



## HB6M 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 with optional index
- Multiple Output Drive Options
- 64 to 10,000 cycles per revolution (CPR); 256 to 40,000 pulses per revolution (PPR)



## HB6M Product Description

The HB6M is a high-resolution hollow bore (hollow shaft/thru-bore) optical encoder with a machined aluminum enclosure and an anodized protective finish. The HB6M 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.

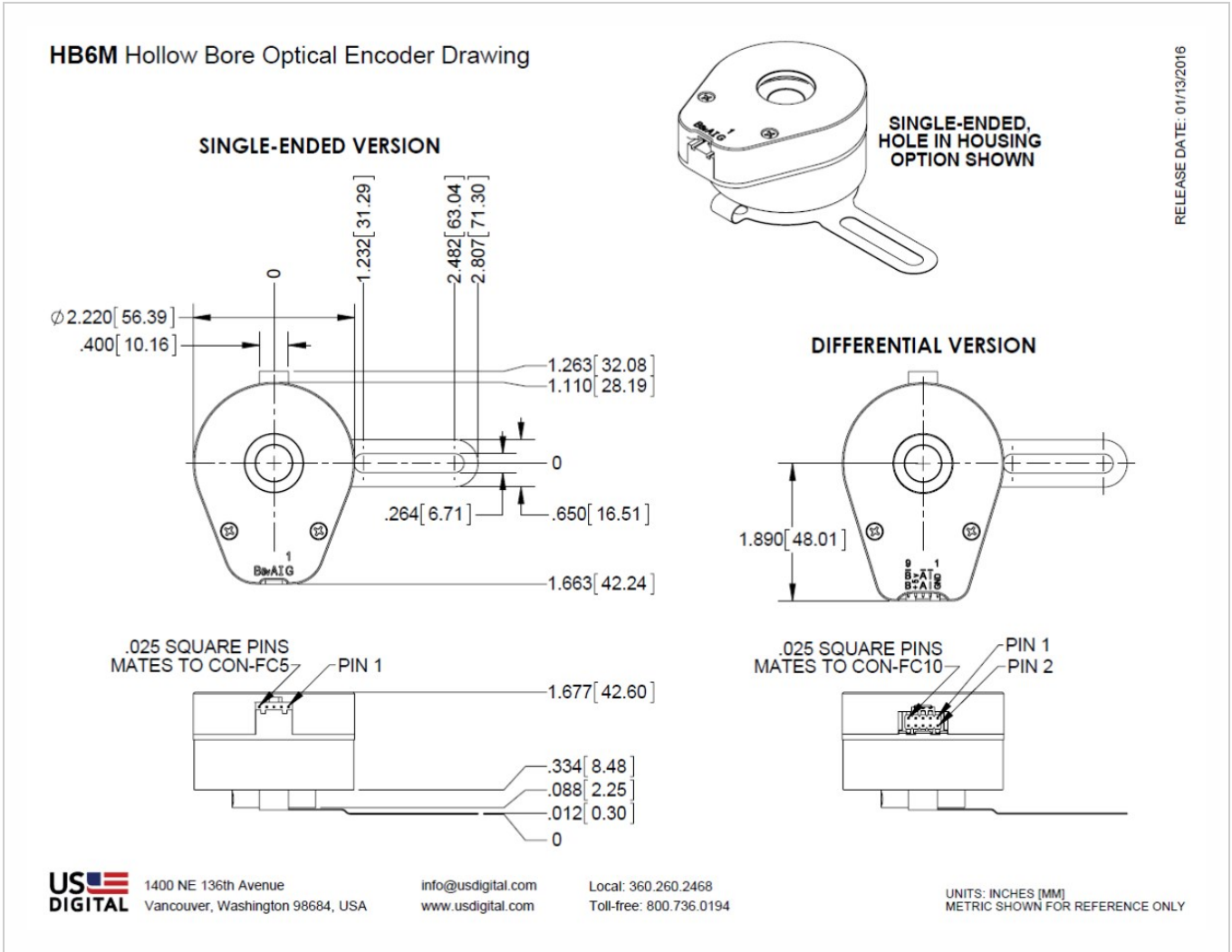


The HB6M bearing style encoder features a hollow bore that accepts shaft diameters from 0.236 in. to 0.750 in. in diameter. The encoder slips over the shaft and is locked into place with two 6-32 set screws. A flexible anti-rotation mount makes the encoder more tolerant of shaft runout than a standard kit encoder. The HB5M can accommodate shaft axial play up to  $\pm 0.030$  in. and shaft runout up to 0.010 in. The flexible tether provides single-point mounting for bolt circle diameters from 2.5 in. to 5.0 in.

