

H6 Features

- Ball-bearing option tracks to 10,000 RPM
- 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)
- Wide operating temperature



H6 Product Description

The H6 series ball-bearing optical shaft encoder has a molded plastic, glass-filled enclosure, which utilizes either a 5-pin or 10-pin latching connector. This non-contacting rotary to digital converter is designed to provide digital feedback information.



The H6 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 4 mounting holes for #2 - #4 size screws.

A secure connection to the H5 Series encoder is made through a 5-pin (single-ended versions) or 10-pin (differential or high-voltage versions) latching connector. The mating connectors are available from US Digital with several cable options and lengths.

The internal differential line driver (26C31) can source and sink 20mA at TTL levels for differential versions. The recommended receiver is the 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 conserves power; otherwise, power consumption would increase by approximately 20mA per pair or 60mA for 3 pairs.

Mechanical Drawings



MECHANICAL

| PARAMETER | DIMENSION / UNITS |
|---|--|
| Max. Acceleration | 100000 rad/sec ² |
| 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: | |
| Single-ended | 3.02 oz. |
| Differential | 3.15 oz. |
| High-Voltage, Open-Collector (H, C option) | 3.15 oz. |
| Max. Shaft Runout | 0.006 in. T.I.R. |
| Mounting Plate Screw Torque | (#2-56) 2-3 |
| Moment of Inertia | 0.001 oz-in-s 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

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation when viewed from the shaft side 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 | mA | $I_{OL} = 5mA$ max., CPR \geq 3600 |
| | | 0.05 | | mA | no load, CPR < 3600 |
| | | 0.25 | | mA | 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 outputs
- Specifications apply over the entire operating temperature range
- Typical values are specified at Vcc = 5.0Vdc and 25°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 ≥ 1000 and < 3600, no load |
| | | 74 | 88 | mA | CPR ≥ 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)
- 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 ≥ 500 and < 2000, no load |
| | | 22 | 25 | mA | CPR ≥ 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-OUT

| 5-PIN SINGLE-ENDED | | 10-PIN DIFFERENTIAL | |
|--------------------|-------------|---------------------|-------------|
| 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

| H6 | - | CPR | - | Index | - | Output |
|----|---|-------|---|-------------------------|---|--|
| | | 64 | | IE (<i>Index</i>) | | S (<i>Single-Ended</i>) |
| | | 100 | | NE (<i>Non-Index</i>) | | H (<i>Single-Ended High-Voltage</i>) |
| | | 200 | | | | D (<i>Differential</i>) |
| | | 400 | | | | |
| | | 500 | | | | |
| | | 512 | | | | |
| | | 1000 | | | | |
| | | 1024 | | | | |
| | | 1800 | | | | |
| | | 2000 | | | | |
| | | 2048 | | | | |
| | | 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 H6 product page (<https://www.usdigital.com/products/H6>) for pricing and additional information.