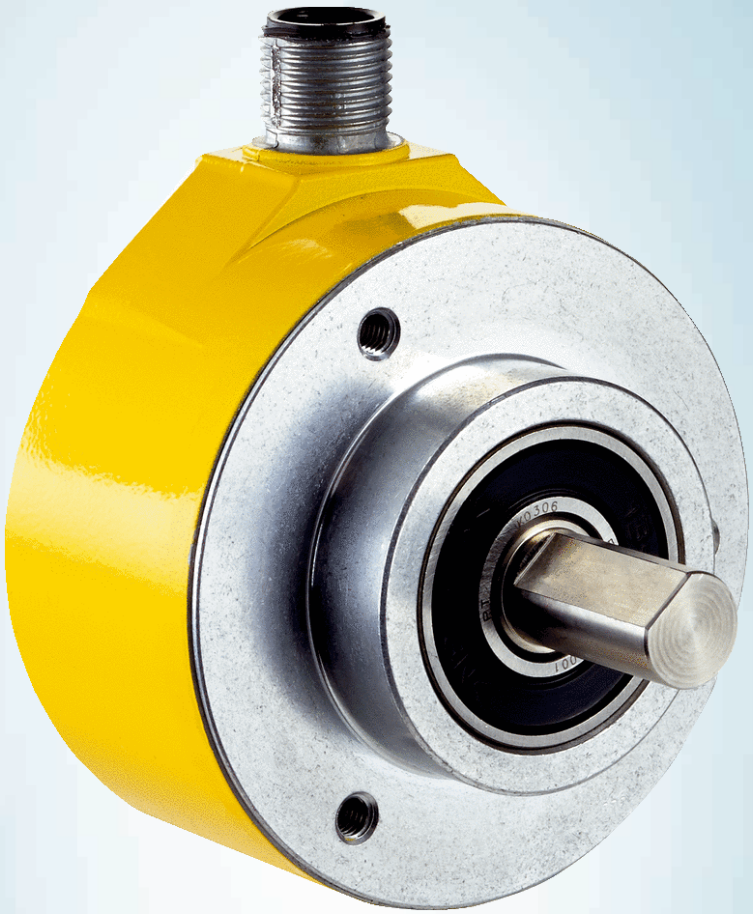
Product data sheet



DFS60S-S40C01024

DFS60S Pro

SAFETY ENCODERS

SICK
Sensor Intelligence.

Illustration may differ

Ordering information

Type	Part no.
DFS60S-S40C01024	1069519

Other models and accessories ➜ www.sick.com/DFS60S_Pro

Detailed technical data

Safety-related parameters

Safety integrity level	SIL2 (IEC 61508), SILCL2 (IEC 62061) [1]
Performance level	PL d (EN ISO 13849) [1]
Category	3 (EN ISO 13849)
PFH_D: Probability of dangerous failure per hour	1.7×10^{-8} [2]
T_M (mission time)	20 years (EN ISO 13849)
Safety-related measuring step	0.09°, Quadrature analysis
Safety-related accuracy	± 0.09°

[1] For more detailed information on the exact configuration of your machine/unit, please consult your relevant SICK branch office.
[2] The values displayed apply to a diagnostic degree of coverage of 99%, which must be achieved by the external drive system and 95 °C operating temperature.

Performance

Sine/cosine periods per revolution	1,024
Measuring step	0.3 ″, For interpolation of the sine/cosine signals with, e. g., 12 bits [1]
Initialization time	50 ms [2]
Integral non-linearity	Typ. ± 45 Winkelsekunden (without mechanical tension of the stator coupling)
Differential non-linearity	± 7 Winkelsekunden
Reference signal, number	1
Reference signal, position	90°, electronically, gated with Sinus and Cosinus

[1] Not safety-related.
[2] Valid signals can be read once this time has elapsed.

Electrical data

Communication interface	Incremental
Communication Interface detail	Sin/Cos [1]
Connection type	Male connector, M12, 8-pin, radial
Supply voltage	4.5 V ... 32 V
Maximum output frequency	≤ 153.6 kHz
Load resistance	≥ 120 Ω
Power consumption max. without load	≤ 0.7 W
Power consumption	Without load
Reverse polarity protection	✓
Protection class	III (according to DIN EN 61140)
Short-circuit protection	✓ [2]

[1] 1.0 V_{SS} (differential).

