

# H38 Incremental Optical Encoder



The H38 is an explosion proof version of the field-proven H25 encoder series.

The H38 is UL certified for NEMA Class 4X and 6 (outdoor non-hazardous locations) and Class 4X and 13 (indoor non-hazardous locations). It is available with Class 1, Group D, Division 1 or Class 2, Division 1 Group E, F, and G rating for use

in hazardous locations. It features a standard shaft seal, double bearing seals, and a cast aluminum housing with hard anodized and dichromate sealed finish. The H38 is suitable for use in petroleum service industries, solvent refining operations, spray painting applications, and explosive dust environments.

The HS45 Incremental Encoder is available with the following certifications:

EN 55011 and EN 61000-6-2

CENELEC EEX ia IIC T4

U.S. Standards Class I, Group A,B,C & D; Class II Group E, F & G

Canadian Standards Class I, Zone 0, Group IIC

The Mine Safety and Health Administration (MSHA) is an organization that operates in the United States and enforces compliance with safety and health standards in the Nation's mines. Consult factory for MSHA rated product.

## Mechanical Specifications

**Shaft Diameter:** 3/8" nominal

**Shaft Loading:** Up to 40 pounds axial and 20 pounds radial applied 1/4" from housing

**Shaft Runout:** 0.0005 T.I.R.

**Starting Torque at 25° C:** 4.0 in-oz (max)

**Bearings:** Class ABEC 7 standard

**Shaft Material:** 303 stainless steel

**Enclosure:** Die cast aluminum, hard anodized with dichromate sealed finish. Shaft seals and sealed bearings are standard to achieve environmental ratings.

**Bearing Life:** 2 X 10<sup>8</sup> revs (1300 hrs at 2500 RPM) at rated load; 1 X 10<sup>10</sup> revs (67,000 hrs at 2500 RPM) at 10% of rated load

**Maximum RPM:** 10,000 RPM (see Frequency Response, below)

**Moment of Inertia:** 4.1 X 10<sup>-4</sup> oz-in-sec<sup>2</sup>

**Weight:** 64 oz typical (approx 4 lbs)

## Electrical Specifications

**Code:** Incremental or Absolute

**Output Format:** 2 channels in quadrature, 1/2 cycle index gated with negative B channel, or Absolute to 13 bits

**Cycles per Shaft Turn:** 1 to 72,000 (see table 2, back page). For resolutions above 3,600 see interpolation options in the 2008 BEI Spec Guide on pages 36 and 37; Absolute to 8192 counts per turn

**Supply Voltage:** 5 to 28 VDC available

**Current Requirements:** 100 mA typical

+output load, 250 mA (max)

**Voltage/Output:** (see note 3)

15V/V: Line Driver, 5–15 VDC in, V<sub>out</sub> = V<sub>in</sub>

28V/V: Line Driver, 5–28 VDC in, V<sub>out</sub> = V<sub>in</sub>

28V/5: Line Driver, 5–28 VDC in, V<sub>out</sub> = 5 VDC

28V/OC: Open Collector, 5–28 VDC in, OC<sub>out</sub>

**Protection Level:** Reverse, overvoltage and output short circuit (see note 3)

**Frequency Response:** 100 KHz, Up to 1MHz with interpolation option (see note 5)

**Output Terminations:** see Table 1, back page

**Termination Type:** Compression type, UL recognized. Accepts AWG 14 to 22, stranded wire, strip 1/4"

**Note:** Consult factory for other electrical options

## Environmental Specifications

**Enclosure Rating:** NEMA 4X & 6 (IP66), outdoor Non-Hazardous locations, NEMA 4X & 13 (IP66), indoor Non-Hazardous locations

**Temperature:** Operating, 0° to 70° C; extended temperature testing available (see note 6, back page); 80° C max for UL and CEN approved units; storage; -25° to 90° C.

