H38 | ABSOLUTE EXPLOSION-PROOF ENCODER

Introduction

The H38 absolute 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 single and triple certifications for use in hazardous locations and includes a standard shaft seal, double bearing seals, and a cast aluminum housing with hard anodized and dichromate sealed finish. The H38 absolute encoder is suitable for use in petroleum service industries, solvent refining operations, spray painting applications, and explosive dust environments. When your application needs the ability to recover position information quickly after a power loss and you are operating in a hazardous area—the H38 may be the answer to your needs.

Features

- Parallel 12 / 13 bit or SSI Transmission
- Transmission lengths to 1000 feet
- Accepts clock rates from 100 KHz to 1.8 MHz

SPECIFICATIONS

Electrical

Code	12 or 13 bits NB or GC; excess gray and BCD available
Counts Per Shaft Turn	4096 or 8192
Count Transition Accuracy	± 1/2 bit maximum
Supply Voltage	5–28 VDC
Current Requirements	120 mA typical
Output Formats	Parallel: Gray Code, Natural Binary and Binary Coded Decimal; Serial: Serial Synchronous Interface (SSI); Analog: 4–20 mA, 0–10V
Voltage/Output	**28V/V:** Line Driver, 5–28 VDC in, Vout = Vin **28V/5:** Line Driver, 5–28 VDC in, Vout = 5 VDC **28V/OC:** Open Collector, 5–28 VDC in OCout **SSI:** 5–28 VDC in/5Vout
Protection Level	Reverse, overvoltage and output short circuit protection
Frequency Response	100kHz (1200 RPM for 12-bits, 600 RPM for 13-bits)
Output Termination Pinouts	See Table 1 or Table 2

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SPECIFICATIONS (CONTINUED)

Mechanical

Shaft Diameter	3/8" nominal
Flats On Shaft	Two flats, 0.80" long X 0.30" deep at 90°
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^{8} revs (1300 hrs at 2500 RPM) at rated load; 1 X 10^{10} 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^{-4} oz-in-sec^2
Weight	64 oz typical (approx 4 lbs)

Environmental

Enclosure Rating	NEMA 4 X & 6 (IP66), outdoor Non-Hazardous locations, NEMA 4 X & 13 (IP66), indoor Non-Hazardous locations
Temperature	Standard operating all models, 0° to +70°C; Storage all models, -50° to +90°C; Extended temp testing avail.: for UL, -40° to +80°C; for CEN, -50° 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 I, Div. 1, Group D or Class I, Div. 1, Groups C, D and CLass II, Div. 1, Groups E, F, G.

Notes & Tables: All notes and tables referred to in the text can be found on the back of this page.

