

# HS25 SERIES

## INCREMENTAL ENCODER

### Introduction

The HS25 combines the rugged, heavy duty features usually associated with shafted encoders into a hollow-shaft style. Its design includes dual bearings and seals for up to IP65 environmental ratings, a rugged metal housing and a sealed cable gland. This low profile design, just 2" deep, is easily mounted on a through shaft. Securing the encoder to the shaft is simple with a collet-style single screw clamp. A tether arm and tether block are available options to maintain housing stability during operation.

### GEN<sup>2</sup>

For **Generation 1** datasheet [click here](#).



### Features

- Accommodates shafts up to 3/4" in diameter.
- Two available tethering styles provides installation flexibility
- Reducer bushings provide both electrical and thermal isolation
- Shaft seal and sealed bearing are standard features to provide IP rating
- Selected configurations available in 1 to 3 days shipment ("Express Encoder" option)

### Applications

- Motor feedback – variable frequency drives
- Paper converting and printing equipment – registration, cut-to-length, cartonizing
- Robotics – compact size saves space
- Elevators – traction control

## SPECIFICATIONS

### Mechanical

<b>Shaft Bore</b>	0.750", 0.625", 0.500", 0.375. Diameters 0.625" and under are supplied with insulating sleeves.
<b>Allowable Misalignment</b>	0.005: T.I.R. on mating shaft 0.75" from shaft end
<b>Bore Runout</b>	0.001" T.I.R.
<b>Starting Torque at 25°C</b>	7 oz-in max. for Through shaft (SS) and 4 oz-in max. for Blind shaft (BS).
<b>Bearings</b>	High precision ball bearings, Material: Chrome steel
<b>Shaft Material</b>	6061-T6 aluminum alloy
<b>Bearing Housing</b>	Die cast aluminum with protective finish
<b>Cover</b>	Die cast aluminum with protective finish
<b>Bearing Life</b>	7.5 X 10 <sup>9</sup> revolutions
<b>Maximum RPM</b>	6,000 RPM (see Frequency Response, below)
<b>Moment of Inertia</b>	17 X 10 <sup>-4</sup> oz-in-sec <sup>2</sup>
<b>Weight</b>	9 oz typical

## Electrical

<b>Code</b>	Incremental
<b>Output Format</b>	2 outputs in quadrature, A leads B CCW, 1/2 cycle index , Z, gated with negative B Consult factory for other output formats.
<b>Cycles per Shaft Turn</b>	2 to 80,000 (see table 2)
<b>Supply Voltage</b>	5 to 28 VDC +/- 5%
<b>Current Requirements</b>	100 mA typical +output load, 250 mA (max)
<b>Voltage/Output</b>	(See notes) <b>15/V:</b> Line Driver, 5–15 VDC in, Vout = Vin <b>28/V:</b> Line Driver, 5–28 VDC in, Vout = Vin <b>28/5:</b> Line Driver, 5–28 VDC in, Vout = 5 VDC <b>28/O:</b> Open Collector, 5–28 VDC in, OCout
<b>Protection Level</b>	Reverse, overvoltage and line driver output protection diodes
<b>Frequency Response</b>	300 kHz
<b>Output Terminations</b>	See Table 1

