



**BOURNS®**

## Features

- Lead free
- HCMOS, CMOS and TTL compatible
- Compact package size
- High rotational cycle life
- Optional “soft touch” push switch
- Optional detent
- Splashproof shaft seal
- Recommended for human/machine interface applications (HMI)



# EM14 - 14 mm Rotary Optical Encoder w/Switch

## Electrical Characteristics

Electrical Output .....	2-bit quadrature code
Resolution .....	8 to 64 pulses per revolution (PPR)
Supply Voltage ( $V_{CC}$ ) .....	5.0 VDC $\pm$ 0.25 VDC
Supply Current ( $I_{CC}$ ) .....	26 mA maximum
Output Voltage	
Low ( $V_{CE(sat)}$ ), per Channel .....	800 mV maximum at $I_{(SINK)} = 25$ mA
High ( $V_{O(HI)}$ ), per Channel .....	4.0 VDC minimum @ $V_{CC} = 4.75$ VDC
Output Current $I_{(SINK)}$ , per Channel .....	25 mA minimum
Rise/Fall Time .....	200 ns typical
Power Dissipation .....	167 mW maximum
Pulse Width (per Channel) .....	180 °e typical
Phase Angle (Channel A Leads Channel B, Clockwise Rotation) .....	90 °e $\pm$ 45 °e
Insulation Resistance @ 500 VDC .....	1,000 megohms minimum
RPM (Operating)	
Non-Detent .....	300 maximum
With Detent .....	200 maximum
Switch Power Rating .....	12 VDC / 20 mA (600 ohms maximum load)
Switch Contact Resistance .....	200 ohms maximum

## Environmental Characteristics

Operating Temperature Range @ 5.0 VDC .....	-40 °C to +70 °C (-40 °F to +158 °F)
Storage Temperature Range .....	-55 °C to +125 °C (-67 °F to +257 °F)
Vibration .....	15 G
Shock .....	50 G
Humidity .....	MIL-STD-202, Method 103, Condition B
Flammability .....	Conforms to UL 94-V0
IP Rating .....	IP 54*

## Mechanical Characteristics

Mechanical Angle .....	360 ° Continuous
Torque	
Starting/Running .....	1.06 N-cm (1.5 oz.-in.) maximum
Detent .....	1.2 N-cm (1.7 oz.-in.) typical
Rotational Life	
Non-detent (@ 100 RPM) .....	1,000,000 cycles (2,000,000 revolutions)
With detent (@ 30 RPM) .....	100,000 cycles (200,000 revolutions)
Switch Life .....	100,000 cycles
Switch Actuation Force .....	250 gm (8.82 oz.) typical
Switch Travel .....	0.04 in. typical
Shaft Radial Play .....	0.005 in. maximum
Shaft Axial Structural Strength .....	40 lbs. minimum
Mounting Torque .....	2.0 N-m (18 lb.-in.) maximum

## Materials and Finishes

Terminals .....	Sn plated PC pins
Soldering Condition	
Manual Soldering .....	96.5Sn/3.0Ag/0.5Cu solid wire or no-clean rosin cored wire 370 °C (700 °F) max. for 3 seconds
Wave Soldering .....	96.5Sn/3.0Ag/0.5Cu solder with no-clean flux 260 °C (500 °F) max. for 5 seconds
Wash processes .....	Not recommended
Mounting Hardware	
Nut .....	Black anodized brass, hex (metric)/Nickel-plated brass, hex (SAE)
Lockwasher .....	Nickel-plated spring steel, internal tooth
Marking .....	Manufacturer's symbol, model number, product code, terminal style and date code
Standard Packaging .....	Antistatic plastic tube (25 pcs./tube)

\*When device is mounted by normal mounting means.

# EM14 - 14 mm Rotary Optical Encoder w/Switch

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## Part Numbering System

**E M 1 4 A 0 D - C 2 4 - L 0 3 2 S**

MODEL NO. DESIGNATOR	
EM14	14 mm Rotary Optical Encoder

BUSHING CONFIGURATION	
Code	Description
A	3/8 " D x 3/8 " L Threaded
C	1/4 " D x 1/4 " L Threaded
R	10 mm D x 9.5 mm L Threaded

DETENT OPTION	
Code	Description
0	No Detent
1	32 Detents (Available with 8 or 32 PPR only)

