Features

- RoHS compliant*
- HCMOS, CMOS and TTL compatible
- Compact package size
- High rotational cycle life
- Standard or high force push switch option
- Optional detent

BOURNS® PRO AUDIO

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 (VCC)	5.0 VDC ± 0.25 VDC
Supply Current (ICC)	26 mA maximum
Output Voltage	
Low (VCE(sat)), per Channel	800 mV maximum at I(SINK) = 25 mA
High (VO(HI)), per Channel	4.0 VDC minimum @ VCC = 4.75 VDC
Output Current I(SINK), per Channel	25 mA maximum
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 ± 45 °e
Insulation Resistance @ 500 VDC	1,000 megohms minimum
Operating RPM	120 maximum
Switch Power Rating	12 VDC / 20 mA (600 ohms minimum 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 ºC to +125 ºC (-67 °F to +257 °F)
Vibration	15 G
Shock	50 G
Humidity	MIL-STD-202, Method 103, Condition B
Flammability	Conforms to UL 94HB
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 (@ 30 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	
Standard	250 gm (8.82 oz.) typical
High Force	850 gm (29.98 oz.) typical
Switch Travel	
Standard	0.04 in. typical
High Force	0.025 in. typical
Shaft Radial Play	0.005 in. maximum
Shaft Axial Structural Strength	35 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 annodized 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	Anti-static plastic tube (25 pcs./tube)

**When device is mounted by normal mounting means.

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

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

Additional Features

- Splashproof shaft seal
- Recommended for human/machine interface applications (HMI)
- Cable/connector option
- Optional bracket

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 DESIGNATOR	
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 for 8 or 32 PPR only)

ANTI-ROTATION LUG/BRACKET OPTION	
Code	**Description**
A	A/R Lug
B	Bracket (No hardware/no cable or connector)
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

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

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

SWITCH OPTION	
Code	**Description**
S	Push Switch (Standard)
H	Push Switch (High Force)
N	No Switch

RESOLUTION (Pulses Per Revolution)	
Code	**Description**
08	8 PPR
16	16 PPR
32	32 PPR
64	64 PPR

CABLE/CONNECTOR OPTION	
Code	**Description**
0	No Cable/Connector
1	6 ˝ Cable with Female Connector and stripped/tinned leads
2	6 ˝ Cable with Female Connector on both ends
3	12 ˝ Cable with Female Connector and stripped/tinned leads
4	12 ˝ Cable with Female Connector on both ends
5	3 ˝ Cable with Female Connector and stripped/tinned leads
6	1.5 ˝ Cable with Female Connector and stripped/tinned leads
7	2 ˝ Cable with Female Connector and stripped/tinned leads
8	5 ˝ Cable with Female Connector and stripped/tinned leads

For other cable and connector options, please contact the factory.

