

# 15T / 15H Encoder

## Hollow Bore Performance Encoder



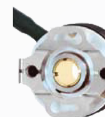
### Flex Mount Options



Slotted Flex Mount (SF)



Two Hole Flex Mount (SA)



Small Diameter Slotted Flex Mount (SB, SC, SD)

The Model 15T or 15H offers a high performance feedback solution in a low profile package. Unlike modular or kit encoders, the Model 15 utilizes an integral bearing set, and an innovative flexible mounting system which is much more tolerant to axial misalignment or radial shaft run-out. The slotted flex mounts provide 20 or 30 degrees of rotational adjustment for commutation or index pulse timing.

Installation is quick and easy. For brushless servo motor applications, three 120° electrical phase tracks can provide up to 12 pole commutation feedback. The optional 100°C and 120°C temperature options allow servo motors to operate at higher power outputs and duty cycles. The Model 15 provides stable and reliable operation and is an excellent replacement for other manufacturers modular encoders where a high performance solution is desired.

### Key Features

- High Performance Economical Encoder
- Low Profile 1.0" (25.4 mm) Height and 1.5" (38 mm) Diameter
- Thru-Bore (sizes up to 0.375" or 10 mm)
- Simple, Innovative Flex Mounting System (Global Mounting Standards)
- Up To 12 Pole Commutation Optional (for brushless motor control)

### Applications

- Servo motor control
- Robotics
- Specialist assembly machines
- Digital plotters
- High power motors

## Ordering Information

Blue type indicates price adder options. Not all configuration combinations may be available.

Mechanical			Electrical				Optional Features					
							Leave Blank For Standard Options -20° to +85°C Std    IP50 Std    None Std					
<b>15T</b>	<b>01</b>	<b>SF</b>	<b>0500</b>	<b>N</b>	<b>12</b>	<b>A</b>	<b>OC</b>	<b>F00</b>				
<b>BORE SIZE<sup>1</sup></b> 15 3/16", 0.1875" 01 1/4", 0.250" 03 5/16", 0.375" 02 3/8", 0.375" 06 5mm 04 6mm 14 8mm 05 10mm			<b>CYCLES PER REVOLUTION</b> See CPR Options below		<b>INPUT VOLTAGE</b> 5 5 VDC 12 12 VDC <b>V1</b> 5 to 28 VDC		<b>CONNECTOR TYPE</b> F00 18" Cable <sup>4</sup> (Std) F01 12" Cable F02 24" Cable F03 36" Cable M00 2M Cable <sup>5</sup> <b>J00</b> 18" Cable with 5-pin M12 <sup>8</sup> <b>K00</b> 18" Cable with 8-pin M12 <sup>8</sup>		<b>OPERATING TEMPERATURE</b> -20° to +85°C (Std) <b>T1</b> -40° to +85°C <b>T2</b> -20° to +100°C <b>T3</b> -20° to +120°C <sup>10</sup>		<b>CERTIFICATION</b> None (Std) <b>CE</b> CE Marked <sup>6</sup>	
<b>MODEL</b> 15T Thru-Bore 15H Hollow Bore			<b>COMMUTATION<sup>2</sup></b> N No Commutation <b>A</b> 4 Pole <b>B</b> 6 Pole <b>C</b> 8 Pole <b>E</b> 10 Pole <b>D</b> 12 Pole		<b>NUMBER OF CHANNELS<sup>3</sup></b> <b>A</b> Channel A  <b>Channel A Leads B</b> <b>Q</b> Quadrature A & B <b>R</b> Quadrature A & B with Index  <b>Channel B Leads A</b> <b>K</b> Reverse Quadrature A & B <b>D</b> Reverse Quadrature A & B with Index		<b>OUTPUT TYPE</b> <b>OC</b> Open Collector <sup>9</sup> <b>PP</b> Push-Pull <b>HV</b> Line Driver <b>PU</b> Pull-Up Resistor <sup>9</sup> <b>OD</b> Open Collector with Differential Outputs <sup>9</sup> Available on special request. Additional lead time may apply: <b>LO</b> Line Driver on ABZ, Open Collector on UVW <sup>9</sup>		<b>MAXIMUM FREQUENCY</b> Standard <b>F3</b> Extended See Specifications		<b>SEALING</b> <b>IP50</b> (Std) <b>S1</b> IP64 for Thru Bore & Blind Hollow Bore	
<b>MOUNTING</b> <b>SF</b> 1.812" (46mm) Slotted Flex Mount <b>SA</b> 1.812" (46mm) Two Hole Flex Mount <b>SB</b> 1.142 (29mm) Slotted Flex Mount <sup>7</sup> <b>SC</b> 1.2795" (32.5mm) Slotted Flex Mount <sup>7</sup> <b>SD</b> 1.575" (40mm) Slotted Flex Mount <sup>7</sup>												

