

## Features

- Virtually infinite electrical circuit isolation
- Metal or plastic shaft options
- DPST and DPDT switch options
- RoHS compliant\*

## Model 97 & 99 - 5/8" Square Single-Turn Panel Control with Rotary Switch

### Potentiometer Specifications

Initial Electrical Characteristics <sup>1</sup>	Conductive Plastic Element	Cermet Element
<b>Standard Resistance Range</b>		
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)
<b>Dielectric Withstanding Voltage (MIL-STD-202, Method 301)</b>		
Sea Level.....	1,500 VAC minimum.....	1,500 VAC minimum
70,000 Feet.....	500 VAC minimum.....	500 VAC minimum
<b>Insulation Resistance (500 VDC) .....</b>		
	1,000 megohms minimum .....	1,000 megohms minimum
<b>Power Rating (Voltage Limited By Power Dissipation or 350 VAC, Whichever Is Less)</b>		
+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<sup>1</sup>

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
<b>Temperature Coefficient Over Storage</b>		
Temperature Range .....	±1,000 ppm/°C .....	±150 ppm/°C
<b>Vibration (Single Section) .....</b>		
	15 G.....	15 G
Total Resistance Shift.....	±2 % maximum .....	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum .....	±5 % maximum
<b>Shock (Single Section).....</b>		
	30 G.....	30 G
Total Resistance Shift.....	±2 % maximum .....	±2 % maximum
Voltage Ratio Shift.....	±5 % maximum .....	±5 % maximum
<b>Load Life.....</b>		
	1,000 hours .....	1,000 hours
Total Resistance Shift.....	±10 % maximum .....	±5 % maximum
<b>Rotational Life (No Load) .....</b>		
	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	
<b>Contact Resistance Variation</b>		
@ 50,000 cycles.....	(Linear tapers) ±2 %.....	±2 %
	(Audio tapers) ±3 % .....	±3 %
<b>Moisture Resistance (MIL-STD-202, Method 103, Condition B)</b>		
Total Resistance Shift.....	(Linear tapers) ±10 % TRS maximum .....	(All tapers) ±5 % TRS maximum
	(Audio tapers) ±20 % TRS maximum	
<b>Insulation Resistance (500 VDC).....</b>		
	100 megohms minimum.....	100 megohms minimum
IP Rating.....	IP 40 .....	IP 40

## Model 97 & 99 - 5/8 " Square Single-Turn Panel Control with Rotary Switch

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### Potentiometer Specifications

#### Mechanical Characteristics<sup>1</sup>

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.

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

# Model 97 & 99 - 5/8" Square Single-Turn Panel Control with Rotary Switch

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## Rotary Switch Specifications

### Initial Electrical Characteristics<sup>1</sup>

Contacts:	
DPST .....	N.O./N.O., N.C./N.C. or N.O./N.C.
DPDT .....	2 N.O./N.C. (break before make)
Power Rating (Resistive Load):	
DPST .....	2 A @ 125 volts RMS-60 Hz or 2 A @ 28 VDC, 1 A @ 250 volts RMS-60 Hz
DPDT .....	1 A @ 125 volts RMS-60 Hz or 1 A @ 28 VDC
Contact Resistance (0.1 VDC-10 mA) .....	10 milliohms nominal
Contact Bounce .....	5 milliseconds maximum
Dielectric Withstanding Voltage (MIL-STD-202, Method 301)	
Sea Level .....	1500 VAC minimum
Insulation Resistance .....	1000 megohms minimum

### Environmental Characteristics<sup>1</sup>

Operating Temperature Range .....	0 °C to +70 °C
Exposure Temperature Range .....	-65 °C to +125 °C
Vibration (Dual Section) .....	8 G
Contact Resistance .....	10 milliohms maximum
Contact Bounce .....	0.1 millisecond maximum
Shock (Dual Section) .....	20 G
Contact Resistance .....	10 milliohms maximum
Contact Bounce .....	0.1 millisecond maximum
Rotational Life .....	25,000 cycles
Switch Actuating Torque (50% Duty cycle @ Rated Power Load) .....	1.41 to 4.94 N-cm (2 to 7 oz.-in.)
Contact Resistance .....	100 milliohms maximum
Moisture Resistance (MIL-STD-202, Method 106, Condition B)	
Contact Resistance (0.1 VDC-10 mA) .....	10 milliohms maximum
Insulation Resistance (After 24 Hours @ Room Temperature) (500 VDC) .....	100 megohms minimum
Housing Material .....	High temperature, flame retardant, thermosetting plastic

