

# 22.5 mm Push Buttons

## Product Overview



### Bulletin 800F Plastic and Metal Operators

- 22.5 mm mounting hole
- IP65/66, Type 4/4X/13
- Internationally rated operators

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### Bulletin 800FP Plastic Operators

- IP65/66, Type 4/4X/13
- Engineering grade thermoplastics
- Chemical-resistant for harsh environments



**Bul. 800FP Plastic Operators**

### Bulletin 800FM Metal Operators

- IP65/66, Type 4/13
- Die-cast metal construction
- Chrome-plated



**Bul. 800FM Die-Cast Metal Operators**



**Overview, Continued**

**3-Across x 2-Deep Back-of-Panel (6 Circuits Max.)**

- Rugged snap-fit design for plastic or metal latch
- Stackable contact blocks
- Rotating collar for easy one-hand latch removal
- Color-coded contact block plungers for contact identification

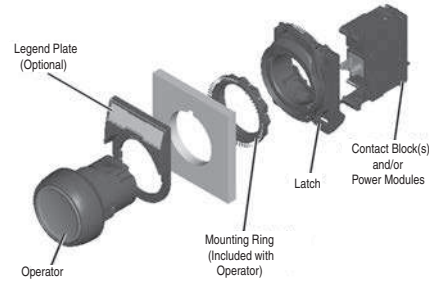


**Plastic Latch with Contact Block**



**Metal Latch with Contact Block**

**Assembly Overview**



**Specifications\***

**Front-of-Panel (Operators)**

Description		Mechanical Ratings	
		Plastic (Bulletin 800FP)	Metal (Bulletin 800FM)
Vibration (assembled to panel)		Tested at 10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. for 3 hr duration, no damage	
Shock		Tested at 1/2 cycle sine wave for 11 ms; no damage at 100 G	
Degree of protection*		IP65/66 (Type 3/3R/4/4X/12/13)	IP65/66 (Type 3/3R/4/12/13)
Mechanical durability per EN 60947-5-1 (Annex C)	10 000 000 Cycles	Momentary push buttons, momentary mushroom	
	1 000 000 Cycles	Multi-function, selector switch, key selector switch, selector jog, SensEject™ key selector switch	
	500 000 Cycles	Non-illuminated push-pull E-stop‡	
	300 000 Cycles	Twist-to-release E-stop, illuminated push-pull E-stop‡, alternate action push buttons	
	100 000 Cycles	Potentiometer, toggle switch	
Operating forces (typical with one contact block)		Flush/extended = 5 N, E-stop = 36 N Mushroom = 9 N	
Operating torque (typical application with one contact block)		Selector switch = 0.25 N•m (2.2 lb•in)	
Mounting torque	Plastic	1.7 N•m (15 lb•in)	
	Metal	4.4 N•m (40 lb•in)	
Environmental			
Temperature range (operating)		-25...+70 °C (-13...+158 °F)§	
Temperature range (short term storage)		-40...+85 °C (-40...+185 °F)	
Humidity		50...95% RH from 25...60 °C (77...140 °F)	

\* Performance Data — see page Important-3 of the Industrial Controls catalog.

⊛ Momentary mushroom operators are IP65. Plastic keyed operators are IP66, Type 4/13; not Type 4X.

‡ Limit of four contact blocks max. for these devices.

§ Operating temperatures below 0 °C (32 °F) are based on the absence of freezing moisture and liquids, UL Recognized to 55 °C (131 °F) - Incandescent module max. 40 °C (104 °F).

**Product Certifications**

Certifications	UR/UL, CSA, CCC, CE
Standards Compliance — CE Marked	NEMA ICS-5; UL 508, EN ISO 13850, EN 60947-1, EN 60947-5-1, EN 60947-5-5
Terminal Identification	EN/IEC 60947-1
Shipping Approvals	ABS
RoHS	✓

