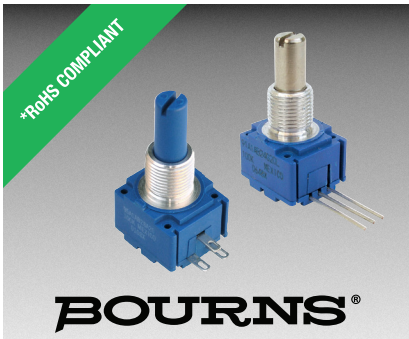




THE DATASHEET OF
91A1A-B24-B13L





Features

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

Additional Information

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[TECHNICAL LIBRARY](#)



[INVENTORY](#)



[SAMPLES](#)



[CONTACT](#)

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.

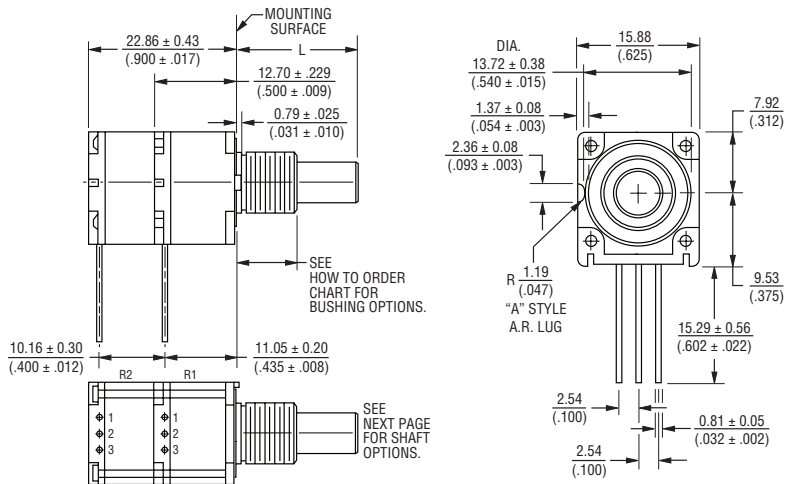
¹Electrical specifications tested at 200 RPM, at room ambient: +25 °C nominal.

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

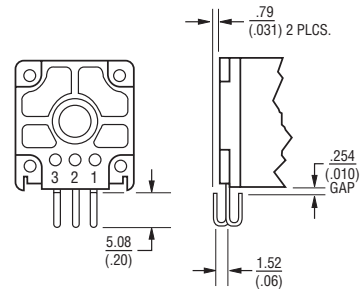
BOURNS®

Product Dimensions

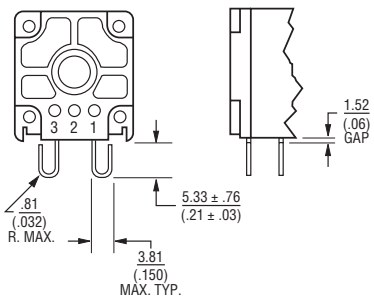
Model 91 PC Pin Terminals, In-Line



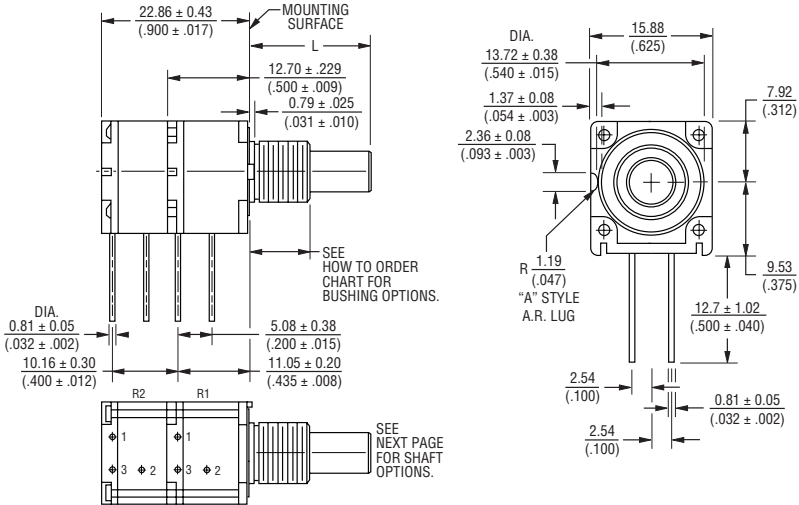
Model 92 J-Hooked Terminals, In-Line



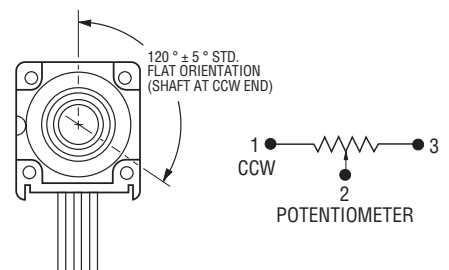
Model 94 J-Hooked Terminals, "L" Pattern



