



# DFS60I-BFWC01000

DFS60

INCREMENTAL ENCODERS

**SICK**  
Sensor Intelligence.



Illustration may differ



### Ordering information

Type	Part no.
DFS60I-BFWC01000	1099061

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

### Detailed technical data

#### Safety-related parameters

<b>MTTF<sub>D</sub> (mean time to dangerous failure)</b>	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

<b>Pulses per revolution</b>	1,000 <sup>1)</sup>
<b>Measuring step</b>	90°, electric/pulses per revolution
<b>Measuring step deviation at non binary number of lines</b>	± 0.008°
<b>Error limits</b>	± 0.03°

<sup>1)</sup> See maximum revolution range.

#### Interfaces

<b>Communication interface</b>	Incremental
<b>Communication Interface detail</b>	HTL / Push pull
<b>Number of signal channels</b>	6-channel
<b>0-set function via hardware pin</b>	✓
<b>0-SET function</b>	H-active, L ≡ 0 - 3 V, H ≡ 4.0 - U <sub>S</sub> V <sup>1)</sup>
<b>Initialization time</b>	30 ms
<b>Output frequency</b>	≤ 820 kHz
<b>Load current</b>	≤ 30 mA
<b>Operating current</b>	40 mA (without load)
<b>Power consumption</b>	≤ 0.7 W (without load)
<b>Load resistance</b>	≥ 120 Ω

<sup>1)</sup> Only with devices with M12 connector in connection with electrical interfaces M, V and W.

## Electronics

<b>Connection type</b>	Male connector, M12, 12-pin, radial
<b>Supply voltage</b>	4.5 ... 32 V
<b>Reference signal, number</b>	1
<b>Reference signal, position</b>	90°, electric, logically gated with A and B
<b>Reverse polarity protection</b>	✓
<b>Short-circuit protection of the outputs</b>	✓ <sup>1)</sup>

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

## Mechanics

<b>Mechanical design</b>	Blind hollow shaft
<b>Shaft diameter</b>	1/2"
<b>Weight</b>	+ 0.5 kg
<b>Shaft material</b>	Stainless steel V2A
<b>Flange material</b>	Stainless steel V2A
<b>Housing material</b>	Stainless steel V2A
<b>Start up torque</b>	1 Ncm (+20 °C)
<b>Operating torque</b>	0.5 Ncm (+20 °C)
<b>Permissible movement static</b>	± 0.3 mm (radial) ± 0.5 mm (axial)
<b>Permissible movement dynamic</b>	± 0.05 mm (radial) ± 0.01 mm (axial)
<b>Operating speed</b>	≤ 6,000 min <sup>-1</sup> <sup>1)</sup>
<b>Moment of inertia of the rotor</b>	40 gcm <sup>2</sup>
<b>Bearing lifetime</b>	3.6 x 10 <sup>10</sup> revolutions
<b>Angular acceleration</b>	≤ 500,000 rad/s <sup>2</sup>

<sup>1)</sup> Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

## Ambient data

<b>EMC</b>	According to EN 61000-6-2 and EN 61000-6-3
<b>Enclosure rating</b>	IP67, housing side (IEC 60529) <sup>1)</sup> IP67, shaft side (IEC 60529)
<b>Permissible relative humidity</b>	90 % (Condensation not permitted)
<b>Operating temperature range</b>	-40 °C ... +100 °C <sup>2)</sup> -30 °C ... +100 °C <sup>3)</sup>
<b>Storage temperature range</b>	-40 °C ... +100 °C, without package
<b>Resistance to shocks</b>	100 g, 6 ms (EN 60068-2-27)
<b>Resistance to vibration</b>	10 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

<sup>1)</sup> With mating connector fitted.

