

# DFS60B-BDAA07200

DFS60

**INCREMENTAL ENCODERS** 





## Ordering information

Туре	Part no.
DFS60B-BDAA07200	1059142

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

Illustration may differ



#### Detailed technical data

#### Safety-related parameters

MTTF <sub>D</sub> (mean time to dangerous failure)	300 years (EN ISO 13849-1) 1)
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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.

#### Performance

Pulses per revolution	7,200 <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
Operating current	40 mA (without load)

#### **Electronics**

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
Short-circuit protection of the outputs	<b>✓</b> <sup>1)</sup>

 $<sup>^{1)}\,\</sup>mbox{Short-circuit}$  opposite to another channel, US or GND permissable for maximum 30 s.

#### Mechanics

Mechanical design	Blind hollow shaft
Shaft diameter	10 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

 $<sup>^{1)}</sup>$  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) <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)

<sup>&</sup>lt;sup>1)</sup> With mating connector fitted.

#### 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

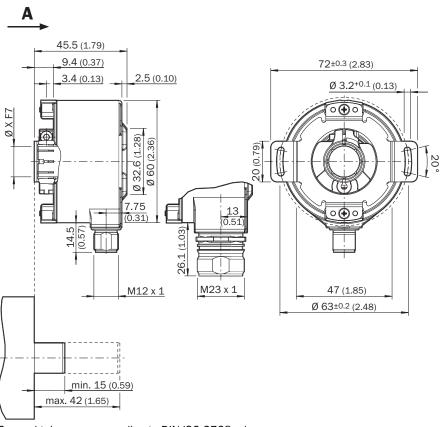
<sup>2)</sup> Stationary position of the cable.

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

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-BAxxxxxxxx	6 mm	Provided by customer
DFS60x-BBxxxxxxxx	8 mm	
DFS60x-BCxxxxxxxx	3/8"	
DFS60x-BDxxxxxxxx	10 mm	
DFS60x-BExxxxxxxx	12 mm	
DFS60x-BFxxxxxxxxx	1/2"	
DFS60x-BGxxxxxxxx	14 mm	
DFS60x-BHxxxxxxxxx	15 mm	
DFS60x-BJxxxxxxxx	5/8"	

# PIN assignment



View of M23 male device connector on encoder

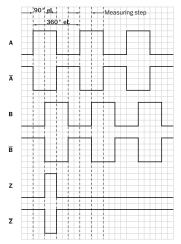
PIN Male connector M12, 8-pin	PIN Male connec- tor M23, 12-pin	Wire colors (ca- ble connection)	TTL/HTL signal	Sin/Cos 1.0 V <sub>PP</sub>	Explanation
1	6	Brown	_A	COS-	Signal wire
2	5	White	A	COS+	Signal wire
3	1	Black	<sup>-</sup> в	SIN-	Signal wire
4	8	Pink	В	SIN+	Signal wire
5	4	Yellow	-z	-Z	Signal 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 1)	Orange	0-SET 1)	N.c.	Set zero pulse
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

1)

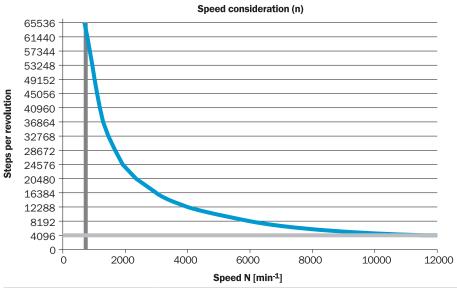
For electrical interfaces only: M, U, V, W with 0-SET function on PIN 7 on M23 plug. The 0-SET input is used to set the zero pulse to the current shaft position. If the 0-SET input is applied to US for longer than 250 ms after it has previously been open or applied to GND for at least 1,000 ms, the current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

## **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	ΠL
10 V 32 V	ΠL
10 V 32 V	HTL

#### Recommended accessories

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

	Brief description	Туре	Part no.		
Flanges					
	Description: Standard stator coupling	BEF-DS00XFX	2056812		
Other mountii	Other mounting accessories				
	<ul> <li>Description: Clamping ring for metal hollow shaft<sup>c</sup></li> <li>Details: Metal</li> </ul>	BEF-KR-M	2064709		
Others					
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 2 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G02MLA3	2030682		
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 7 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G07MLA3	2030685		
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 10 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G10MLA3	2030688		
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 15 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G15MLA3	2030692		
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 20 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G20MLA3	2030695		
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 25 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G25MLA3	2030699		

	Brief description	Туре	Part no.
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 30 m, 11-wire, PUR</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312-G30MLA3	2030702
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 1.5 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: Cable Cable: incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- G1M5MA3	2029212
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 3 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: Cable Cable: incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- GO3MMA3	2029213
->	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 5 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: Cable Cable: incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- G05MMA3	2029214
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 10 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: Cable Cable: incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- G10MMA3	2029215
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 20 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: Female connector, M23, 12-pin, straight Head B: Cable Cable: Incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- G20MMA3	2029216
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight</li> <li>Connection type head B: Flying leads</li> <li>Signal type: Incremental</li> <li>Cable: 30 m, 12-wire, PUR, halogen-free</li> <li>Description: Incremental, shielded, Head A: female connector, M23, 12-pin, straight Head B: Cable Cable: incremental, suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² +2 x 0.5 mm² +1 x 0.14 mm², Ø 7.8 mm</li> </ul>	DOL-2312- G30MMA3	2029217
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, straight, A-coded</li> <li>Signal type: HIPERFACE<sup>®</sup>, SSI, Incremental</li> <li>Description: HIPERFACE<sup>®</sup>, SSI, Incremental, shielded, Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm 10.5 mm Head B: - Operating temperature: -40 °C +125 °C</li> <li>Connection systems: Solder connection</li> </ul>	DOS-2312-G02	2077057
	<ul> <li>Connection type head A: Female connector, M23, 12-pin, angled, A-coded</li> <li>Signal type: HIPERFACE<sup>®</sup>, SSI, Incremental</li> <li>Description: HIPERFACE<sup>®</sup>, SSI, Incremental, shielded, Head A: female connector, M23, 12-pin, angled, shielded, for cable diameter 4.2 mm 6.6 mm Head B: - Operating temperature: -20 °C +130 °C</li> <li>Connection systems: Solder connection</li> </ul>	DOS-2312-W01	2072580

# SICK AT A GLANCE

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