## Environmental

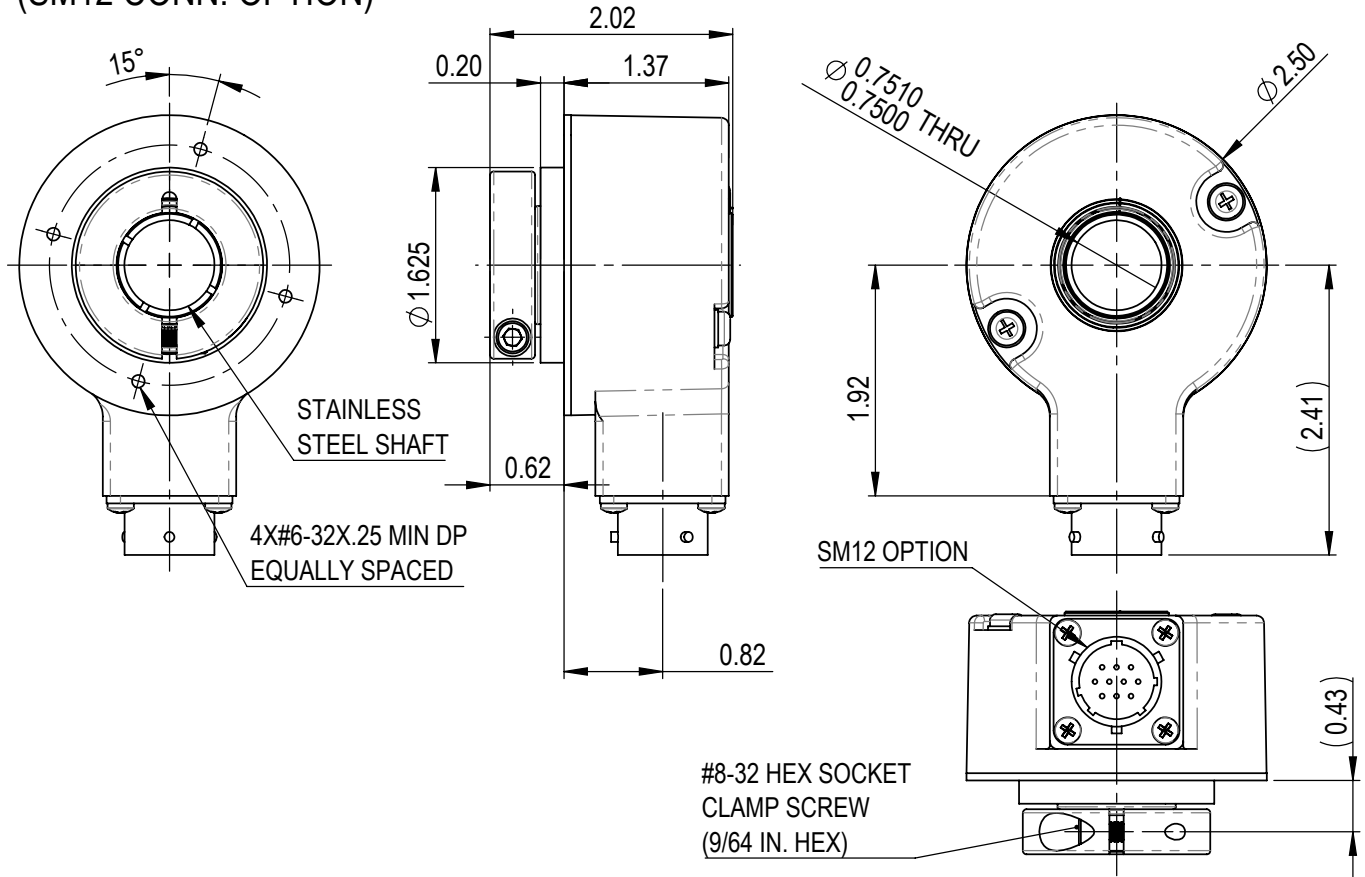
<b>Enclosure Rating</b>	IP65 Standard with M12 connector or Cable Gland output terminations. (Includes SCS18-M18 option)
<b>Temperature</b>	Standard operating temperature -40° C to +85° C; options available at -40° C to +100° C (Consult factory). Storage temperature -40° C to +100° C.
<b>Shock</b>	100 g's for 5 msec duration
<b>Vibration</b>	50 to 2000 Hz @ 30grms
<b>Humidity</b>	98% RH without condensation



