

## Hazardous Location Information

Do you need encoders designed for hazardous environments? To keep pace with the growth of complex industrial processes, BEI has developed rugged, quality encoders that meet high standards and certifications for use in potentially explosive environments. There are a variety of protection methods available depending on the circumstance of a particular installation. For optical encoders, the most commonly used methods are explosion proof construction and intrinsic safety, detailed below:

### Explosion Proof Construction Method

In this encoder protection technique the equipment is contained in an enclosure that can withstand an internal explosion of the most volatile gas-to-air mixture that can penetrate into the interior of the encoder enclosure. The enclosure must contain the explosion without damage

and without allowing the flame to leave the enclosure through any joints or other openings.

### Intrinsic Safety Method

This encoder protection technique uses an apparatus that limits the maximum level of current and voltage (usually measured as energy in millijoules) that can be delivered into the hazardous location. This equipment ensures that even in a double fault condition, there will not be enough energy to ignite the gas or vapor in that area. Note that encoders that use this method of protection, must use energy limiting devices (commonly called Barriers) in their installation. An Intrinsically Safe encoder, installed without an Intrinsic Safety Barrier is not an Intrinsically Safe system.

**Table 2.1—European and N. American Intrinsic Safety Approvals**

Encoder Type	Output Driver	Input VDC	CENELEC/ATEX	U.S. Standards	Canadian U.S. Standards Class I, Div. I, Group	Standards Class II, Div I, Group	System Diagram Class I, Div I, Zone 0
H25, L25, E25, HS25 <sup>1</sup> , H35, HS35, H37, H38, or H40	4469	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08062-001, 002, or 003
	3904R	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08063-001 or 002
	3904	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08064-001 or 002
	3904	9	EEx ia IIB T4	C, D	E, F, G	Group IIB	924-08064-001 or 002
H20 <sup>4</sup> , H25 <sup>3</sup> , HS20 <sup>4</sup> , HS25 <sup>4</sup> , HS35 <sup>2,3</sup> , HS45 <sup>2</sup>	5V/V	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08172-001, or 002
	5V/OCR	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08173,-001, or 002
	5V/OC	5	EEx ia IIC T4	A, B, C, D	E, F, G	Group IIC	924-08174-001, or 002
	9V/OC	9	EEx ia IIB T4	C, D	E, F, G	Group IIB	924-08174-001, or 002

<sup>1</sup> Rating only available with 4469 output driver

<sup>2</sup> Single and dual output versions available

<sup>3</sup> Line driver version available with interpolation T2, T3, T4, T5, T8, T12, T16

<sup>4</sup> Rating only available with 5V/V

**Table 2.2 – Europe and North American “Explosion Proof” Approvals**

Encoder Type	CENELEC/ATEX	NEMA 7 U.S. Standards Class I, Div I, Group:	NEMA 7 U.S. Standards Class II, Div I, Group:
H38 (Standard)		D	
H38 (w/ Labyrinth Seal)	EExd IIB T4	C, D	E, F, G
H40		D	

**Table 3—Hazardous Environment Groups**

GAS GROUPS		DUST GROUPS
Class I		Class II
Division 1 & 2	Zone 0,1 & 2	Division 1 & 2
A (acetylene)	IIC (acetylene & hydrogen)	E (metals)
B (hydrogen)		F (coal)
C (ethylene)	IIB (ethylene)	G (grain)
D (propane)	IIA (propane)	

Encoders with metal connector or conduit terminations are rated to EN 55011 and EN 61000-6-2. For plastic connector, pigtail or shielded/jacketed cable terminations, consult factory

## Model HS35 Drawworks Optical Hollow-Shaft Encoder

### Single and Dual Output Options

This specifically configured drawworks Model HS35 encoder combines rugged, heavy-duty features into a unique through-shaft style for use as a winch-turns counter in the drawworks system of oil rigs. It is supplied with a standard 1"–14 diameter threaded connection and a convertible adapter that allows its use in systems with a 5/8"–18" threaded connection.



**Dual Output Drawworks Encoder**

The dual output option of the HS35 drawworks encoder can supply simultaneous position feedback to two separate systems from a single encoder.



