

Description

The S6 series high resolution optical shaft encoder is a non-contacting rotary to digital converter. Useful for position feedback or manual interface, the encoder converts real-time shaft angle, speed, and direction into TTL-compatible quadrature outputs with or without index. The encoder utilizes a mylar disk, metal shaft and bushing, LED light source, and monolithic electronics. It operates from a single +5VDC supply.

Three shaft torque versions are available. The standard torque version has a sleeve bushing lubricated with a viscous motion control gel to provide torque and feel that is ideal for front panel human interface applications.

The no torque added option has a sleeve bushing and a low viscosity lubricant (that does not intentionally add torque) for low RPM applications where a small amount of torque is acceptable.

The ball bearing version uses miniature precision ball bearings that are suitable for high speed and ultra low torque applications.

A secure connection to the S6 series encoder is made through a 5-pin (single-ended version) or 10-pin (differential version) finger-latching connector (sold separately). The mating connectors are available from US Digital with several cable options and lengths.

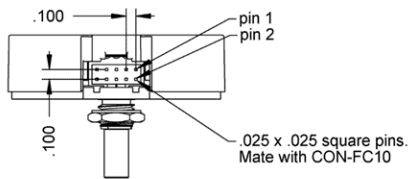
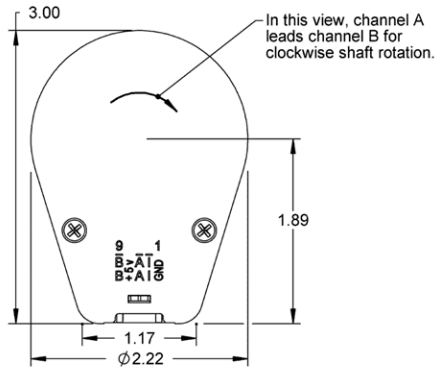
For differential version: the internal differential line driver (26C31) can source and sink 20mA at TTL levels. The recommended receiver is industry standard 26C32. Maximum noise immunity is achieved when the differential receiver is terminated with a 150 Ω resistor in series with a .0047 μ F capacitor placed across each differential pair. The capacitor simply conserves power; otherwise power consumption would increase by approximately 20mA per pair, or 60mA for 3 pairs.



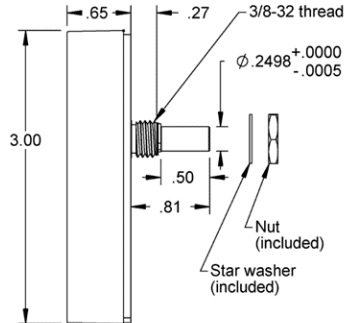
Features

- ▶ Small size
- ▶ Optional differential / line-driver output
- ▶ Positive latching connector
- ▶ 2-channel quadrature, TTL squarewave outputs
- ▶ 3rd channel index option
- ▶ Ball bearing option tracks to 10,000 RPM
- ▶ -40C to +100C operating temperature
- ▶ Single +5VDC supply

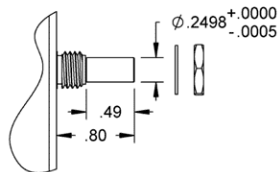
Differential



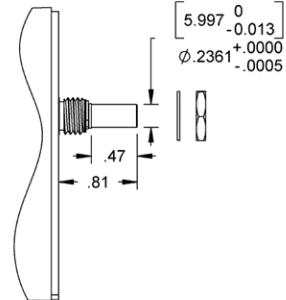
1/4" Sleeve Bushing (Default)



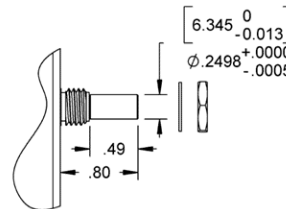
1/4" Ball Bearing (B-option)



