

**INCREMENTAL ENCODERS** 



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### Ordering information

Туре	Part no.
DFS60B-BECC06000	1038222

Other models and accessories -> www.sick.com/DFS60





### Detailed technical data

#### Safety-related parameters

MTTF <sub>D</sub> (mean time to dangerous failure)	300 years (EN ISO 13849-1) <sup>1)</sup>
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<sup>1)</sup> 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	6,000 <sup>1)</sup>
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at non binary number of lines	±0.01°
Error limits	± 0.05°

<sup>1)</sup> 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	≤ 600 kHz
Load current	≤ 30 mA
Power consumption	≤ 0.5 W (without load)

#### Electronics

Connection type	Male connector, M12, 8-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	✓
Short-circuit protection of the outputs	✓ <sup>1)</sup>

 $^{1)}$  Short-circuit opposite to another channel or GND permissable for maximum 30 s.

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### Mechanics

Mechanical design	Blind hollow shaft
Shaft diameter	12 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	± 0.1 mm (radial) ± 0.2 mm (axial)
Operating speed	≤ 6,000 min <sup>-1 1)</sup>
Moment of inertia of the rotor	40 gcm <sup>2</sup>
Bearing lifetime	3.6 x 10^10 revolutions
Angular acceleration	≤ 500,000 rad/s²

 $^{1)}$  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) <sup>1)</sup> IP65, shaft side (IEC 60529)
Permissible relative humidity	90 % (Condensation not permitted)
Operating temperature range	-40 °C +100 °C <sup>2)</sup> -30 °C +100 °C <sup>3)</sup>
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.

<sup>2)</sup> Stationary position of the cable.

<sup>3)</sup> Flexible position of the cable.

### Classifications

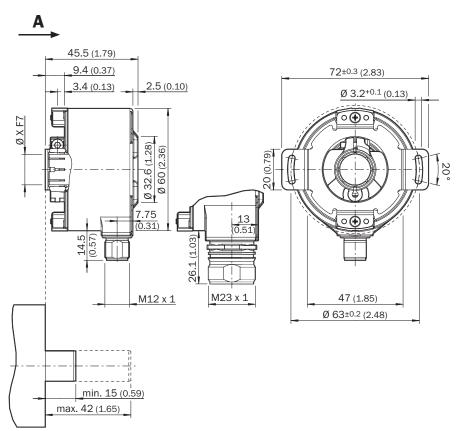
ECLASS 5.0	27270501
ECLASS 5.1.4	27270501
ECLASS 6.0	27270590
ECLASS 6.2	27270590
ECLASS 7.0	27270501
ECLASS 8.0	27270501
ECLASS 8.1	27270501
ECLASS 9.0	27270501
ECLASS 10.0	27270501
ECLASS 11.0	27270501

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ECLASS 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

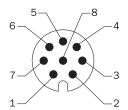


General tolerances according to DIN ISO 2768-mk

Type Blind 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″	

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### **PIN** assignment



#### View of M12 male device connector on encoder

PIN Male connector M12, 8-pin	PIN Male connec- tor M23, 12-pin	Wire colors (ca- ble connection)	TTL/HTL signal	Sin/Cos 1.0 V <sub>PP</sub>	Explanation
1	6	Brown	-A	COS-	Signal wire
2	5	White	A	COS+	Signal wire
3	1	Black	Ъ	SIN-	Signal wire
4	8	Pink	В	SIN+	Signal wire
5	4	Yellow	<sup>-</sup> z	<sup>-</sup> z	Signal wire
6	3	Purple	Z	Z	Signal wire
7	10	Blue	GND	GND	Ground connection
8	12	Red	+U <sub>S</sub>	+U <sub>S</sub>	Supply voltage
-	9	-	N.c.	N.c.	Not assigned
-	2	-	N.c.	N.c.	Not assigned
-	11	-	N.c.	N.c.	Not assigned
-	7 <sup>1)</sup>	Orange	0-SET <sup>1)</sup>	N.c.	Set zero pulse
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

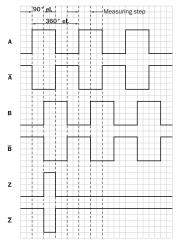
1)

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".