### Model 15T/H CPR Options:

0001 thru 0189*	0198	0200	0250
0256	0300	0315	0360
0500	0512	0580	0600
1000	1024	1200	1250
1800*	2000	2048	2500
3000*	3600*	4096*	5000*
7200*	8192*	10,000*	

\*Contact Customer Service For Availability  
 \*Not available in 12V option

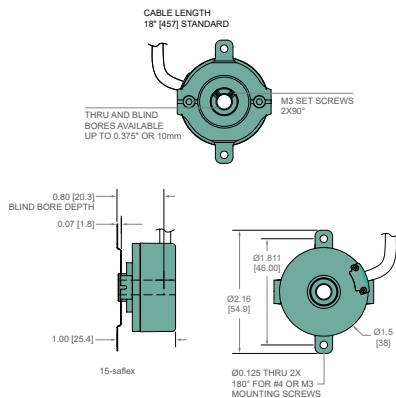
New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

### NOTES:

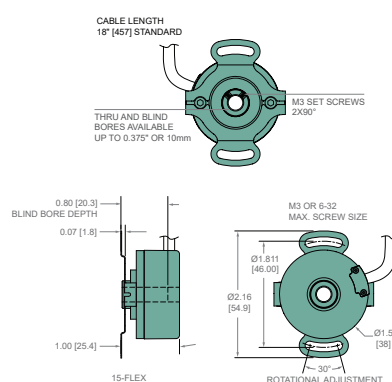
- 1 Contact Customer Service for additional options not shown.
- 2 Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
- 3 Contact Customer Service for non-standard index gating or phase relationship options.
- 4 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
- 5 For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
- 6 Please refer to Technical Bulletin TB100: When to Choose the CE Option
- 7 This mount requires button head screws and a modified Hex wrench. Order appropriate Installation Kit listed under Specifications.
- 8 Not available with commutation. 5-pin not available with Line Driver (HV, OD, LO) outputs. Additional cable lengths available. Please consult Customer Service.
- 9 With Input Voltage above 16 VDC, operating temperature is limited to 85°C.
- 10 Only available with 5 VDC Input Voltage.

## Dimensions

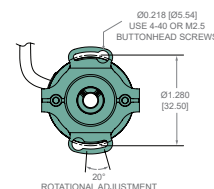
Model 15T/H 1.811" (46 mm) Two Hole Flex Mount (SA)



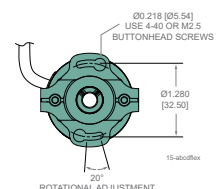
Model 15T/H 1.811" (46 mm) Slotted Flex Mount (SF)



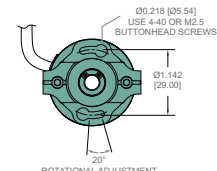
1.142" (29mm): SB\*



1.2795" (32.5mm): SC\*



1.575" (40mm): SD\*



Encoder Length and Diameter are the same as SF and SA mounts detailed above. All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified Metric dimensions are given in brackets [mm].

\*Order Appropriate No Charge Mounting and Installation Kit for SB, SC, or SD Option  
**176150-01** Installation Kit, 4-40 Buttonhead Screws with 0.062" Shortened Hex Wrench  
**176149-01** Installation Kit, M 2.5 Buttonhead Screws with 1.5 mm Shortened Hex Wrench  
 Each kit contains 10 screws for mounting 5 encoders