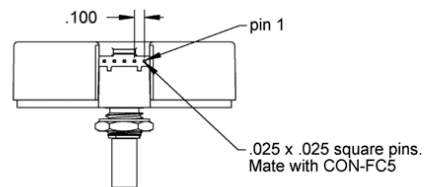
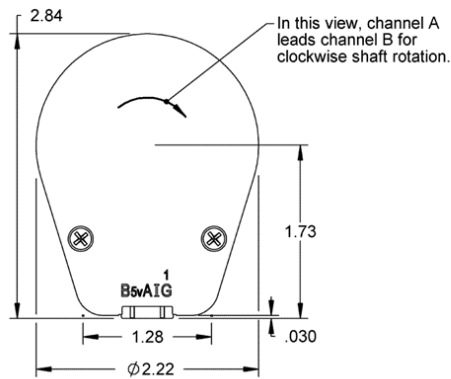
6mm Sleeve Bushing (M6-option)



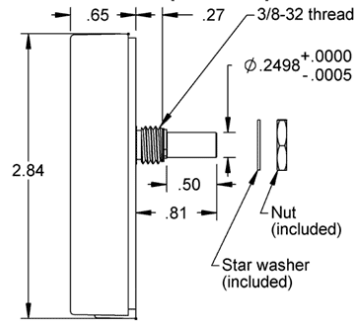
6mm Ball Bearing (BM6-option)



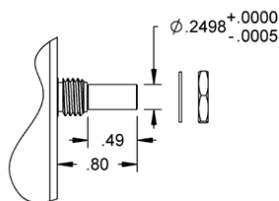
Single-Ended



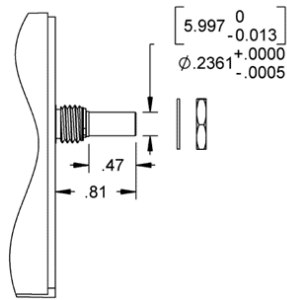
1/4" Sleeve Bushing (Default)



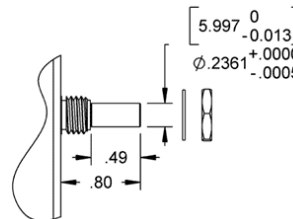
1/4" Ball Bearing (B-option)



6mm Sleeve Bushing (M6-option)



6mm Ball Bearing (BM6-option)



Environmental

| Parameter | Value | Units |
|--|------------|-------|
| Operating Temperature (CPR < 3600) | -40 to 100 | C |
| Operating Temperature (CPR ≥ 3600) | -25 to 100 | C |
| Vibration (5Hz to 2kHz) | 20 | G |
| Electrostatic Discharge, IEC 61000-4-2 | ± 4 | kV |

Mechanical

| Parameter | Sleeve Bushing | Ball Bearing |
|---|---|---|
| Max. Acceleration | 250000 rad/sec ² | 250000 rad/sec ² |
| Max. Shaft Speed | 100 rpm | 10000 rpm |
| Max. Shaft Torque | 0.5 ± 0.2 in-oz 0.3 in-oz (N-option) | 0.05 in-oz |
| Max. Shaft Loading | 2 lbs. dynamic 20 lbs. static | 1 lb. |
| Bearing Life | > 1000000 revolutions | $L_{10} = (19.3/F_r)^3 *$ Where L_{10} = bearing life in millions of revs, and F_r = radial shaft loading in pounds |
| Weight | | |
| Single-ended | 1.92 oz. | 1.78 oz. |
| Differential | 2.00 oz. | 1.86 oz. |
| Max. Shaft Total Indicated Runout | 0.0015 in. | 0.0015 in. |
| Max. Panel Nut Tightening Torque | 20 in-lbs | 20 in-lbs |
| Technical Bulletin TB1001 - Shaft and Bore Tolerances | | Download |

* Only valid with negligible axial shaft loading.

Phase Relationship

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation viewed from the shaft side of the encoder (see *the EM1 and EM2 page*).

