



DFS60E-TDCA02048

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	part no.
DFS60E-TDCA02048	1055751

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

Detailed technical data

Safety-related parameters

MTTF_D (mean time to dangerous failure)	300 years (EN ISO 13849-1) ¹⁾
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¹⁾ 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.

Performance

Pulses per revolution	2,048 ¹⁾
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at binary number of lines	± 0.15°
Error limits	± 0.3°

¹⁾ See maximum revolution range.

Interfaces

Communication interface	Incremental
Communication Interface detail	TTL / RS-422
Number of signal channels	6-channel
Initialization time	40 ms
Output frequency	≤ 300 kHz
Load current	≤ 30 mA
Power consumption	≤ 0.5 W (without load)

Electronics

Connection type	Male connector, M23, 12-pin, radial
Supply voltage	10 ... 32 V
Reference signal, number	1
Reference signal, position	90°, electric, logically gated with A and B
Reverse polarity protection	✓

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

Short-circuit protection of the outputs	✓ ¹⁾
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¹⁾ Short-circuit opposite to another channel or GND permissible for maximum 30 s.

Mechanics

Mechanical design	Through hollow shaft
Shaft diameter	10 mm Front clamp
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	± 0.1 mm (radial) ± 0.2 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 61000-6-4
Enclosure rating	IP65, Housing side, male connector (IEC 60529) ¹⁾ IP65, shaft side (IEC 60529)
Permissible relative humidity	90 % (Condensation not permitted)
Operating temperature range	0 °C ... +85 °C
Storage temperature range	-40 °C ... +100 °C, without package
Resistance to shocks	50 g, 6 ms (EN 60068-2-27)
Resistance to vibration	20 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

¹⁾ With mating connector fitted.

Certificates

EU declaration of conformity	✓
UK declaration of conformity	✓
ACMA declaration of conformity	✓
Moroccan declaration of conformity	✓
China RoHS	✓
cULus certificate	✓
Information according to Art. 3 of Data Act (Regulation EU 2023/2854)	✓

ECLASS 5.0	27270501
ECLASS 5.1.4	27270501
ECLASS 6.0	27270590
ECLASS 6.2	27270590
ECLASS 7.0	27270501
ECLASS 8.0	27270501
ECLASS 8.1	27270501
ECLASS 9.0	27270501
ECLASS 10.0	27270501
ECLASS 11.0	27270501
ECLASS 12.0	27270501
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

Technical drawing of the M23 x 1 1/2, showing three views: front, side, and top.

Front View (Left): Shows the main body with dimensions: 43 (1.69) total width, 9.4 (0.37) and 3.4 (0.13) for mounting holes, 14.5 (0.57) for the lower section, and 7.75 (0.31) for the lower section. The main body is labeled $\emptyset 60$ (2.36). The mounting holes are labeled $\emptyset X F7$. The bottom section is labeled M12 x 1.

Side View (Middle): Shows the side profile with dimensions: 26.1 (1.03) for the main body and 13 (0.51) for the lower section. The bottom section is labeled M23 x 1.

Top View (Right): Shows the top of the component with dimensions: 72 $\pm$ 0.3 (2.83) for the outer diameter, $\emptyset 3.2^{+0.1}_{-0}$ (0.13) for the mounting holes, 20 (0.79) for the mounting holes, 47 (1.85) for the inner diameter, and $\emptyset 63^{+0.2}_{-0}$ (2.48) for the outer diameter. The mounting holes are labeled 20°.

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① cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

TypeThrough hollow shaft	Shaft diameter XF7	Shaft diameter xj7
DFS60x-TAxxxxxxx	6 mm	Provided by customer
DFS60x-TBxxxxxxx	8 mm	
DFS60x-TCxxxxxxx	3/8"	
DFS60x-TDxxxxxxx	10 mm	
DFS60x-TExxxxxxx	12 mm	
DFS60x-TFxxxxxxx	1/2"	
DFS60x-TGxxxxxxx	14 mm	
DFS60x-THxxxxxxx	15 mm	
DFS60x-TJxxxxxxx	5/8"	

PIN assignment



view of M23 male device connector on encoder

PINMale connector M12, 8-pin	PINMale 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	O-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 O-SET function on PIN 7 on M23 plug. The O-SET input is used to set the zero pulse to the current shaft position. If the O-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".

maximum revolution range



signal outputs



CW with view on the encoder shaft in direction “A”, compare dimensional drawing.

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.
Mounting systems			
	• Product family: Stator couplings • Description: Standard stator coupling	BEF-DS00XFX	2056812
	• Description: Clamping ring for metal hollow shaft • Material: Steel • Details: Metal	BEF-KR-M	2064709

	Brief description	Type	part no.
connectors and cables			
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 2 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G02MLA3	2030682
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 7 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G07MLA3	2030685
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 10 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G10MLA3	2030688
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 15 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G15MLA3	2030692
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 20 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G20MLA3	2030695
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 25 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G25MLA3	2030699
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 30 m, 11-wire, PUR • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G30MLA3	2030702
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 1.5 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G1M5MA3	2029212
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 3 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G03MMA3	2029213
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 5 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G05MMA3	2029214
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 10 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded	DOL-2312-G10MMA3	2029215

	Brief description	Type	part no.
	• Application: Zones with oils and lubricants • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 20 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G20MMA3	2029216
	• Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: Incremental • Cable: 30 m, 12-wire, PUR, halogen-free • Description: Incremental, shielded • Application: Zones with oils and lubricants	DOL-2312-G30MMA3	2029217
	• Description: HIPERFACE[®], shielded, SSI, Incremental • Connection type head A: Female connector, M23, 12-pin, straight, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Connection systems: Solder connection	DOS-2312-G02	2077057
	• Description: HIPERFACE[®], shielded, SSI, Incremental • Connection type head A: Female connector, M23, 12-pin, angled, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Connection systems: Solder connection	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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