### Mechanical Characteristics<sup>1</sup>

Actuating Torque (Each Section, Switch Module Only) .....	3.53 to 10.59 N-cm (5 to 15 oz.-in.)
Running Torque (Out of Detent, 2-4 Module Assembly) .....	0.21 to 1.41 N-cm (0.3 to 2 oz.-in.)
Detent .....	CW or CCW standard
Actuation Angle .....	20 ° ±5 °
Contact Materials .....	Fine silver with gold overlay
Terminal Styles .....	Solder lug only
Standard Orientation .....	In-line with control terminals
Optional .....	Rotated 90 ° CCW from standard
Terminal Strength (Before and After Soldering Heat Exposure) .....	0.9 kg (2 lbs.) minimum

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

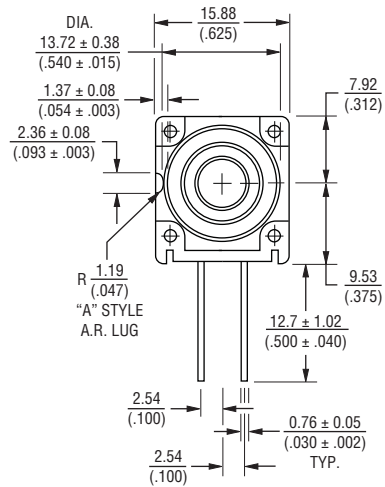
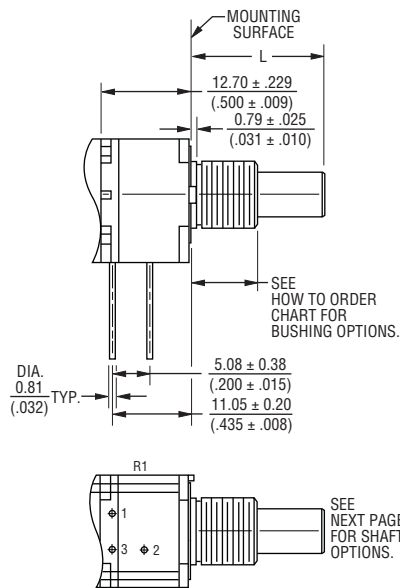
<sup>1</sup>At room ambient: +25 °C nominal and 50 % relative humidity nominal, except as noted.

# Model 97 & 99 - 5/8" Square Single-Turn Panel Control with Rotary Switch

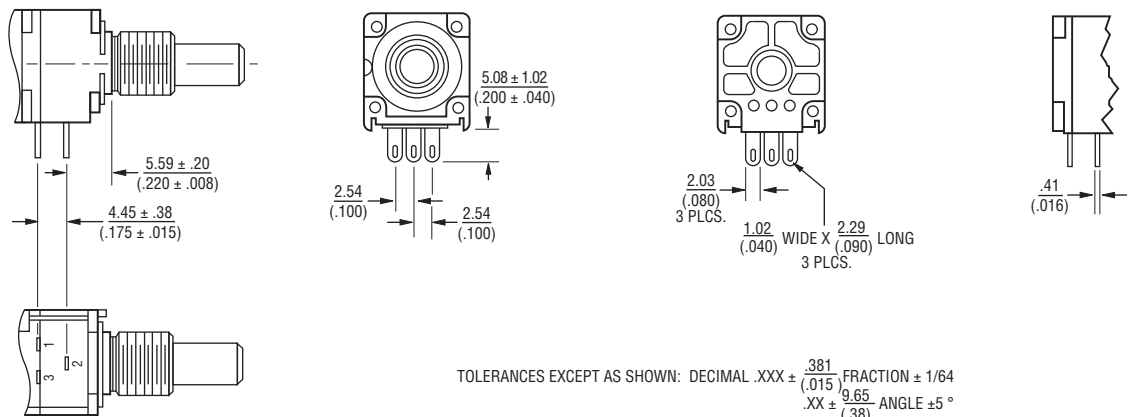
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## Product Dimensions