**Bulletin 800F**  
**22.5 mm Push Buttons**  
**Specifications**

**Back-of-Panel Components\***

Electrical Ratings			
Standard contact block ratings	A600, Q600 600V AC AC 15, DC 13 to IEC/EN 60947-5-1 and UL 508, 17V, 5 mA min.		
Low voltage contact block ratings*	5V, 1 mA DC min. C300, R150, AC 15, DC 13 to EN 60947-5-1 and UL 508		
	<b>Nominal Voltage</b>	<b>Range</b>	<b>Current Draw</b>
LED Module Ratings	24...120V AC/DC	20...132V AC/DC	15 mA (AC), 12 mA (DC)
	24V AC	10...29V AC	31 mA
	24V DC	10...30V DC	24 mA
	120V AC	102...132V AC	6 mA
	240V AC	204...264V AC	6 mA
Frequency	50/60 Hz, DC		
Thermal current	10 A max. enclosed (40 °C ambient) to UL508, EN 60947-5-1		
Insulation voltage (U <sub>i</sub> )	Screw terminal = 690V, spring-clamp = 300V		
Wire capacity (screw terminal)‡	#18...12 AWG (0.75...2.5 mm <sup>2</sup> ) Max. (2) #14 AWG or (1) #12 AWG		
Wire capacity (spring-clamp terminal)	#18...14 AWG (0.75...1.5 mm <sup>2</sup> ) One per spring clamp, two spring clamps per terminal		
Recommended tightening torque on screw terminals	0.7...0.9 N•m (6...8 lb•in)		
Dielectric strength (minimum)	2500V for one minute		
External short circuit protection	Standard blocks	10 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)	
	Low voltage contact blocks	6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)	
Electrical shock protection	Finger-safe conforming to IP2X		
Mechanical Ratings			
Vibration (assembled to panel)	Tested at 10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. 6 hr		
Shock	Tested at 1/2 cycle sine wave for 11 ms and no damage at 100 G max.		
Contact durability per EN 60947-5-1 (Annex C)	10 000 000 cycles		
Contact operation	N.O.	Slow double make and break	
	N.C. & S.M.C.B.	Slow double make and break — positive opening ⊖	
	N.O.E.M.	Double break / double make, early make	
	N.C.L.B.	Double break / double make, late break — positive opening ⊖	
	N.C.E.B.	Double break / double make, early break — positive opening ⊖	
Push button travel to change electrical state	N.C. and N.O.E.M.	1.5 mm (0.060 in.)	
	N.O. and N.C.L.B.	2.5 mm (0.1 in.)	
Operating forces (typical)	Single circuit contact block	3.4 N	
	Dual circuit contact block	5...6.5 N	
Illumination			
LED Dominant Wavelength	Green	525 nm	
	Red	629 nm	
	Yellow	590 nm	
	Blue	470 nm	
	White	—	
LED Luminous Intensity	Green	780 mcd	
	Red	780 mcd	
	Yellow	600 mcd	
	Blue	168 mcd	
	White	360 mcd	
Incandescent maximum wattage	2.6 W		
Materials			
Springs	Stainless steel and zinc coated music wire		
Electrical contacts	Standard	Silver-nickel	
	Low voltage	Gold-plated over silver	
Terminals	Screw	Brass	
	Spring-clamp	Silver-plated brass	

\* Performance Data — see page Important-3 of the Industrial Controls catalog.

\* Low voltage contacts are recommended for applications below 17V, 5 mA.

‡ Wires less than #18 AWG (0.75 mm<sup>2</sup>) may not hold in terminal securely.



**Material Listing**

Component	For Use with	Material Used
Panel gasket	All operators	Nitrile, TPE
Diaphragm seal	Illuminated push button, non-illuminated push button	Automotive industry acceptable silicone
K-seal	Selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Nitrile
Diaphragm retainer, return spring I	Illuminated push button, non-illuminated push button, momentary mushroom	Stainless steel
Return spring II	Reset, selector switch, key selector switch, alternate action, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Zinc-coated music wire
Button cap/mushroom head	Non-illuminated push button, momentary mushroom, reset, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function	PBT/polycarbonate blend
2-color molded button cap	Non-illuminated push button	PBT/polycarbonate blend
Lens	Multi-function	Acetal
Lens, knob	Illuminated push button, illuminated momentary mushroom, illuminated selector switch	Polyamide
Knob	Non-illuminated selector switch	Glass-filled polyamide
Plastic bezel/bushing I	Non-illuminated push button, illuminated push button, momentary mushroom, selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function, reset	Glass-filled polyamide
Plastic bezel/bushing II, jam nut	Pilot light, reset jam nut, reset pushers	Glass-filled PBT
Metal bezel/bushing	All metal operators	Zinc
Diffuser	Illuminated push button, pilot light	Polycarbonate
Legend frames	—	Glass-filled polyamide
Plastic mounting ring	All plastic operators	Glass-filled polyamide
Metal mounting ring	All metal operators	Chromated zinc
Plastic latch	—	Glass-filled polyamide
Metal latch	—	Chromated zinc + stainless steel
Plastic enclosure	—	PBT/polycarbonate blend
Metal enclosure	—	Aluminum
Terminal screws	LED module, incandescent module, contact blocks	Zinc-plated steel with chromate
Terminals	LED module, incandescent module, contact blocks	Brass with silver-nickel contacts
Spring clamps	LED module, incandescent module, contact blocks	Stainless steel
Lamp socket	Incandescent module	Brass
Housing	Incandescent module, LED module	Glass-filled polyamide
Low-voltage terminals	Contact blocks	Gold-plated silver-nickel contacts
Low-voltage spanner	Contact blocks	Gold-plated silver-nickel contacts
Spanner	Contact blocks	Brass with silver-nickel contacts
Boot	Toggle Switch, illuminated push button, non-illuminated push button, multi-function illuminated and non-illuminated	Automotive industry acceptable silicone

