



## DSM5 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. The DSM5 series features a shafted mounting and is also available in a stainless steel version that is IP69K sealed for washdown applications. Both have a body diameter of 58mm.



DSM5H



DSM5X

#### 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  $-20^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 58mm standard size encoder
- Multiple shaft configurations:  
Solid shaft: 6mm, 9.52mm or 10mm (DSM5H)  
Other shaft configurations available (blind, through, tapered)
- IP69K Stainless steel housing option (DSM5X)
- 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

	DSM5H	DSM5X
<b>Material</b>	<b>Cover:</b> coated zinc alloy <b>Body:</b> aluminum <b>Shaft:</b> AISI 303 stainless steel	<b>Cover:</b> AISI 316 stainless steel <b>Body:</b> AISI 316 stainless steel <b>Shaft:</b> AISI 316 stainless steel
<b>Bearings</b>	6000 series - sealed	6000 series - protected by hybrid rotary seal
<b>Maximum Loads</b>	<b>Axial:</b> 40 N <b>Radial:</b> 80 N	<b>Axial:</b> 100 N <b>Radial:</b> 200 N
<b>Shaft Inertia</b>	< 2,800 g.mm <sup>2</sup>	< 2,500 g.mm <sup>2</sup>
<b>Static/Dynamic torque</b>	5 / 35 mN.m	10 / 45 mN.m
<b>Permissible max. speed</b>	9,000 RPM	6,000 RPM

<b>Continuous max. speed</b>	6,000 RPM	3,000 RPM
<b>Theoretical mechanical lifetime L<sub>10h</sub><sup>(A)</sup></b>	> 29.7 X 10 <sup>9</sup> turns / 82,365 hours	> 4.71 X 10 <sup>9</sup> turns / 26,150 hours
<b>Encoder weight (approx.)</b>	0.30 kg	0.75 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 RS422	5V +/-5% <sup>(C)</sup> --- 250mA	100mA with no load	40mA	Yes	Yes	7.51E-05	8.58E-10	1331	HIGH
5G2		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

	DSM5H	DSM5X
<b>Protection (EN 60529)</b>	IP65	IP68/69K
<b>Salt Spray (EN 60068-2-11 part 2)</b>	96h	168h
<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>	≤ 200m.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

### DSM5H 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

### DSM5X connections

Type	Cable	0V	+V	A or S	B or C	Z	A/ or S/	B/ or C/	Z/	Ground
TE	8230/005	WH white	BN brown	GN green	YE yellow	GY grey	PK pink	BU blue	RD red	General shielding

Note: TE connection is not UL certified



## RESOLUTIONS

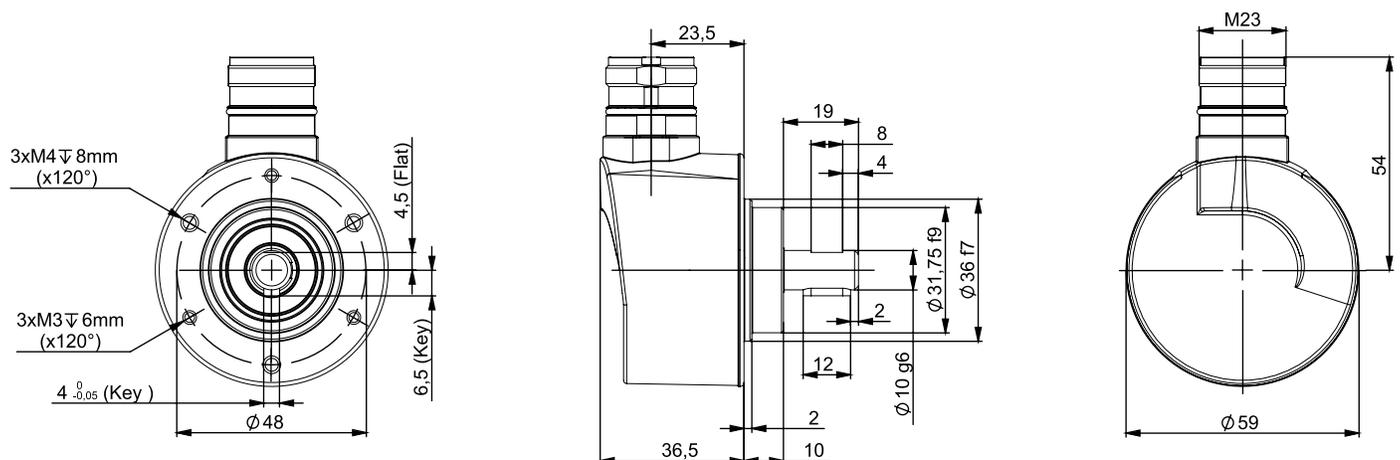
250 256 360 500 512 1000 1024 1500 2000 2048 2500