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

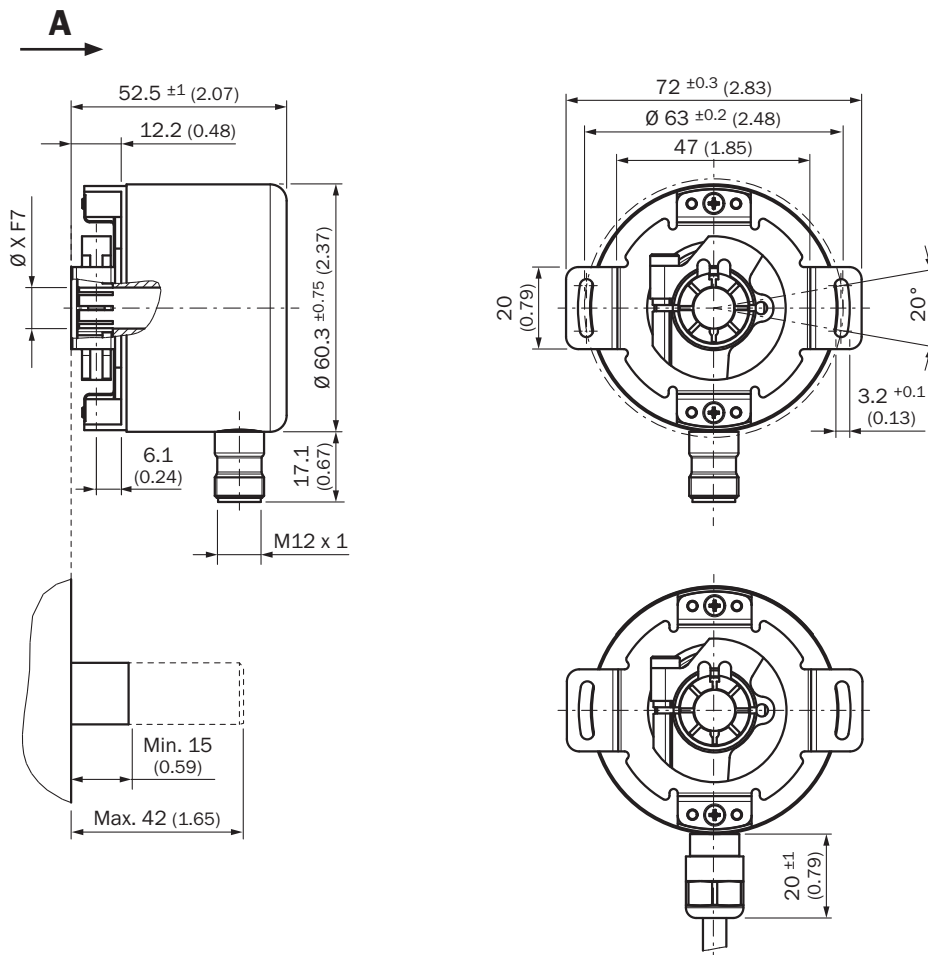
<sup>3)</sup> Flexible position of the cable.

## Classifications

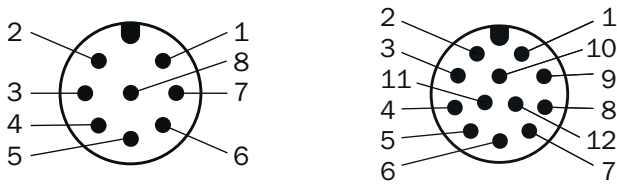
<b>ECLASS 5.0</b>	27270501
<b>ECLASS 5.1.4</b>	27270501

<b>ECLASS 6.0</b>	27270590
<b>ECLASS 6.2</b>	27270590
<b>ECLASS 7.0</b>	27270501
<b>ECLASS 8.0</b>	27270501
<b>ECLASS 8.1</b>	27270501
<b>ECLASS 9.0</b>	27270501
<b>ECLASS 10.0</b>	27270501
<b>ECLASS 11.0</b>	27270501
<b>ECLASS 12.0</b>	27270501
<b>ETIM 5.0</b>	EC001486
<b>ETIM 6.0</b>	EC001486
<b>ETIM 7.0</b>	EC001486
<b>ETIM 8.0</b>	EC001486
<b>UNSPSC 16.0901</b>	41112113

Dimensional drawing (Dimensions in mm (inch))