EM14 - 14 mm Rotary Optical Encoder w/Switch

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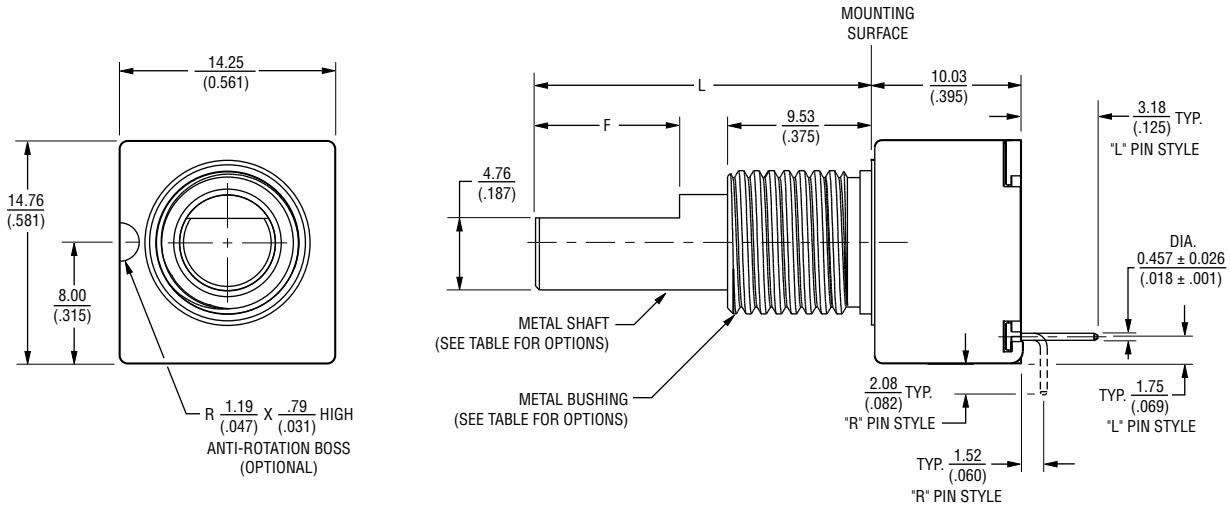
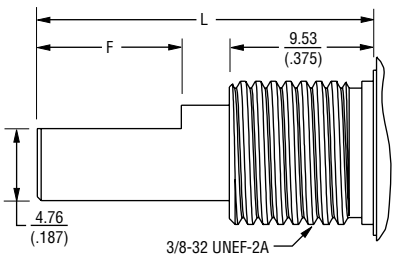
Product Dimensions



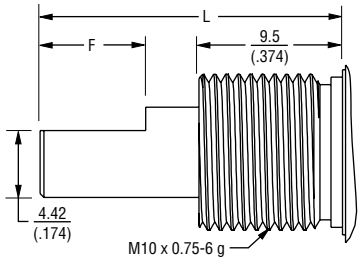
Shaft / Flat Length Dimensions

"A" Style Bushing - Flatted Shafts



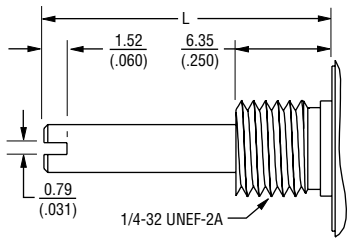
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"	FLAT LENGTH "F"
6.35 (.250)	9.52 (.375)	19.05 (.750)	7.94 (.313)
		22.22 (.875)	9.52 (.375)

"R" Style Bushing - Flatted Shafts



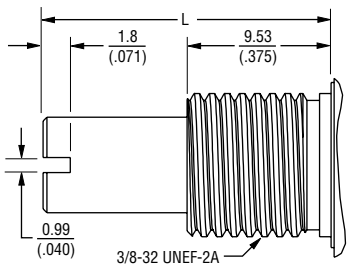
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"	FLAT LENGTH "F"
6.0 (.236)	10.0 (.394)	20.0 (.787)	7.0 (.275)
		25.0 (.984)	12.0 (.472)

"C" Style Bushing - Slotted Shafts



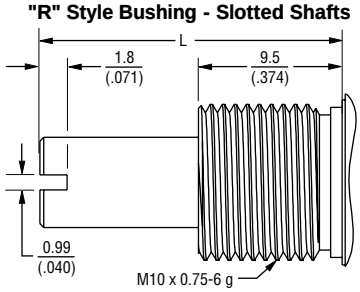
SHAFT DIA.	BUSHING DIA.	SHAFT LENGTH "L"
3.17 (.125)	6.35 (.250)	19.05 (.750)
		22.22 (.875)

"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)

DIMENSIONS: MM / (INCHES)