[2] Short-circuit to another channel or GND permitted for max. 30 s. In the case of U_S ≤ 12 V additional short-circuit to U_S permitted for max. 30 s.

Mechanical data

Mechanical design	Solid shaft, face mount flange
Shaft diameter	10 mm
Shaft length	19 mm
Shaft material	Stainless steel
Flange material	Aluminum
Housing material	Aluminum die cast
Weight	Approx. 0.3 kg [1]
Start up torque	≤ 0.5 Ncm (at 20 °C)
Operating torque	≤ 0.3 Ncm (at 20 °C)
Permissible shaft loading	80 N (radial) 40 N (axial)
Max. angular acceleration	≤ 500,000 rad/s²
Operating speed	9,000 min^{-1} [2]
Moment of inertia of the rotor	8 gcm²
Bearing lifetime	3.6 x 10^9 revolutions [3]

[1] Based on encoder with male connector.

[2] Allow for self-heating of approx. 3.0 K per 1,000 rpm regarding the permissible operating temperature.

[3] On maximum operating speed and temperature.

Ambient data

EMC	According to EN 61000-6-2, EN 61000-6-3 and IEC 61326-3-1
Enclosure rating	IP65 (IEC 60529) [1]
Permissible relative humidity	90 %, Condensation not permitted
Operating temperature range	–30 °C ... +95 °C [2]

[1] With male connector and mating connector fitted minimum IP65.

[2] At operating temperature measuring point.

[3] Checked during operation using vector length monitoring.

[4] Checked to operation with vector length monitoring. Including mating connector.

Storage temperature range	–30 °C ... +90 °C, without package
Resistance to shocks	100 g, 6 ms (according to EN 60068-2-27) [3]
Frequency range of resistance to vibrations	30 g, 10 Hz ... 1,000 Hz (EN 60068-2-6) [4]

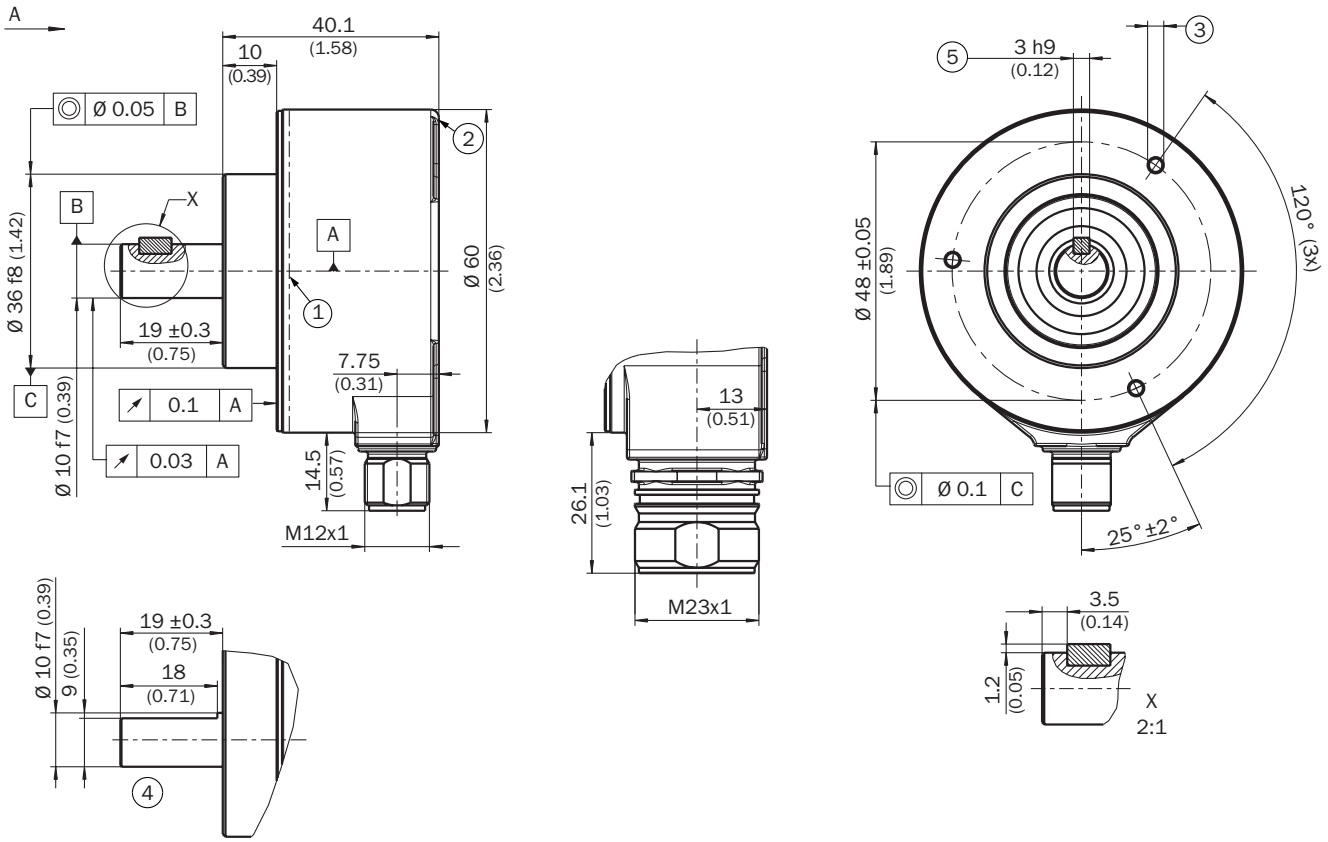
[1] With male connector and mating connector fitted minimum IP65.
[2] At operating temperature measuring point.
[3] Checked during operation using vector length monitoring.
[4] Checked to operation with vector length monitoring. Including mating connector.