The HB6M housing comes standard with a closed cover or an optional hole in the body to allow a shaft to pass completely through the encoder.

A secure connection to the HB6M Series encoder is made through a 5-pin (single-ended versions) or 10-pin (differential, high-voltage or open-collector versions) latching connector. The mating connectors are available from US Digital with several cable options and lengths.

Mechanical Drawings



Specifications



## ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature (CPR < 3600)	-40 to 100	C
Operating Temperature (CPR ≥ 3600)	-25 to 100	C
Electrostatic Discharge		kV
Single-ended (-S version), IEC 61000-4-2	± 4	
Differential (-D version), Human Body Model	± 2	
High-Voltage, Open-collector (H, C option), IEC 61000-4-2	± 4	
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G

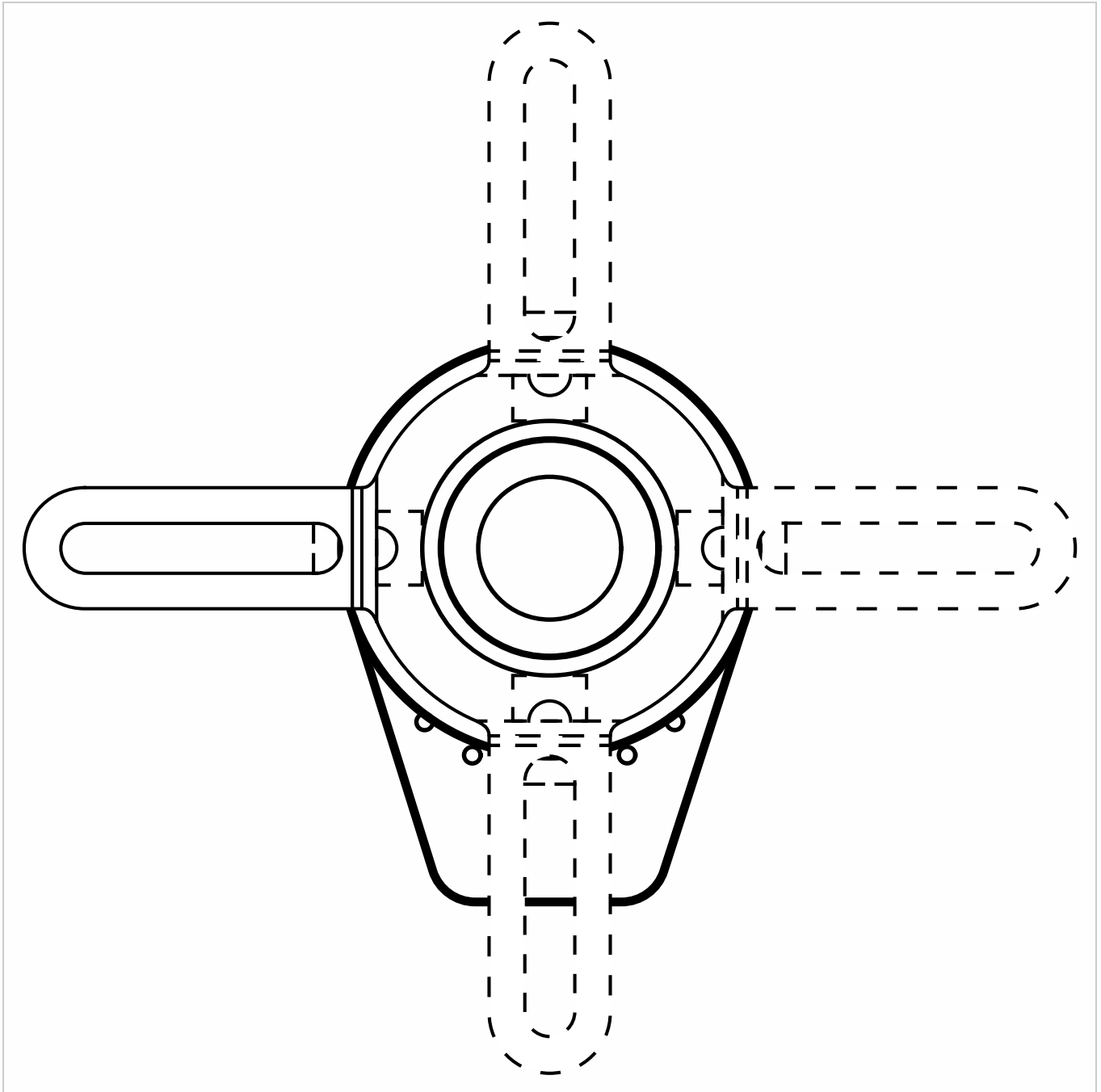
## MECHANICAL

PARAMETER	DIMENSION
Max. Acceleration	100000 rad/sec <sup>2</sup>
Max. Shaft Speed	6000 rpm
Max. Starting Torque	0.70 oz-in
Max. Bore Loading	5 lb.
Weight	11.5 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. = 1.4 in. with default cover. Max. = No limit with H-option cover.
Moment of Inertia	3.7x10 <sup>-3</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> )



## TETHER MOUNTING

The tether is shipped detached and may be mounted in the four different methods as shown below.