Specifications are subject to change without notice.
Users should verify actual device performance in their specific applications.
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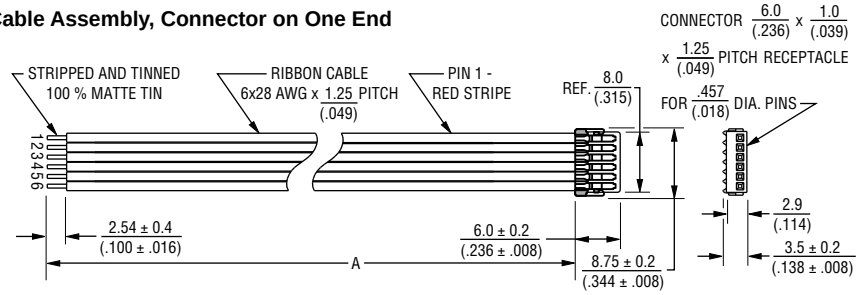
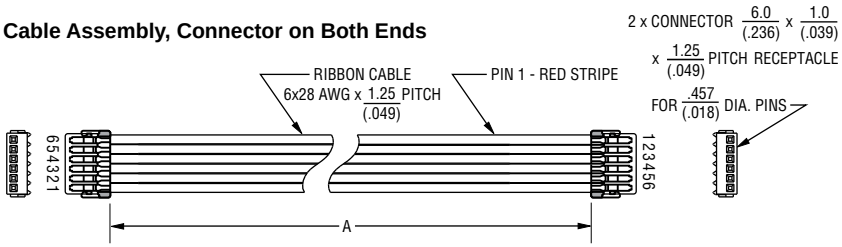
Cable/Connector Options

Cable Assembly, Connector on One End



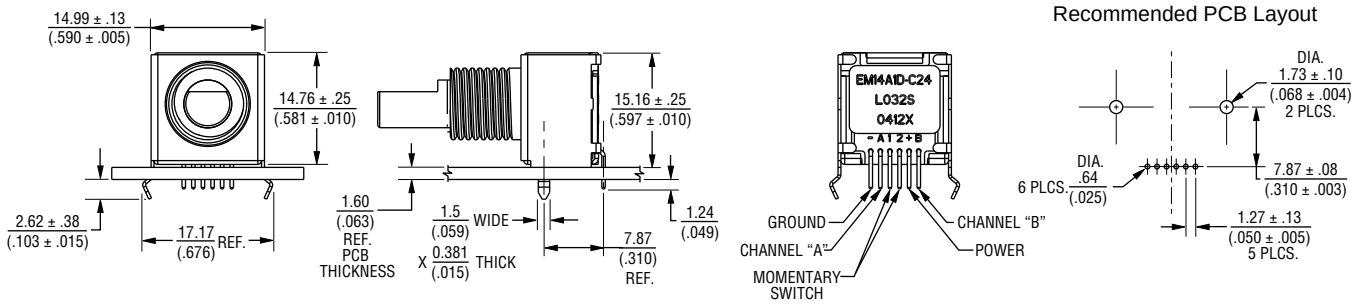
Cable Assembly, Connector on Both Ends



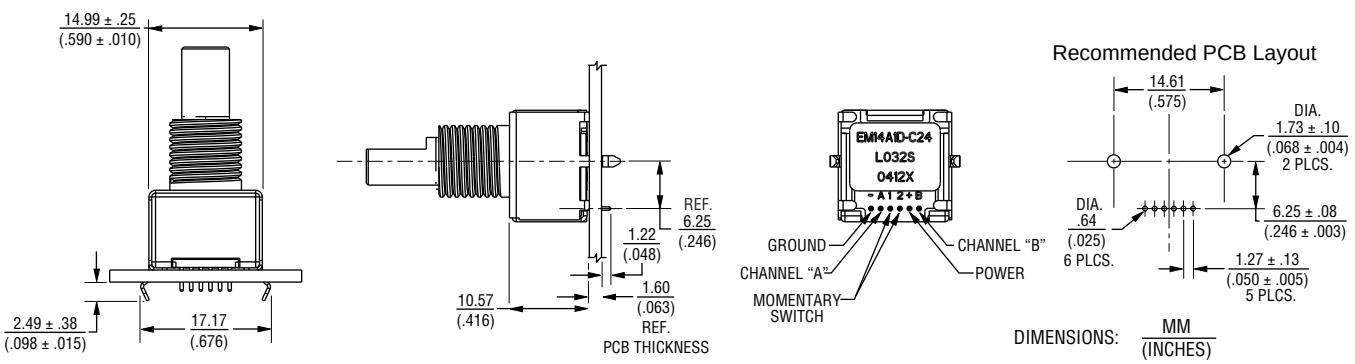
HDW. NO.	DESCRIPTION	"A" DIM.
H-290-1	CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS	152.4 ± 5.0 (6.0 ± .197)
H-290-2	CABLE ASSEMBLY, CONNECTOR ON ONE END	304.8 ± 5.0 (12.0 ± .197)
H-290-3	CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS	304.8 ± 5.0 (12.0 ± .197)
H-290-4	CABLE ASSEMBLY, CONNECTOR ON ONE END	152.4 ± 5.0 (6.0 ± .197)
H-290-5	RIBBON CABLE, 28 AWG, CONNECTOR ON ONE END	76.2 ± 5.0 (3.0 ± .197)
H-290-6	RIBBON CABLE, 28 AWG, CONNECTOR ON ONE END	38.1 ± 5.0 (1.5 ± .197)
H-290-7	RIBBON CABLE, 28 AWG, CONNECTOR ON ONE END	50.8 ± 5.0 (2.0 ± .197)
H-290-8	RIBBON CABLE, 28 AWG, CONNECTOR ON ONE END	127 ± 5.0 (5.0 ± .197)