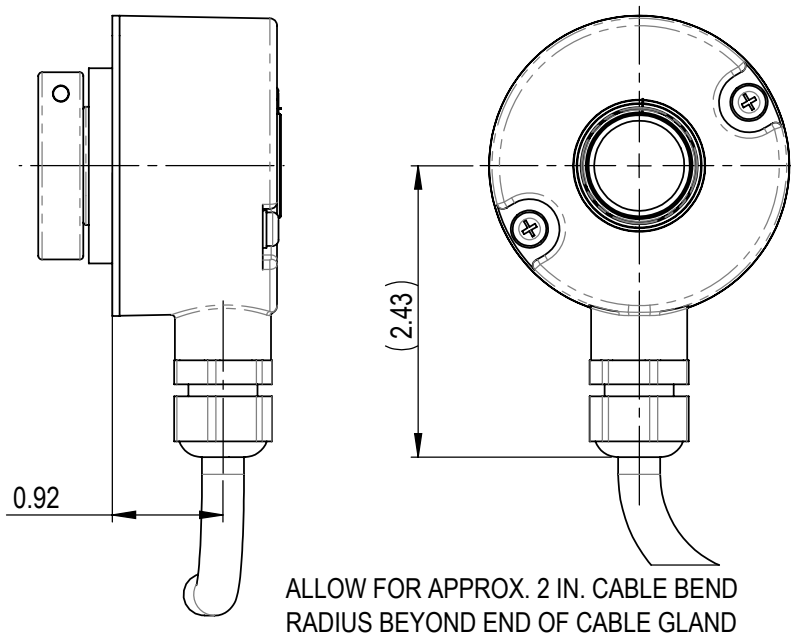
# DIMENSIONS

Dimensions in inches

## HS25F-75-SS: .75 IN. THRU BORE (SM12 CONN. OPTION)

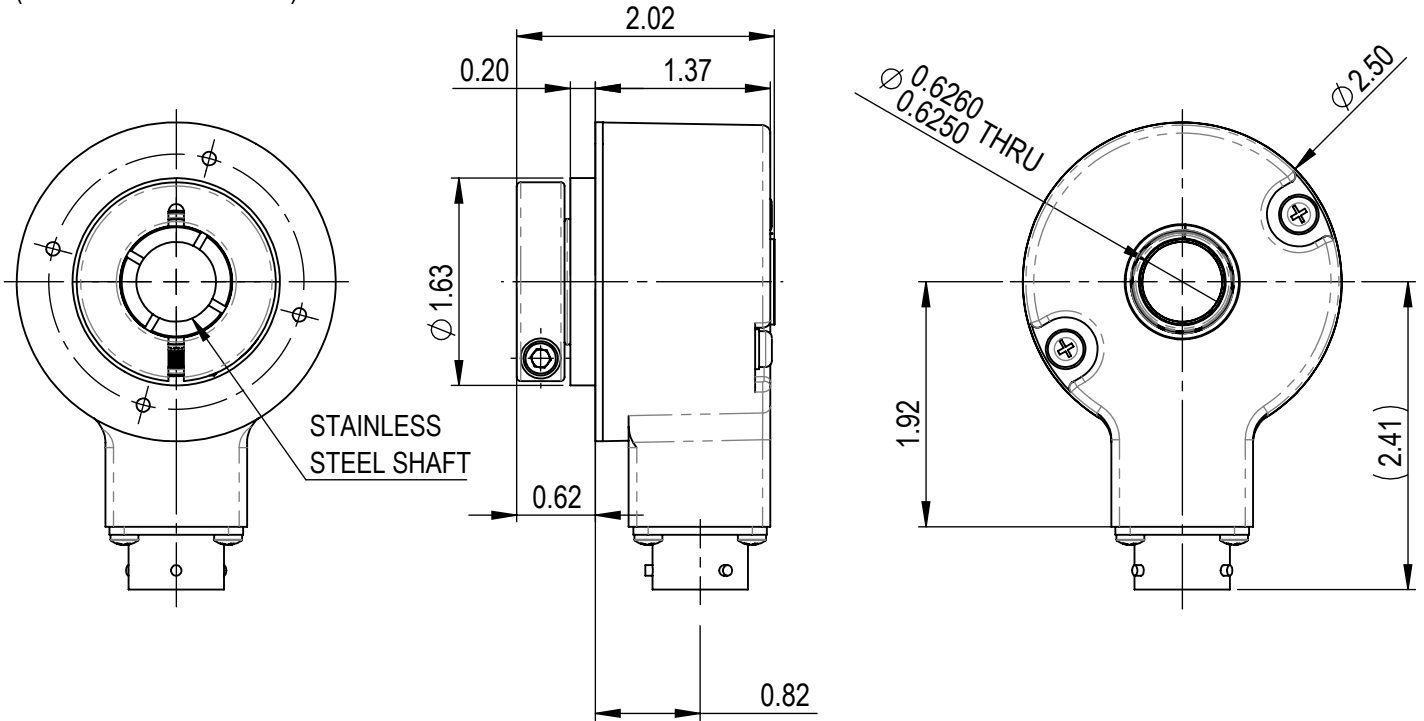


