



HB5M Features

- Hollow bore (hollow shaft/thru-bore) bearing design
- Rugged anodized aluminum housing
- Heavy-duty ball bearings track up to 6,000 RPM
- Positive latching polarized connector
- 2-channel quadrature, TTL squarewave outputs
- 3rd channel index option
- Differential line driver output option
- 32 to 5,000 cycles per revolution (CPR)
- 128 to 20,000 pulses per revolution (PPR)



HB5M Product Description

The HB5M is a hollow bore (hollow shaft/thru-bore) optical encoder with a machined aluminum enclosure and an anodized protective finish. The HB5M optical incremental encoder is designed to easily mount to an existing shaft to provide digital feedback information. Typical applications include motor feedback, process control, robotics, textile machines, and elevator controls.



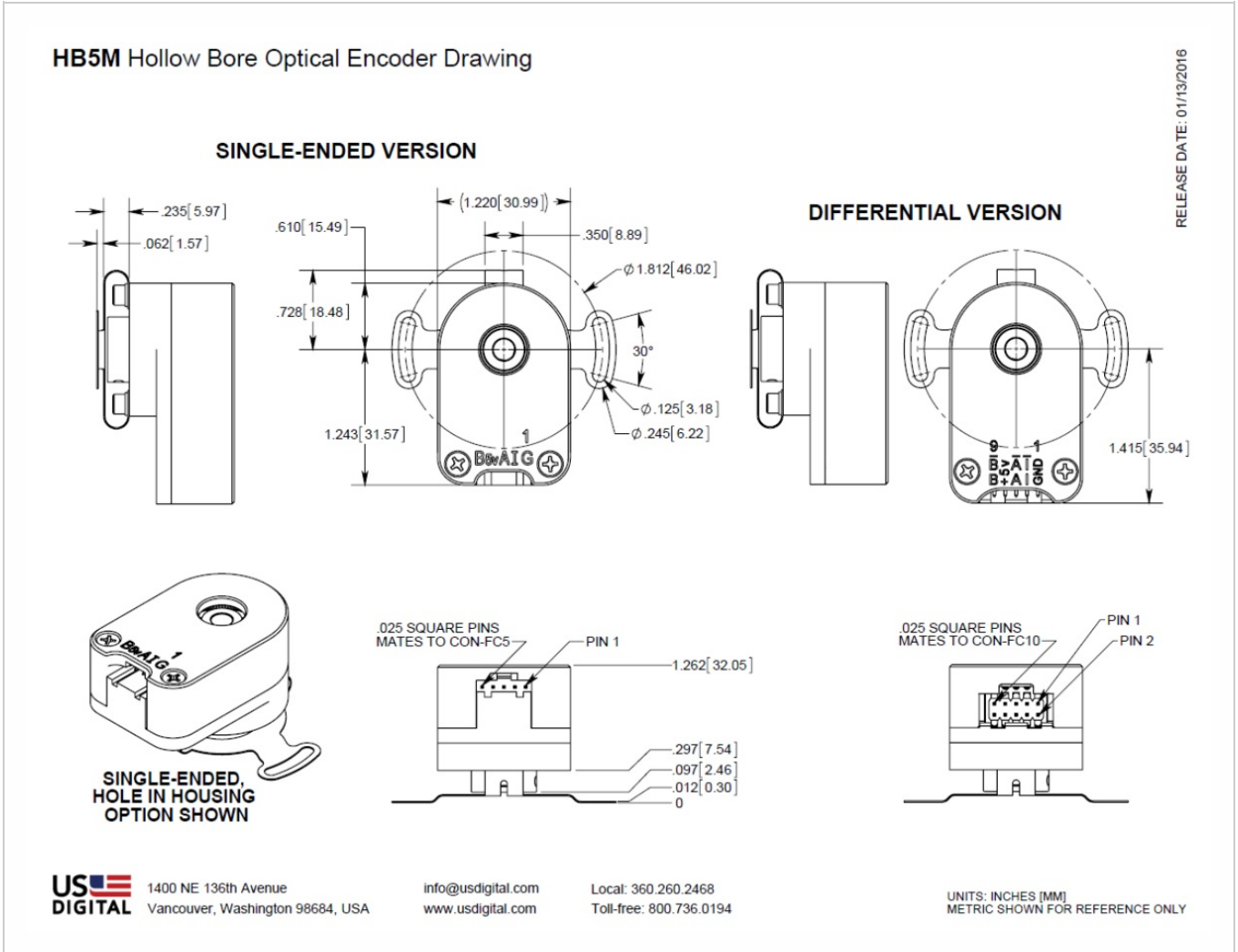
The HB5M bearing style encoder features a hollow bore that accepts shaft diameters from 5mm to 8mm in diameter. The encoder slips over the shaft and is locked into place with two 4-48 set screws. A flexible anti-rotation mount makes the encoder more tolerant of shaft runout than a standard kit encoder. The HB5M can accommodate shaft runout up to 0.030 in. axial and 0.010 in. radial. The flexible tether provides mounting for two 4-40 machine screws on a 1.812 in. bolt circle.

