

# DSK5HKB MODELS

## SIL3 PLe INCREMENTAL ENCODERS

### Introduction

When an automation system requires a high degree of risk mitigation of failure modes, often times Functional Safety equipment can be a part of the solution. Sensata | BEI Sensors offers a wide range of Functional Safety encoders to fit most any application or electrical interface requirement. Rated at SIL3 (PLe), these encoders allow safe operation in set-up, production and maintenance modes, significantly reducing operational risks. All encoders have the option of a Digital HTL or TTL operation as an alternative to the Sine/Cosine outputs found on most Functional Safety encoders. This makes them a compatible replacement for existing encoders when migrating to a higher safety level of operation. This encoder series employs a tapered hollow shaft style of mounting. It will accept a nominal 7.3 mm tapered shaft as the mounting shaft and has several a variety of flexible tethering options. The encoder body is a nominal 58mm diameter.



### Features

- Usable up to SIL3 and Cat.4 / PLe according to IEC 61508 / EN ISO 13849
- Suitable for safe motor feedback according to IEC 61800-5-2
- Robust and excellent resistance to shock and vibration
- High protection level: IP65
- High temperature performance -20°C to +85°C
- 58mm standard size encoder
- Shaft configurations: Blind 7.3mm - Tapered 10%
- Wide choice of connection configurations
- Power supply 5Vdc or 11 - 30Vdc
- Digital TTL/RS422, HTL or sine/cosine 1Vpp output
- Resolutions up to 2500ppr

### Applications

- Industrial automation
- Automated guided vehicles
- Mills for lumber, steel and other metals
- Printing and packaging equipment
- Food processing equipment
- Forming and die presses

## SPECIFICATIONS

### Mechanical

	DSM5HKB
<b>Material</b>	<b>Cover:</b> cast zinc alloy or aluminum <b>Body:</b> aluminum <b>Shaft:</b> AISI 303 stainless steel
<b>Bearings</b>	6000 series - sealed
<b>Maximum Loads</b>	<b>Axial:</b> 40 N <b>Radial:</b> 80 N
<b>Shaft Inertia</b>	< 2,800 g.mm <sup>2</sup>
<b>Static/Dynamic torque</b>	5 / 35 mN.m
<b>Permissible max. speed</b>	9,000 RPM

<b>Continuous max. speed</b>	6,000 RPM
<b>Theoretical mechanical lifetime L<sub>10h</sub> <sup>(A)</sup></b>	> 29.7 X 10 <sup>9</sup> turns / 82,365 hours
<b>Encoder weight (approx.)</b>	0.30 kg

<sup>(A)</sup> **Continuous max. speed – ½ max. load – according to ISO 281:** 1990, L<sub>10</sub>

## Electrical Characteristics / Functional Safety Parameters <sup>(B)</sup>

Electronic Version	Output signals	Operating Voltage +V	Supply current	Current per channel pair	Short circuit protected	Reverse polarity protected	PFD	PFH	MTTFd	DC
2G2	Digital TTL	5V +/-5% <sup>(C)</sup> --- 250mA	100mA with no load	40mA	Yes	Yes	7.51E-05	8.58E-10	1331	HIGH
5G2	RS422	11-30V <sup>(C)</sup> --- 250mA			Not to +V		9.52E-05	1.09E-09	1050	
5G5	Digital HTL				Yes		9.52E-05	1.09E-09	1050	
2WT	Sine Cosine 1Vpp	5V +/-5% <sup>(C)</sup> --- 250mA	70mA with no load	10mA	Yes		4.29E-05	4.90E-10	2328	
5WT		11-30V <sup>(C)</sup> --- 250mA			Not to +V		6.60E-05	7.53E-10	1515	

<sup>(B)</sup> Safety mission time: 20 years

<sup>(C)</sup> Device must be supplied by a Class 2 LPS or SELV/PELV limited energy source ≤60V.