## HS25F-75-SS: .75 IN. THRU BORE (SCS CABLE OPTION)



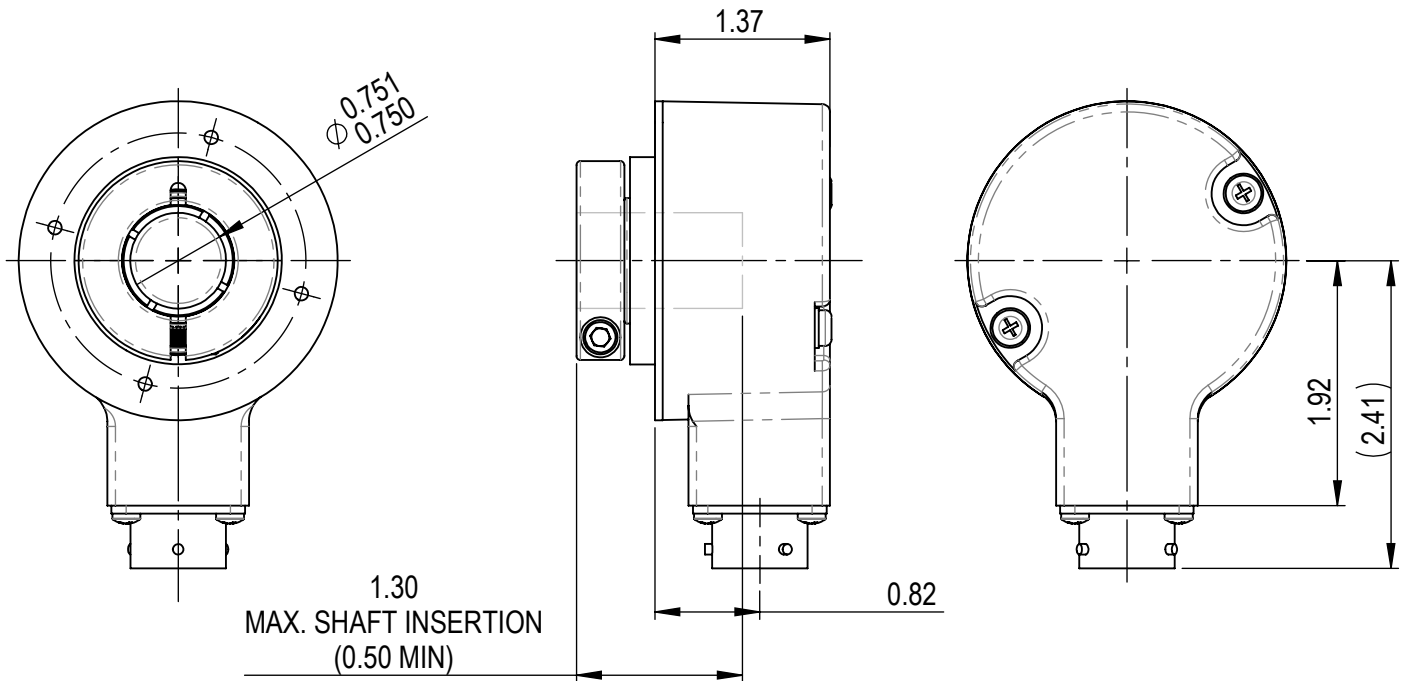
# HS25F-62-SS: .625 IN. THRU BORE

(SM12 CONN. OPTION)



