

# L15

## INCREMENTAL OPTICAL ENCODER

### Introduction

The L15 provides the industrial marketplace with a rugged high resolution encoder in a compact size 15 servo package. Engineered with robust interpolative electronics, the L15 offers up to 40,640 cycles per turn. Ideal for space or weight limited applications, these compact encoders discount size without compromising performance. The L15 encoder features a 1/4-inch diameter stainless steel shaft and can accommodate up to 5 pounds radial or axial load. The L15 encoder package has field-proven ASIC electronics, sealed dual bearings and BEI's accurate code disk in an all metal housing to ensure ruggedness and reliability.



### Features

- Robustness and excellent resistance to shocks / vibrations
- Protection level to IP53
- High Resolutions Available: Up to 40,640 ppr
- Universal Electronic Circuits from 5 to 28 Vdc +/- 10% Vdc
- Operating temperature range up to -40° to +85°C
- High bandwidth: Up to 1MHz

### Applications

- Factory automation
- Motor feedback
- Conveyors
- Automated warehousing
- General industrial system monitoring and feedback

## SPECIFICATIONS

### Mechanical

<b>Shaft Diameter</b>	1/4 inch nominal
<b>Shaft Loading</b>	Up to 5 pounds axial and 5 pounds radial
<b>Shaft Runout</b>	0.002 T.I.R. at midpoint of shaft
<b>Starting Torque at 25°C</b>	0.20 in-oz (max)
<b>Bearings</b>	Sealed, instrument grade
<b>Shaft Material</b>	416 stainless steel
<b>Bearing Housing</b>	Aluminum with protective finish
<b>Cover</b>	Drawn aluminum
<b>Bearing Life</b>	1 X 10 <sup>9</sup> revs (10,000 hrs at 1500 RPM)
<b>Maximum RPM</b>	5,000 RPM nominal (see Frequency Response, below)
<b>Moment of Inertia</b>	1.0 X 10 <sup>-4</sup> oz-in-sec <sup>2</sup>
<b>Weight</b>	6 oz (max)

## Electrical

<b>Output Format</b>	2 channels in quadrature, 1/2 cycle index gated with negative B channel
<b>Cycles Per Shaft Turn</b>	See Resolutions list, below
<b>Supply Voltage</b>	5-28 VDC
<b>Current Requirements</b>	100mA typical + output load 250mA (max), 150mA (max) with 28V/5
<b>Voltage/Output</b>	28V/V: Line Driver, 5–28VDC <sub>in</sub> , Vout = Vin 28V/5: Line Driver, 5–28VDC <sub>in</sub> , Vout = 5 Vdc 28V/OC: Open Collector, Vout = OC, Vin = 5 - 28 Vdc
<b>Protection Level</b>	Reverse, overvoltage and output short circuit
<b>Frequency Response</b>	100kHz (non-interpolated), Up to 1 MHz interpolated
<b>Output Termination Pinouts</b>	See Output Functions, below

## Environmental

<b>Enclosure Rating</b>	NEMA 3. (IP53)
<b>Temperature</b>	Operating, 0° to 70° C; extended temperature testing available, -40° to 85° ; storage, -40° to 90° C
<b>Shock</b>	50 G's for 11 msec duration (1/2 Sine)
<b>Vibration</b>	20 to 2000 Hz @ 20 g's
<b>Humidity</b>	98% RH non-condensing



## OUTPUT FUNCTIONS

Color	Function
RED	+V (SUPPLY)
BLK	0 V (COMMON)
YEL	A
WHT/YEL	A/
BLU	B
WHT/BLU	B/
ORN	Z
WHT/ORN	Z/
BARE	SHIELD DRAIN



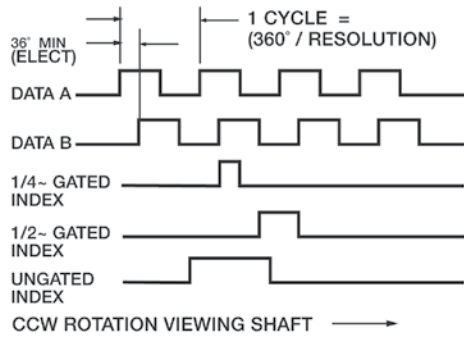
## RESOLUTIONS (NON-INTERPOLATED)

24 50 100 200 256 300 360 400 500 512 625 900 1000 1024 1200 1250 1440 1800 2000 2048 2500 2540

Interpolation up to 16X is available.



