



DFS60B-BJNC01024

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	Part no.
DFS60B-BJNC01024	1075190

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

Sine/cosine periods per revolution	1,024
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at binary number of lines	± 0.008°
Error limits	± 0.05°

Interfaces

Communication interface	Incremental
Communication Interface detail	Sin/Cos ¹⁾
Number of signal channels	6-channel
Initialization time	40 ms
Output frequency	≤ 200 kHz
Operating current	40 mA (without load)
Load resistance	≤ 120 Ω

¹⁾ 1.0 V_{SS} (differential).

Electronics

Connection type	Male connector, M12, 8-pin, radial
Supply voltage	4.5 ... 5.5 V
Reference signal, number	1
Reference signal, position	90°, electronically, gated with Sinus and Cosinus
Short-circuit protection of the outputs	✓ ¹⁾

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

Mechanics

Mechanical design	Blind hollow shaft
Shaft diameter	5/8"
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 61000-6-3
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	70 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

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

PIN assignment



View of M12 male device connector on encoder

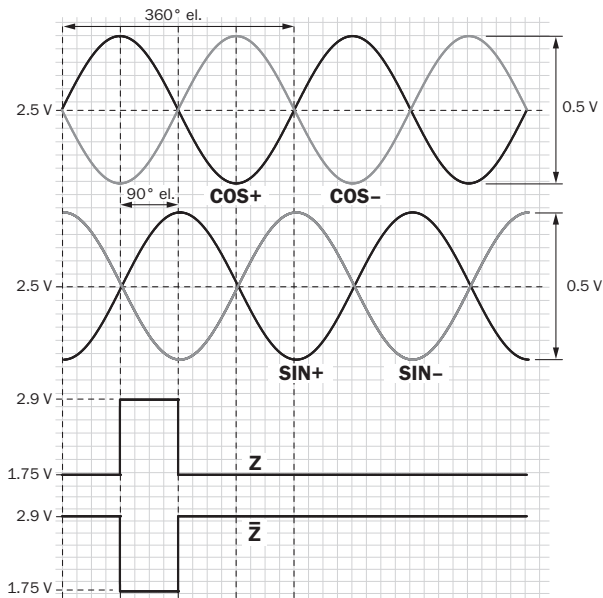
PIN Male connector M12, 8-pin	PIN Male connector M23, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V _{pp}	Explanation
1	6	Brown	\bar{A}	COS-	Signal wire
2	5	White	A	COS+	Signal wire
3	1	Black	\bar{B}	SIN-	Signal wire
4	8	Pink	B	SIN+	Signal wire
5	4	Yellow	\bar{Z}	\bar{Z}	Signal wire
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

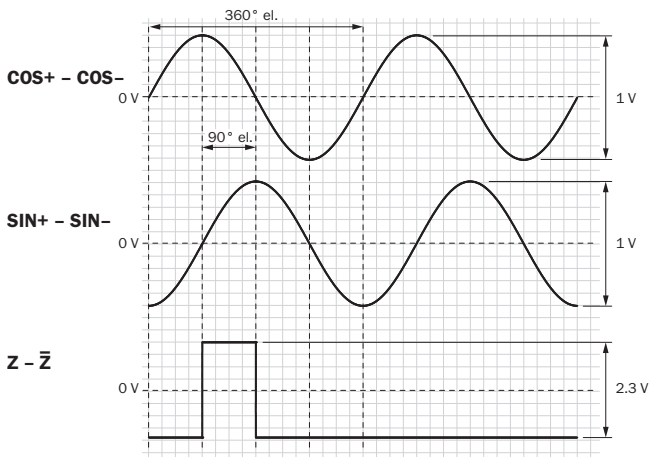
Signal SIN/COS before differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)

Signal	Interface signals	Signal before differential generation At load 120 Ω	Signal offset
+ SIN - SIN + COS - COS	Analog, differential	0,5 V _{SS} ± 20 %	2,5 V ± 10 %
Z Z ₋	Digital differential	Low: 1,75 V ± 15 %, High: 2,90 V ± 15 %	

Signal SIN/COS after differential generation



For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)





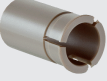

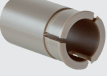
Supply voltage	Output
4,5 V ... 5,5 V	Sin/Cos 1.0 V _{pp}

