



## Features

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



## 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 $\pm$ 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 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                  |
| Operating RPM .....  | 120 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 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<br>370 °C (700 °F) max. for 3 seconds |
| Wave Soldering .....    | 96.5Sn/3.0Ag/0.5Cu solder with no-clean flux<br>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..... | Anti-static plastic tube (25 pcs./tube)  |

\*\*When device is mounted by normal mounting means.

\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.  
Specifications are subject to change without notice.  
Customers should verify actual device performance in their specific applications.

## 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

**BOURNS®**

## 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                |

| 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 (0.050 "/1.27 mm pitch centers in-line) and stripped/tinned leads  |
| 2                      | 6 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) on both ends               |
| 3                      | 12 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) and stripped/tinned leads |
| 4                      | 12 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) on both ends              |

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

### Cable and Connector Options:

- H-290-4 = 6 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) and stripped/tinned leads
- H-290-1 = 6 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) on both ends
- H-290-2 = 12 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) and stripped/tinned leads
- H-290-3 = 12 " Cable with Female Connector (0.050 "/1.27 mm pitch centers in-line) on both ends

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

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

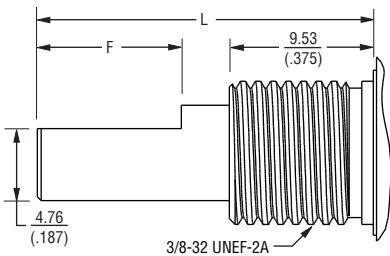
**BOURNS®**

## Product Dimensions



## Shaft / Flat Length Dimensions

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



| SHAFT DIA.   | BUSHING DIA. | SHAFT LENGTH "L" | FLAT LENGTH "F" |
|--------------|--------------|------------------|-----------------|
| 6.35 (0.250) | 9.52 (0.375) | 19.05 (0.750)    | 7.94 (0.313)    |
|              |              | 22.22 (0.875)    | 9.52 (0.375)    |

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



| SHAFT DIA.  | BUSHING DIA. | SHAFT LENGTH "L" | FLAT LENGTH "F" |
|-------------|--------------|------------------|-----------------|
| 6.0 (0.236) | 10.0 (0.394) | 20.0 (0.787)     | 7.0 (0.275)     |
|             |              | 25.0 (0.984)     | 12.0 (0.472)    |

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



| SHAFT DIA.   | BUSHING DIA. | SHAFT LENGTH "L" |
|--------------|--------------|------------------|
| 3.17 (0.125) | 6.35 (0.250) | 19.05 (0.750)    |
|              |              | 22.22 (0.875)    |

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



| SHAFT DIA.   | BUSHING DIA. | SHAFT LENGTH "L" |
|--------------|--------------|------------------|
| 6.35 (0.250) | 9.52 (0.375) | 19.05 (0.750)    |
|              |              | 22.22 (0.875)    |

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



| SHAFT DIA.  | BUSHING DIA. | SHAFT LENGTH "L" |
|-------------|--------------|------------------|
| 6.0 (0.236) | 10.0 (0.394) | 20.0 (0.787)     |
|             |              | 25.0 (0.984)     |

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

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

**BOURNS®**

## Cable/Connector Options

### Cable Assembly, Connector on One End



### Cable Assembly, Connector on Both Ends



| HARDWARE NUMBER | DESCRIPTION                            | "A" DIM.                     |
|-----------------|--|------------------------------|
| H-290-4         | CABLE ASSEMBLY, CONNECTOR ON ONE END   | 152.4 ± 5.0<br>(6.0 ± .197)  |
| H-290-2         | CABLE ASSEMBLY, CONNECTOR ON ONE END   | 304.8 ± 5.0<br>(12.0 ± .197) |
| H-290-1         | CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS | 152.4 ± 5.0<br>(6.0 ± .197)  |
| H-290-3         | CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS | 304.8 ± 5.0<br>(12.0 ± .197) |

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

## Terminal Configurations

### Radial (shown with optional mounting bracket)



### Recommended PCB Layout



### Axial (shown with optional mounting bracket)



### Recommended PCB Layout



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

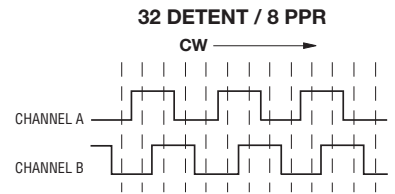
# EM14 - 14 mm Rotary Optical Encoder w/Switch

**BOURNS®**

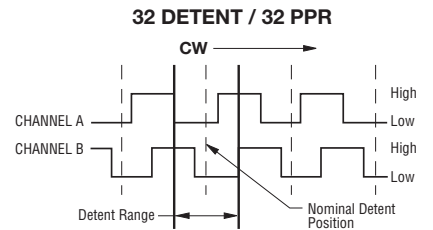
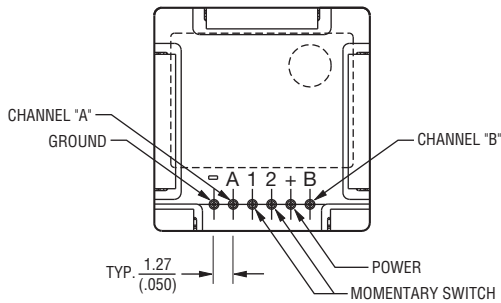
## Electrical Block Diagram



## Quadrature Output



## Terminal Diagram



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.

**BOURNS®**

Asia-Pacific: Tel: +886-2 2562-4117 • Fax: +886-2 2562-4116

Europe: Tel: +41-41 768 5555 • Fax: +41-41 768 5510

The Americas: Tel: +1-951 781-5500 • Fax: +1-951 781-5700

[www.bourns.com](http://www.bourns.com)

REV. 12/12

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

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А