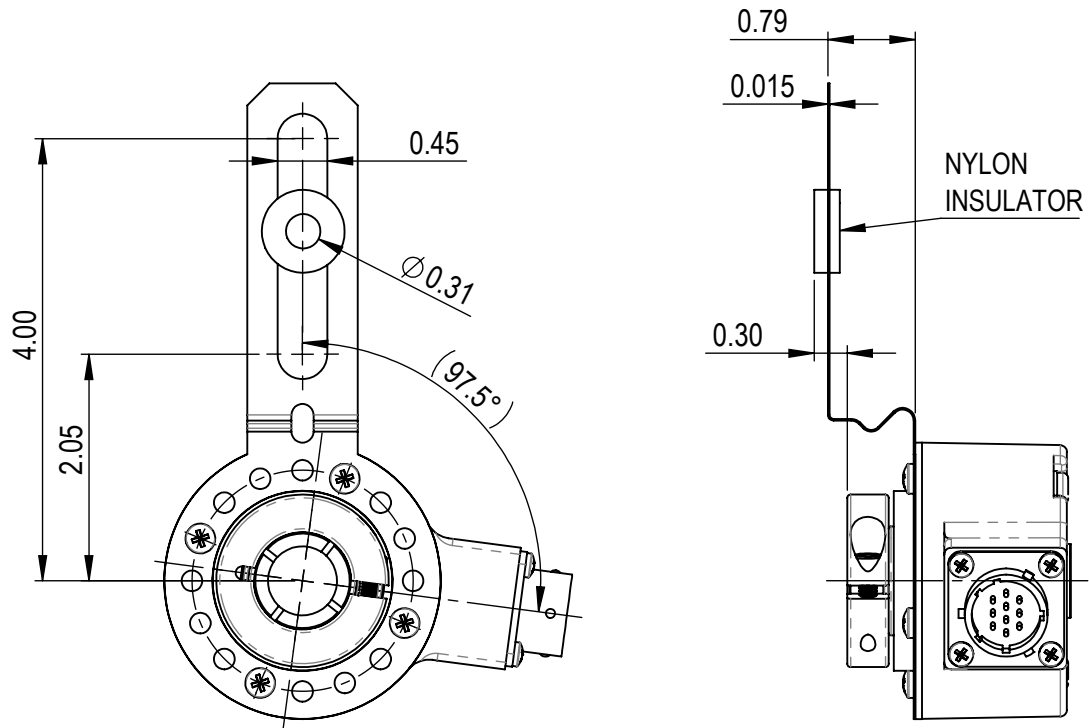
# HS25F-75-BS: .75 IN. BLIND BORE

(SCS CABLE OPTION)



# HS25F - R2 TETHER ARM (STAINLESS STEEL)

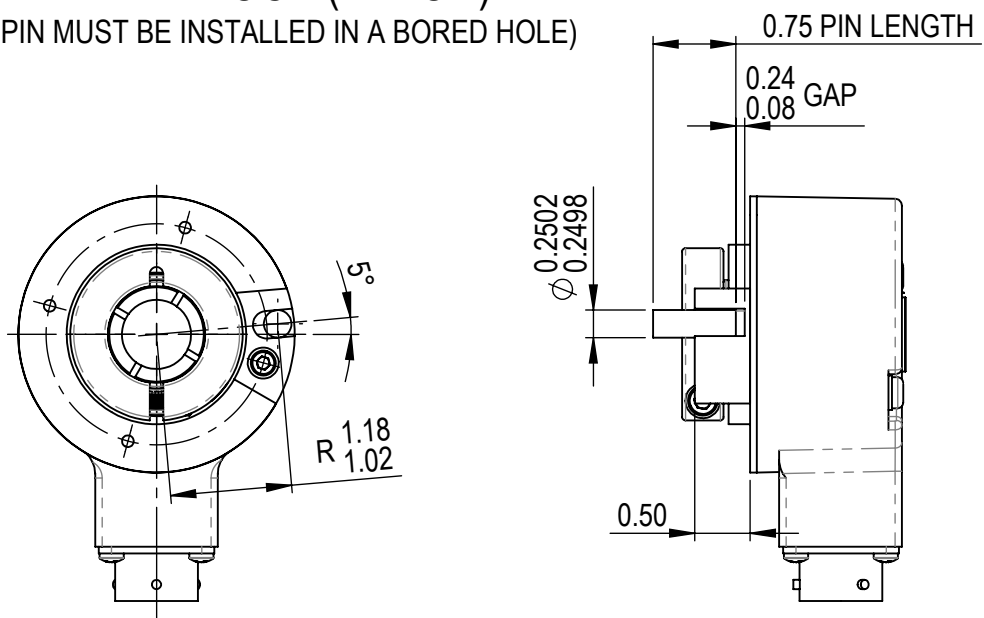
(INCLUDES 5/16"-18 MOUNTING BOLTS NOT SHOWN)



TETHER ARM POSITION SHOWN FOR REFERENCE ONLY, CAN BE MOUNTED AT ANY OTHER ANGLE IN 22.5° INCREMENTS.

# HS25F - R1 TETHER BLOCK (NYLON)

(STEEL TETHER PIN MUST BE INSTALLED IN A BORED HOLE)



TETHER BLOCK POSITION SHOWN FOR REFERENCE ONLY, CAN BE MOUNTED AT ANY OF FOUR POSITIONS.