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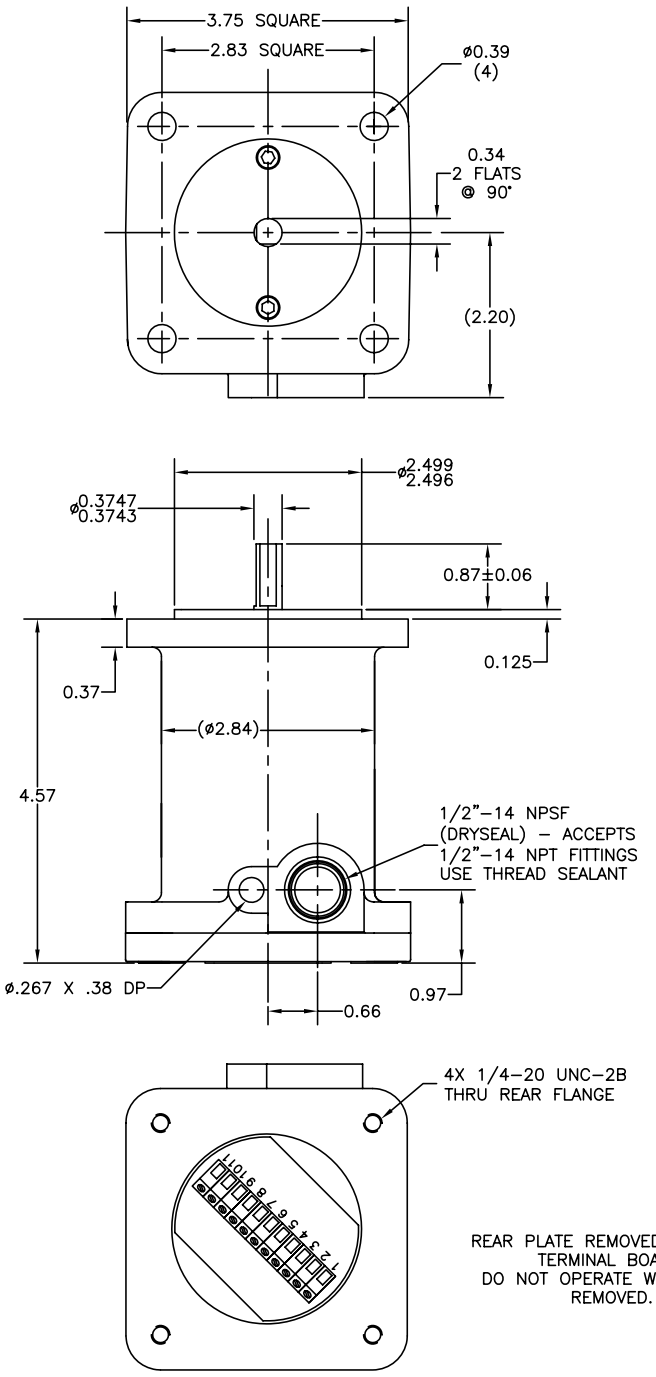
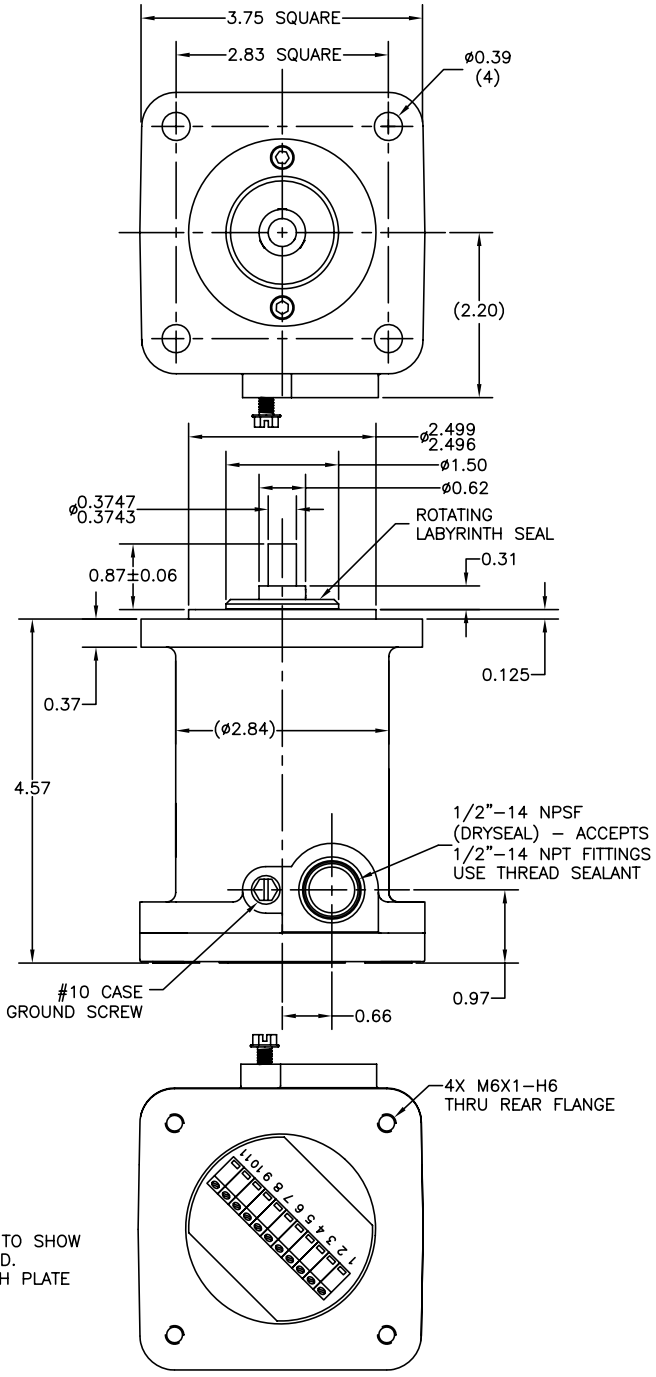
DIMENSIONS

Dimensions in inches

H38 WITH UL MODEL OPTION



H38 WITH CEN MODEL OPTION



REAR PLATE REMOVED TO SHOW TERMINAL BOARD.
DO NOT OPERATE WITH PLATE REMOVED.