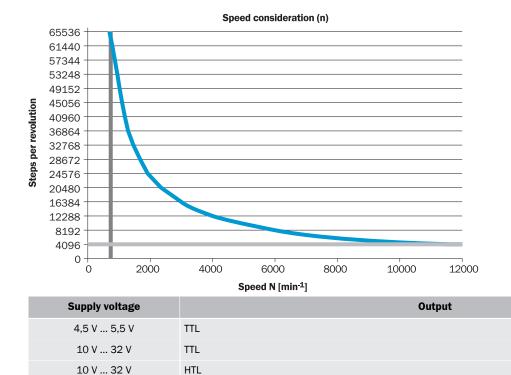
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### Diagrams

Signal outputs



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



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#### **Recommended accessories**

Other models and accessories -> www.sick.com/DFS60

	Brief description	Туре	Part no.					
Flanges								
Ŵ	Description: Standard stator coupling	BEF-DS00XFX	2056812					
Other mount	Other mounting accessories							
-9.	<ul> <li>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 ø 12 mm. Operating speed max. 6,000 rpm^-1, axial shaft load 100 N, radial shaft load 100 N, bearing service life 3.6 x 10^9 revolutions</li> <li>Items supplied: Fastening screws included</li> </ul>	BEF-FA-B12-010	2042728					
()	<ul> <li>Description: Clamping ring for metal hollow shaft<sup>*</sup></li> <li>Details: Metal</li> </ul>	BEF-KR-M	2064709					
Others								
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental, SSI</li> <li>Cable: 2 m, 8-wire, PUR, halogen-free</li> <li>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 mm<sup>2</sup>, Ø 7.0 mm</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-G02MAC1	6032866					
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental, SSI</li> <li>Cable: 5 m, 8-wire, PUR, halogen-free</li> <li>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 mm<sup>2</sup>, Ø 7.0 mm</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-G05MAC1	6032867					
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental, SSI</li> <li>Cable: 10 m, 8-wire, PUR, halogen-free</li> <li>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 mm<sup>2</sup>, Ø 7.0 mm</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-G10MAC1	6032868					
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental, SSI</li> <li>Cable: 20 m, 8-wire, PUR, halogen-free</li> <li>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 mm<sup>2</sup>, Ø 7.0 mm</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-G20MAC1	6032869					
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, straight, A-coded</li> <li>Signal type: Incremental, SSI</li> <li>Cable: CAT5, CAT5e</li> <li>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</li> <li>Connection systems: IDC quick connection</li> <li>Permitted cross-section: 0.14 mm<sup>2</sup> 0.34 mm<sup>2</sup></li> </ul>	DOS-1208-GA01	6045001					

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	Brief description	Туре	Part no.
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Signal type: HIPERFACE<sup>®</sup>, Incremental</li> <li>Cable: 2 m, 8-wire, PUR, halogen-free</li> <li>Description: HIPERFACE<sup>®</sup>, Incremental, shielded</li> </ul>	DOL-1208-W02MAC1	6037724
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Signal type: HIPERFACE<sup>®</sup>, Incremental</li> <li>Cable: 5 m, 8-wire, PUR, halogen-free</li> <li>Description: HIPERFACE<sup>®</sup>, Incremental, shielded</li> </ul>	DOL-1208-W05MAC1	6037725
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Signal type: HIPERFACE<sup>®</sup>, Incremental</li> <li>Cable: 10 m, 8-wire, PUR, halogen-free</li> <li>Description: HIPERFACE<sup>®</sup>, Incremental, shielded</li> </ul>	DOL-1208-W10MAC1	6037726
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Signal type: HIPERFACE<sup>®</sup>, Incremental</li> <li>Cable: 20 m, 8-wire, PUR</li> <li>Description: HIPERFACE<sup>®</sup>, Incremental, shielded</li> </ul>	DOL-1208-W20MAC1	6037727
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Cable: 2 m, 8-wire, PVC</li> <li>Description: Shielded</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-W02MA	6020992
//>	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Sensor/actuator cable</li> <li>Cable: 2 m, 8-wire, PUR, halogen-free</li> <li>Description: Sensor/actuator cable, shielded</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208- W02MAS01	6029224
•	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Cable: 2 m, 8-wire, PUR, halogen-free</li> <li>Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 2 m, PUR halogen free</li> </ul>	DOL-1208-W02MC	6035623
	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Cable: 5 m, 8-wire, PVC</li> <li>Description: Shielded</li> <li>Connection systems: Flying leads</li> </ul>	DOL-1208-W05MA	6021033
>	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Cable: 5 m, 8-wire, PUR</li> <li>Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 5 m, PUR halogen free</li> </ul>	DOL-1208-W05MC	6035624
>	<ul> <li>Connection type head A: Female connector, M12, 8-pin, angled</li> <li>Connection type head B: Flying leads</li> <li>Cable: 10 m, 8-wire, PUR, halogen-free</li> <li>Description: Unshielded, Cable, M12, 8-pin, angled connector female with molded cable, 10 m, PUR halogen free</li> </ul>	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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