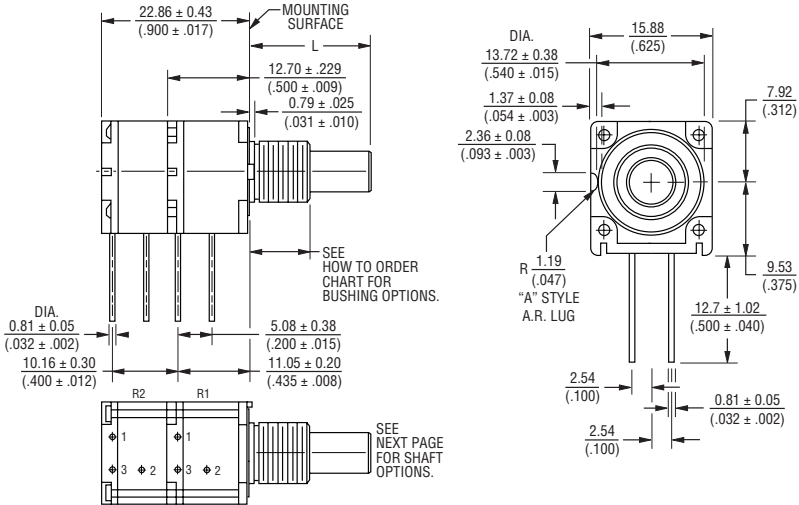
Model 92 J-Hooked Terminals, In-Line



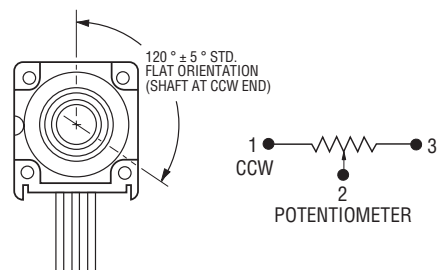
Model 94 J-Hooked Terminals, "L" Pattern



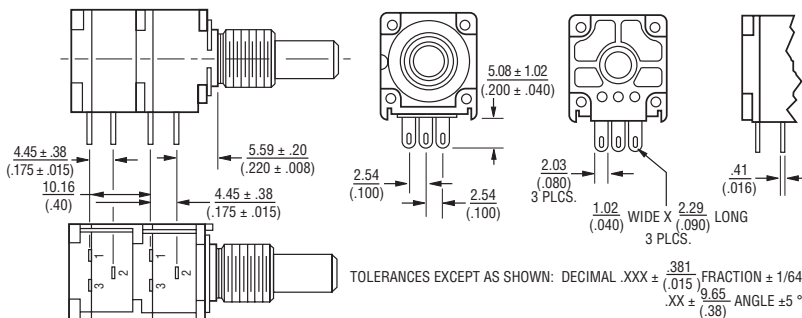
Model 93 PC Pin Terminals, "L" Pattern



Shaft Flat Orientation



Model 95 Solder Lug Terminals, "Triangular" Pattern



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

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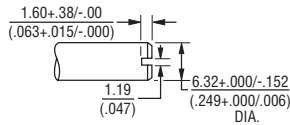
Model 91, 92, 93, 94 & 95 – 5/8" Square Single-Turn Panel Control

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Product Dimensions

Plastic Shaft Styles

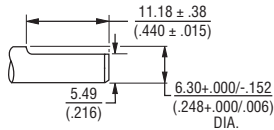
SHAFT TYPE "B" (USES BUSHING A)



STD. LENGTHS:

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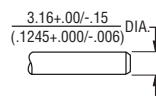
SHAFT TYPE "C" (USES BUSHING A)



STD. LENGTHS:

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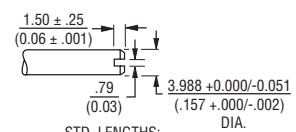
SHAFT TYPE "D" (USES BUSHING C)



STD. LENGTHS:

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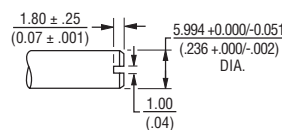
SHAFT TYPE "T" (USES BUSHING U)



STD. LENGTHS:

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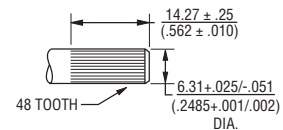
SHAFT TYPE "R" (USES BUSHING R)



STD. LENGTHS:

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

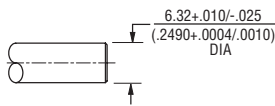


STD. LENGTHS:

25.40 (1.00)

Metal Shaft Styles

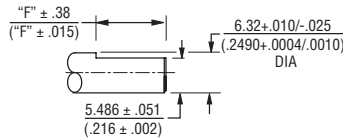
SHAFT TYPE "A" (USES BUSHING A)



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)



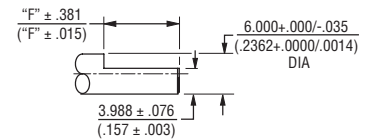
STD. LENGTHS:

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)