## Specifications

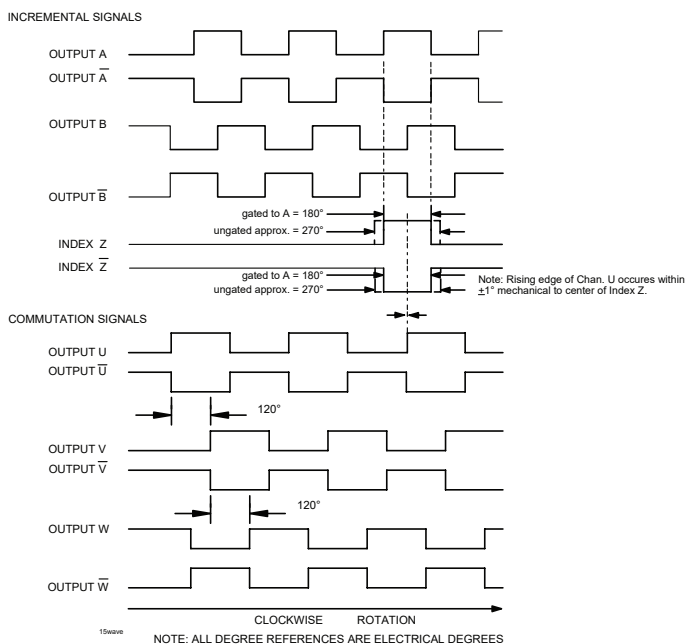
### Electrical

<b>Input Voltage</b>	5 VDC $\pm 10\%$ Fixed Voltage 12 VDC $\pm 10\%$ Fixed Voltage 4.75 to 28 VDC max for temperatures up to 85°C 4.75 to 24 VDC for temperatures between 85° to 100°C
<b>Input Current</b>	100 mA max (65 mA typical) with no output load
<b>Output Format</b>	Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mount-ing face. See <i>Waveform Diagrams</i> .
<b>Output Types</b>	Open Collector- 20 mA max per channel Push-Pull- 20 mA max per channel Pull-Up- Open collector with 22K ohm Pull-Up 20 mA max per channel Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
<b>Index</b>	Once per revolution. 190 to 10,000 CPR: Gated to output A 1 to 189 CPR: Ungated See <i>Waveform Diagrams</i> .
<b>Max. Frequency</b>	Standard Frequency Response is 200 kHz for CPR 1 to 2540 500 kHz for CPR 2541 to 5000 1 MHz for CPR 5001 to 10,000 Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540
<b>Noise Immunity</b>	Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811
<b>Symmetry</b>	180° ( $\pm 18^\circ$ ) electrical
<b>Quad. Phasing</b>	90° ( $\pm 22.5^\circ$ ) electrical
<b>Min. Edge Sep</b>	67.5° electrical
<b>Accuracy</b>	Within 0.017° mechanical or 1 arc-minute from true position. (for CPR>189)
<b>Commutation</b>	Up to 12 pole. Contact Customer Service for availability.
<b>Comm. Accuracy</b>	1° mechanical

### Mechanical

<b>Max Shaft Speed</b>	8000 RPM. Higher speeds may be achievable, contact Customer Service.
<b>Bore Size</b>	0.1875" through 0.375", 5 mm through 10 mm
<b>Bore Tolerance</b>	-0.0000" / +0.0006"
<b>User Shaft Tolerances</b>	
<b>Radial Runout</b>	0.008" max
<b>Axial Endplay</b>	$\pm 0.030$ " max
<b>Starting Torque</b>	IP50 Hollow Bore: 02 oz-in IP50 Thru-Bore: 0.3 oz-in IP64: 0.6 oz-in
<b>Moment of Inertia</b>	6.7 x 10 <sup>-5</sup> oz-in-sect (4.8 gm-cm 2)
<b>Max Acceleration</b>	1 x 10 <sup>5</sup> rad/sec <sup>2</sup>
<b>Electrical Conn</b>	18" cable (foil and braid shield, 24 AWG conductors non-commutated, 28 AWG commutated), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
<b>Mounting</b>	1.812" (46 mm) Slotted Flex mount 1.812" (46 mm) Two Hole Flex Mount 1.142" (29 mm) Slotted Flex Mount 1.2795" (32.5 mm ) Slotted Flex Mount 1.575" (40 mm ) Slotted Flex Mount (See mechanical drawings for dimensions)
<b>Weight</b>	3 oz typical
<b>Environmental</b>	
<b>Operating Temp</b>	-20° to +85° C standard models -40° to +85° C for low temperature option -20° to +100° C for high temperature option -20° to +120° C for extreme temperature option -25° to +85° C
<b>Storage Temp</b>	98% RH non-condensing
<b>Humidity</b>	10g@58 to 500 Hz
<b>Vibration</b>	80 g @ 11 ms duration
<b>Shock</b>	IP50 standard; IP64 available
<b>Sealing</b>	

## Waveform Diagrams



## Wiring Table

Function	Cable Wire Color	5-pin M12**	8-pin M12**	
COM	Black	3	7	*CE Option: Cable shield (bare wire) is connected to internal case
+VDC	White	1	2	
A	Brown	4	1	
A'	Yellow	--	3	
B	Red	2	4	**Non-CE Option: Cable shield is connected to M12 connector body.
B'	Green	--	5	
Z	Orange	5	6	
Z'	Blue	--	8	
U	Violet	--	--	CE Option: Cable shield and M12 connector body is connected to internal case.
U'	Gray	--	--	
V	Pink	--	--	
V'	Tan	--	--	
W	Red/Green	--	--	
W'	Red/Yellow	--	--	
Shield	Bare*	--	--	