**Shaft Bore:** 0.375" diameter through with convertible adapter for 1" or 5/8" air coupler.

**Bearing Housing:** Die cast aluminum, hard anodized with dichromate sealed finish

**Output Format:** 2 channels (A and B) in quadrature, with index and complements (see Figure 1, page 24)

**Cycles Per Shaft Turn:** Up to 80,000 (See table A, page 25)

**Supply Voltage:** 5 or 9V (Supplied through IS barrier)

**Current Requirements:** 120mA (typical)

**Output Termination:** See table 1, page 65

**Temperature:** -40° to +85°C standard

**NOTE:** Reference HS35 Incremental Encoder for further electrical, mechanical and environmental specs, pages 24–25

### Certifications

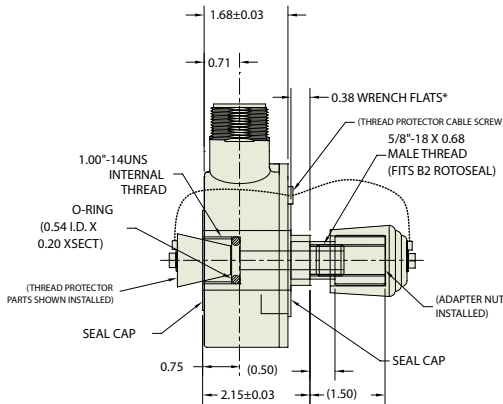
EN 55011 and EN 61000-6-2

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

### HS35 MS Connector Termination

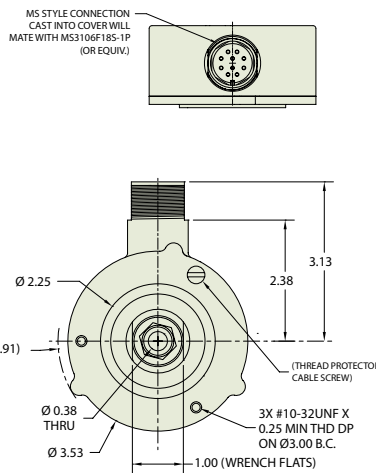


**Model number**

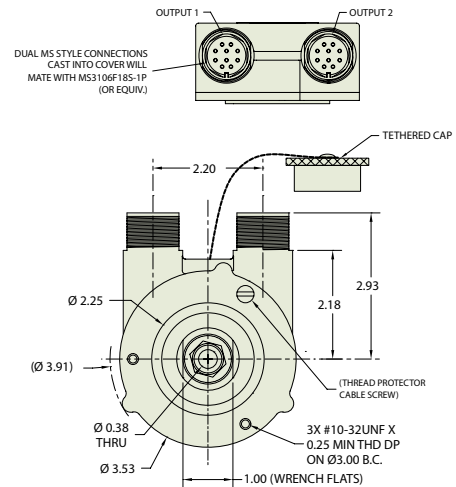
HS35F-1-14-SS-100-ABZC-5V/V-SM18-EX-S

-S = Threaded shaft (convertible), hard anodized, gross leak test, wrench 40203 included, shaft seal caps

\*Extended tool face available. Adds 0.38 to shaft length.