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Serial Synchronous Interface (SSI)

SSI output provides effective synchronization in a closed-loop control system. A clock pulse train from a controller is used to clock out sensor data: one bit of position data is transmitted to the controller per one clock pulse received by the sensor. The use of a differential driver permits reliable transmission of data over long distances in environments that may be electrically noisy. The encoder utilizes a clock signal, provided by the user interface, to time the data transmission. Receiving electronics must include an appropriate receiver as well as line terminating resistors.

Data Transmission Sequence

1. Output driver of the encoder is a MAX 491 transceiver in transmit mode. The recommended receiver is a MAX 491 transceiver in receive mode.
2. Controller provides a series of pulses (or differential pulse pairs) on the CLOCK input lines.
3. On the first HIGH-to-LOW CLOCK transition, the encoder latches its data at the current position and prepares to transmit.
4. Controller reads data on the falling edge of the next 15 clock cycles.
5. The first bit is a START bit and is always HIGH.
6. Next comes 13 data bits beginning with the most significant bit (MSB) and ending with the parity bit. On 12 bit encoders, bit 13 is LOW. When parity is not ordered, parity is LOW.
7. After the last CLOCK HIGH-to-LOW transition, a minimum of 40 microseconds must pass before the beginning of the next CLOCK series.

Interfacing Long Data Lines

Ordering SSI: HOW TO SPECIFY SSI OUTPUT IN THE ENCODER MODEL NUMBER: Use the designation, S3 between the Code Format designation and the Connector designation. Example: H38D-12GC-S3-CW-SC-CEN

Cable impedance can create a transmission delay, in effect, shifting the phase relationship between the clock pulse and the data. If this phase shift exceeds 180°, then the wrong bit position will be sampled by the receiver. As a result, the maximum allowable clock frequency is a function of the cable length. For 24 AWG, stranded, 3 pair cable (BEI part number 37048-003 or equivalent) the group delay is 1.36ns/ft. The table below shows the maximum transmission rate allowable as a function of cable length to ensure a phase shift of less than 90°.

CLOCK, Maximum (kHz) = 92,000 / Cable Length (ft)CW

Cable Length (ft)	50	100	200	300	500	1000
Max Freq (kHz)	1800	900	500	300	200	100

