# MODEL 15T/H – INCREMENTAL ENCODER

Ø1.5"

## FEATURES

**Very High Performance Economical Encoder**
**Low Profile 1.0" (25.4 mm) Height and 1.5" (38 mm) Diameter**
**Thru-Bore with Sizes up to 0.375" (10 mm)**
**Simple, Innovative Flex Mounting System (Global Mounting Standards)**
**Up to 12 Pole Commutation Optional for Brushless Motor Control**

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 are 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.

## COMMON APPLICATIONS

**Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors**

## MODEL 15T/H ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

**Mechanical** | **Electrical** | **Optional Features** (Leave Blank For Standard Options)

| 15T | – | 01 | SF | – | 0500 | N | 5 | A | OC | – | F00 | – | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | -20° to +85° C Std | IP50 Std | None Std |

**MODEL**
**15T** Thru-Bore
**15H** Hollow Bore

**BORE SIZE**[1]
**15** 3/16", 0.1875"
**01** 1/4", 0.250"
**03** 5/16", 0.3125"
**02** 3/8", 0.375"
**08** 4 mm
**06** 5 mm
**04** 6 mm
**14** 8 mm
**05** 10 mm

**MOUNTING**
**SF** 1.812" (46 mm) Slotted Flex-Mount
**SA** 1.812" (46 mm) Two Hole Flex Mount
**SB** 1.142" (29 mm) Slotted Flex Mount[2]
**SC** 1.2795" (32.5 mm) Slotted Flex Mount[2]
**SD** 1.575" (40 mm) Slotted Flex Mount[2]

**CYCLES PER REVOLUTION**
See CPR Options below
Price adder for CPR>1999

**COMMUTATION**[3]
**N** No Commutation
**A** 4 Pole
**B** 6 Pole
**C** 8 Pole
**E** 10 Pole
**D** 12 Pole

**INPUT VOLTAGE**
**5** 5 VDC
**V1** 5 to 28 VDC

**NUMBER OF CHANNELS**[4]
**A** Channel A
***Channel A Leads B***
**Q** Quadrature A & B
**R** Quadrature A & B with Index
***Channel B Leads A***[5]
**K** Reverse Quadrature A & B
**D** Reverse Quadrature A & B with Index

**OUTPUT TYPE**
**OC** Open Collector
**PP** Push-Pull
**HV** Line Driver
**PU** Pull-Up Resistor[6]
**OD** Open Collector with Differential Outputs
***Available on special request.***
***Additional lead times may apply:***
**LO** Line Driver on ABZ
Open Collector on UVW[6]

**CONNECTOR TYPE**[7]
**F00** 18" Cable[8] (Std)
**F01** 12" Cable
**F02** 24" Cable
**F03** 36" Cable
**M00** 2M Cable[9]
**J00** 18" Cable with 5-pin M12[10]
**K00** 18" Cable with 8-pin M12[10]
**A00** 15-pin Header with 18" Cable[11]

**MAXIMUM FREQUENCY**
Standard
**F3** Extended
See Specifications

**OPERATING TEMPERATURE**
-20° to +85° C (Std)
**T1** -40° to +85° C
**T2** -20° to +100° C
**T3** -20° to +120° C[12]

**SEALING**
IP50 (Std)
**S1** IP64 for Thru-Bore & Blind Hollow Bore

**CERTIFICATION**
None (Std)
**CE** CE Marked[13]

## MODEL 15T/H CPR OPTIONS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0001 thru 0189 | 0198 | 0200 | 0250 | 0256 | 0300 | 0315 | 0360 | |
| 0400 | 0500 | 0512 | 0580 | 0600 | 0750 | 0800 | 1000 | 1024 |
| 1125 | 1200 | 1250 | 1500 | 1800 | 2000 | 2048 | 2500 | 2540 |
| 3000 | 3600 | 4000 | 4096 | 5000 | 6000 | 7200 | 8192 | 10,000 |

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 This mount requires button head screws and a modified Hex wrench. Order appropriate Installation Kit listed under Specifications.
3 Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
4 Contact Customer Service for non-standard index gating or phase relationship options.
5 Reverse Quadrature not available with PU output type.
6 With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
7 For mating connectors, cables, and cordsets see Encoder Accessories on page 102 or visit www.encoder.com. For Pin Configuration Diagrams, see page 107 or visit www.encoder.com.
8 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.
9 For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
10 Not available with commutation. 5-pin not available with Line Driver (HV, OD, LO) outputs. Additional cable lengths available. Please consult Customer Service.
11 Pin Header available with 5 VDC Input Voltage, HV Line Driver and standard quadrature phasing only. Not available with CE Certification. IP50 sealing option only.
12 Only available with 5 VDC Input Voltage.
13 Please refer to **Technical Bulletin TB100:** ***When to Choose the CE Option*** at www.encoder.com.