# 22.5 mm Push Buttons

## Product Selection

### Momentary Push Button Operators, Non-Illuminated — Mushroom\*



40 mm Mushroom  
Cat. No. 800FM-MM42



60 mm Mushroom  
Cat. No. 800FP-MM63



90 mm Mushroom  
Cat. No. 800FP-MM94

Color	Pkg. Quantity	40 mm Mushroom		60 mm Mushroom	
		Plastic	Metal	Plastic	Metal
		Cat. No.	Cat. No.	Cat. No.	Cat. No.
Black	1	800FP-MM42	800FM-MM42	800FP-MM62	800FM-MM62
Green		800FP-MM43	800FM-MM43	800FP-MM63	800FM-MM63
Red		800FP-MM44	800FM-MM44	800FP-MM64	800FM-MM64
Yellow		800FP-MM45	800FM-MM45	800FP-MM65	800FM-MM65
Blue		800FP-MM46	800FM-MM46	800FP-MM66	800FM-MM66

**800F**    **P**    **- MM4**    **3**  
a    b    c

a

Operator Construction	
Code	Description
P	Round plastic operator (IP65, Type 4/4X/13)
M	Round metal operator (IP65, Type 4/13)

b

Size and Operator Type	
Code	Type
MM4	40 mm momentary
MM6	60 mm momentary
MM9	90 mm momentary*

c

Color Cap	
Code	Color
2	Black
3	Green
4	Red
5	Yellow
6	Blue

\* Momentary mushroom operators are IP65 rated.  
 \* Only available with black, red, and yellow cap colors.

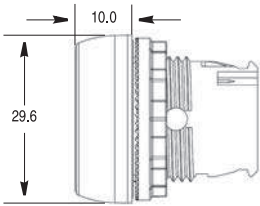
# 22.5 mm Push Buttons

## Approximate Dimensions

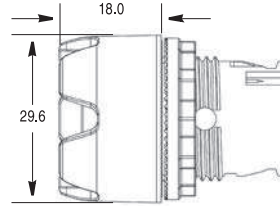
### Approximate Dimensions

Dimensions in millimeters. Dimensions are not intended to be used for manufacturing purposes. Refer to RAISE software for additional dimensional information.

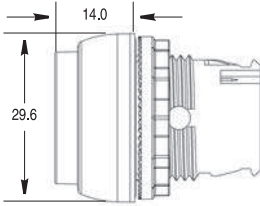
#### Non-Illuminated and Illuminated Momentary Flush Push Button Operators



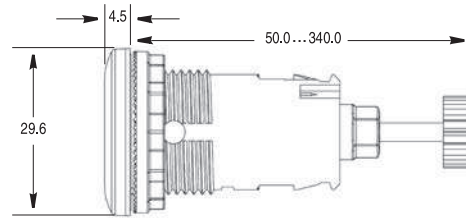
#### Illuminated Momentary Guarded Push Button Operators



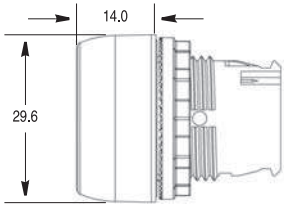
#### Illuminated and Non-Illuminated Momentary Extended Push Button Operators