## Environmental & Standards Conformity

	<b>DSK5HKB</b>
<b>Protection (EN 60529)</b>	IP65
<b>Salt Spray (EN 60068-2-11 part 2)</b>	96h
<b>Humidity (EN 60068-2-38)</b>	93% @ 65°C
<b>Shock (EN 60068-2-27)</b>	≤ 500m.s <sup>-2</sup> (6 ms, half sine)
<b>Vibration (EN 60068-2-6)</b>	≤ 100m.s <sup>-2</sup> (55... 2 000 Hz)
<b>Operating temperature</b>	-20 to 85°C (encoder T°)
<b>Storage temperature</b>	-20 to 85°C
<b>EMC Immunity Test</b>	EN 61000-6-2, increased levels
<b>EMC Emission Test</b>	EN 61000-6-4, increased levels
<b>Isolation</b>	1000 Veff
<b>Functional safety</b>	IEC 61508
	IEC 62061
	ISO 13849-1
	IEC 61800-5-2
<b>Encoders usable up to SIL3 / PLe with specific requirements, see safety user manual for details.</b>	
<b>Z and Z/ are not safety signals.</b>	



# STANDARD CONNECTIONS

## DSK5HKB connections

		0V	+V	A or S	B or C	Z	A/ or S/	B/ or C/	Z/	Ground
<b>G6</b>	<b>M23 - 12 pins CW</b>	1	2	3	4	5	6	7	8	Connector body
<b>G8</b>	<b>M23 - 12 pins CCW</b>	10 + 11	2 + 12	8	5	3	1	6	4	Connector body
<b>G3</b>	<b>PVC cable 8 wires 8230/020</b>	WH white	BN brown	GN green	YE yellow	GY grey	PK pink	BU blue	RD red	General shielding
<b>GP</b>	<b>PUR cable 12 wires 8230/050</b>	WH white + WH/GN white /green	BU blue + BN/GN brown / green	GY grey	BN brown	RD red	PK pink	GN green	BK black	General shielding
<b>U3</b>	<b>PVC cable 8 wires</b>	WH	BN	GN	YE	GY	PK	BU	RD	General shield
<b>GC</b>	<b>PUR cable</b>	BK	RD	GN	BN	VT	YE	OG	BU	General shield
<b>GM</b>	<b>M12 8 pins</b>	1	2	3	4	5	6	7	8	Connector body

Note: All connections are UL certified, except G3 and GP



## RESOLUTIONS

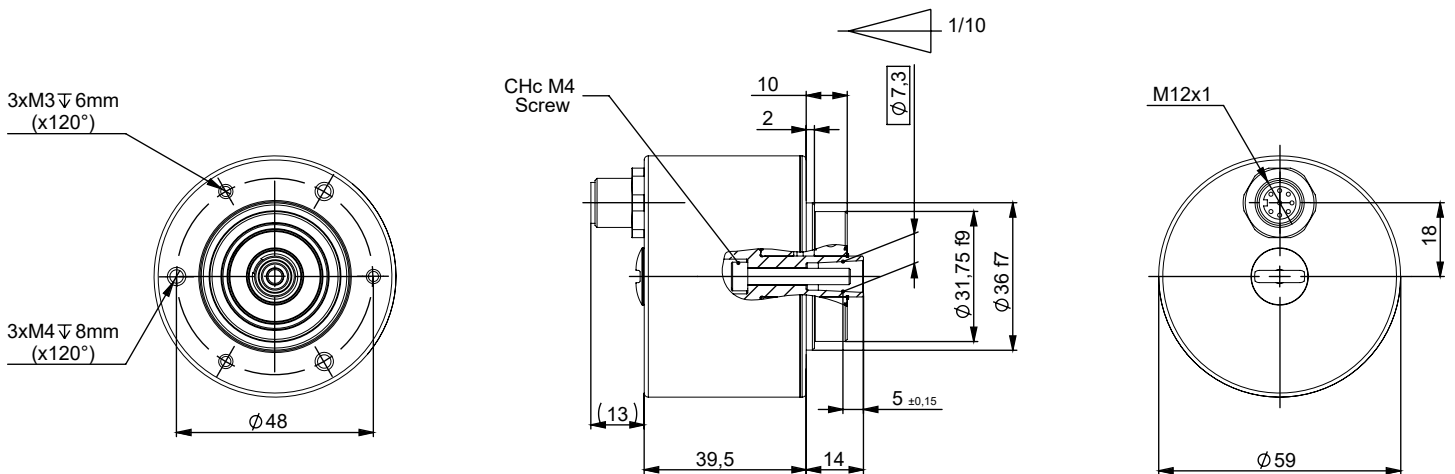
250 256 360 500 512 1000 1024 1500 2000 2048 2500