ANTI-ROTATION LUG/BRACKET OPTION	
Code	Description
A	A/R Lug
D	None

SHAFT STYLE (See Outline Drawing for Details)		
Code	Description	Available w/ Bushing
B	1/4 " Dia. Slotted End	A
C	1/4 " Dia. Flatted End	A
E	1/8 " Dia. Slotted End	C
R	6 mm Dia. Slotted End	R
M	6 mm Dia. Flatted End	R

SWITCH OPTION	
Code	Description
S	Push Switch
N	No Switch

RESOLUTION (Pulses Per Revolution)	
Code	Description
008	8 PPR
016	16 PPR
032	32 PPR
064	64 PPR

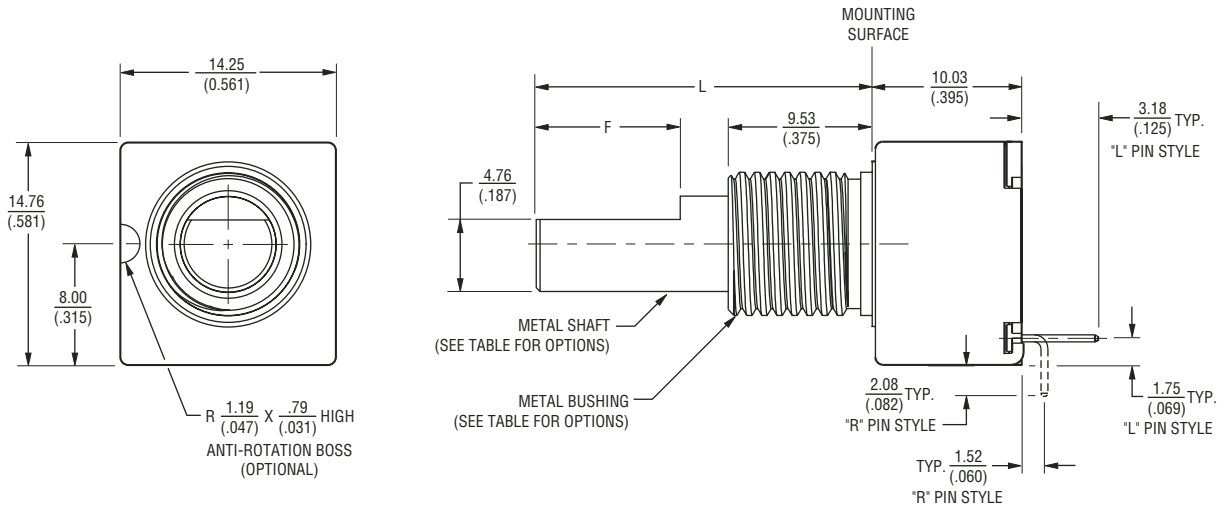
TERMINAL CONFIGURATION	
Code	Description
L	Axial Multi-Purpose Pin
R	Radial Multi-Purpose Pin

SHAFT LENGTH DESIGNATOR		
Code	Length (FMS)	Available w/Bushing
24	3/4 "	A, C
28	7/8 "	A, C
20	20 mm	R
25	25 mm	R

# EM14 - 14 mm Rotary Optical Encoder w/Switch

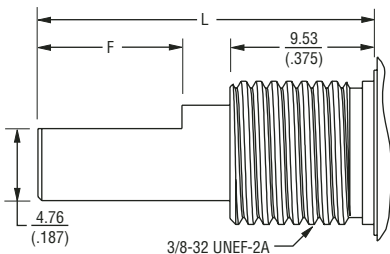
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## Product Dimensions



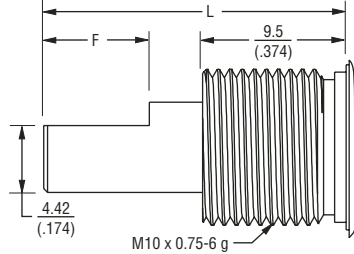
## Shaft / Flat Length Dimensions

**"A" Style Bushing - Flatted Shafts**



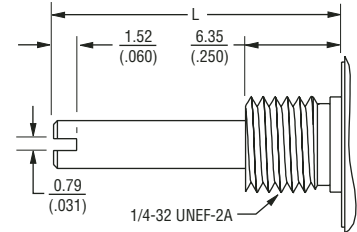
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"	FLAT LENGTH "F"
6.35 (.250)	9.52 (.375)	19.05 (.750)	7.94 (.313)
		22.22 (.875)	9.52 (.375)