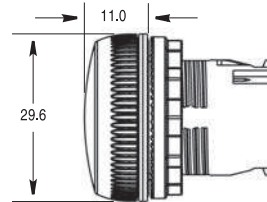
#### Reset Operators with Reset Rod



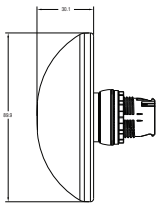
#### Non-Illuminated Guarded, Illuminated and Non-Illuminated Alternate Action Push Button Operators



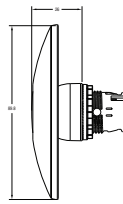
#### Pilot Light Operators



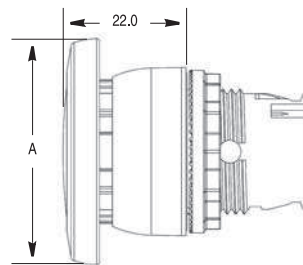
#### 90 mm Half Dome



#### 90 mm Mushroom

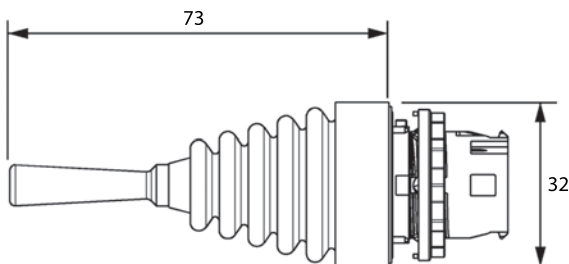


#### Illuminated and Non-Illuminated Momentary Mushroom Operators 40 mm and 60 mm

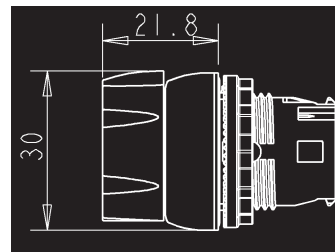


Operator	A
40 mm	39.8
60 mm	59.8

#### Toggle Switch Operators

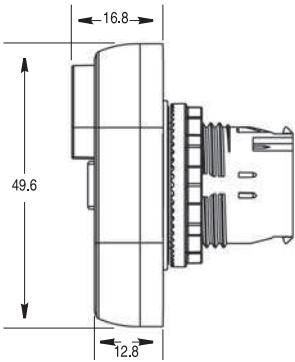


#### Selector Jog Operators

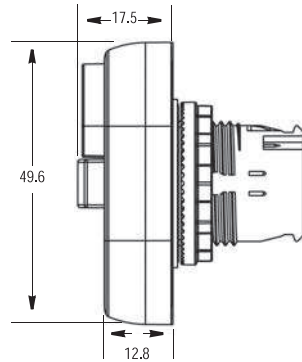


Dimensions in millimeters. Dimensions are not intended to be used for manufacturing purposes.

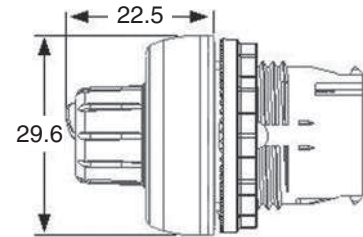
**Illuminated and Non-Illuminated 2-Position Multi-Function Operators**



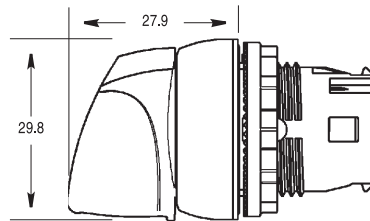
**Non-Illuminated 3-Position Multi-Function Operators**



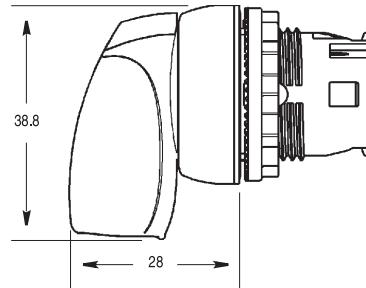
**Potentiometer Operator**



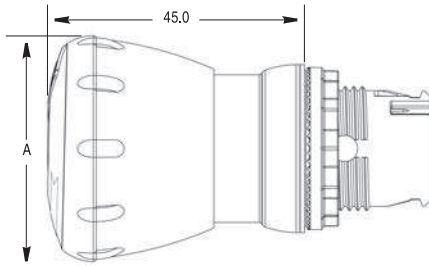
**Illuminated and Non-Illuminated Knob Selector Switch Operators**