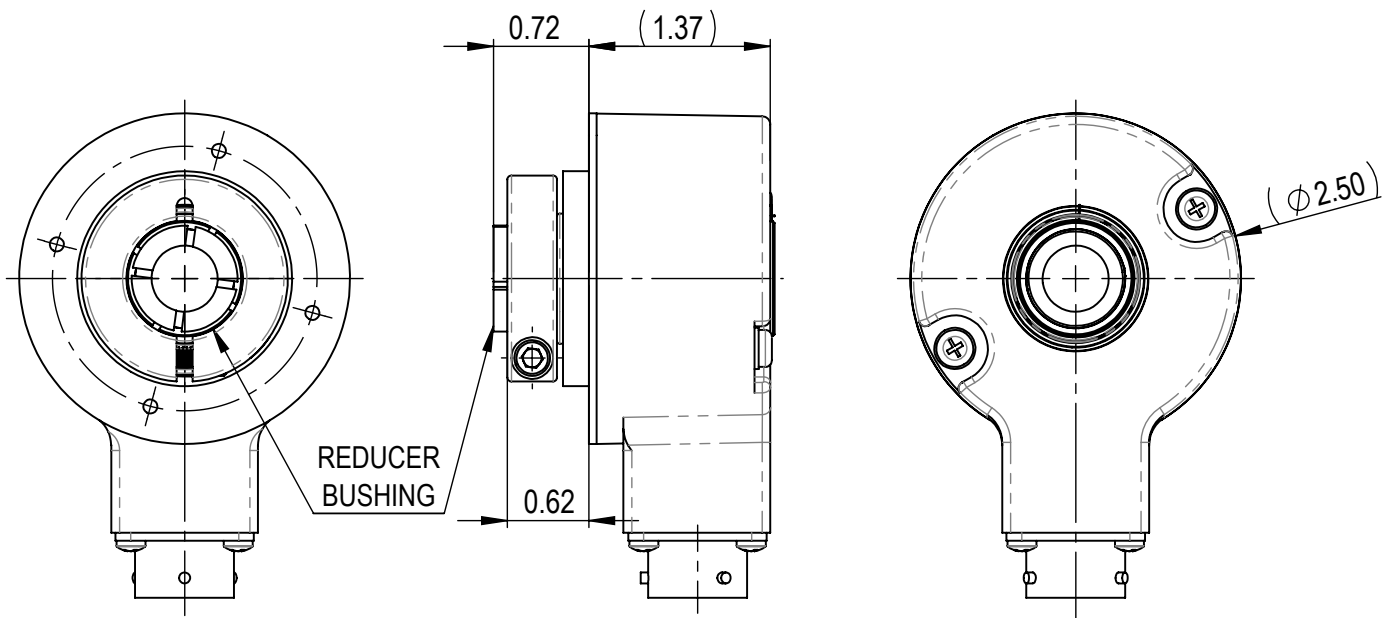
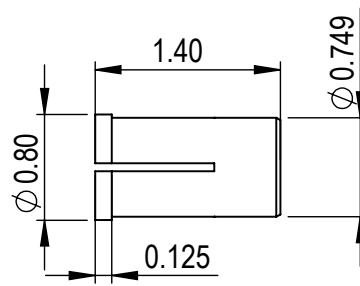
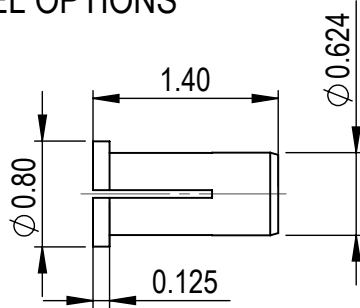
# HS25F REDUCER BUSHING

GLASS FILLED NYLON. FOR BORE SIZES LESS THAN  
.750 IN. OR .625 IN. DEPENDING ON MODEL OPTIONS

REDUCER BUSHING  
FOR .625 IN. BORE

BORE SIZE:  
NOM. +0.002/-0.000

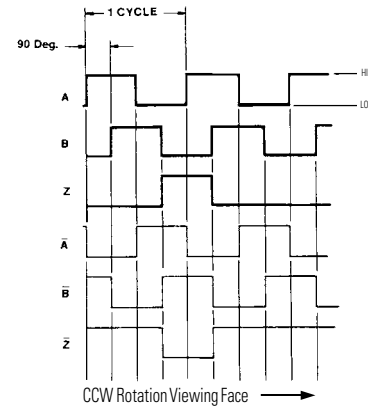
REDUCER BUSHING  
FOR .750 IN. BORE



## NOTES

1. The shaft seal is recommended in virtually all installations. The most common exceptions are applications requiring a very low starting torque or those requiring operation at both high temperature and high speed.
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 are available as either Line Driver (LD) or NPN Open Collector (OC) types.
4. 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.
5. 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, which may damage the driver.
6. Outputs protection diodes on std. product, diodes will redirect current away from output node if shorted to +V or OV, excessive voltage will damage diodes.
7. Reverse voltage protection: indefinite revers polarity at 30VDC.
8. Transient voltage protection: 10/100 us waveform. 600W peak pulse power on 10/100 us waveform.
9. 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.

Figure 1: Output Waveform



## TABLES

Table 1: Incremental Output Terminations

Wire Color (22AWG)	SCS18-M18 Connector		M12 Connector	
	Pin	Channel	Pin	Channel
YEL	A	A	A	A
BLU	B	B	B	B
ORN	C	Z	C	Z
RED	D	+V	D	+V
---	E	—	E	—
BLK	F	OV	F	OV
GRN	G	CG	G	CG
W-Yel	H	$\bar{A}$	H	$\bar{A}$
W-Blu	I	$\bar{B}$	J	$\bar{B}$
W-Orn	J	$\bar{Z}$	K	$\bar{Z}$

## Table 2: HS25 Resolutions

Note: These resolutions are the only ones available with 3/4 in., 17mm, 18mm or 5/8 in. isolated thru options [HS25F-75(-)-SS-... or HS25F(-)-62-SS-...]