Classifications

eCl@ss 5.0	27272501
eCl@ss 5.1.4	27272501
eCl@ss 6.0	27272590
eCl@ss 6.2	27272590
eCl@ss 7.0	27272590
eCl@ss 8.0	27272590
eCl@ss 8.1	27272590
eCl@ss 9.0	27272590
eCl@ss 10.0	27270502
eCl@ss 11.0	27270502
eCl@ss 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))

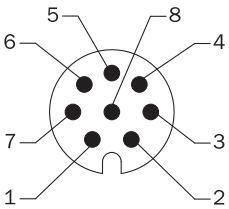
Solid shaft, face mount flange, M12 and M23 radial male connector



General tolerances according to DIN ISO 2768-mk

① Operating temperature measuring point (freely selectable, around the housing surface area in each case, approx. 3 mm away from flange)
② Measuring point vibration (respectively at the housing face. approx. 3 mm away from the cover edge)
③ M3 / M4 (3x) (6 mm deep)
④ Shaft with flat
⑤ Square key, DIN 6885-A 3x3x6

PIN assignment



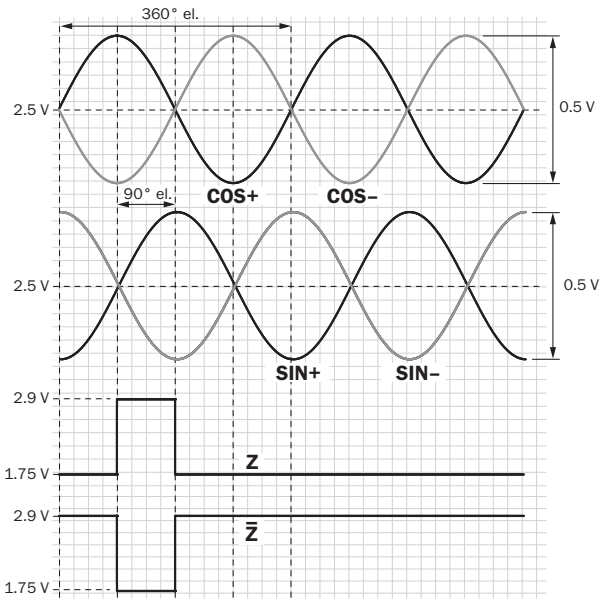
View of M12 male device connector on encoder

