



DFS60A-BHUA03500

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	Part no.
DFS60A-BHUA03500	1058524

Other models and accessories → www.sick.com/DFS60

Detailed technical data

Performance

Pulses per revolution	3,500 ¹⁾
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at non binary number of lines	± 0.008°
Error limits	± 0.03°

¹⁾ See maximum revolution range.

Interfaces

Communication interface	Incremental
Communication Interface detail	TTL / RS-422
Number of signal channels	6-channel
0-set function via hardware pin	✓
0-SET function	H-active, L = 0 - 3 V, H = 4,0 - U _s V ¹⁾
Initialization time	30 ms
Output frequency	≤ 820 kHz
Load current	≤ 30 mA
Operating current	40 mA (without load)

¹⁾ Only with devices with M23 connector in connection with electrical interfaces M, U, V and W.

Electrical data

Connection type	Male connector, M23, 12-pin, radial
Supply voltage	4.5 ... 5.5 V
Reference signal, number	1
Reference signal, position	90°, electric, logically gated with A and B
Reverse polarity protection	✓
Short-circuit protection of the outputs	✓ ¹⁾

¹⁾ Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

²⁾ This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40°C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

MTTFd: mean time to dangerous failure	300 years (EN ISO 13849-1) ²⁾
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Mechanical data

Mechanical design	Blind hollow shaft
Shaft diameter	15 mm
Weight	+ 0.2 kg
Shaft material	Stainless steel
Flange material	Aluminum
Housing material	Aluminum die cast
Start up torque	0.8 Ncm (+20 °C)
Operating torque	0.6 Ncm (+20 °C)
Permissible movement static	± 0.3 mm (radial) ± 0.5 mm (axial)
Permissible movement dynamic	± 0.05 mm (radial) ± 0.01 mm (axial)
Operating speed	≤ 6,000 min ⁻¹ ¹⁾
Moment of inertia of the rotor	40 gcm ²
Bearing lifetime	3.6 x 10 ¹⁰ revolutions
Angular acceleration	≤ 500,000 rad/s ²

¹⁾ Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

Ambient data

EMC	According to EN 61000-6-2 and EN 61000-6-3
Enclosure rating	IP67, Housing side, male connector (IEC 60529) ¹⁾ IP65, shaft side (IEC 60529)
Permissible relative humidity	90 % (Condensation not permitted)
Operating temperature range	-40 °C ... +100 °C ²⁾ -30 °C ... +100 °C ³⁾
Storage temperature range	-40 °C ... +100 °C, without package
Resistance to shocks	100 g, 6 ms (EN 60068-2-27)
Resistance to vibration	30 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

¹⁾ With mating connector fitted.

²⁾ Stationary position of the cable.

³⁾ Flexible position of the cable.

Classifications

eCI@ss 5.0	27270501
eCI@ss 5.1.4	27270501
eCI@ss 6.0	27270590
eCI@ss 6.2	27270590
eCI@ss 7.0	27270501
eCI@ss 8.0	27270501

eCl@ss 8.1	27270501
eCl@ss 9.0	27270501
eCl@ss 10.0	27270501
eCl@ss 11.0	27270501
eCl@ss 12.0	27270501
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

Dimensional drawing (Dimensions in mm (inch))

Blind hollow shaft, radial male connector M12 and M23



General tolerances according to DIN ISO 2768-mk

Type	Shaft diameter XF7	Shaft diameter xj7
Blind hollow shaft		
DFS60x-BAxxxxxxx	6 mm	Provided by customer
DFS60x-BBxxxxxxx	8 mm	
DFS60x-BCxxxxxxx	3/8"	
DFS60x-BDxxxxxxx	10 mm	
DFS60x-BExxxxxxx	12 mm	

Type Blind hollow shaft	Shaft diameter XF7	Shaft diameter xj7
DFS60x-BFxxxxxxx	1/2"	
DFS60x-BGxxxxxxx	14 mm	
DFS60x-BHxxxxxxx	15 mm	
DFS60x-BJxxxxxxx	5/8"	

PIN assignment



View of M23 male device connector on encoder

PIN Male connector M12, 8-pin	PIN Male connector M23, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V _{PP}	Explanation
1	6	Brown	\bar{A}	COS-	Signal wire
2	5	White	A	COS+	Signal wire
3	1	Black	\bar{B}	SIN-	Signal wire
4	8	Pink	B	SIN+	Signal wire
5	4	Yellow	\bar{Z}	\bar{Z}	Signal wire
6	3	Purple	Z	Z	Signal wire
7	10	Blue	GND	GND	Ground connection
8	12	Red	+U _S	+U _S	Supply voltage
-	9	-	N.c.	N.c.	Not assigned
-	2	-	N.c.	N.c.	Not assigned
-	11	-	N.c.	N.c.	Not assigned
-	7 ¹⁾	Orange	0-SET ¹⁾	N.c.	Set zero pulse ¹⁾
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

¹⁾

For electrical interfaces only: M, U, V, W with 0-SET function on PIN 7 on M23 plug. The 0-SET input is used to set the zero pulse to the current shaft position. If the 0-SET input is applied to US for longer than 250 ms after it has previously been open or applied to GND for at least 1,000 ms, the current shaft position is assigned zero pulse signal "Z".

Diagrams

Signal outputs



CW with view on the encoder shaft in direction "A", compare dimensional drawing.
 Maximum revolution range



Supply voltage	Output
4,5 V ... 5,5 V	TTL
10 V ... 32 V	TTL
10 V ... 32 V	HTL

Recommended accessories

Other models and accessories → www.sick.com/DFS60

	Brief description	Type	Part no.
Flanges			
	Standard stator coupling	BEF-DS00XFX	2056812
Other mounting accessories			
	Clamping ring for metal hollow shaft ¹⁾ , metal	BEF-KR-M	2064709
Plug connectors and cables			
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 2 m	DOL-2312-G02MLD1	2062202
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 3 m	DOL-2312-G03MMD1	2062243
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 5 m	DOL-2312-G05MMD1	2062244
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 7 m	DOL-2312-G07MLD1	2062203
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 10 m	DOL-2312-G10MLD1	2062204
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 10 m	DOL-2312-G10MMD1	2062245
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 15 m	DOL-2312-G15MLD1	2062205
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 1.5 m	DOL-2312-G1M5MD1	2062240
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 20 m	DOL-2312-G20MLD1	2062206
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 20 m	DOL-2312-G20MMD1	2062246
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 25 m	DOL-2312-G25MLD1	2062207
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, shielded, 30 m	DOL-2312-G30MLD1	2062208
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: Incremental, PUR, halogen-free, shielded, 30 m	DOL-2312-G30MMD1	2062247
	Head A: female connector, M23, 12-pin, straight Cable: HIPERFACE [®] , SSI, Incremental, shielded	DOS-2312-G02	2077057

	Brief description	Type	Part no.
	Head A: female connector, M23, 12-pin, angled Cable: HIPERFACE [®] , SSI, Incremental, shielded	DOS-2312-W01	2072580

SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

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