Terminal Configurations

Radial (shown with optional mounting bracket)



Axial (shown with optional mounting bracket)



EM14 - 14 mm Rotary Optical Encoder w/Switch

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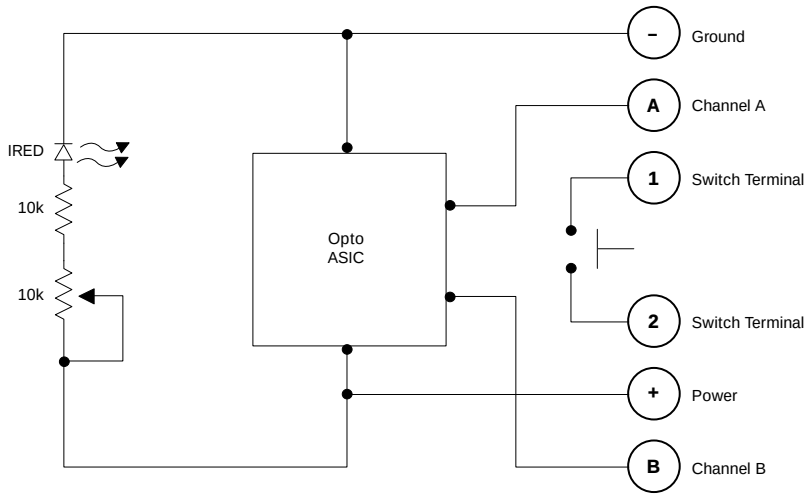
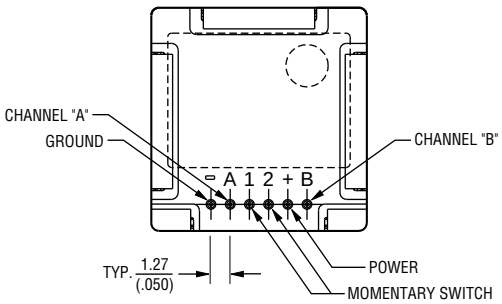
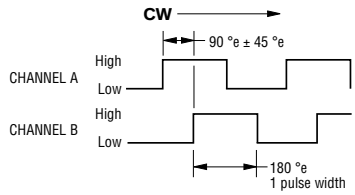
Electrical Block Diagram



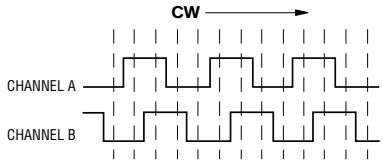
Terminal Diagram



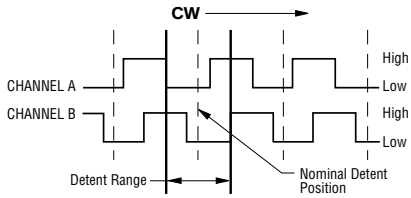
Quadrature Output



32 DETENT / 8 PPR



32 DETENT / 32 PPR



1. Nominal detent position occurs when both Channel A and B are in low states.
2. Channel A leads Channel B in CW direction and lags in CCW direction.

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