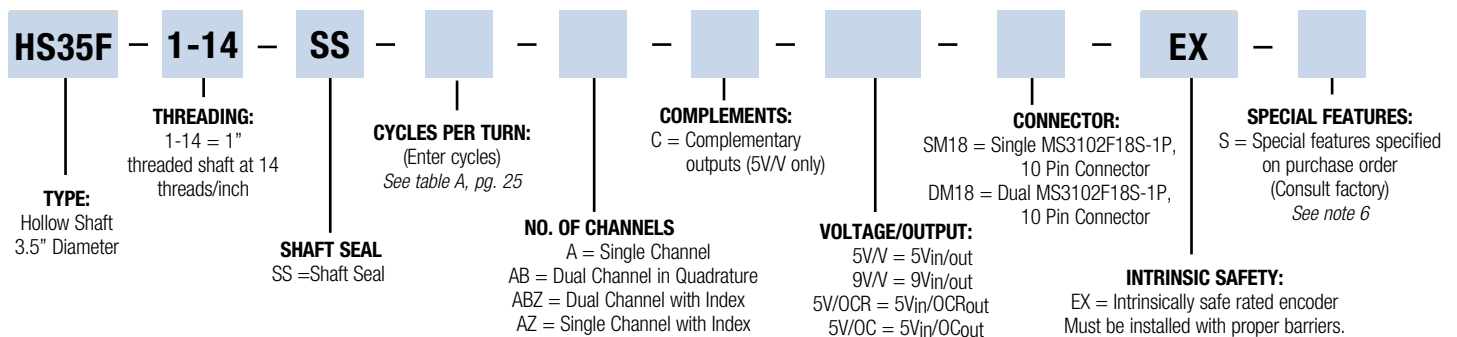
### HS35 Dual Output



## Drawworks Ordering Options

FOR ASSISTANCE CALL 800-350-2727

Use this diagram, working from left to right to construct your model number.

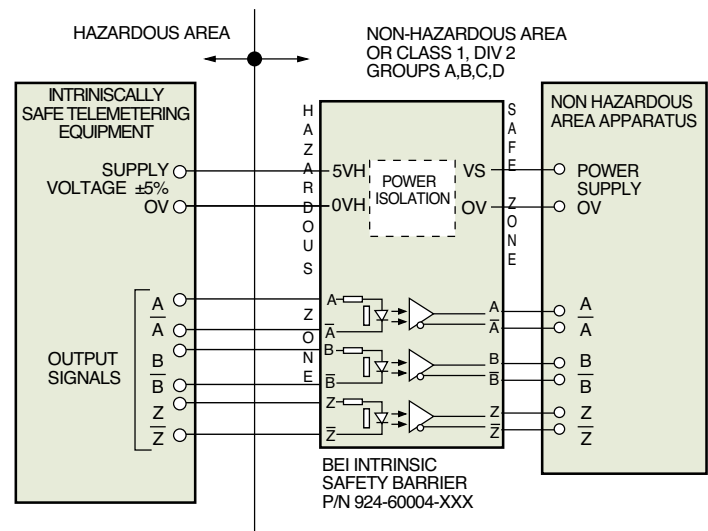




This Galvanically Isolated Electronic Module is the perfect complement to our Intrinsically Safe Encoders. Together with our cable assemblies they constitute a completely engineered solution to operation in Class I and Class II Division 1 Hazardous Environments. This single barrier provides both power and signal isolation for an incremental encoder with differential quadrature outputs and an index. This all-in-one approach saves the cost and inconvenience of buying separate power and signal barriers as required by other systems. This barrier is galvanically isolated and saves the added cost of maintaining a high integrity earth ground. With differential line driver outputs, this barrier can be used to carry signals up to 500 feet with a bandwidth of up to 250 kHz.

The Intrinsic Safety Barrier Module is designed around a standard DIN Rail mounting (Type EN 50 022, 35 mm X 7.5 mm) for easy installation in standard enclosures.

Intrinsic Safety Barrier Specifications					
POWER SUPPLY/OUTPUT TYPE					
Part Number:	Barrier Supply Vs +/-5%	Output logic to Non-Hazardous Area Apparatus:			
924-60004-002	12-24 Volts	$V_{out} = 5V$	Line Driver 100mA Source/Sink		
924-60004-003	12-24 Volts	$V_{out} = V_{in}$ (Nominal)	Line Driver 100mA Source/Sink		
924-60004-004	12-24 Volts	Open Collector	NPN 80mA Sink		
BARRIER PARAMETERS					
Voltage Supply	$V_{oc}$ (Io) $I_{sc}$ (Io)	Class I, Group D Class II, Groups E,F,G Group IIA	Class I, Group C Group IIB	Class I, Groups A,B Group IIC	
+5V DC±5%	8.9V 345mA	Ca(Co) La(Io) 560 µF 2.0 mH	Ca(Co) La(Io) 40 µF 0.80 mH	Ca(Co)	La(Io) 5.2 µF 0.4 mH



Note: This system diagram is for general information only. installation must be consistent with BEI Installation Drawing 924-08067-001.

## Intrinsic Safety Barrier Ordering Options for assistance call 800-350-2727

Use this diagram, working from left to right to construct your model number (example: EM-DR1-IS-5-RTB-24V/V).

All notes and tables referred to can be found on pages 64-65.