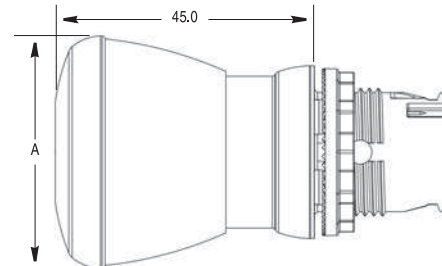
**Non-Illuminated Knob Lever Selector Switch Operators**



**Illuminated and Non-Illuminated Twist-to-Release Operators 30 mm, 40 mm, and 60 mm**

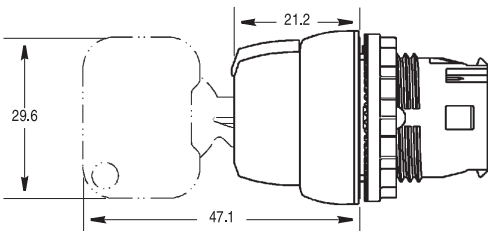


**Illuminated and Non-Illuminated Push-Pull Mushroom Operators 30 mm, 40 mm, and 60 mm**

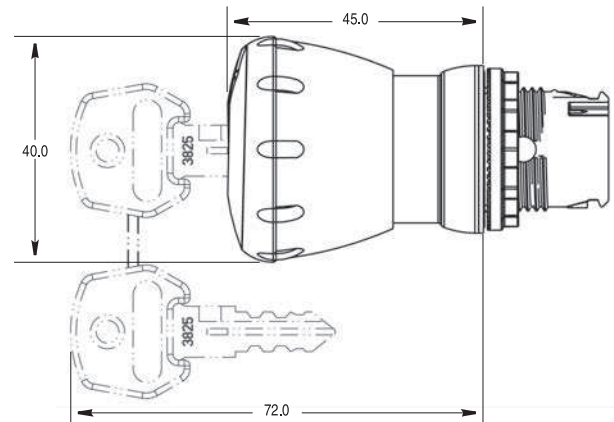


Operator	A
30 mm	30.0
40 mm	40.0
60 mm	60.0

**Key Selector Switch and Key Ejected SensEject Operators**



**Mushroom Key Release Operator 40 mm**



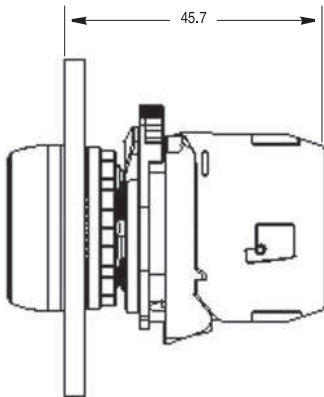


# 22.5 mm Push Buttons

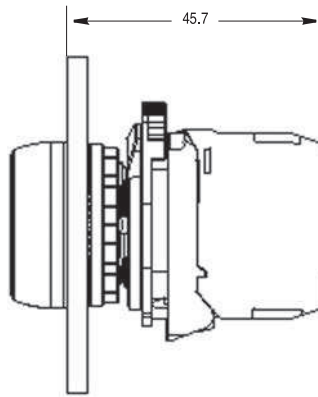
## Approximate Dimensions

Dimensions in millimeters. Dimensions are not intended to be used for manufacturing purposes.

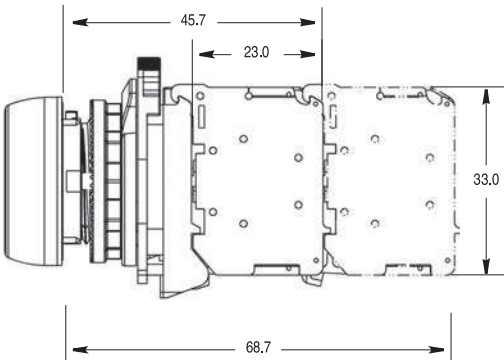
**Back-of-Panel Components —  
Incandescent Module with Latch**