**Shock:** 50 g's at 11 msec

**Vibration:** 5 to 2000 Hz @ 20 g's

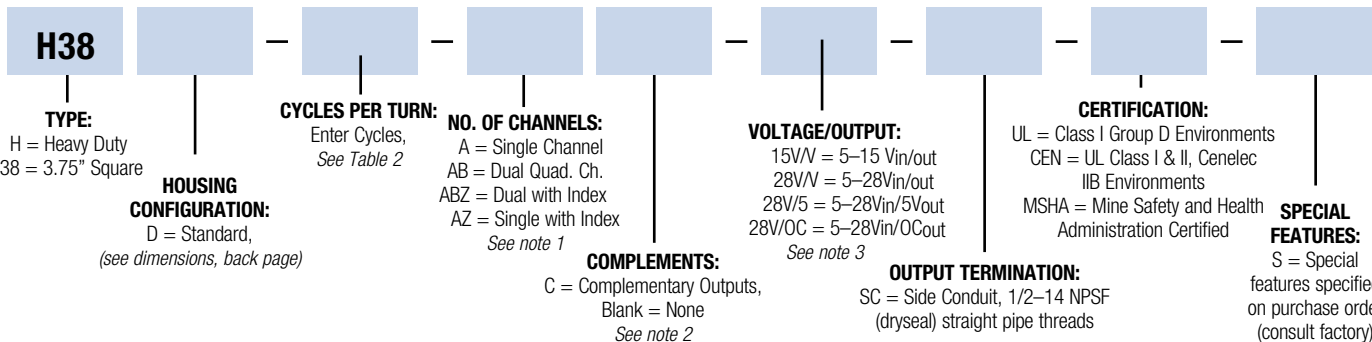
**Humidity:** 100% RH

**Hazardous Area Rating:** Underwriters Laboratories listed for use in hazardous locations; NEMA Enclosure 7, Class 1, Group C & D, Division 1, NEC Class 2 circ. **NOTES & TABLES 2, Groups E, F, and G** All notes and tables referred to in the text can be found on the back page.

## H38 Explosion Proof Ordering Options FOR ASSISTANCE CALL 800-350-2727

Use this diagram, working from left to right to construct your model number (example: H38D-2000-ABZC-28V/V-SC-CEN).

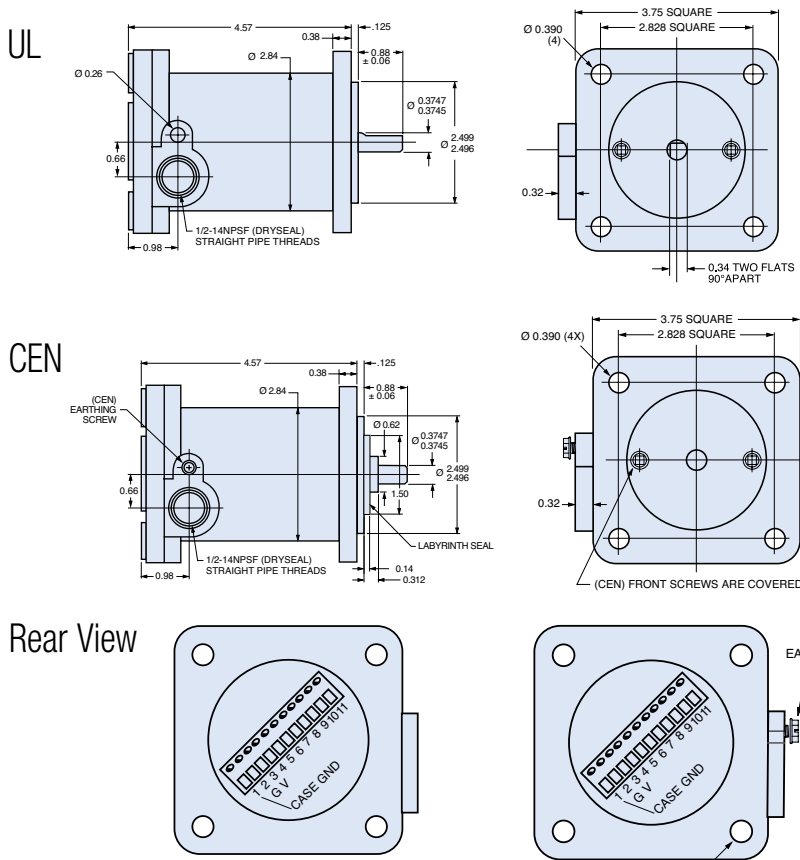
All notes and tables referred to can be found on the back of this page.



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Specification No. 02051-001 Rev.08-11

## Dimensions



## Notes

1. Non-standard index widths and multiple indices are available by special order. Consult factory.
2. Complementary outputs are recommended for use with line driver type (source/sink) outputs. When used with differential receivers, this combination provides a high degree of noise immunity.
3. **Output IC's:** Output IC's are available as either Line Driver (LD) or NPN Open Collector (OC) types. Open Collectors require pull-up resistors, resulting in higher output source impedance (sink impedance is similar to that of line drivers). In general, use of a Line Driver style output is recommended. Line Drivers source or sink current and their lower impedance mean better noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to circuit common/OV. Those may damage the driver. Unused outputs should be isolated and left floating. Our applications specialists would be pleased to discuss your system requirements and the compatibility of your receiving electronics with Line Driver type outputs. **28V/V:** Multi-voltage Line Driver (7272\*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard (Note:  $V_{out} = V_{in}$ ). This driver is TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 120 mA typical (plus load current). This is the recommended replacement for 3904R and 7406R open collector outputs with internal pullup resistors. It is also a direct replacement for any 4469, 88C30, 8830 or 26LS31 line driver. **28V/S:** Multi-voltage Line Driver (7272\*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard, internally regulated with 5V (TTL compatible) logic out. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current). **15V/V:** Multi-voltage Line Driver (4469\*): 100 mA source/sink. Input voltage 5 to 15 VDC +/- 5% standard (Note:  $V_{out} = V_{in}$ ). TTL compatible when used with 5 volt. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current). This is a direct replacement for the 4469 Line Driver. **28V/OC:** NPN Open Collector (3904\*, 7273\*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled up to voltage other than supply voltage (30 V max). Input voltage 5 to 28 VDC +/- 5% standard. Supply current is 120 mA typical. This replaces prior IC's with designations of

