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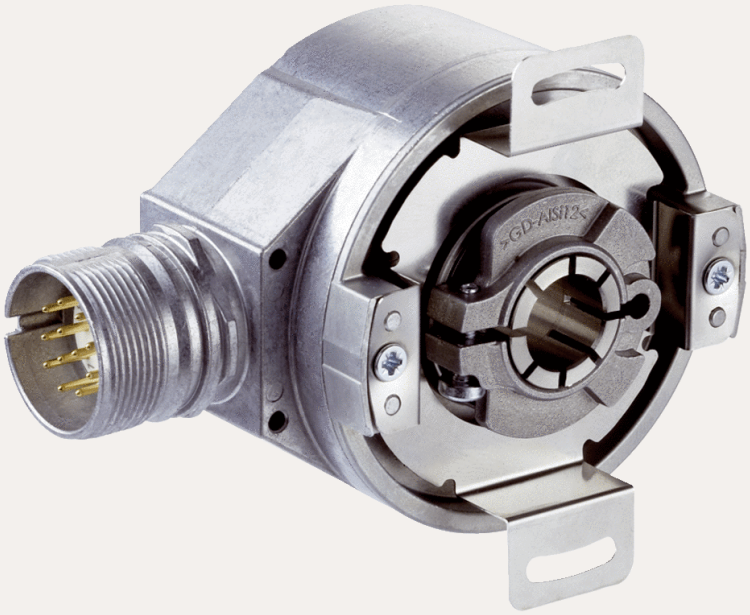


DATA SHEET

DFS60B-TDNA01024

DFS60
Incremental encoders

SICK
Sensor Intelligence

Illustration may differ

INCREMENTAL ENCODERS

DFS60B-TDNA01024

ORDERING INFORMATION

Type	part no.
DFS60B-TDNA01024	1099715

Further device versions and accessories at www.sick.com/DFS60

DETAILED TECHNICAL DATA

SAFETY-RELATED PARAMETERS

$MTTF_D$ (mean time to dangerous failure)	300 years (EN ISO 13849-1) [1]

[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, M23, 12-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 permissable for maximum 30 s.

MECHANICS

Mechanical design	Through hollow shaft
Shaft diameter	10 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 61000-6-3
Enclosure rating	IP65, 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.

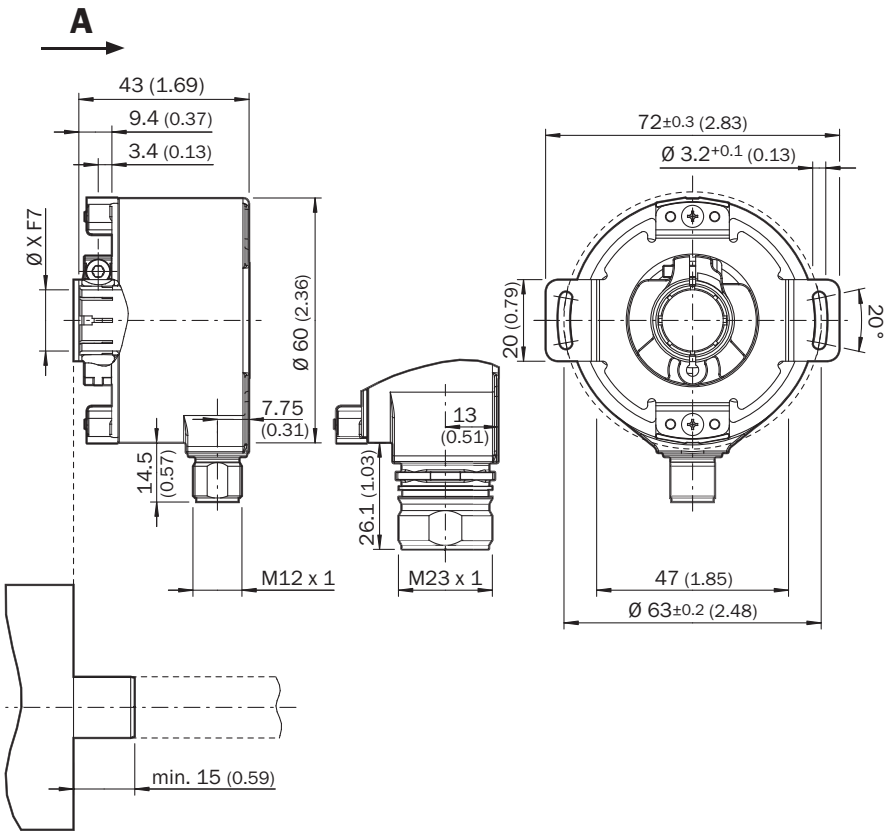
[3] Flexible position of the cable.

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)	✓

DIMENSIONAL DRAWING

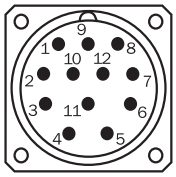


Dimensions in mm (inch)

① cable diameter = 5.6 mm +/- 0.2 mm bend radius = 30 mm

TypeThrough hollow shaft	Shaft diameter XF7	Shaft diameter xj7
DFS60x-TAxxxxxxxx	6 mm	Provided by customer
DFS60x-TBxxxxxxxx	8 mm	
DFS60x-TCxxxxxxxx	3/8″	
DFS60x-TDxxxxxxxx	10 mm	
DFS60x-TExxxxxxxx	12 mm	
DFS60x-TFxxxxxxxx	1/2″	
DFS60x-TGxxxxxxxx	14 mm	
DFS60x-THxxxxxxxx	15 mm	
DFS60x-TJxxxxxxxx	5/8″	