The HB5M housing comes standard with a closed cover or an optional hole in the body to allow a shaft to pass completely through the encoder.

The differential version has an internal differential line driver (26C31) that can source and sink 20mA at TTL levels. The cable connected to this encoder should have 3 twisted pairs for the data channels plus power and ground. The recommended receiver is the industry-standard 26C32.

The mating connector is polarized and latches into the encoder. Depressing the latch tab allows the connector to be unplugged. Mating connector assemblies are available from US Digital. Custom cables are also readily available (see the Cables (<https://www.usdigital.com/products/accessories/cables/>)/Connectors (<https://www.usdigital.com/products/accessories/connectors/>)page).

Mechanical Drawings



Specifications

ENVIRONMENTAL

| PARAMETER | VALUE | UNITS |
|---|------------|-------|
| Operating Temperature, CPR < 2000 | -40 to 100 | C |
| Operating Temperature, CPR ≥ 2000 | -25 to 100 | C |
| Vibration (5Hz to 2kHz) | 20 | G |
| Shock, 11 mSec | 50 | G |
| Electrostatic Discharge | | |
| Single-ended (-S version), IEC 61000-4-2 | ± 4 | kV |
| Differential (-D version), Human Body Model | ± 2 | |



MECHANICAL

| Parameter | Value |
|---|--|
| Max. Acceleration | 100000 rad/sec ² |
| Max. Shaft Speed (mechanical) | 6000 rpm (1) |
| Max. Starting Torque | 0.20 oz-in |
| Max. Bore Load | 2 lb. |
| Weight | 2.84 oz. |
| Max. Shaft Runout | 0.010 in. T.I.R. |
| Max. Shaft Axial Play | ± 0.030 in. |
| Required Shaft Length (From mounting surface) | Min. = 0.3 in. Max. = 1.0 in. with default cover. Max. = No limit with H-option cover. |
| Moment of Inertia | 1.29 x 10 ⁻⁴ oz-in-sec ² |
| Technical Bulletin TB1001 - Shaft and Bore Tolerances | Download (https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/) |

(1) The maximum speed due to electrical considerations is dependent on the CPR. See the EM1

(<https://www.usdigital.com/products/encoders/incremental/modules/em1/>) and EM2

(<https://www.usdigital.com/products/encoders/incremental/modules/em2/>) product pages.

PHASE RELATIONSHIP

A leads B in a clockwise shaft rotation, and B leads A in counterclockwise shaft rotation when viewed from the rear side (opposite flexible mount) of the encoder.



SINGLE-ENDED ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at $V_{cc} = 5.0V_{dc}$ and $25^{\circ}C$.
- For complete details, see the EM1 (<https://www.usdigital.com/products/encoders/incremental/modules/em1/>) or EM2 (<https://www.usdigital.com/products/encoders/incremental/modules/em2/>) product pages.