### Model 97 PC Pin Terminals, "L" Pattern



### Model 99 Solder Lug Terminals, "Triangular" Pattern



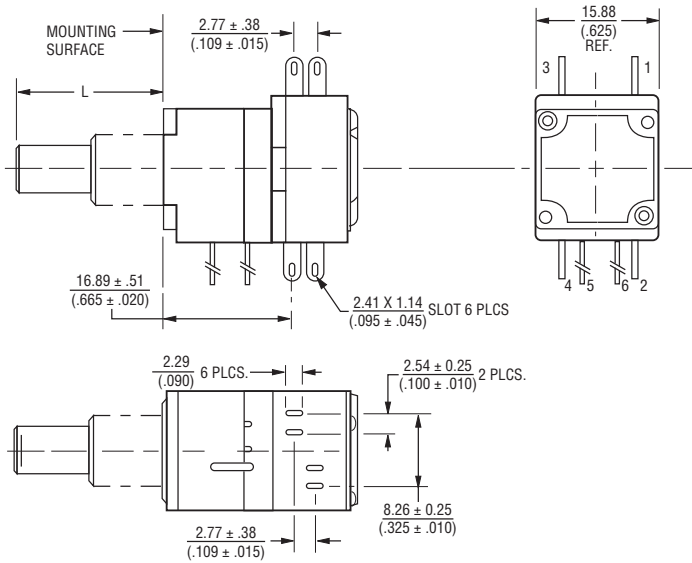
Specifications are subject to change without notice.  
 Customers should verify actual device performance in their specific applications.

# Model 97 & 99 - 5/8" Square Single-Turn Panel Control with Rotary Switch

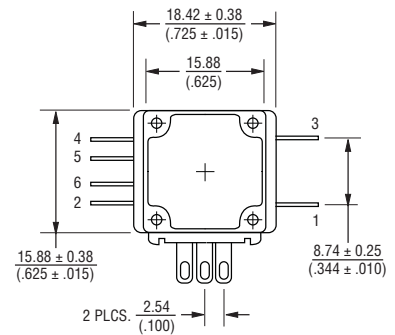


## Product Dimensions

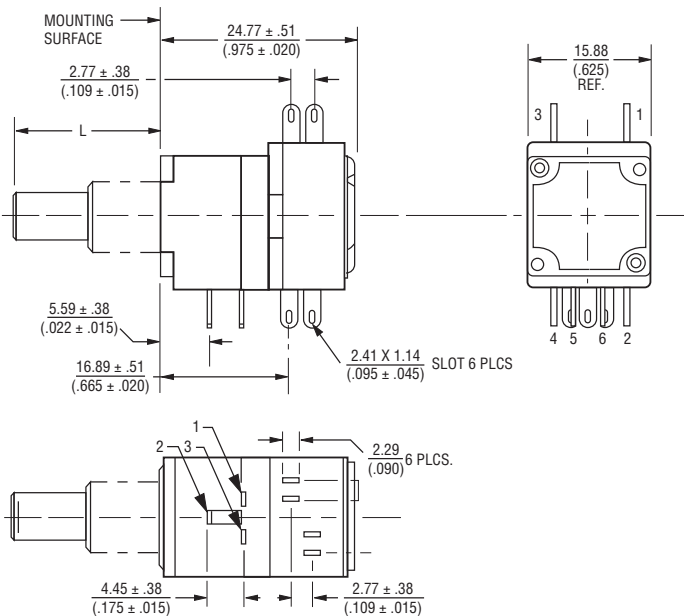
### Model 97 (2nd Cup - Switch)



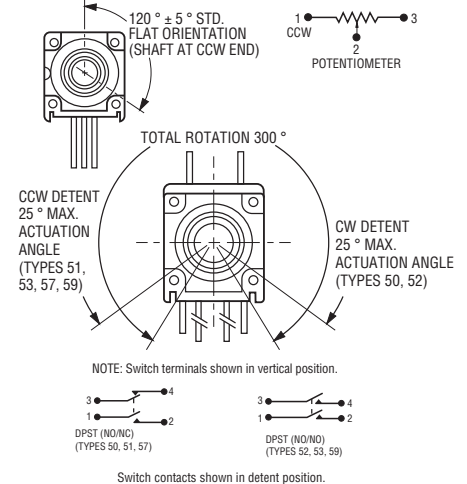
### Horizontal Term. (Switch Types R57, R59)