SSI Timing

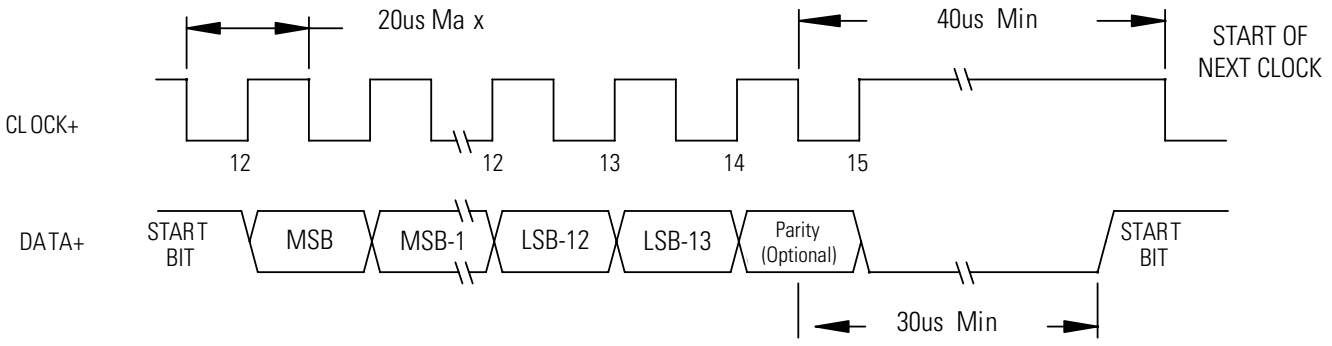

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Table 1 - Output Code and Terminations (12 & 13 Bit)							
			Parallel Code			Termination Type	
	Gray Code		Natural Binary		Binary Coded Decimal	Cable	Term Board H38
	12 Bit	13 Bit	12 Bit	13 Bit			
MSB	G_{11}	G_{12}	2_{11}	2_{12}	A_0	WHT/BLK	1
	G_{10}	G_{11}	2_{10}	2_{11}	B_0	WHT/BRN	2
	G_9	G_{10}	2_9	2_{10}	C_0	WHT/RED	3
	G_8	G_9	2_8	2_9	D_0	WHT/ORN	4
	G_7	G_8	2_7	2_8	A_1	WHT/YEL	5
	G_6	G_7	2_6	2_7	B_1	WHT/GRN	6
	G_5	G_6	2_5	2_6	C_1	WHT/BLU	7
	G_4	G_5	2_4	2_5	D_1	WHT/VIO	8
	G_3	G_4	2_3	2_4	A_2	WHT/GRY	9
	G_2	G_3	2_2	2_3	B_2	WHT	10
	G_1	G_2	2_1	2_2	C_2	GRY/BLK	11
LSB_{12}	G_0	G_1	2_0	2_1	D_2	GRY/BRN	12
LSB_{13}		G_0		2_0	A_3	GRY/RED	13
	0V (CIRCUIT COMMON)				B_3	GRY/ORN	
	DIRECTION OF COUNT					ORN	18
	CASE GROUND					GRN	16
	0V (CIRCUIT COMMON)					BLK	15
	LATCH CONTROL					YEL	17
	+V (SUPPLY VOLTAGE)					RED	14
SHIELD DRAIN						BARE	—

Table 2 - SSI Output Termination Table		
	Cable Conn.	Term. Board
DATA+	YEL	4
DATA-	WHT/YEL	7
CLOCK+	BLU	5
CLOCK-	WHT/BLU	8
DIR CONTROL	ORN	6
CASE GROUND	GRN	1
CIRCUIT COMMON	BLK	2
+V SUPPLY VOLTAGE	RED	3
SHIELD DRAIN	BARE	—

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OPTIONS AND TABLES (CONTINUED)

Direction of Count: Standard is CW increasing when viewed from the shaft end. Pin 18 is normally HI (or N/C) and is pulled up internally to +V. To reverse the count direction, Pin 18 must be pulled LO (COMMON).

Latch control: Encoder outputs are active and provide continuous parallel position information when Pin 17 is HI (or N/C). Pin 17 is pulled up internally to +V. When Pin 17 is LO (COMMON) the encoder outputs are latched at the logic state that is present when the latch is applied and will stay latched until Pin 17 is no longer grounded.

NOTES

See Doc. 01059-000 supplied with encoders for Important Installation and Usage notes summarized here.

Encoder Installation

1. Environment: Hazardous Locations — UL Complies with UL and cUL requirements; CEN Shall comply with UL requirements plus CENELAC/ATEX plus IECEx standards
2. WARNING: Open all circuits prior to connecting this product to power and controller.
3. The installation must comply with NEC Class 2 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 agency approved 105° C minimum rated cable/conductors housed within an approved rigid conduit.
6. Conduit runs must have a sealing fitting certified to 60079-0 Ex 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.
9. Thread sealant compound should be used for 1/2-14 fitting or cable gland to prevent ingress of contamination.

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.

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ORDERING OPTIONS

Example : H38D-12GC-28V/V-CW-SC-UL

Contact the factory for special versions, ex: special flanges, electronics, connections…

H38 D – 12 GC – 28V/V – CW – SC – UL – X

Type

H = Heavy Duty;
38 = 3.75" Square

Housing Configuration

D = Standard

Number of Bits

12 = 12-Bits, 4096 counts per turn
13 = 13 Bits, 8192 counts per turn
14, 15, bits and HMT — Consult factory
(Excess gray codes and BCD available–consult factory)

Code Type

GC = Gray Code
NB = Natural Binary
BCD = Binary Coded Decimal
X = Excess gray code

Voltage/Output

28V/V = 5-28Vin/out
28V/5 = 5-28Vin/5Vout
28V/OC = 5-28Vin/OCout
A1 = 4-20mA
A2 = 0-10V
S1 = RS422 Asynchronous Serial Interface
S3 = Serial Synchronous Interface
(See Options and Tables section description of SSI sequence and operation)

Direction of Count

CW = Clockwise increasing count
CCW = Counter clockwise increasing count

Output Termination

SC = Side Conduit, 1/2–14 NPSF (dryseal) straight pipe threads

Certification

UL = Class I Group D Environments
CEN = UL Class I & II, Cenelec IIB Environments
MSHA = Mine Safety and Health Admin

Special Features

S = Special features specified on purchase order (consult factory)

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AGENCY APPROVALS & CERTIFICATIONS

EN 61000-6-4 and EN 61000-6-2

II 2 G Ex d IIB T4 Gb

Class I, Group C & D;
Class II Group E,F & G;
Class I, Group D

Ex d IIB T4 Gb
IECEx UL 14.0006X

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