| PARAMETER | MIN. | TYP. | MAX. | UNITS | CONDITIONS |
|----------------------------|------|------|------|-------|--|
| Supply Voltage | 4.5 | 5.0 | 5.5 | V | |
| Supply Current | | 27 | 33 | mA | CPR < 500, no load |
| | | 54 | 62 | mA | CPR \geq 500 and < 2000, no load |
| | | 72 | 85 | mA | CPR \geq 2000, no load |
| Low-level Output | | | 0.5 | V | $I_{OL} = 8mA$ max., CPR < 2000 |
| | | | 0.5 | V | $I_{OL} = 5mA$ max., CPR \geq 2000 |
| | | 0.05 | | V | no load, CPR < 2000 |
| | | 0.25 | | V | no load, CPR \geq 2000 |
| High-level Output | 2.0 | | | V | $I_{OH} = -8mA$ max. and CPR < 2000 |
| | 2.0 | | | V | $I_{OH} = -5mA$ max. and CPR \geq 2000 |
| | | 4.8 | | V | no load and CPR < 2000 |
| | | 3.5 | | V | no load and CPR \geq 2000 |
| Output Current Per Channel | -8 | | 8 | mA | CPR < 2000 |
| | -5 | | 5 | mA | CPR \geq 2000 |
| Output Rise Time | | 110 | | nS | CPR < 2000 |
| | | 50 | | nS | CPR \geq 2000, $\pm 5mA$ load |
| Output Fall Time | | 100 | | nS | CPR < 2000 |
| | | 50 | | nS | CPR \geq 2000, $\pm 5mA$ load |



DIFFERENTIAL ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at $V_{CC} = 5.0V_{DC}$ and $25^{\circ}C$.
- For complete details, see the EM1 (<https://www.usdigital.com/products/encoders/incremental/modules/em1/>) or EM2 (<https://www.usdigital.com/products/encoders/incremental/modules/em2/>) product pages.

| PARAMETER | MIN. | TYP. | MAX. | UNITS | CONDITIONS |
|------------------------------------|------|------|------|-------|------------------------------------|
| Supply Voltage | 4.5 | 5.0 | 5.5 | V | |
| Supply Current | | 29 | 36 | mA | CPR < 500, no load |
| | | 56 | 65 | mA | CPR \geq 500 and < 2000, no load |
| | | 74 | 88 | mA | CPR \geq 2000, no load |
| Low-level Output | | 0.2 | 0.4 | V | $I_{OL} = 20mA$ max. |
| High-level Output | 2.4 | 3.4 | | V | $I_{OH} = -20mA$ max. |
| Differential Output Rise/Fall Time | | | 15 | nS | |



PIN-OUTS

5-PIN SINGLE-ENDED:

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | Ground |
| 2 | Index |
| 3 | A channel |
| 4 | +5VDC power |
| 5 | B channel |

10-PIN DIFFERENTIAL

| 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 |



PRODUCT CHANGE NOTIFICATIONS

| Title | Date | Description | Download |
|---|-----------|---|---|
| EM1 LED Die - PCN 1016 | 2/7/2013 | <p>As part of US Digital's continual assurance of supply strategy, we have qualified additional sources for our LED die used in our EM1 encoder module, which in turn impacts all of the following products:</p> <p>EM1, E2, E3, E5, E6, H1, H15, H3, H5, H6, HB5M, HB6M, HD25, PE, S1, S2, S5, S6, T5 and T6</p> <p>The device specification will remain the same, i.e. there will be no change to form, fit or function of the product(s) as specified by US Digital. The appropriate quality and reliability testing has been performed on representative products to ensure normal parametric distribution, consistent with US Digital's quality and reliability standards.</p> | <p>Download (https://www.usdigital.com/support/resources/product-change-notifications/pcn-1016-em1-led-die/)</p> |
| EM1 & EM2 Update - PCN 4199 | 1/14/2014 | <p>Based on our continuous process improvement program, US Digital is changing the current marking method for our EM1 and EM2 encoder modules to a serialization method. This change will allow for each module to have a unique code; the current marking method is based on a date code system that includes all encoder modules produced within a specific week / year. The serialization system will be based on a hexadecimal system.</p> | <p>Download (https://www.usdigital.com/support/resources/product-change-notifications/pcn-4199-em1-em2-update/)</p> |

Notes

- Cables and connectors are not included and must be ordered separately.
- US Digital® warrants its products against defects in materials and workmanship for two years. See complete warranty (<https://www.usdigital.com/company/warranty>) for details.
- For ordering information please see the Compatible Cables / Connectors section above.