## MODEL 15T/H SPECIFICATIONS

### Electrical

Input Voltage..... 5 VDC +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

Input Current ..... 100 mA max (65 mA typical) with no output load

Output Format ..... Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector- 20 mA max per channel
Push-Pull- 20 mA max per channel
Pull-Up- Open collector with 2.2K ohm Pull-Up 20 mA max per channel
Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution
1 to 189 CPR: Ungated
190 to 10,000 CPR: Gated to output A
See *Waveform Diagrams*.

Max. Frequency ..... 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

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry... 180°(±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or 1 arc-minute from true position (for CPR>189)

Commutation..... Up to 12 pole. Contact Customer Service for availability.

Comm. Accuracy ..... 1° mechanical

### Mechanical

Max Shaft Speed..... 8000 RPM. Higher speeds may be achievable, contact Customer Service.

Bore Tolerance ..... -0.0000" / +0.0006"

User Shaft Tolerances
Radial Runout ..... 0.008" max
Axial Endplay..... ±0.030" max

Starting Torque ..... IP50 Hollow Bore: 0.2 oz-in
IP50 Thru-Bore: 0.3 oz-in
IP64: 0.6 oz-in

Moment of Inertia ... 6.7 x $10^{-5}$ oz-in-sec$^2$ (4.8 gm-cm$^2$)

Max Acceleration ..... 1 x $10^5$ rad/sec$^2$

Weight..... 3 oz typical

### Environmental

Storage Temp ..... -25° to +85° C

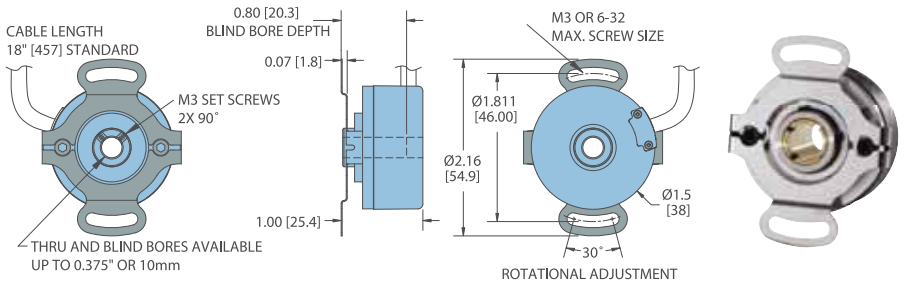
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

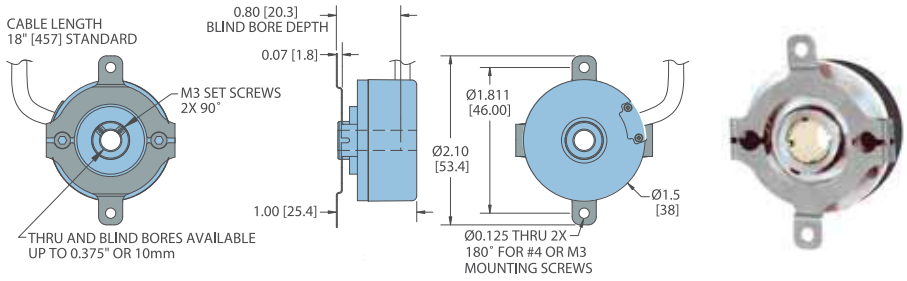
Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP64 available