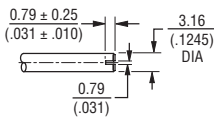
STD. LENGTHS:

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

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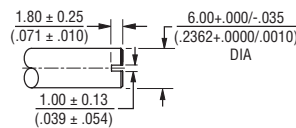
SHAFT TYPE "E" (USES BUSHING C)



STD. LENGTHS:

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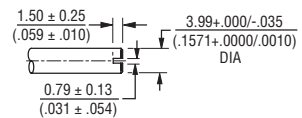
SHAFT TYPE "J" (USES BUSHING R)



STD. LENGTHS:

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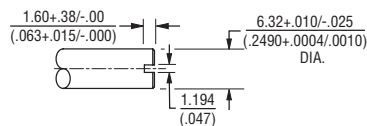
SHAFT TYPE "V" (USES BUSHING U)



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
 (.050)
 .XXX = ± .005
 (.127)
 .XXXX = ± .0005
 (.0127)

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

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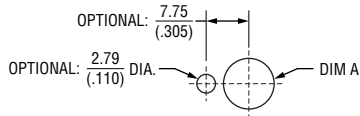
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Model 91, 92, 93, 94 & 95 – 5/8" Square Single-Turn Panel Control

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Suggested Panel Layout



BUSHING	DIM A
A	$\frac{9.91}{(.39)}$
C	$\frac{6.73}{(.265)}$
R	$\frac{10.5}{(.413)}$
U	$\frac{7.5}{(.295)}$

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

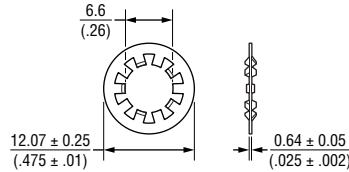
Date Code Description

YYWWMM

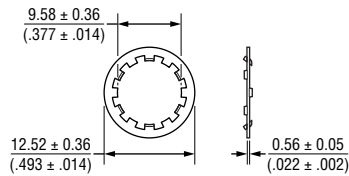
- M = COUNTRY OF MANUFACTURE (MEXICO)
- WW = WEEK NUMBER
- YY = LAST TWO DIGITS OF YEAR MANUFACTURED

Hardware

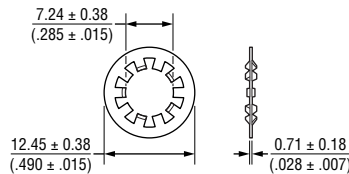
LOCKWASHER H-37-1



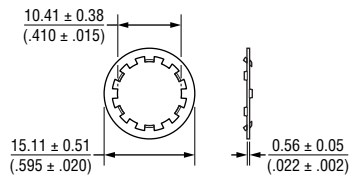
LOCKWASHER H-37-2



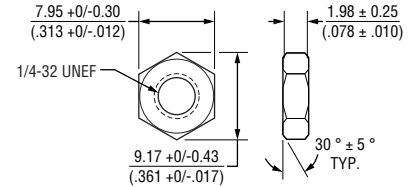
LOCKWASHER H-37-3



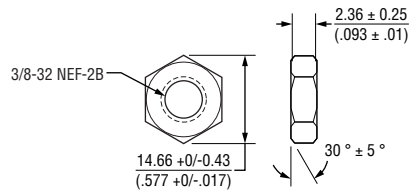
LOCKWASHER H-37-4



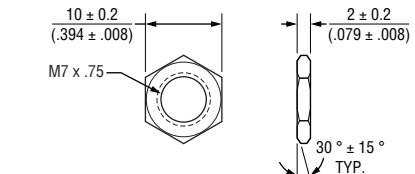
NUT H-38-1



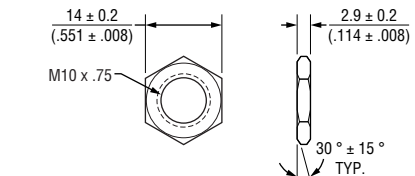
NUT H-38-2



NUT H-38-8



NUT H-38-9



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)		AVAILABLE ONLY IN BUSHING
Code	Description	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 mm L	R, U
22	22 mm L	R, U

RoHS IDENTIFIER	
L	Compliant

ELEMENT TAPER TYPE/TOLERANCE		RESISTANCE CODE VALUE IN OHMS	
(A) (H)	Linear Cermet ±10 %	(05) - 100	(30) - 15 K
	Linear Cermet ±5 %	(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			
(B) (E)	Linear C-P ±20 %	(10) - 1 K	(18) - 50 K
	Linear C-P ±10 %	(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			
(C)	CW Audio Cermet ±10 %	(10) - 1 K	(18) - 50 K
(D)	CW Audio C-P ±20 %	(12) - 2.5 K	(20) - 100 K
(F)	CCW Audio Cermet ±10 %	(13) - 5 K	(22) - 250 K
(G)	CCW Audio C-P ±20 %	(15) - 10 K	(23) - 500 K
(S)	CW Audio C-P ±10 %	(17) - 25 K	(25) - 1 M
(T)	CCW Audio C-P ±10 %		

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

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-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management