360	500	600	720	1000	1024	1200	1270	1440	1800	2000
2048	2400	2500	2540	3600	4000	4096	5000	5080	7200	10000

All other HS25 models can have these resolutions:

1, 2, 3... THROUGH ...10000 PPR INCLUDING TABLE BELOW											
10160	15000	19456	24500	28800	33792	38912	44450	51200	58000	64800	71680
10200	15240	19500	24576	29000	34000	39000	45000	52000	58368	65000	72000
10240	15360	19800	24600	29210	34200	39370	45056	52070	58420	65536	72390
10800	15500	20000	25000	29400	34290	39600	45720	52200	59000	66000	72500
11000	15600	20320	25200	29500	34500	39936	46000	52224	59392	66040	72704
11264	16000	20400	25400	29696	34800	40000	46080	52500	59400	66560	73660
11400	16200	20480	25500	30000	34816	40200	46800	53000	59690	66600	73728
11430	16384	21000	25600	30480	35000	40640	46990	53248	60000	67000	73800
12000	16500	21504	25800	30600	35400	40800	47000	53340	60416	67310	74930
12288	16510	21590	26000	30720	35500	40960	47104	54000	60960	67500	75000
12500	16800	21600	26400	31000	35560	41000	47500	54272	61000	67584	75600
12600	17000	22000	26500	31200	35840	41400	48000	54610	61200	68000	76200
12700	17400	22200	26624	31744	36000	41910	48128	55000	61440	68400	77400
13000	17408	22500	26670	31750	36830	41984	48260	55296	62000	68580	77470
13200	17500	22528	27000	31800	36864	42000	48600	55800	62230	68608	77500
13312	17780	22800	27500	32000	37000	42500	49000	55880	62464	69000	78740
13500	18000	22860	27600	32400	37200	42600	49152	56000	62500	69632	79200
13800	18432	23000	27648	32500	37500	43000	49530	56320	63000	69850	80000
13970	18500	23400	27940	32768	37800	43008	50000	57000	63488	70000	
14000	18600	23500	28000	33000	37888	43180	50176	57150	63500	70200	
14336	19000	23552	28200	33020	38000	43200	50400	57344	64000	70656	
14400	19050	24000	28500	33500	38100	44000	50800	57500	64512	71000	
14500	19200	24130	28672	33600	38400	44032	51000	57600	64770	71120	



**EXPRESS ENCODERS:** Items highlighted with this are standard Express Encoders and ship in one to three days.



## ORDERING OPTIONS

Example : HS25F-75-R1-SS-1024-ABZ-C-28/V-SM12

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

	HS25	F	75	R1	SS	1024	ABZ	C	28/V	SM12	-	-
<b>Type</b>												
<b>X</b> = Express (3 days leadtime) <b>Blank</b> = Standard Leadtime												
<b>Family</b>												
<b>HS25</b> = Hollow Shaft; 2.5" diameter												
<b>Housing Configuration</b>												
<b>F</b> = Standard												
<b>Shaft Bore</b>												
<b>75</b> = 0.750" non-isolated bore** <b>62</b> = 0.625" isolated bore** <b>62S</b> = 0.625" non-isolated bore*** <b>50</b> = 0.500" isolated bore <b>37</b> = 0.375" isolated bore												
<b>Tether</b>												
<b>Blank</b> = None <b>R1</b> = Tether Block and Pin <b>R2</b> = Tether Arm												
<b>Shaft Seal Configuration</b>												
<b>SS</b> = Through Shaft Rubber Seals** <b>BS</b> = Blind Shaft Rubber Seal												
<b>Cycles Per Turn</b>												
(Enter Cycles) See Table 2												
<b>Number of Channels</b>												
<b>A</b> = Single Channel <b>AB</b> = Dual Quad. Channel <b>ABZ</b> = Dual with Index <b>AZ</b> = Single with Index												
<b>Complements</b>												
<b>C</b> = Complementary Outputs <b>Blanks</b> = None												
<b>Voltage Output</b>												
<b>15/V</b> = 5-15 Vin/out <b>28/V</b> = 5-28Vin/out <b>28/5</b> = 5-28Vin/5Vout <b>28/OC</b> = 5-28Vin/Oout												
<b>Output Termination</b>												
<b>SM12</b> = MS3112E12-10P <b>SCSXXX</b> = Shielded, Jacketed Cable with Cable gland seal and cable length in inches, (i.e. SCS18 = 18 inches) <b>SCSXX-M18</b> = M18 connector (MS3101F18-1P equiv.) on end of XX in. cable. SCS18-M18 is standard option												
<b>Hazardous Area Ratings*</b>												
<b>Blank</b> = None <b>EX</b> = Intrinsically Safe <b>NI</b> = Non-Incendive Contact factory for voltage options												
<b>Special Features</b>												
<b>S</b> = Special Features specified on purchase order (consult factory)												