## MODEL 15T/H 1.811" (46 MM ) SLOTTED FLEX MOUNT (SF)

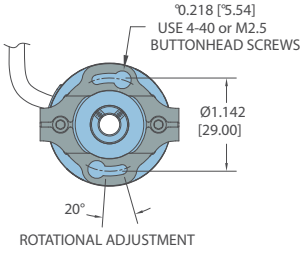



## MODEL 15T/H 1.811" (46 MM) TWO HOLE FLEX MOUNT (SA)

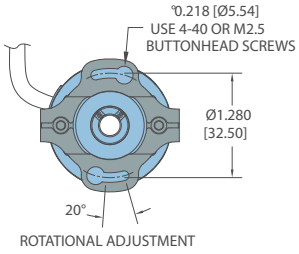



## MODEL 15T/H SMALL DIAMETER SLOTTED FLEX MOUNTS

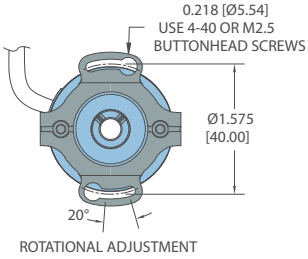
1.142" (29 mm) SB*




1.2795" (32.5 mm) SC*




1.575" (40 mm) SD*




*Order Appropriate No Charge Mounting and Installation Kit for SB, SC, or SD Option. Each kit contains 10 screws for mounting 5 encoders.

**176150-01** Installation Kit, 4-40 Buttonhead Screws with 0.062" Shortened Hex Wrench

**176149-01** Installation Kit, M2.5 Buttonhead Screws with 1.5 mm Shortened Hex Wrench

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].

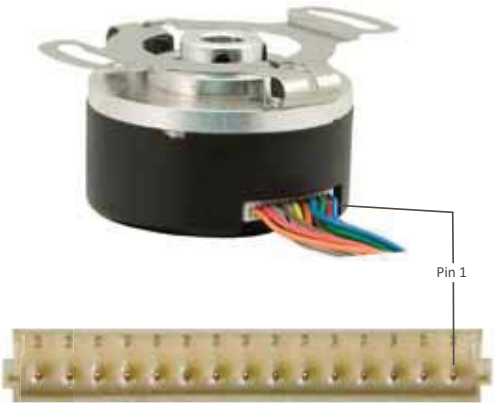
SB Slotted Flex Mount

## WIRING TABLE

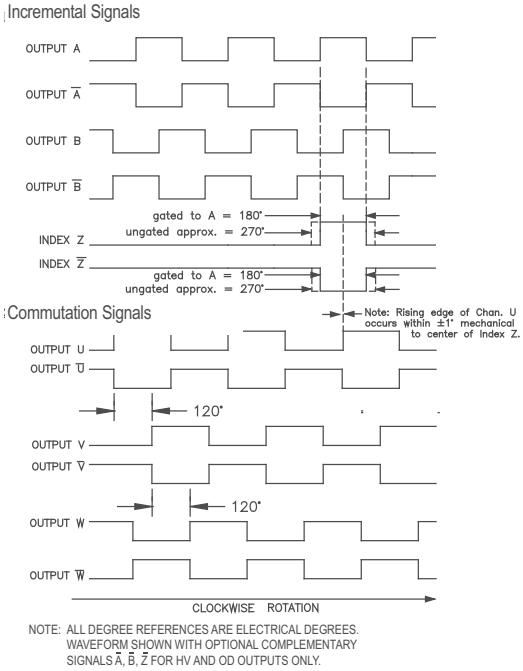
| Function | Cable† Wire Color | 5-pin M12** | 8-pin M12** | 15-pin Header |
|---|---|---|---|---|
| Com | Black | 3 | 7 | 1 |
| +VDC | White | 1 | 2 | 2 |
| A | Brown | 4 | 1 | 4 |
| A' | Yellow | -- | 3 | 3 |
| B | Red | 2 | 4 | 6 |
| B' | Green | -- | 5 | 5 |
| Z | Orange | 5 | 6 | 7 |
| Z' | Blue | -- | 8 | 8 |
| U | Violet | -- | -- | 10 |
| U' | Gray | -- | -- | 9 |
| V | Pink | -- | -- | 14 |
| V' | Tan | -- | -- | 13 |
| W | Red/Green | -- | -- | 12 |
| W' | Red/Yellow | -- | -- | 11 |
| Shield | Bare* | -- | -- | -- |

*CE Option: Cable shield (bare wire) is connected to internal case.
**Non-CE Option: Cable shield is connected to M12 connector body
CE Option: Cable shield and M12 connector body is connected to internal case.
†Standard cable for non-commutated models is 24 AWG For commutated units, conductors are 28 AWG.

15-pin Header




## WAVEFORM DIAGRAMS




NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND OD OUTPUTS ONLY.