PIN assignment

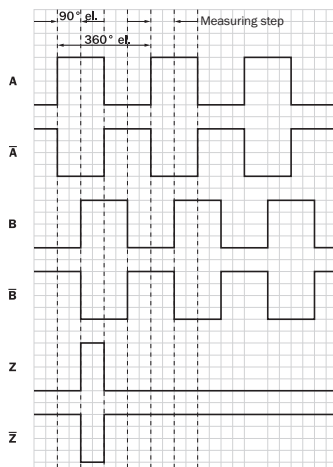


View of M12 male device connector on encoder

Male connector M12, 8-pin	Connector M12, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V <sub>PP</sub>	Explanation
1	7	Brown	$\bar{A}$	COS-	Signal wire
2	6	White	A	COS+	Signal wire
3	9	Black	$\bar{B}$	SIN-	Signal wire
4	8	Pink	B	SIN+	Signal wire
5	4	Yellow	$\bar{Z}$	$\bar{Z}$	Signal wire
6	11	Purple	Z	Z	Signal wire
7	12	Blue	GND	GND	Ground connection
8	5	Red	+U <sub>S</sub>	+U <sub>S</sub>	Supply voltage
-	2	-	N.c.	N.c.	Not assigned
-	3	-	N.c.	N.c.	Not assigned
-	1	-	N.c.	N.c.	Not assigned
-	10 <sup>1)</sup>	-	O-SET <sup>1)</sup>	N.c.	Set zero pulse <sup>1)</sup>
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

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	TTL
10 V ... 32 V	TTL
10 V ... 32 V	HTL

### Recommended accessories

Other models and accessories → [www.sick.com/DFS60](http://www.sick.com/DFS60)

	Brief description	Type	Part no.
<b>Flanges</b>			
	Standard stator coupling	BEF-DS00XFX	2056812
<b>Others</b>			
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Male connector, M12, 8-pin, straight, A-coded</li> <li>• <b>Description:</b> Shielded</li> <li>• <b>Connection systems:</b> Screw-type terminals</li> <li>• <b>Permitted cross-section:</b> ≤ 0.5 mm<sup>2</sup></li> <li>• <b>Application:</b> Hygienic and washdown zones</li> </ul>	YM12ES8-0050S5586A	2097337
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 8-pin, straight, A-coded</li> <li>• <b>Description:</b> Shielded</li> <li>• <b>Connection systems:</b> Screw-type terminals</li> <li>• <b>Permitted cross-section:</b> 0.25 mm<sup>2</sup> ... 0.5 mm<sup>2</sup></li> <li>• <b>Application:</b> Hygienic and washdown zones</li> </ul>	YF12ES8-0050S5586A	2097334
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, straight, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 2 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Female connector, M12, 12-pin</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-G02MAC1	6053273

	Brief description	Type	Part no.
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, straight, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 5 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Female connector, M12, 12-pin, angled, 5 m, PVC, shielded, drilled and twisted pair</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-G05MAC1	6053274
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, straight, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 10 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Female cable connector, M12, 12-pin</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-G10MAC1	6053275
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, straight, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 20 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Female connector, M12, 12-pin, angled, 5 m, PVC, shielded, drilled and twisted pair</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-G20MAC1	6053276
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, angled, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 2 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Head A: female connector, M12, 12-pin, angled Head B: cable Cable: SSI, PUR, halogen-free, shielded, 12 x 0.14 mm<sup>2</sup>, Ø 8.5 mm, suitable for drag chain</li> </ul>	DOL-1212-W02MAC1	6039824
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, angled, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 5 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Head A: female connector, M12, 12-pin, angled Head B: cable Cable: SSI, PUR, halogen-free, shielded, 12 x 0.14 mm<sup>2</sup>, Ø 8.5 mm, suitable for drag chain</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-W05MAC1	6039825
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, angled, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 10 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Head A: female connector, M12, 12-pin, angled Head B: cable Cable: SSI, PUR, halogen-free, shielded, 12 x 0.14 mm<sup>2</sup>, Ø 8.5 mm, suitable for drag chain</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-W10MAC1	6039826
	<ul style="list-style-type: none"> <li>• <b>Connection type head A:</b> Female connector, M12, 12-pin, angled, A-coded</li> <li>• <b>Connection type head B:</b> Flying leads</li> <li>• <b>Signal type:</b> SSI</li> <li>• <b>Cable:</b> 20 m, 12-wire, PUR, halogen-free</li> <li>• <b>Description:</b> SSI, shielded, Head A: female connector, M12, 12-pin, angled Head B: cable Cable: SSI, PUR, halogen-free, shielded, 12 x 0.14 mm<sup>2</sup>, Ø 8.5 mm, suitable for drag chain</li> <li>• <b>Note:</b> Drag chain use</li> </ul>	DOL-1212-W20MAC1	6039827

## 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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