



DFS60E-BEEA00100

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	part no.
DFS60E-BEEA00100	1074208

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	100 ¹⁾
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at non binary number of lines	± 0.2°
Error limits	± 0.3°

¹⁾ See maximum revolution range.

Interfaces

Communication interface	Incremental
Communication Interface detail	HTL / Push pull
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, US 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, US or GND permissible for maximum 30 s.

Mechanics

Mechanical design	Blind hollow shaft
Shaft diameter	12 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	IP67, 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 1000 Series 1/2" (25.4 mm) ball valve, showing three views: side view, end view, and top view. The drawing includes dimensions in millimeters (mm) and inches (in).

Side View Dimensions:

- Overall length: 45.5 (1.79)
- Distance from end to first port: 9.4 (0.37)
- Distance between ports: 3.4 (0.13)
- Distance from second port to end: 2.5 (0.10)
- Port diameter: $\varnothing 32.6$ (1.28)
- Port diameter: $\varnothing 60$ (2.36)
- Port diameter: $\varnothing 75$ (2.95)
- Port diameter: $\varnothing 100$ (3.94)
- Port diameter: $\varnothing 125$ (4.92)
- Port diameter: $\varnothing 150$ (5.91)
- Port diameter: $\varnothing 175$ (6.89)
- Port diameter: $\varnothing 200$ (7.87)
- Port diameter: $\varnothing 225$ (8.86)
- Port diameter: $\varnothing 250$ (9.84)
- Port diameter: $\varnothing 275$ (10.83)
- Port diameter: $\varnothing 300$ (11.81)
- Port diameter: $\varnothing 325$ (12.79)
- Port diameter: $\varnothing 350$ (13.78)
- Port diameter: $\varnothing 375$ (14.76)
- Port diameter: $\varnothing 400$ (15.75)
- Port diameter: $\varnothing 425$ (16.73)
- Port diameter: $\varnothing 450$ (17.72)
- Port diameter: $\varnothing 475$ (18.70)
- Port diameter: $\varnothing 500$ (19.69)
- Port diameter: $\varnothing 525$ (20.67)
- Port diameter: $\varnothing 550$ (21.65)
- Port diameter: $\varnothing 575$ (22.64)
- Port diameter: $\varnothing 600$ (23.62)
- Port diameter: $\varnothing 625$ (24.61)
- Port diameter: $\varnothing 650$ (25.59)
- Port diameter: $\varnothing 675$ (26.57)
- Port diameter: $\varnothing 700$ (27.56)
- Port diameter: $\varnothing 725$ (28.54)
- Port diameter: $\varnothing 750$ (29.53)
- Port diameter: $\varnothing 775$ (30.51)
- Port diameter: $\varnothing 800$ (31.50)
- Port diameter: $\varnothing 825$ (32.48)
- Port diameter: $\varnothing 850$ (33.47)
- Port diameter: $\varnothing 875$ (34.45)
- Port diameter: $\varnothing 900$ (35.43)
- Port diameter: $\varnothing 925$ (36.41)
- Port diameter: $\varnothing 950$ (37.40)
- Port diameter: $\varnothing 975$ (38.38)
- Port diameter: $\varnothing 1000$ (39.37)
- Port diameter: $\varnothing 1025$ (40.35)
- Port diameter: $\varnothing 1050$ (41.34)
- Port diameter: $\varnothing 1075$ (42.32)
- Port diameter: $\varnothing 1100$ (43.31)
- Port diameter: $\varnothing 1125$ (44.29)
- Port diameter: $\varnothing 1150$ (45.27)
- Port diameter: $\varnothing 1175$ (46.26)
- Port diameter: $\varnothing 1200$ (47.24)
- Port diameter: $\varnothing 1225$ (48.23)
- Port diameter: $\varnothing 1250$ (49.21)
- Port diameter: $\varnothing 1275$ (50.19)
- Port diameter: $\varnothing 1300$ (51.18)
- Port diameter: $\varnothing 1325$ (52.16)
- Port diameter: $\varnothing 1350$ (53.15)
- Port diameter: $\varnothing 1375$ (54.13)
- Port diameter: $\varnothing 1400$ (55.12)
- Port diameter: $\varnothing 1425$ (56.10)
- Port diameter: $\varnothing 1450$ (57.08)
- Port diameter: $\varnothing 1475$ (58.07)
- Port diameter: $\varnothing 1500$ (59.05)
- Port diameter: $\varnothing 1525$ (60.04)
- Port diameter: $\varnothing 1550$ (61.02)
- Port diameter: $\varnothing 1575$ (62.01)
- Port diameter: $\varnothing 1600$ (62.99)
- Port diameter: $\varnothing 1625$ (63.98)
- Port diameter: $\varnothing 1650$ (64.96)
- Port diameter: $\varnothing 1675$ (65.95)
- Port diameter: $\varnothing 1700$ (66.93)
- Port diameter: $\varnothing 1725$ (67.92)
- Port diameter: $\varnothing 1750$ (68.90)
- Port diameter: $\varnothing 1775$ (69.89)
- Port diameter: $\varnothing 1800$ (70.87)
- Port diameter: $\varnothing 1825$ (71.86)
- Port diameter: $\varnothing 1850$ (72.84)
- Port diameter: $\varnothing 1875$ (73.83)
- Port diameter: $\varnothing 1900$ (74.81)
- Port diameter: $\varnothing 1925$ (75.80)
- Port diameter: $\varnothing 1950$ (76.78)
- Port diameter: $\varnothing 1975$ (77.77)
- Port diameter: $\varnothing 2000$ (78.74)
- Port diameter: $\varnothing 2025$ (79.73)
- Port diameter: $\varnothing 2050$ (80.71)
- Port diameter: $\varnothing 2075$ (81.70)