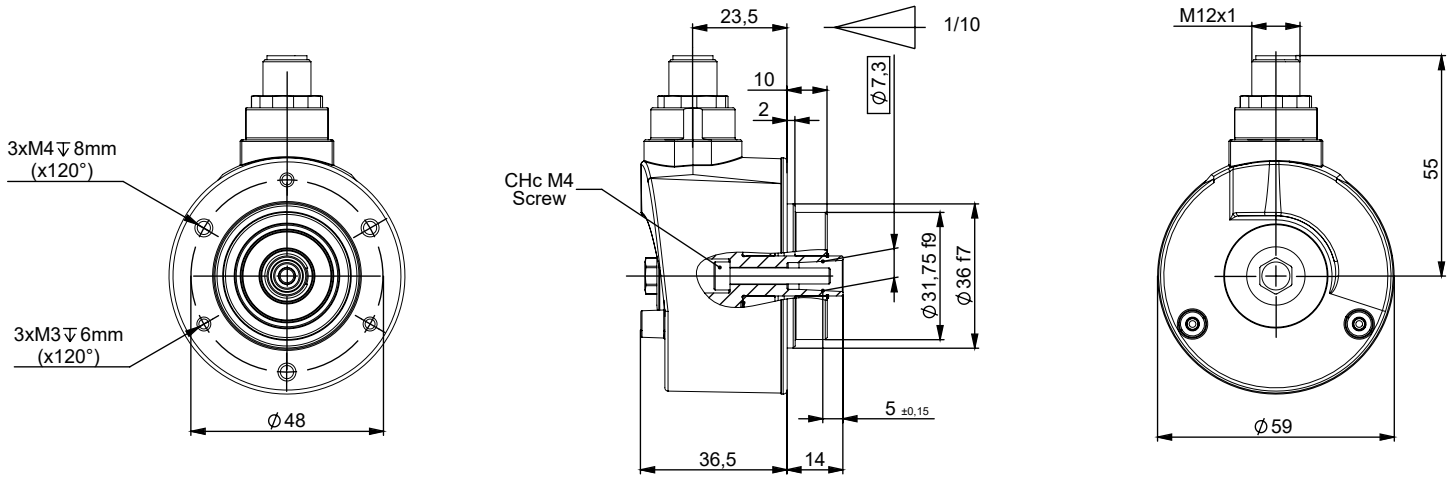
## DIMENSIONS

All dimensions are in mm

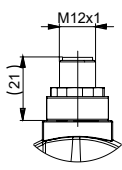
### DSK5HKB - Blind shaft 7.3mm tapered 10% - M12 connector - Axial



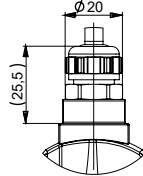
**DSK5HKB - Blind shaft 7.3mm tapered 10% - M12 connector - Radial**