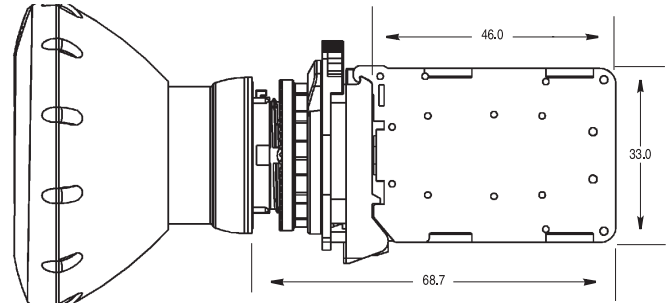
**Back-of-Panel Components —  
LED Module with Latch**



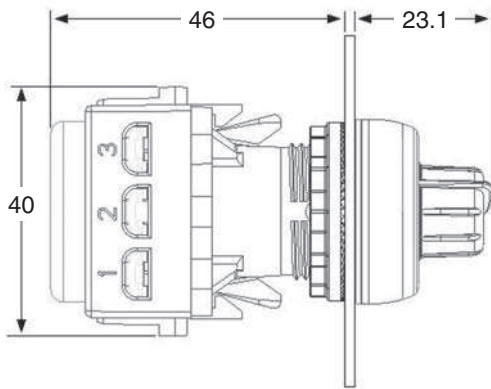
**Back-of-Panel Components —  
Contact Cartridges with Latch**



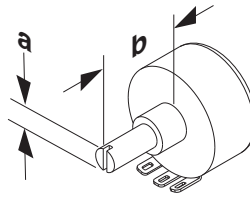
**Back-of-Panel Components —  
Dual Circuit Contact Block or  
Self Monitoring Contact Block  
(Max. of 1 Deep)**



**Potentiometer with Resistive Element**



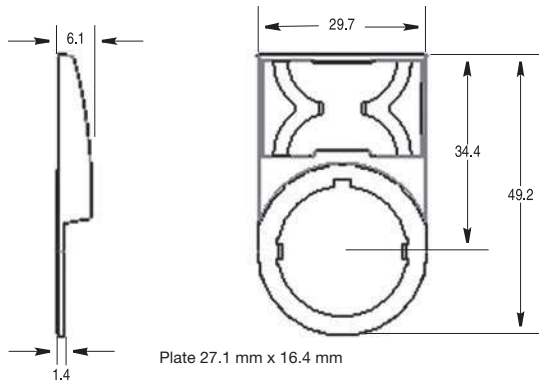
**Customer Supplied Resistive Element**



	Max.		Min.
a (Ø Dia.)	6.4 (0.252)	5.9 (0.232)	5.7 (0.224)
b (Length)	24 (0.945)	32 (1.26)	14 (0.551)

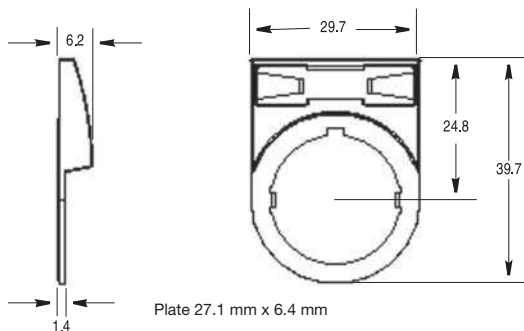
Dimensions in millimeters (inches).

**30 x 50 mm Snap-In Legend Plate**



10

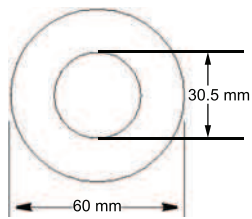
**30 x 40 mm Snap-In Legend Plate**



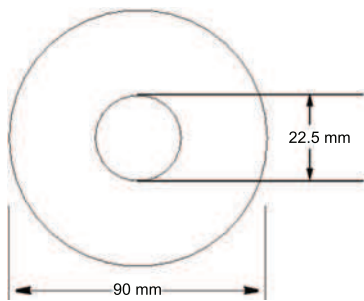


Dimensions in millimeters. Dimensions are not intended to be used for manufacturing purposes.