- 3904, 7406, 3302, 681 and 689. **5V/OCR, 15V/OCR, 24V/OCR:** Open Collector (3904R\*, 7406R\*, 7273R\*): Current sink of 70 mA max. Includes internal pull-ups sized at approximately 100 ohms/volt. Max current source is 10 mA. Supply current is 100 mA typical, 120 mA with internal pull-ups. The 5V/OCR, 15V/OCR and 24V/OCR are often replaced by the 28V/V in system upgrades.
4. Special -S at the end of the model number is used to define a variety of non-standard features such as special shaft lengths, voltage options, or special testing. Please consult the factory to discuss your special requirements.
5. Higher frequency response may be available. Please consult with the factory.
6. Extended temperature ratings are available in the following ranges: -40 to 70°C, -40 to 85°C, -20 to 105°C and -40 to 105°C depending on the particular model. Extended temperature ranges can affect other performance factors. Consult with factory for more specific information.

**Encoder Installation:**

1. Environment: Hazardous Locations — **UL** Complies with UL and cUL Class Groups D, Div.1; **CEN** Complies with UL2 requirements plus CENELAC/ATEX EEx d IIB T4.
2. **WARNING:** Open all circuits prior to connections of this product to power and controller.
3. The installation must comply with NEC Class II circuits or with the regulations of the country of use.
4. AWG 14 - 22 stranded wire stripped to .25" [6.3mm] is recommended.
5. Use 105° C minimum rated cable/conductors housed within an approved rigid conduit.
6. Conduit runs must have a sealing fitting certified to EN50018 as EEx d IIB immediately at the entrance to the device.
7. Tightly close terminal block access cover prior to applying power.
8. For maximum bearing life, a flexible coupling is recommended between encoder shaft and driving shaft.

**During Use:**

1. Keep terminal block access tightly secured during use.
2. DO NOT loosen two 5/16" set screws at opposite face.

**Maintenance and Service:**

1. There are no user serviceable parts inside. Encoder must be returned to factory for service.
2. **WARNING:** Open all circuits to this product prior to opening access cover to disconnect wires.

## Tables

TERMINAL PIN NO.	INCREMENTAL OUTPUT	8 BIT GRAY CODE OUTPUT*
1	CASE GRND.	CASE GRND.
2	OV	OV
3	+V	+V
4	A	G0
5	B	G1
6	Z	G2
7	$\bar{A}$	G3
8	$\bar{B}$	G4
9	$\bar{Z}$	G5
10	SPARE	G6
11	SPARE	G7

1, 2, 3, 5, 6, 7, 8, 10, 13, 16, 20, 24, 25, 26, 30, 32, 33, 34, 36, 37, 40, 45, 48, 50, 51, 56*, 60, 64, 66, 72, 75, 80, 86, 88, 90, 100, 102, 120, 122, 125, 127, 128, 132, 144, 148, 150, 158, 160, 175, 176, 180, 187, 192, 200, 202, 204*, 217, 220, 240, 250, 254, 255, 256, 264*, 274, 280, 283, 288, 292, 300, 312, 320, 321, 325, 360, 366, 372, 375, 377, 380, 381, 384, 385, 393, 400, 430, 432, 450, 462, 480, 490, 500, 502, 508, 512, 522, 530, 550, 560*, 576, 598, 600, 604, 625, 628, 635, 638, 640, 660, 672, 676, 680, 687, 690, 700, 720, 725, 735, 740, 744, 748, 750, 762, 768, 780, 785, 800, 812, 825, 850, 864, 878, 888, 900, 912, 914, 938, 942, 955, 960, 1000, 1016, 1024, 1030, 1035, 1036, 1040, 1054, 1056, 1074, 1076, 1080, 1088, 1100, 1101, 1125, 1136, 1200, 1237, 1250, 1257, 1270, 1280, 1300, 1314, 1332, 1333, 1390, 1400, 1414, 1427, 1440, 1484, 1500, 1562, 1570, 1596, 1600, 1650, 1666, 1718, 1745, 1774, 1800, 1840*, 1850, 1855, 1875, 1894, 1920, 1952, 1968, 1979, 1995, 2000, 2048, 2080, 2094, 2100, 2160, 2164, 2199, 2200, 2250, 2356, 2400, 2485, 2500, 2514, 2519, 2540, 3000, 3125, 3600, 4000, 4096, 5000
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\*AB or ABC output only.  
NOTE: Resolutions up to 72,000 are available.