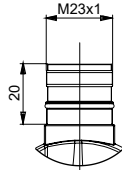
**M12  
GMR**



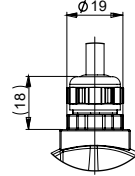
**Cable  
U3R, GCR**



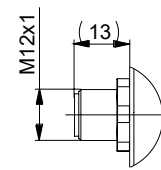
**M23  
G6R, G8R**



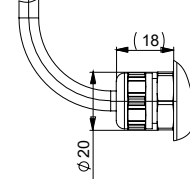
**Cable  
G3R, GPR**



**M12  
GMA**

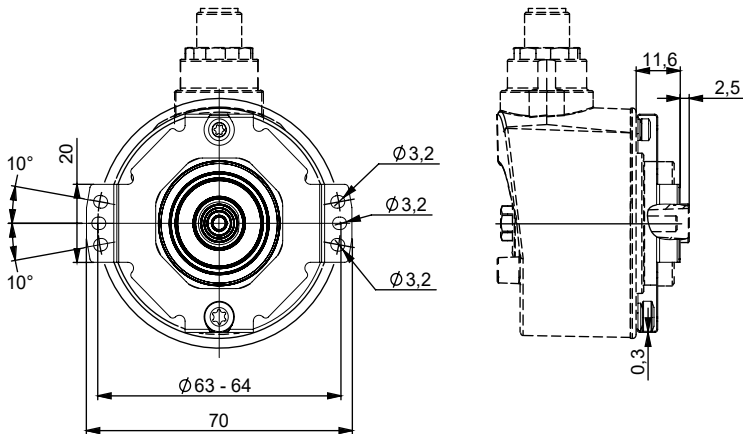


**Cable  
G3A, U3A,  
GPA, GCA**

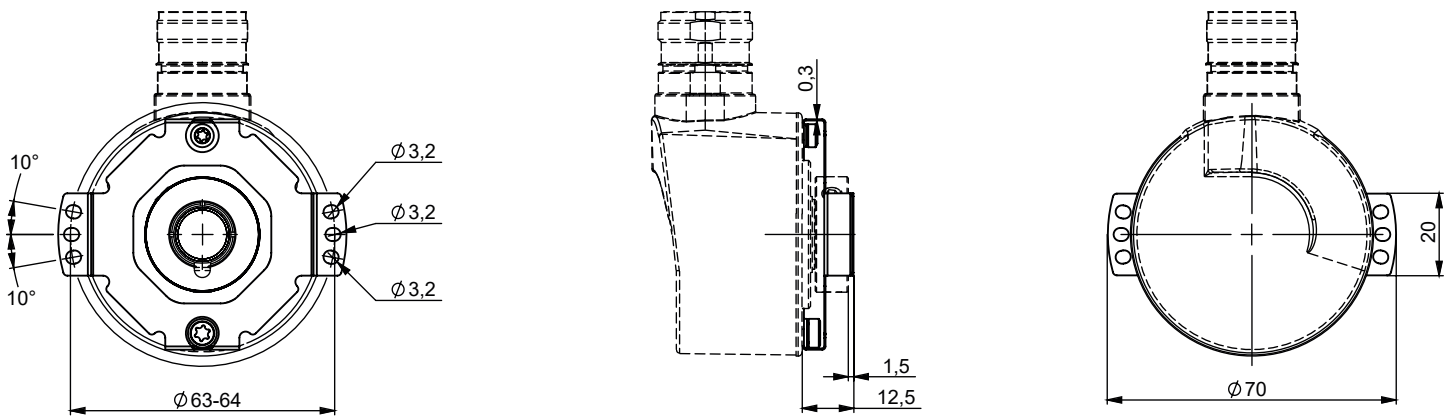


**COUPLING INTERFACES**

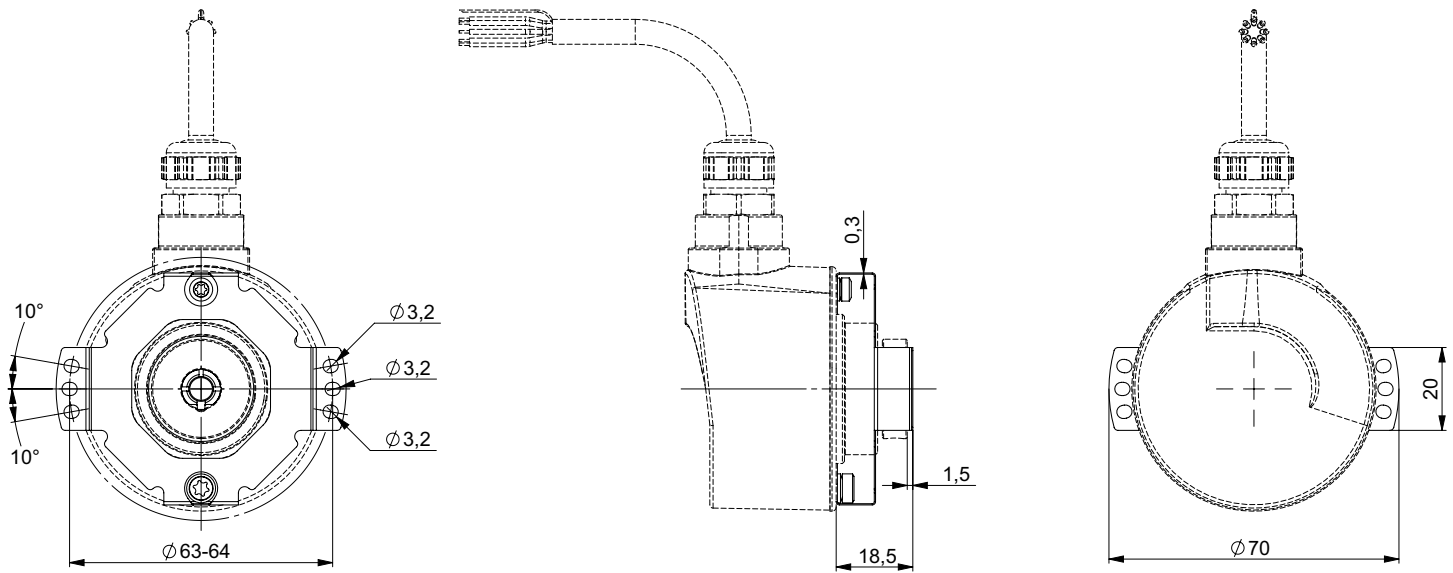
**Stator coupling kit M9445/044**



### Stator coupling kit M9445/063 for DSK5H 9.52 to 14mm shaft



### Stator coupling kit M9445/064







# DSK5H ORDERING OPTIONS

Example : DSK5HKB//5G29//1024//GPR050//\*\*DX\*\*

Contact the factory for special versions, ex: resolution, connection, flange...