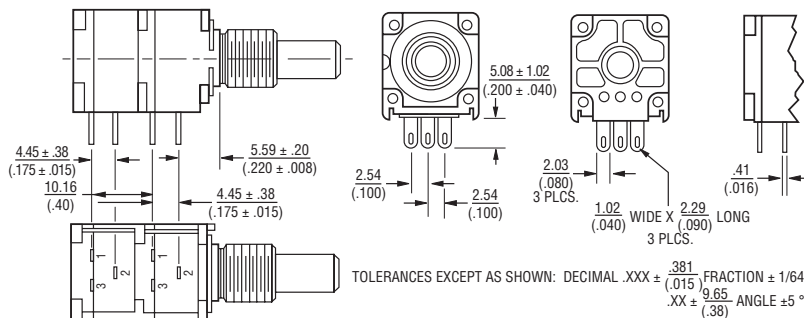
Model 93 PC Pin Terminals, "L" Pattern



Shaft Flat Orientation



Model 95 Solder Lug Terminals, "Triangular" Pattern



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

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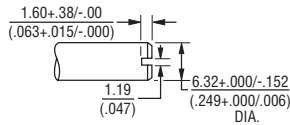
Model 91, 92, 93, 94 & 95 – 5/8" Square Single-Turn Panel Control

BOURNS®

Product Dimensions

Plastic Shaft Styles

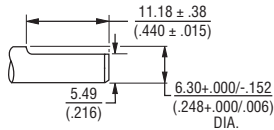
SHAFT TYPE "B" (USES BUSHING A)



STD. LENGTHS:

| | | | |
|-----------------|-----------------|-----------------|-----------------|
| 12.70 (.500) | 15.88 (.625) | 19.05 (.750) | 22.23 (.875) |
|-----------------|-----------------|-----------------|-----------------|

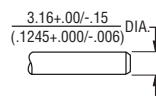
SHAFT TYPE "C" (USES BUSHING A)



STD. LENGTHS:

| | |
|-----------------|-----------------|
| 19.05 (.750) | 22.23 (.875) |
|-----------------|-----------------|

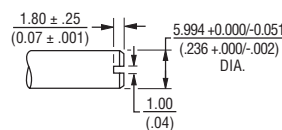
SHAFT TYPE "D" (USES BUSHING C)



STD. LENGTHS:

| | | |
|-----------------|-----------------|-----------------|
| 12.70 (.500) | 15.88 (.625) | 19.05 (.750) |
|-----------------|-----------------|-----------------|

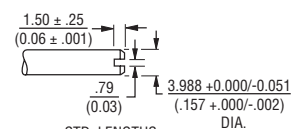
SHAFT TYPE "R" (USES BUSHING R)



STD. LENGTHS:

| | |
|----------------|----------------|
| 16.0 (.630) | 22.0 (.866) |
|----------------|----------------|

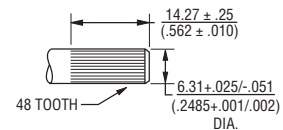
SHAFT TYPE "T" (USES BUSHING U)



STD. LENGTHS:

| | |
|----------------|----------------|
| 16.0 (.630) | 22.0 (.866) |
|----------------|----------------|

SHAFT TYPE "W" (USES BUSHING A)

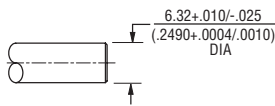


STD. LENGTHS:

| |
|-----------------|
| 25.40 (1.00) |
|-----------------|

Metal Shaft Styles

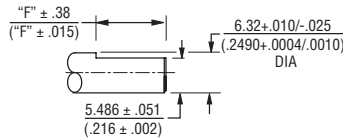
SHAFT TYPE "A" (USES BUSHING A)



STD. LENGTHS:

| | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| 12.70 (.500) | 15.88 (.625) | 19.05 (.750) | 22.23 (.875) | 25.4 (1.000) |
|-----------------|-----------------|-----------------|-----------------|-----------------|

SHAFT TYPE "H" (USES BUSHING A)



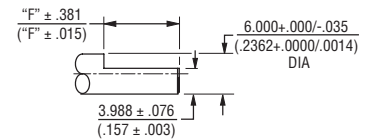
STD. LENGTHS:

| | |
|-----------------|-----------------|
| 19.05 (.750) | 22.23 (.875) |
|-----------------|-----------------|

FLAT LENGTH "F":

| | |
|----------------|-----------------|
| 7.95 (.313) | 11.13 (.438) |
|----------------|-----------------|