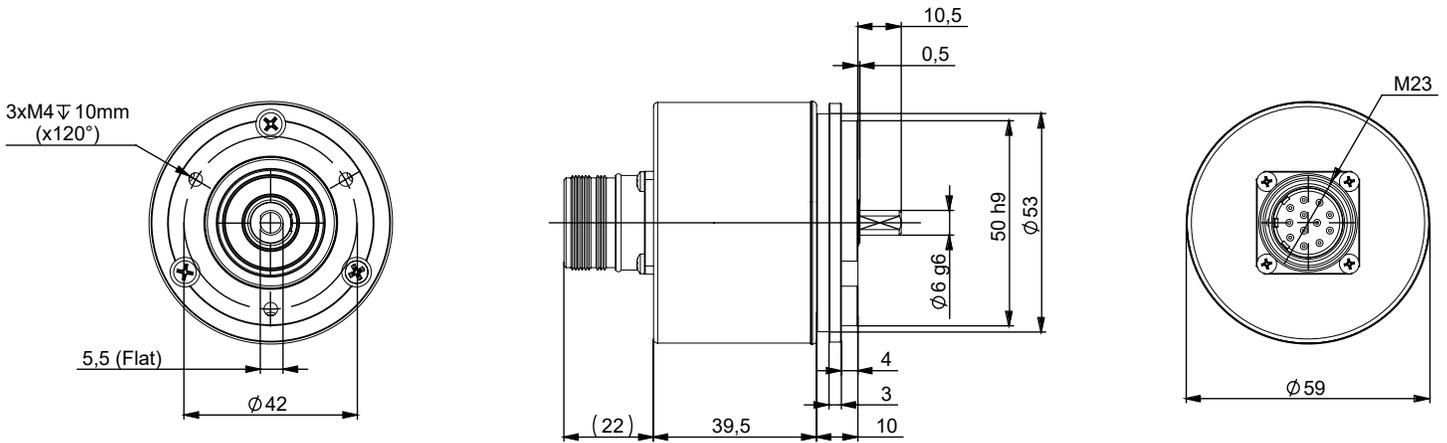
## DIMENSIONS

All dimensions are in mm

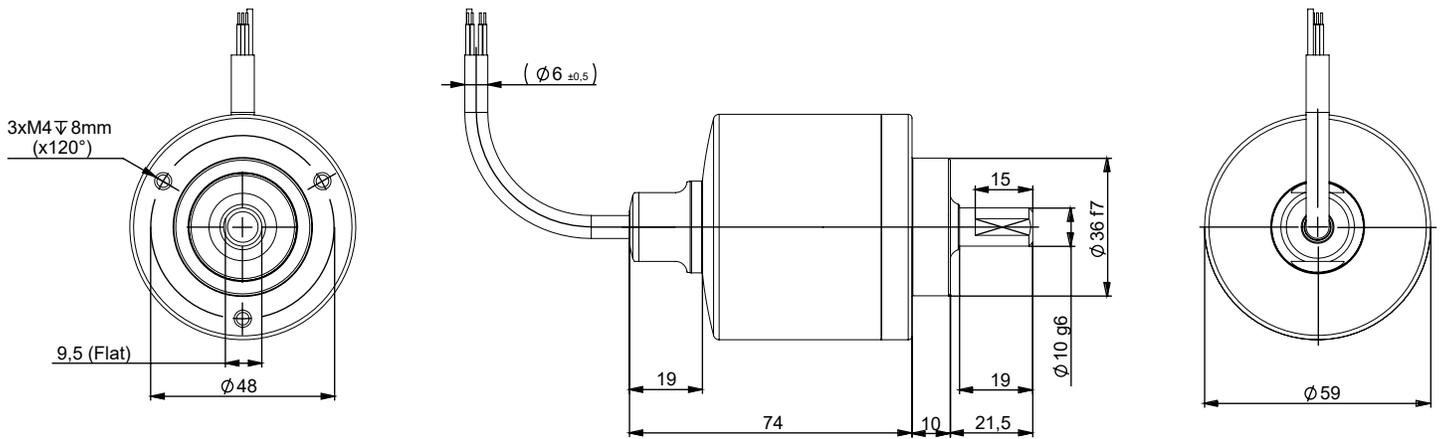
### DSM5H10 - Solid shaft 10mm - M23 connector - Radial