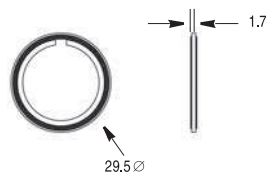
**60 mm Round Legend — 15Y**



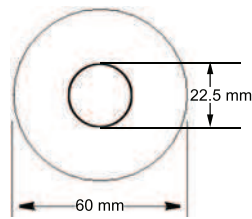
**90 mm Round Legend**



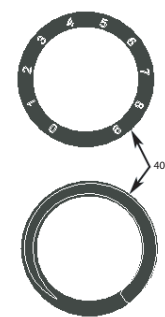
**Trim Washer**



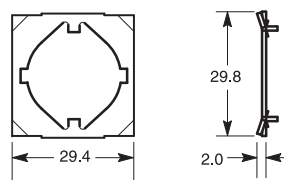
**60 mm Round Legend — 15YS**



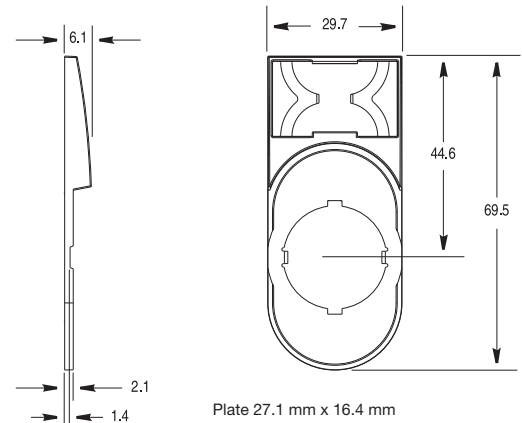
**Potentiometer Legend Plate (Series A)**



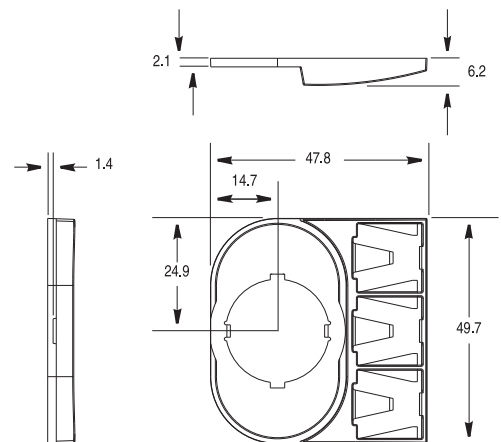
**Anti-Rotation Washer**



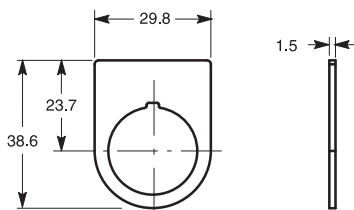
**30 x 60 mm Snap-In Legend Plate**



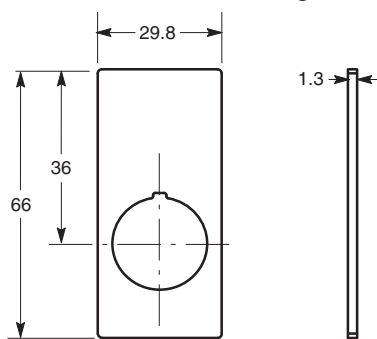
**Special Multi-Function Snap-In Legend Plate**



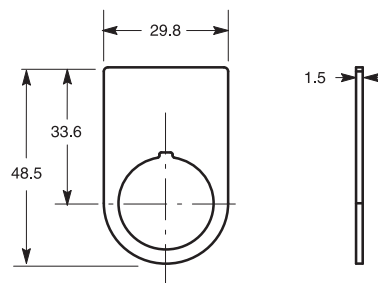
**30 x 40 mm One-Piece Legend Plate**



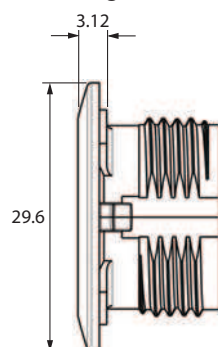
**30 x 66 mm One-Piece Legend Plate**



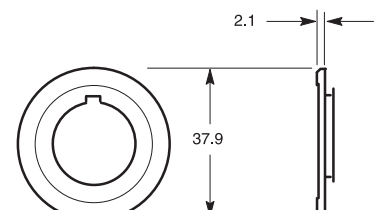
**30 x 50 mm One-Piece Legend Plate**



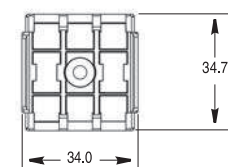
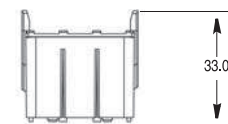
**Hole Plug**



**30 mm to 22.5 mm Hole Adapter**



**Base Mount Adapter**



Note: Panel thickness range is 1.0...6.0 mm maximum.

