



## H1 Features

- Ball-bearing option tracks to 10,000 RPM
- 2-channel quadrature, TTL squarewave outputs
- 3rd channel index option available on some resolutions
- 32 to 5,000 cycles per revolution (CPR)
- 128 to 20,000 pulses per revolution (PPR)
- Wide operating temperature
- Single +5VDC supply



## H1 Product Description

The H1 series ball-bearing optical shaft encoder has a glass-filled polymer enclosure. This non-contacting rotary to digital converter is designed to provide digital feedback information. The H1 is fully assembled with a brass shaft, two 1/4 in. ID by 1/2 in. OD ball bearings, and a mounting plate. The mounting plate comes with 2 mounting holes for #4 size screws.



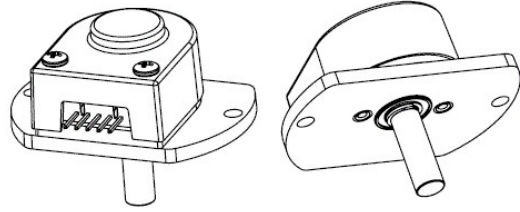
The H1 is designed to drive cables up to 10 feet long. For longer cable lengths, adding a PC4

(<https://www.usdigital.com/products/accessories/interfaces/cable-drivers/pc4/>)/PC5 (<https://www.usdigital.com/products/interfaces/encoder/cable-drivers/pc5/>) differential line driver is recommended. A connection to the H1 series encoder is made through a 5-pin standard connector.

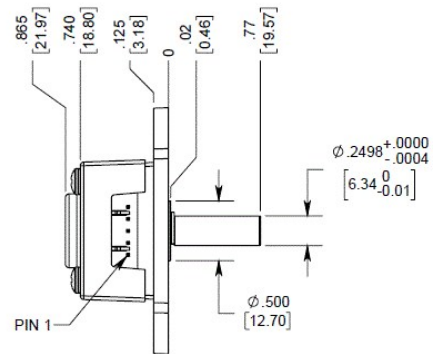
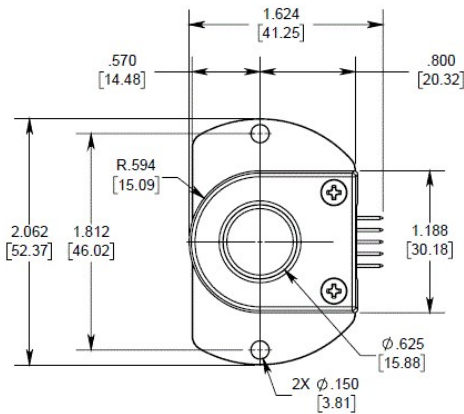
The mating connectors are available from US Digital with several cable options and lengths.

## Mechanical Drawings

H1 Ball Bearing Optical Shaft Encoder



RELEASE DATE: 04/27/2015



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UNITS: INCHES [MM]  
METRIC SHOWN FOR REFERENCE ONLY

## 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
Electrostatic Discharge, IEC 61000-4-2	± 4	kV



## MECHANICAL

PARAMETER	VALUE
Max. Acceleration	100000 rad/sec <sup>2</sup>
Max. Shaft Speed (mechanical)	10000 RPM (1)
Max. Shaft Torque	0.05 in-oz
Max. Shaft Loading	2 lbs.
Bearing Life	life in millions of revs = $(90/P)^3$ where P = radial load in pounds
Weight	1.49 oz.
Max. Shaft Runout	0.006 in. T.I.R.
Mounting Plate Screw Torque	(#4-40) 4-6
Moment of Inertia	0.001 oz-in-s <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

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation when viewed from the shaft side of the encoder.



## 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
		0.25		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

## PIN-OUT

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



## PRODUCT CHANGE NOTIFICATIONS

Title	Date	Description	Download
H1 Mold Update - PCN 5259	4/21/2015	As part of our ongoing continuous improvement efforts, and in order to enhance both function and appearance of the H1 product line, multiple improvements are being incorporated into a plastic component redesign.	Download <a href="https://www.usdigital.com/support/resources/product-change-notifications/pcn-5259-h1-mold-update/">(https://www.usdigital.com/support/resources/product-change-notifications/pcn-5259-h1-mold-update/)</a>
EM1 & EM2 Update - PCN 4199	1/14/2014	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.	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>
EOL Sealed Housing Option - PCN 1021	4/11/2013	This PCN is a formal notification that US Digital is discontinuing the Sealed Housing option for the following products: <ul style="list-style-type: none"> <li>• A2 Absolute Optical Encoder</li> <li>• A2T Absolute Optical Inclinometer</li> <li>• H1 Ball Bearing Optical Shaft Encoder</li> <li>• H3 Ball Bearing Optical Shaft Encoder</li> <li>• S1 Optical Shaft Encoder</li> <li>• S2 Optical Kit Encoder</li> </ul> <p>The Sealed Housing option provides the encoder with low level capability of surviving in moisture environments, however the encoder is NOT water proof or intended to be used in applications where this is required.</p>	Download <a href="https://www.usdigital.com/support/resources/product-change-notifications/pcn-1021-eol-sealed-housing-option/">(https://www.usdigital.com/support/resources/product-change-notifications/pcn-1021-eol-sealed-housing-option/)</a>
EM1 LED Die - PCN 1016	2/7/2013	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>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>	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>

## 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 [\(https://www.usdigital.com/company/warranty/\)](https://www.usdigital.com/company/warranty/) for details.



# | H1 BALL BEARING OPTICAL SHAFT ENCODER