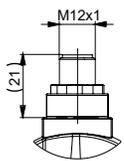
**DSM5H06 - Solid shaft 6mm - M23 connector - Axial**



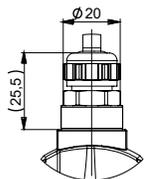
**DSM5X10 - Solid shaft 10mm – Cable output radial**



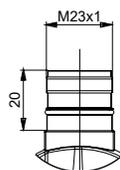
**M12  
GMR**



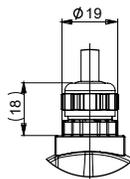
**Cable  
U3R, GCR**



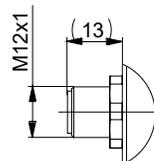
**M23  
G6R, G8R**



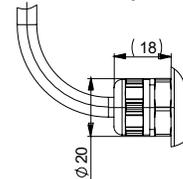
**Cable  
G3R, GPR, TER**



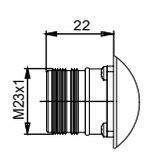
**M12  
GMA**



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



**M23  
G6A G8A**



**GENERAL NOTES**

**For a safe installation according to the required safety level needed in the application, refer to the user safety User Manual. The safety User Manual provides the technical information (drawings, electrical data, etc...) for a safe integration. A quick installation guide is provided with each encoder for use by the technician who installs the device on the equipment.**



# ORDERING OPTIONS

Example : DSM5H10 // 5G5 // 01024 // GPR050 // CS03\*\*

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

	DSM5H	10	//	5G5	9	//	01024	//	GP	R	050	//	CS03**
<b>Family</b>	DSM5H: Aluminum housing DSM5X: Stainless steel housing												
<b>Shaft</b>	06 = 6 mm (not available in DSM5X models) 10 = 10 mm E3 = 9.52mm (not available in DSM5X models)												
<b>Voltage Output</b>	2G2: 5Vdc, TTL RS422 5G2: 11- 30Vdc, TTL RS422 5G5: 11- 30Vdc, HTL 2WT: 5Vdc, Sine 1 Vpp (analog) 5WT: 11- 30Vdc, Sine 1 Vpp (analog)												
<b>Channels</b>	9: Digital electronics AA/ BB/ ZZ/ B before A, CW viewed from flange side Z gated A&B  N: Analog electronics SS/ CC/ ZZ/ C before S, CW viewed from flange side Z ungated Contact factory for other configurations												
<b>Resolution</b>	250, 256, 360, 500, 512, 1000, 1024, 1500, 2000, 2048, 2500												
<b>Output Termination</b>	DSM5H G6: M23 12 pins CW G8: M23 12 pins CCW GM: M12 8 pins GP: PUR cable 12 wires G3: PVC cable 8 wires U3: PVC Cable 8 wires GC: PUR cable 8 wires DSM5X TE: Silicone Cable 8 wires												
<b>Output Orientation</b>	R: Radial A: Axial												
<b>Cable Length</b>	xxx: Cable Length (ex.: 020 = 2 Meters) Blank: No Cable												
<b>Accessories*</b>	*****: No accessory CS****: Key for keyway (not available for DSM5H06 model) **03**: 9500/003 Servo flange (for DSM5H06 model only) CS03**: Key + Servoflange (not available for DSM5H06 model)												

\* Parts mounted on encoder



## AGENCY APPROVALS & CERTIFICATIONS



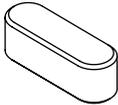
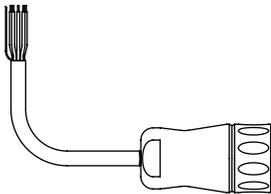
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## ACCESSORIES

Description	Part Number
<b>Square shaft keys</b> 	9435/006 = 4mm x 12mm
<b>Safety Bellows Couplings</b> For 10mm shaft 	9404/S/10-10
<b>Standard Mating Connector</b> 2m, 5m, 10m Mating Cable Assembly Other lengths from 0.5m to 25m available upon request, consult factory. 	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

Made in France

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