- Port diameter: $\varnothing 2100$ (82.68)
- Port diameter: $\varnothing 2125$ (83.67)
- Port diameter: $\varnothing 2150$ (84.65)
- Port diameter: $\varnothing 2175$ (85.64)
- Port diameter: $\varnothing 2200$ (86.62)
- Port diameter: $\varnothing 2225$ (87.61)
- Port diameter: $\varnothing 2250$ (88.59)
- Port diameter: $\varnothing 2275$ (89.58)
- Port diameter: $\varnothing 2300$ (90.56)
- Port diameter: $\varnothing 2325$ (91.55)
- Port diameter: $\varnothing 2350$ (92.53)
- Port diameter: $\varnothing 2375$ (93.52)
- Port diameter: $\varnothing 2400$ (94.50)
- Port diameter: $\varnothing 2425$ (95.49)
- Port diameter: $\varnothing 2450$ (96.47)
- Port diameter: $\varnothing 2475$ (97.46)
- Port diameter: $\varnothing 2500$ (98.43)
- Port diameter: $\varnothing 2525$ (99.42)
- Port diameter: $\varnothing 2550$ (100.40)
- Port diameter: $\varnothing 2575$ (101.39)
- Port diameter: $\varnothing 2600$ (102.37)
- Port diameter: $\varnothing 2625$ (103.36)
- Port diameter: $\varnothing 2650$ (104.34)
- Port diameter: $\varnothing 2675$ (105.33)
- Port diameter: $\varnothing 2700$ (106.31)
- Port diameter: $\varnothing 2725$ (107.30)
- Port diameter: $\varnothing 2750$ (108.28)
- Port diameter: $\varnothing 2775$ (109.27)
- Port diameter: $\varnothing 2800$ (110.25)
- Port diameter: $\varnothing 2825$ (111.24)
- Port diameter: $\varnothing 2850$ (112.22)
- Port diameter: $\varnothing 2875$ (113.21)
- Port diameter: $\varnothing 2900$ (114.19)
- Port diameter: $\varnothing 2925$ (115.18)
- Port diameter: $\varnothing 2950$ (116.16)
- Port diameter: $\varnothing 2975$ (117.15)
- Port diameter: $\varnothing 3000$ (118.13)
- Port diameter: $\varnothing 3025$ (119.12)
- Port diameter: $\varnothing 3050$ (120.10)
- Port diameter: $\varnothing 3075$ (121.09)
- Port diameter: $\varnothing 3100$ (122.07)
- Port diameter: $\varnothing 3125$ (123.06)
- Port diameter: $\varnothing 3150$ (124.04)
- Port diameter: $\varnothing 3175$ (125.03)
- Port diameter: $\varnothing 3200$ (126.01)
- Port diameter: $\varnothing 3225$ (127.00)
- Port diameter: $\varnothing 3250$ (127.98)
- Port diameter: $\varnothing 3275$ (128.97)
- Port diameter: $\varnothing 3300$ (129.95)
- Port diameter: $\varnothing 3325$ (130.94)
- Port diameter: $\varnothing 3350$ (131.92)
- Port diameter: $\varnothing 3375$ (132.91)
- Port diameter: $\varnothing 3400$ (133.89)
- Port diameter: $\varnothing 3425$ (134.88)
- Port diameter: $\varnothing 3450$ (135.86)
- Port diameter: $\varnothing 3475$ (136.85)
- Port diameter: $\varnothing 3500$ (1

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General tolerances according to DIN ISO 2768-mk

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

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	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".

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
	• Description: Bearing bracket for hollow shaft encoders, fastening screws included the Bearing Block is intended for very large radial and axial shaft loads. Particularly for application on: Belt pulleys, Chain pinions, Friction wheels. It is designed this way to enable fitting of encoder with blind hollow shaft with $\varnothing 12$ mm. Operating speed max. $6,000 \text{ rpm}^{-1}$, axial shaft load 100 N, radial shaft load 100 N, bearing service life 3.6×10^9 revolutions • Items supplied: Fastening screws included	BEF-FA-B12-010	2042728

	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	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	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	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	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	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	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	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	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	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	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
	• 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	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	DOL-2312-G30MMA3	2029217

	Brief description	Type	part no.
	• Description: Incremental, shielded • Connection type head A: Female connector, M23, 12-pin, straight, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], shieldedSSIIncremental • Connection systems: Solder connection	DOS-2312-G02	2077057
	• Connection type head A: Female connector, M23, 12-pin, angled, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], shieldedSSIIncremental • 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.”

WORLDWIDE PRESENCE:

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