PIN ASSIGNMENT

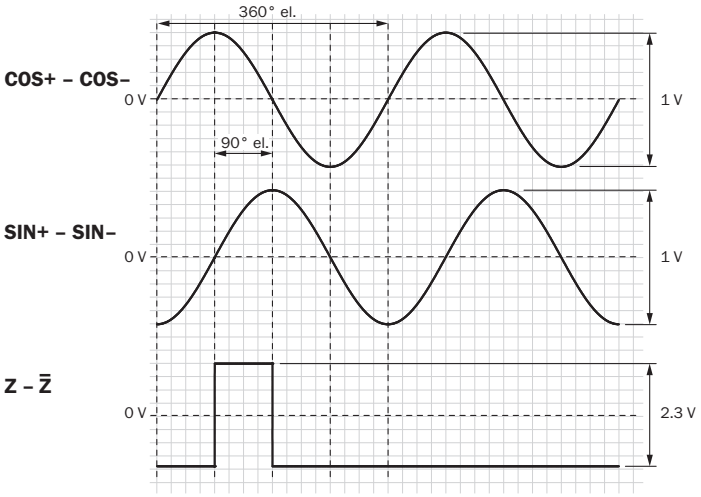


view of M23 male device connector on encoder

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”.

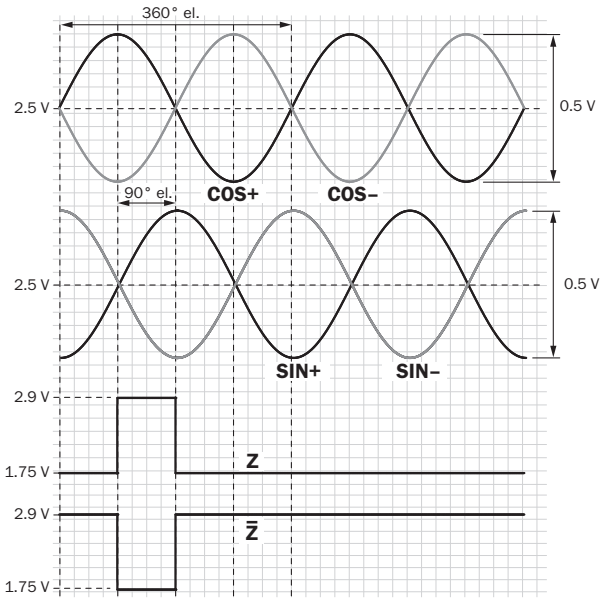
DIAGRAMS SIGNAL SIN/COS AFTER DIFFERENTIAL GENERATION



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}

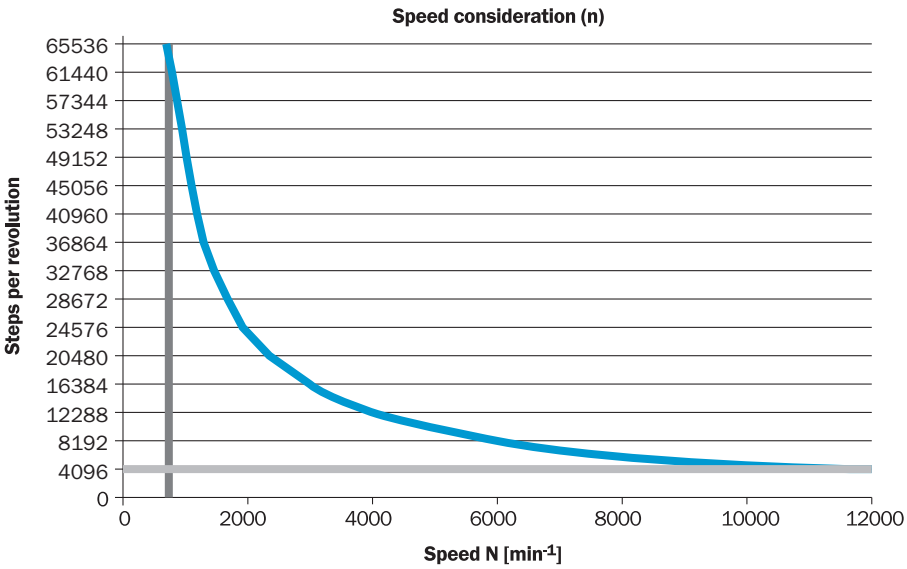
DIAGRAMS SIGNAL SIN/COS BEFORE DIFFERENTIAL GENERATION



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

Signal	Interface signals	Signal before differential generationAt load 120 Ω	Signal offset
+ SIN- SIN+ COS- COS	Analog, differential	0,5 V_{ss} ± 20 %	2,5 V ± 10 %
ZZ_	Digital differential	Low: 1,75 V ± 15 %, High: 2,90 V ± 15 %	–

MAXIMUM REVOLUTION RANGE



Further information as well as suitable accessories, example applications and downloads such as CAD dimensional models, operating instructions and software can be found at www.sick.com/1099715

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SICK AT A GLANCE

SICK is a leading global technology company for intelligent sensors and integrated solutions in industrial automation. Our technologies set benchmarks, making your industrial processes more efficient, safer and more sustainable – both in logistics and manufacturing operations.

SICK combines sensor intelligence with industry expertise and certified consulting services. We provide the ideal foundation for scalable as well as tailor-made automation solutions and create added value along the entire value chain. Our close partnerships with our customers are more than just a promise: Together, we optimize productivity, improve quality, protect health and safety, and help build a sustainable future. All with empathy and trust.

Since 1946, we have been developing innovative technologies with passion and a pioneering spirit. With a global network in around 40 countries, SICK has a global presence and is always close by. The company's headquarters are located in Waldkirch near Freiburg, Germany. Our customers benefit from our understanding of both local and global requirements, which enables us to deliver tailor-made solutions

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