<b>DSK5H</b>	<b>KB</b>	//	<b>5G2</b>	<b>9</b>	//	<b>01024</b>	//	<b>GP</b>	<b>R</b>	<b>050</b>	//	<b>**DX**</b>
<b>Family</b>												
<b>DSK5H</b>												
<b>Shaft</b>												
<b>KB:</b> Blind shaft 7.3mm, tapered 10%												
<b>Voltage Output</b>												
<b>2G2:</b> 5Vdc, TTL RS422 <b>5G2:</b> 11- 30Vdc, TTL RS422 <b>5G5:</b> 11- 30Vdc, HTL <b>2WT:</b> 5Vdc, Sine 1 Vpp (analog) <b>5WT:</b> 11- 30Vdc, Sine 1 Vpp (analog)												
<b>Channels</b>												
<b>9:</b> Digital electronics AA/ BB/ ZZ/ B before A, CW viewed from flange side Z gated A&B  <b>N:</b> Analog electronics SS/ CC/ ZZ/ C before S, CW viewed from flange side Z ungated Contact factory for other configurations												
<b>Resolution</b>												
<b>250, 256, 360, 500, 512, 1000, 1024, 1500, 2000, 2048, 2500</b>												
<b>Output Termination</b>												
<b>G6:</b> M23 12 pins CW <b>G8:</b> M23 12 pins CCW <b>GM:</b> M12 8 pins <b>GP:</b> PUR cable 12 wires <b>G3:</b> PVC cable 8 wires <b>U3:</b> PVC Cable 8 wires <b>GC:</b> PUR cable 8 wires												
<b>Output Orientation</b>												
<b>R:</b> Radial <b>A:</b> Axial												
<b>Cable Length</b>												
<b>xxx:</b> Cable Length (ex.: 020 = 2 Meters) <b>Blank:</b> No Cable												
<b>Accessories*</b>												
<b>*****:</b> No accessory <b>**DX**:</b> 9445/044 stator coupling <b>**BA**:</b> 9445/047 Tether arm <b>CSS3**:</b> Key + 9445/063 stator coupling <b>?????:</b> Key + 9445/064 stator coupling												

\* Parts mounted on encoder and fasteners included in the encoder box.

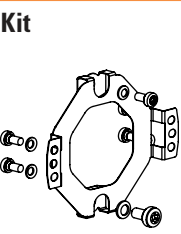
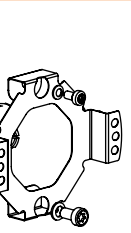
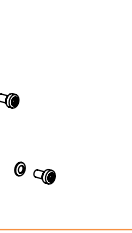
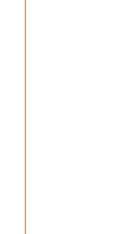



## AGENCY APPROVALS & CERTIFICATIONS



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Description	Part Number
<b>Safety Rated Flexmount Kit</b> Hardware included 	M9445/044
<b>Safety Rated Flexmount Kit</b> Hardware included 	M9445/063
<b>Safety Rated Flexmount Kit</b> Hardware included 	M 9445/064
<b>Safety Encoder Tether Arm Kit</b> Hardware included 	M9445/047
<b>Standard Mating Connector</b> 2m, 5m, 10m Mating Cable Assembly 	Extension cords compatible with G6 connection option: RAL-020-001 = M23, PVC cable, 2m RAL-050-001 = M23, PVC cable, 5m RAL-100-001 = M23, PVC cable, 10m  Extension cords compatible with G8 connection option: RAL-020-012 = M23, PUR cable, 2m RAL-050-020 = M23, PUR cable, 5m RAL-100-028 = M23, PUR cable, 10m  Extension cords compatible with GM connection option: RAL-020-039 = M12 overmolded, PUR cable, 2m RAL-050-052 = M12 overmolded, PUR cable, 5m RAL-100-050 = M12 overmolded, PUR cable, 10m



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