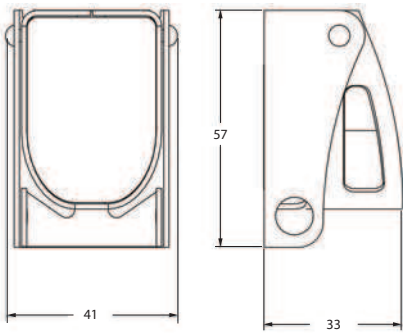
Panel thickness reduced to 4 mm (standard anti-rotation washer) or 5 mm (thin anti-rotation washer) when optional legend plates are used.

# 22.5 mm Push Buttons

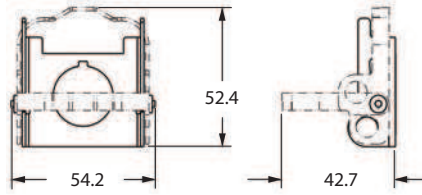
## Approximate Dimensions

Dimensions in millimeters. Dimensions are not intended to be used for manufacturing purposes.

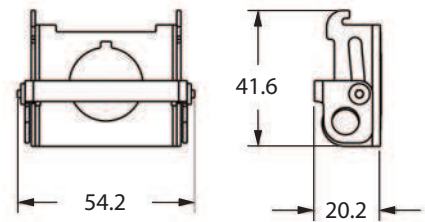
**Locking Cover**



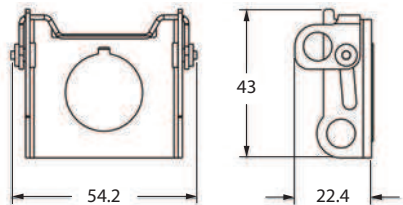
**Maintained Mushroom Locking Attachment**



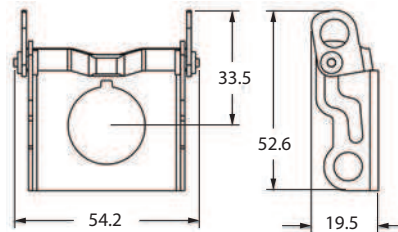
**Momentary Mushroom Locking Attachment**



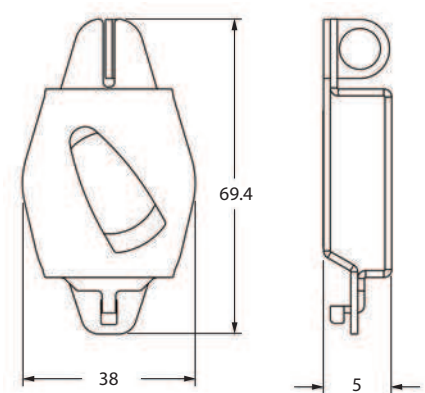
**Extended Non-Illuminated Locking Attachment**



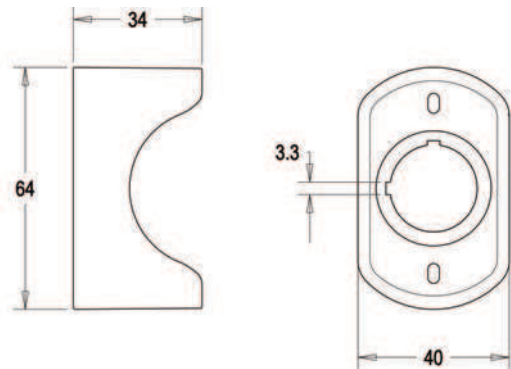
**Flush Non-Illuminated Locking Attachment**



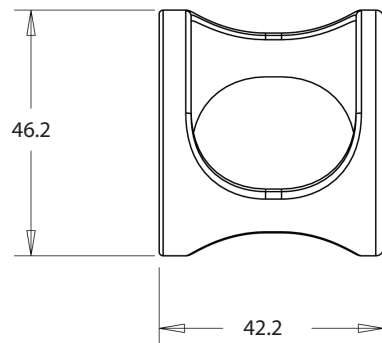
**Selector Switch Locking Cover (Same for all Lock Positions)**



**Narrow Guard**



**Protective Ring**



**Plastic Guard**