## PHASE RELATIONSHIP

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



## SINGLE-ENDED OPTION

- S option provides 5V TTL compatible outputs
- 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/>) and 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 < 1000, no load
		54	62	mA	CPR $\geq$ 1000 and < 3600, no load
		72	85	mA	CPR $\geq$ 3600, no load
Low-level Output			0.5	V	$I_{OL} = 8mA$ max., CPR < 3600
			0.5	V	$I_{OL} = 5mA$ max., CPR $\geq$ 3600
		0.05		V	no load, CPR < 3600
		0.25		V	no load, CPR $\geq$ 3600
High-level Output	2.0			V	$I_{OH} = -8mA$ max., CPR < 3600
	2.0			V	$I_{OH} = -5mA$ max., CPR $\geq$ 3600
		4.8		V	no load, CPR < 3600
		3.5		V	no load, CPR $\geq$ 3600
Output Current Per Channel	-8		8	mA	CPR < 3600
	-5		5	mA	CPR $\geq$ 3600
Output Rise Time		110		nS	CPR < 3600
		50		nS	CPR $\geq$ 3600
Output Fall Time		35		nS	CPR < 3600
		50		nS	CPR $\geq$ 3600



## DIFFERENTIAL OPTION

- D Option provides differential line driver output
- 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/>) and 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 < 1000, no load
		56	65	mA	CPR $\geq$ 1000 and < 3600, no load
		74	88	mA	CPR $\geq$ 3600, 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	

## HIGH-VOLTAGE OPTION

- H option uses a higher supply voltage and provides both single-ended and open-collector outputs
- Single-ended outputs are 5V TTL compatible (same as S option). See Pin-out.
- Specifications apply over the entire operating temperature range
- 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	7.5		30.0	V	
Supply Current, 24V power		8	10	mA	CPR < 500, no load
		16	19	mA	CPR $\geq$ 500 and < 2000, no load
		22	25	mA	CPR $\geq$ 2000, no load
Open Collector "On" Resistance		2		ohms	
Open Collector Sink Current			200	mA	
Output Low Voltage			0.4	V	200 mA sink current
Open Collector Pullup Voltage			50	V	

## PIN-OUTS



# HB6M Hollow Bore Optical Encoder

5-PIN SINGLE-ENDED S OPTION (1)		10-PIN DIFFERENTIAL D OPTION (2)	
Pin	Description	Pin	Description
1	Ground	1	Ground
2	Index	2	Ground
3	A channel	3	Index-
4	+5VDC power	4	Index+
5	B channel	5	A- channel
		6	A+ channel
		7	+5VDC power
		8	+5VDC power
		9	B- channel
		10	B+ channel

10-PIN HIGH-VOLTAGE H OPTION (2)	
Pin	Description
1	Ground
2	Ground
3	Index- (open collector)
4	Index+ (single-ended)
5	A- channel (open collector)
6	A+ channel (single-ended)
7	7.5-30V power
8	7.5-30V power
9	B- channel (open collector)
10	B+ channel (single-ended)

(1) 5-pin single-ended mating connector is CON-FC5 (<https://www.usdigital.com/products/accessories/connectors/con-fc5/>).

(2) 10-pin differential mating connector is CON-FC10 (<https://www.usdigital.com/products/accessories/connectors/con-fc10/>).

## 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.

## Configuration Options

HB6M	CPR (Cycles Per Revolution)	Bore Size	Index	Output	Housing
	64	236 (6.0mm)	IE (Index)	S (Single-Ended)	D (Default)
	100	250 (1/4")	NE (Non-Index)	H (Single-Ended High-Voltage)	H (Hole in Cover)
	200	313 (5/16")		D (Differential)	
	400	315 (8.0mm)			
	500	375 (3/8")			
	512	394 (10.0mm)			
	1000	472 (12.0mm)			
	1024	500 (1/2")			
	1800	551 (14.0mm)			
	2000	625 (5/8" Bore)			
	2048	750 (3/4" Bore)			
	2500				
	3600				
	4000				
	4096				
	5000				
	7200				
	8000				
	8192				
	10000				

**PLEASE NOTE: This chart is for informational use only.** Certain product configuration combinations are not available. Visit the HB6M product page (<https://www.usdigital.com/products/HB6M>) for pricing and additional information.