



## 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.



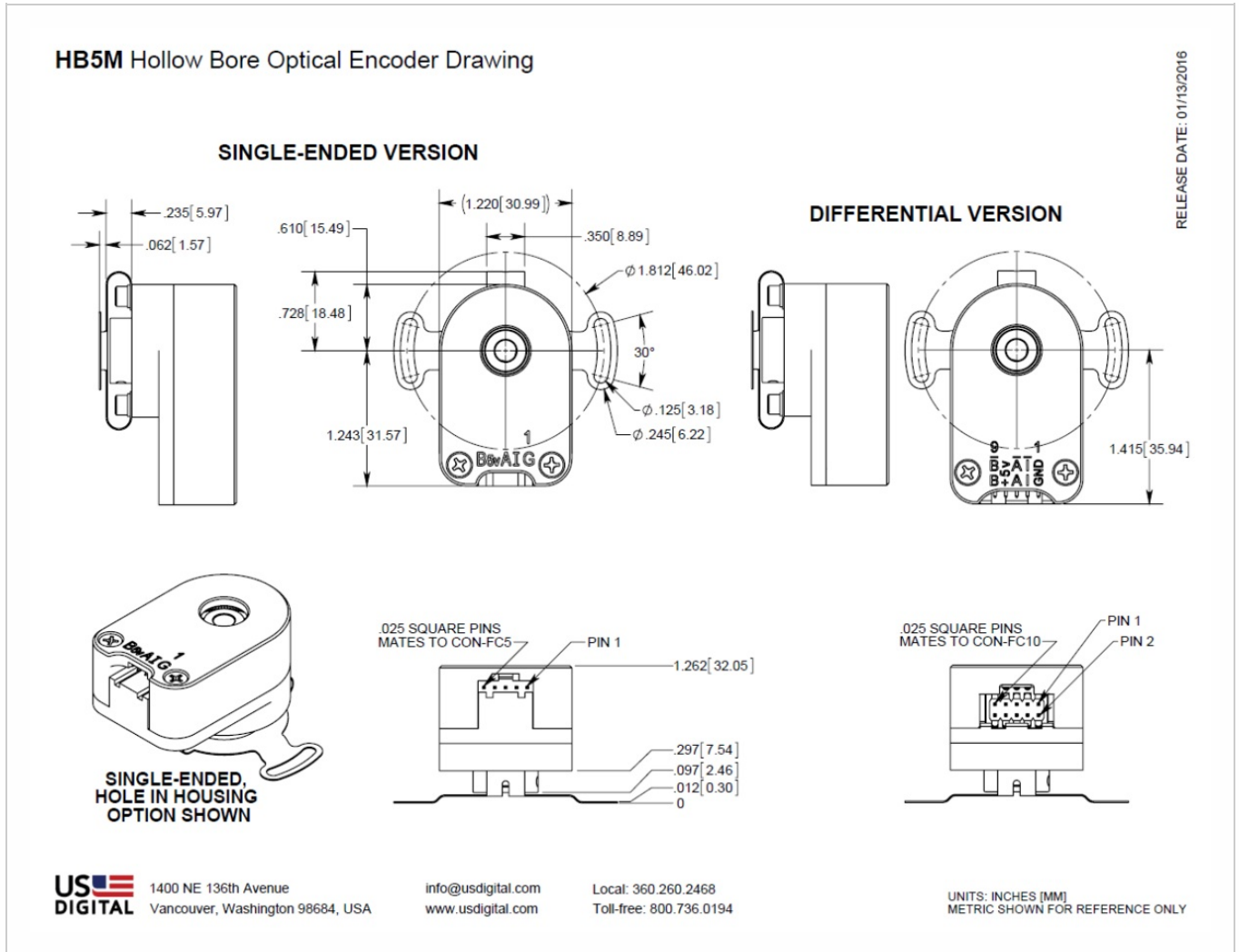
The HB5M bearing style encoder features a hollow bore that accepts shaft diameters from 5mm to 8mm in diameter. The encoder slips over the shaft and is locked into place with two 4-48 set screws. A flexible anti-rotation mount makes the encoder more tolerant of shaft runout than a standard kit encoder. 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 <sup>2</sup>
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 <sup>-4</sup> oz-in-sec <sup>2</sup>
Technical Bulletin TB1001 - Shaft and Bore Tolerances	Download ( <a href="https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/">https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/</a> )

(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 (<a href="https://www.usdigital.com/support/resources/product-change-notifications/pcn-1016-em1-led-die/">https://www.usdigital.com/support/resources/product-change-notifications/pcn-1016-em1-led-die/</a>)</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 (<a href="https://www.usdigital.com/support/resources/product-change-notifications/pcn-4199-em1-em2-update/">https://www.usdigital.com/support/resources/product-change-notifications/pcn-4199-em1-em2-update/</a>)</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.