Maximum revolution range





Recommended accessories

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

	Brief description	Type	Part no.
Flanges			
	<ul style="list-style-type: none"> Description: Standard stator coupling 	BEF-DS00XFX	2056812
Other mounting accessories			
	<ul style="list-style-type: none"> Description: Clamping ring for metal hollow shaft¹⁾ Details: Metal 	BEF-KR-M	2064709
Shaft adaptation			
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 6 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-006-P	2076228
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 8 mm, outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-008-M	2076219
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 8 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-008-P	2076229
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 10 mm, outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-010-M	2076220
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 10 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-010-P	2076230

	Brief description	Type	Part no.
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 12 mm, outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-012-M	2076221
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 12 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-012-P	2076231
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 14 mm, outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-014-M	2076222
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 14 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-014-P	2076232
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 15 mm, outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-015-M	2076223
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 15 mm, outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-015-P	2076233
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 1/2" (12.7 mm), outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-12Z-M	2076225
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 1/2" (12.7 mm), outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-12Z-P	2076227
	<ul style="list-style-type: none"> Description: Collet metal for hollow shaft, shaft diameter 3/8" (9.525 mm), outer diameter 5/8" (15.875 mm) Details: Metal 	SPZ-58Z-38Z-M	2076224
	<ul style="list-style-type: none"> Description: Collet plastic (PEEK) insulated for hollow shaft, shaft diameter 3/8" (9.525 mm), outer diameter 5/8" (15.875 mm) Details: Plastic, PEEK 	SPZ-58Z-38Z-P	2076226
Others			
	<ul style="list-style-type: none"> Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 2 m, 8-wire, PUR, halogen-free Description: Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm Connection systems: Flying leads 	DOL-1208-G02MAC1	6032866
	<ul style="list-style-type: none"> Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 5 m, 8-wire, PUR, halogen-free Description: Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm Connection systems: Flying leads 	DOL-1208-G05MAC1	6032867
	<ul style="list-style-type: none"> Connection type head A: Female connector, M12, 8-pin, straight Connection type head B: Flying leads Signal type: Incremental, SSI Cable: 10 m, 8-wire, PUR, halogen-free Description: Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm Connection systems: Flying leads 	DOL-1208-G10MAC1	6032868

	Brief description	Type	Part no.
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, straight • Connection type head B: Flying leads • Signal type: Incremental, SSI • Cable: 20 m, 8-wire, PUR, halogen-free • Description: Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm • Connection systems: Flying leads 	DOL-1208-G20MAC1	6032869
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, straight, A-coded • Signal type: Incremental, SSI • Cable: CAT5, CAT5e • Description: Incremental, SSI, shielded, Head A: female connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: -40 °C ... +85 °C • Connection systems: IDC quick connection • Permitted cross-section: 0.14 mm² ... 0.34 mm² 	DOS-1208-GA01	6045001
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Signal type: HIPERFACE[®], Incremental • Cable: 2 m, 8-wire, PUR, halogen-free • Description: HIPERFACE[®], Incremental, shielded 	DOL-1208-W02MAC1	6037724
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Signal type: HIPERFACE[®], Incremental • Cable: 5 m, 8-wire, PUR, halogen-free • Description: HIPERFACE[®], Incremental, shielded 	DOL-1208-W05MAC1	6037725
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Signal type: HIPERFACE[®], Incremental • Cable: 10 m, 8-wire, PUR, halogen-free • Description: HIPERFACE[®], Incremental, shielded 	DOL-1208-W10MAC1	6037726
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Signal type: HIPERFACE[®], Incremental • Cable: 20 m, 8-wire, PUR • Description: HIPERFACE[®], Incremental, shielded 	DOL-1208-W20MAC1	6037727
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Cable: 2 m, 8-wire, PVC • Description: Shielded • Connection systems: Flying leads 	DOL-1208-W02MA	6020992
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Signal type: Sensor/actuator cable • Cable: 2 m, 8-wire, PUR, halogen-free • Description: Sensor/actuator cable, shielded • Connection systems: Flying leads 	DOL-1208-W02MAS01	6029224
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Cable: 2 m, 8-wire, PUR, halogen-free • Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 2 m, PUR halogen free 	DOL-1208-W02MC	6035623
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Cable: 5 m, 8-wire, PVC • Description: Shielded • Connection systems: Flying leads 	DOL-1208-W05MA	6021033

	Brief description	Type	Part no.
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Cable: 5 m, 8-wire, PUR • Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 5 m, PUR halogen free 	DOL-1208-W05MC	6035624
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M12, 8-pin, angled • Connection type head B: Flying leads • Cable: 10 m, 8-wire, PUR, halogen-free • Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 10 m, PUR halogen free 	DOL-1208-W10MC	6035625

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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