**"R" Style Bushing - Flatted Shafts**



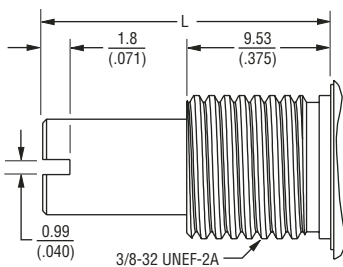
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"	FLAT LENGTH "F"
6.0 (.236)	10.0 (.394)	20.0 (.787)	7.0 (.275)
		25.0 (.984)	12.0 (.472)

**"C" Style Bushing - Slotted Shafts**



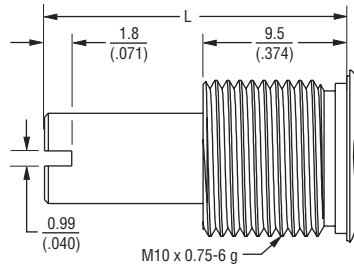
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"
6.35 (.250)	9.52 (.375)	19.05 (.750)
		22.22 (.875)

**"A" Style Bushing - Slotted Shafts**



SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"
6.35 (.250)	9.52 (.375)	19.05 (.750)
		22.22 (.875)

**"R" Style Bushing - Slotted Shafts**



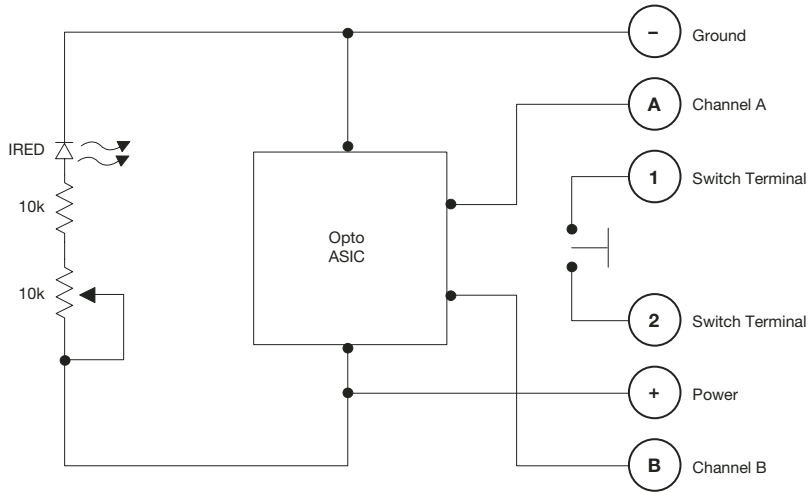
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"
6.0 (.236)	10.0 (.394)	20.0 (.787)
		25.0 (.984)

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

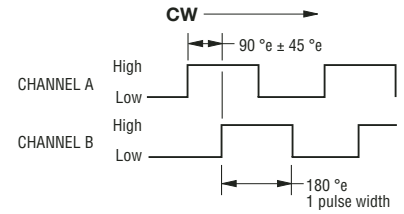
# EM14 - 14 mm Rotary Optical Encoder w/Switch

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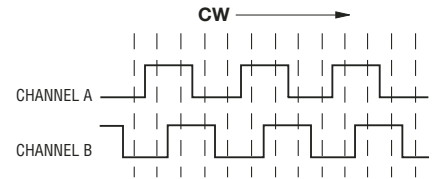
## Electrical Block Diagram



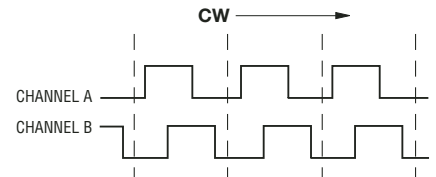
## Quadrature Output



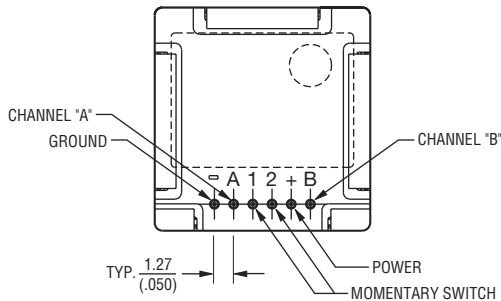
## 32 DETENT / 8 PPR



## 32 DETENT / 32 PPR



## Terminal Diagram



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