### Model 99 (2nd Cup - Switch)



### Switch Module Variations Shaft Flat Orientation



TOLERANCES EXCEPT AS SHOWN: DECIMAL .XXX ±  $\frac{.381}{.015}$  FRACTION ± 1/64  
 .XX ±  $\frac{9.65}{.38}$  ANGLE ± 5°

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

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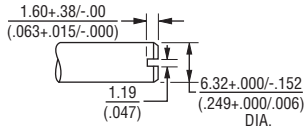
# Model 97 & 99 - 5/8" Square Single-Turn Panel Control with Rotary Switch

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## Product Dimensions

### Plastic Shaft Styles

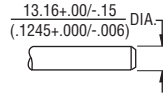
**SHAFT TYPE "B"** (USES BUSHING A)



STD. LENGTHS:

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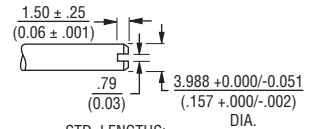
**SHAFT TYPE "D"** (USES BUSHING C)



STD. LENGTHS:

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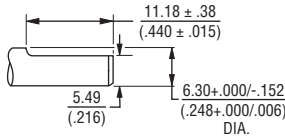
**SHAFT TYPE "T"** (USES BUSHING U)



STD. LENGTHS:

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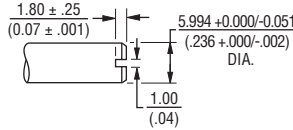
**SHAFT TYPE "C"** (USES BUSHING A)



STD. LENGTHS:

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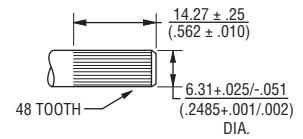
**SHAFT TYPE "R"** (USES BUSHING R)



STD. LENGTHS:

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

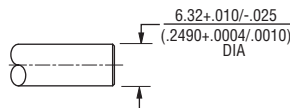


STD. LENGTHS:

25.40 (1.00)
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### Metal Shaft Styles

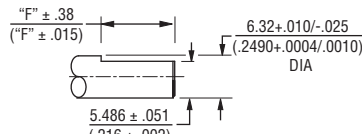
**SHAFT TYPE "A"** (USES BUSHING A)



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)



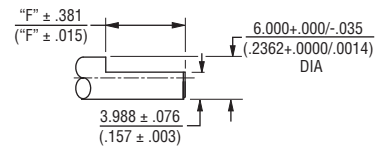
STD. LENGTHS:

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)



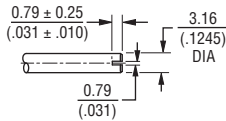
STD. LENGTHS:

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

9.98 (.393)	12.98 (.511)
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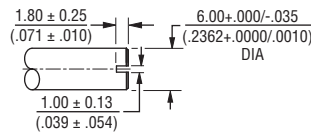
**SHAFT TYPE "E"** (USES BUSHING C)



STD. LENGTHS:

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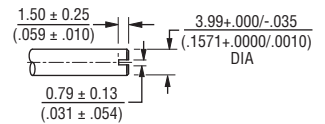
**SHAFT TYPE "J"** (USES BUSHING R)



STD. LENGTHS:

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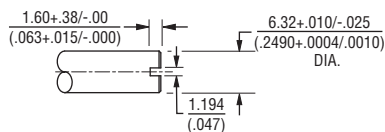
**SHAFT TYPE "V"** (USES BUSHING U)



STD. LENGTHS:

19.05 (.750)	22.23 (.875)
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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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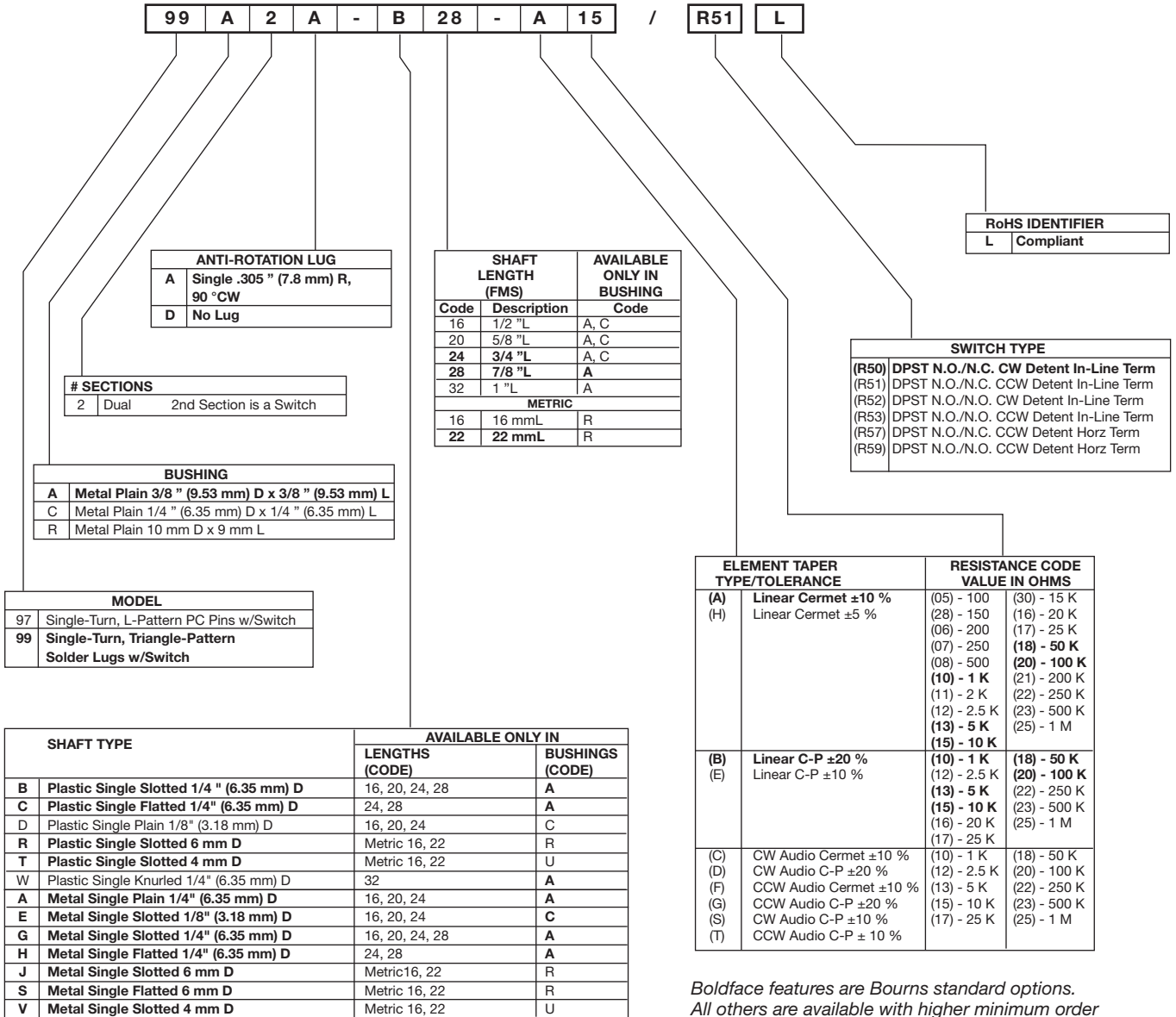
TOLERANCES EXCEPT AS SHOWN: .XX ± .02  
(.050)  
.XXX ± .005  
(.127)  
.XXXX ± .0005  
(.0127)

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

Specifications are subject to change without notice.  
Customers should verify actual device performance in their specific applications.

# How to Order Model 97 & 99 Panel Controls

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

ELEMEN TAPER TYPE/TOLERANCE		RESISTANCE CODE VALUE IN OHMS	
<b>(A)</b> (H)	Linear Cermet ±10 % Linear Cermet ±5 %	(05) - 100	(30) - 15 K
		(28) - 150	(16) - 20 K
<b>(B)</b> (E)	Linear C-P ±20 % Linear C-P ±10 %	(06) - 200	(17) - 25 K
		(07) - 250	<b>(18) - 50 K</b>
		(08) - 500	<b>(20) - 100 K</b>
		<b>(10) - 1 K</b>	(21) - 200 K
		(11) - 2 K	(22) - 250 K
		(12) - 2.5 K	(23) - 500 K
		<b>(13) - 5 K</b>	(25) - 1 M
		<b>(15) - 10 K</b>	
		(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			
(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 %		

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