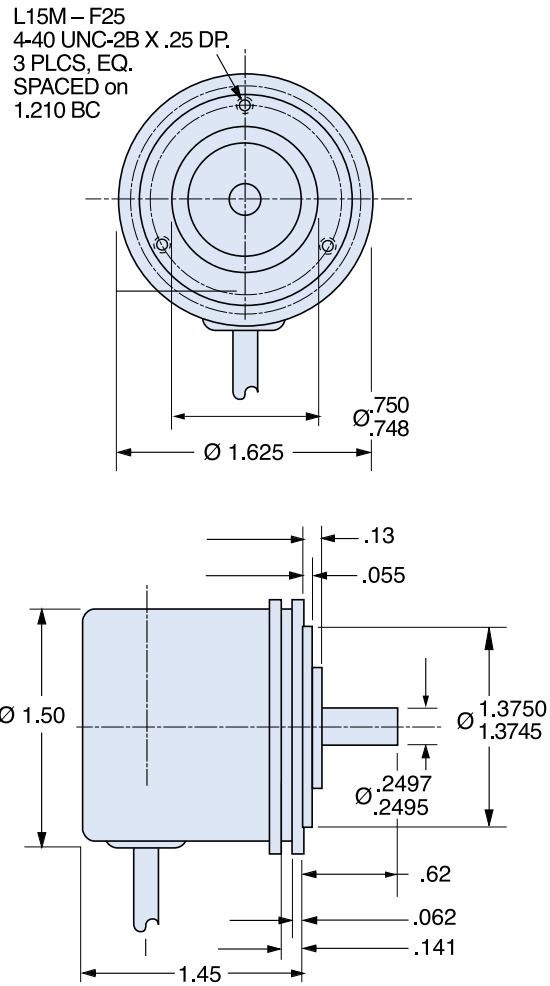
## OUTPUT WAVEFORMS



## DIMENSIONS

All dimensions are in inches.

Tolerances: .XX=±0.02, .XXX=±0.005





## ORDERING OPTIONS

Example : L15M-F25-256- - ABZC - 28V/V - SCS18 -

	L15	M	F25	256		ABZC	28V/V	SCS18	
<b>Type</b>									
L = Light Duty 15 = 1.5 inch diameter									
<b>Housing</b>									
M = Standard									
<b>Face Mount</b>									
F25 = Standard									
<b>Resolution (Number of Cycles)</b>									
1 to 2540 See Resolutions section									
<b>Interpolation</b>									
T2, T3, T4, T5, T8,T10, T12, T16									
<b>Channels</b>									
ABZ ABZC See Output Functions									
<b>Voltage/Output</b>									
28V/V: Line Driver, 5–28VDCin, Vout = Vin 28V/5: Line Driver, 5–28VDCin, Vout = 5 Vdc 28V/OC: Open Collector, Vout = OC, Vin = 5 - 28 Vdc See note 2									
<b>Output Termination</b>									
SCS = Shielded, Jacketed Cable with Cable Gland Seal and Cable length in inches (i.e. SCS18 = Pigtail 18 inches) See Output Functions									
<b>Special Features</b>									
S= Special features specified on purchase order (consult factory) See note 3									



## AGENCY APPROVALS & CERTIFICATIONS

CE EN 55011 and EN 61000-6-2



## GENERAL NOTES

- Complementary outputs are recommended for use with line driver type (source/sink) outputs. When used with differential receivers, this combination provides a high degree of noise immunity.
- Output IC's: Output IC's are available as either Line Driver (LD) or NPN Open Collector (OC) types. Open Collectors require pull-up resistors, resulting in higher output source impedance (sink impedance is similar to that of line drivers). In general, use of a Line Driver style output is recommended. Line Drivers source or sink current and their lower impedance mean better noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to circuit common/OV, which may damage the driver. Unused outputs should be isolated and left floating. Our applications specialists would be pleased to discuss your system requirements and the compatibility of your receiving electronics with Line Driver type outputs.  
**28V/V:** Multi-voltage Line Driver (7272\*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard (Note: Vout = Vin). This driver is TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 120 mA typical (plus load current). This is the recommended replacement for 3904R and 7406R open collector outputs with internal pullup resistors. It is also a direct replacement for any 4469, 88C30, 8830 or 26LS31 line driver.  
**28V/5:** Multi-voltage Line Driver (7272\*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard, internally regulated with 5V (TTL compatible) logic out. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current). Note: Limit encoder load to 2.5W max at ambient. Example at 12 VDC: 2.5W/

(+12VDC minus +5VDC) = 357 mA total allowed current. Consult factory for your specific requirements.

**15V/V:** Multi-voltage Line Driver (4469\*): 100 mA source/sink. Input voltage 5 to 15 VDC +/- 5% standard (Note:  $V_{out} = V_{in}$ ). TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current). This is a direct replacement for the 4469 Line Driver.

**28V/OC:** NPN Open Collector (3904\*, 7273\*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled up to voltage other than supply voltage (30 V max). Input voltage 5 to 28 VDC +/- 5% standard. Supply current is 120 mA typical. This replaces prior IC's with designations of 3904, 7406, 3302, 681 and 689.

5V/OCR, 15V/OCR, 24V/OCR: Open Collector (3904R\*, 7406R\*, 7273R\*): Current sink of 70 mA max. Includes internal pull-ups sized at approximately 100 ohms/volt. Max current source is 10 mA. Supply current is 100 mA typical, 120 mA with internal pull-ups. The 5V/OCR, 15V/OCR and 24V/OCR are often replaced by the 28V/V in system upgrades.

3. Special -S at the end of the model number is used to define a variety of non-standard features such as special shaft lengths, voltage options, or special testing. Please consult the factory to discuss your special requirements.
4. Higher frequency response may be available. Please consult with the factory.
5. Extended temperature ratings are available in the following ranges: -40 to 70°C, -40 to 85°C, -20 to 105°C and -40 to 105°C depending on the particular model. Some models can operate down to -55°C. Extended temperature ranges can affect other performance factors. Consult with factory for more specific information.

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