Single-ended Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at $V_{cc} = 5.0V_{dc}$ and $25^{\circ}C$.
- For complete details, see the EM1 and EM2 product pages.

| Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------------------------|------|------|------|-------|--------------------------------|
| Supply Voltage | 4.5 | 5.0 | 5.5 | V | |
| Supply Current | | 27 | 33 | mA | CPR < 1000, no load |
| | | 54 | 62 | mA | CPR ≥ 1000 and < 3600, no load |
| | | 72 | 85 | mA | CPR ≥ 3600, no load |
| Low-level Output | | | 0.5 | V | IOL = 8mA max., CPR < 3600 |
| | | | 0.5 | mA | IOL = 5mA max., CPR ≥ 3600 |
| | | 0.05 | | mA | no load, CPR < 3600 |
| | | 0.25 | | mA | no load, CPR ≥ 3600 |
| High-level Output | 2.0 | | | V | IOH = -8mA max., CPR < 3600 |
| | 2.0 | | | V | IOH = -5mA max., CPR ≥ 3600 |
| | | 4.8 | | V | no load, CPR < 3600 |
| | | 3.5 | | V | no load, CPR ≥ 3600 |
| Output Current Per Channel | -8 | | 8 | mA | CPR < 3600 |
| | -5 | | 5 | mA | CPR ≥ 3600 |
| Output Rise Time | | 110 | | nS | CPR < 3600 |
| | | 50 | | nS | CPR ≥ 3600 |
| Output Fall Time | | 35 | | nS | CPR < 3600 |
| | | 50 | | nS | CPR ≥ 3600 |

Differential Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 and EM2 product pages.

| Parameter | Min. | Typ. | Max. | Units | Conditions |
|------------------------------------|------|------|------|-------|--------------------------------|
| Supply Voltage | 4.5 | 5.0 | 5.5 | V | |
| Supply Current | | 29 | 36 | mA | CPR < 1000, no load |
| | | 56 | 65 | mA | CPR ≥ 1000 and < 3600, no load |
| | | 74 | 88 | mA | CPR ≥ 3600, no load |
| Low-level Output | | 0.2 | 0.4 | V | IOL = 20mA max. |
| High-level Output | 2.4 | 3.4 | | V | IOH = -20mA max. |
| Differential Output Rise/Fall Time | | | 15 | nS | |

Pin-outs

5-pin Single-ended: (1)

| Pin | Description |
|-----|-------------|
| 1 | Ground |
| 2 | Index |
| 3 | A channel |
| 4 | +5VDC power |
| 5 | B channel |

10-pin Differential Standard: (2)

| Pin | Description |
|-----|-------------|
| 1 | Ground |
| 2 | Ground |
| 3 | Index- |
| 4 | Index+ |
| 5 | A- channel |
| 6 | A+ channel |
| 7 | +5VDC power |
| 8 | +5VDC power |
| 9 | B- channel |
| 10 | B+ channel |

(1) 5-pin single-ended mating connector is CON-FC5.

(2) 10-pin differential mating connector is CON-FC10.

Ordering Information

S6 - - - - -

| CPR | Shaft | Index | Output | Torque |
|---------|--------------------|--------------|-----------------|--------------------|
| 64 = | 236 =6mm diameter | NE =No Index | S =Single-ended | D =Default |
| 1000 = | 250 =1/4" diameter | IE =Index | D =Differential | B =Ball Bearing |
| 1024 = | | | | N =No Torque Added |
| 1800 = | | | | |
| 2000 = | | | | |
| 2048 = | | | | |
| 2500 = | | | | |
| 3600 = | | | | |
| 4000 = | | | | |
| 4096 = | | | | |
| 5000 = | | | | |
| 7200 = | | | | |
| 8000 = | | | | |
| 8192 = | | | | |
| 10000 = | | | | |

Notes

- Cables and connectors are not included and must be ordered separately.
- For ordering information please see the Compatible Cables / Connectors section above.
- US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.