SHAFT TYPE "S" (USES BUSHING R)



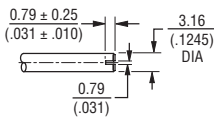
STD. LENGTHS:

| | |
|----------------|----------------|
| 16.0 (.630) | 22.0 (.866) |
|----------------|----------------|

FLAT LENGTH "F":

| | |
|----------------|-----------------|
| 6.99 (.275) | 12.98 (.511) |
|----------------|-----------------|

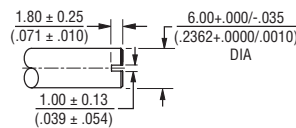
SHAFT TYPE "E" (USES BUSHING C)



STD. LENGTHS:

| | | |
|----------------|----------------|----------------|
| 12.0 (.500) | 16.0 (.625) | 19.0 (.750) |
|----------------|----------------|----------------|

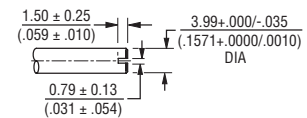
SHAFT TYPE "J" (USES BUSHING R)



STD. LENGTHS:

| | |
|----------------|----------------|
| 16.0 (.630) | 22.0 (.866) |
|----------------|----------------|

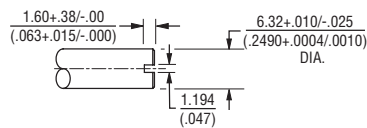
SHAFT TYPE "V" (USES BUSHING U)



STD. LENGTHS:

| | |
|----------------|----------------|
| 16.0 (.630) | 22.0 (.866) |
|----------------|----------------|

SHAFT TYPE "G" (USES BUSHING A)



STD. LENGTHS:

| | | | |
|-----------------|-----------------|-----------------|-----------------|
| 12.70 (.500) | 15.88 (.625) | 19.05 (.750) | 22.23 (.875) |
|-----------------|-----------------|-----------------|-----------------|

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.

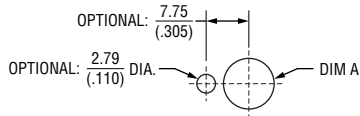
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Model 91, 92, 93, 94 & 95 – 5/8" Square Single-Turn Panel Control

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

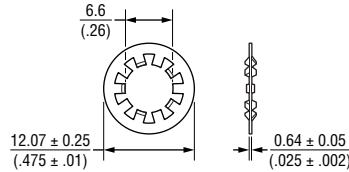
Date Code Description

YYWWMM

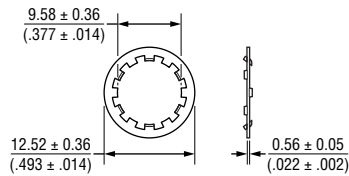
- M = COUNTRY OF MANUFACTURE (MEXICO)
- WW = WEEK NUMBER
- YY = LAST TWO DIGITS OF YEAR MANUFACTURED

Hardware

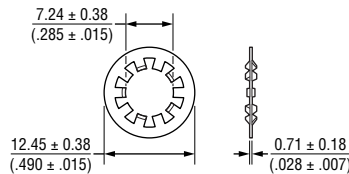
LOCKWASHER H-37-1



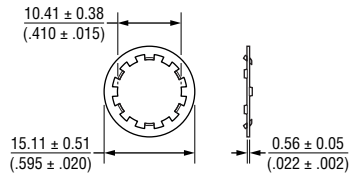
LOCKWASHER H-37-2



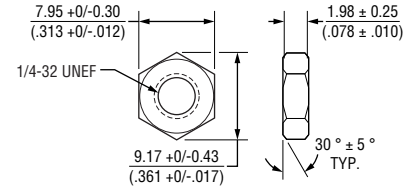
LOCKWASHER H-37-3



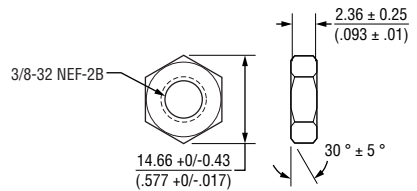
LOCKWASHER H-37-4



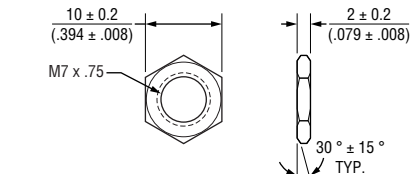
NUT H-38-1



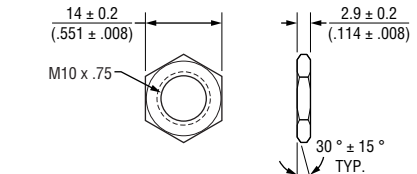
NUT H-38-2



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

BOURNS®

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

| 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 |

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

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