\*For **Generation 1** datasheet [click here](#).

\*\* When shaft bore options "75" or "62" are selected in conjunction to the shaft seal option "SS", the leadtime can be longer than usual; please contact Customer Service for details.

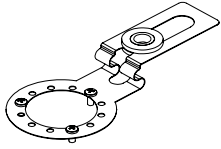

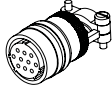
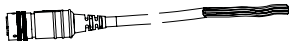
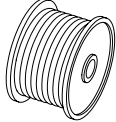
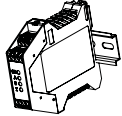
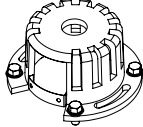
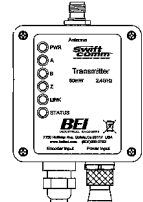

\*\*\* "62S" shaft bore option not available with the blind shaft option "BS"

## AGENCY APPROVALS & CERTIFICATIONS

Special Models of the HS25 Incremental Encoder are available with one or more of the following certifications. Consult with factory in order to ensure how to correctly specify the agency approval(s) that you require.

Model HS25 Hazardous Area Ratings	Agency		Ratings and Markings (for all standard product configurations)	File Number
Blank		CE	EN 55011: Electromagnetic Disturbance (EMI) EN 61000-6-2: Electromagnetic Compatibility (EMC)	
*EX Intrinsic Safety		UL	Class I, Groups A, B, C, D Class II, Groups E, F, G	20180302-E78446
		DEMKO	II 1 G Ex ia IIC T4 Ga (9V/OC is II 1 G Ex ia IIB T4 Ga)	DEMKO 06 ATEX 0614247X
		IEC/IECEx	Ex ia IIC T4 Ga (9V/OC is Ex ia IIB T4 Ga) -40°C ≤ Ta ≤ +85°C	IECEx UL 12.0035X
*NI Non-Incendive		UL	Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G	20170321-E78446
		DEMKO	II 3 G Ex nA IIB T4 Gc	DEMKO 13 ATEX 1209038X
		IEC/IECEx	Ex nA IIB T4 Gc -40°C ≤ Ta ≤ +80°C	IECEx UL 13.0071X

\*For **Generation 1** datasheet [click here](#).

Description	Part Number
<b>HS25 R2 tether arm</b> 	31215-002 = HS25 R2 tether arm
<b>HS25 R1 tether block</b> 	31215-001 = HS25 R1 tether block
<b>Connector mates</b> 	MS3106F18-1S = Mates to standard M18 style, 10pin conn. MS3116F12-10S = Mates to standard M12 style, 10pin conn.
<b>Connector cable assemblies</b> 	31186-1810 = M18, 10pin, 10 ft length 31186-1820 = M18, 10pin, 20 ft length 31186-1850 = M18, 10pin, 50 ft length 31186-1210 = M12, 10pin, 10 ft length 31186-1220 = M12, 10pin, 20 ft length 31186-1250 = M12, 10pin, 50 ft length
<b>Bulk encoder cable</b> 	37048-003-100 = 100 ft spool 37048-003-500 = 500 ft spool 37048-003-1000 = 1K ft spool
<b>Electronic Modules</b> 	60001-010 = Opto isolator 60011-001 = Broadcaster 60002-000 = Encoder tester
<b>Protective cover Kit</b> 	26068-001 = 3/8 bolts on 56C 26068-002 = #10 tapping screws on 56C
<b>SwiftComm</b> 	60032-001 = 5V/V M18 60032-003 = 15V/V M18 60032-005 = 24V/V M18
<b>Reducer bushings</b> 	32059-375 = 3/8" bore 32059-250 = 1/4" bore 32059-313 = 5/16" bore 32059-625 = 5/8" bore 32059-500 = 1/2" bore 32059-472 = 12mm bore

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