PIN Male connector M12, 8-pin	PIN Male connector M23, 12-pin	Wire colors (cable connection)	Signal	Explanation
1	6	Brown	- COS	Signal wire
2	5	White	+ COS	Signal wire
3	1	Black	- SIN	Signal wire
4	8	Pink	+ SIN	Signal wire

PIN Male connector M12, 8-pin	PIN Male connector M23, 12-pin	Wire colors (cable connection)	Signal	Explanation
5	4	Yellow		Signal (do not use for safety operating mode)
6	3	Violet	Z	Signal (do not use for safety operating mode)
7	10	Blue	GND	Ground connection
8	12	Red	U_S	Supply voltage (volt-free to housing)
-	9	-	N.C.	Not assigned
-	2	-	N.C.	Not assigned
-	11	-	N.C.	Not assigned
-	7	-	N.C.	Not assigned
Screen	Screen	Screen	Screen	Screen connected to encoder housing Screen connected to housing on encoder side. Connected to ground on control side.

Diagrams

Signal SIN/COS before differential generation

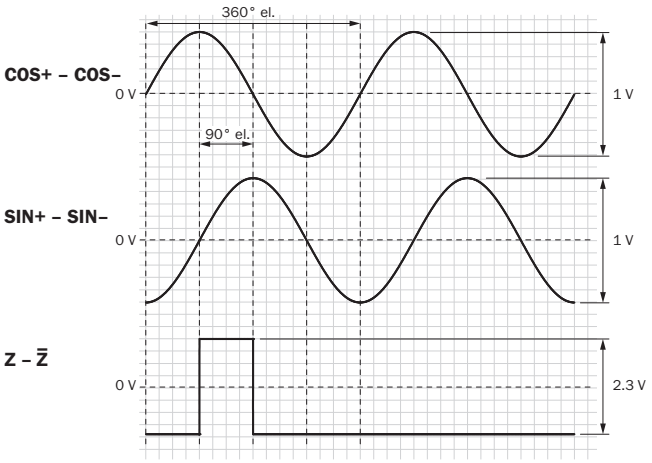


For clockwise shaft rotation, looking in direction “A” (see dimensional drawing)

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 %

Signal	Interface signals	Signal before differential generation At load 120 Ω	Signal offset
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}

Recommended accessories

Other models and accessories ➜ www.sick.com/DFS60S_Pro

	Brief description	Type	Part no.
Flanges			
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10	BEF-FA-036-050	2029160
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 8, Aluminum, including 3 countersunk screws M4 x 8	BEF-FA-036-060REC	2029162
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum, Aluminum	BEF-FA-036-060RSA	2029163
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M4 x 10	BEF-FA-036-063REC	2034225
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum, Aluminum	BEF-FA-036-100	2029161

	Brief description	Type	Part no.
Plug connectors and cables			
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, HIPERFACE®, PUR, halogen-free, shielded	LTG-2308-MWENC	6027529
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, PUR, shielded	LTG-2411-MW	6027530
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, PUR, halogen-free, shielded	LTG-2512-MW	6027531
	Head A: cable Head B: Flying leads Cable: SSI, TTL, HTL, Incremental, PUR, halogen-free, shielded	LTG-2612-MW	6028516
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 2 m	DOL-1208-G02MAC1	6032866
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 5 m	DOL-1208-G05MAC1	6032867
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 10 m	DOL-1208-G10MAC1	6032868
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 20 m	DOL-1208-G20MAC1	6032869
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 2 m Drag chain use	YF2AA8-020S01MKA18	2099207
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 5 m Drag chain use	YF2AA8-050S01MKA18	2099209
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 10 m Drag chain use	YF2AA8-100S01MKA18	2099210
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 20 m Drag chain use	YF2AA8-200S01MKA18	2099208
	Head A: female connector, M12, 8-pin, straight, A-coded Cable: Incremental, SSI, shielded	DOS-1208-GA01	6045001
	Head A: male connector, M12, 8-pin, straight, A-coded Cable: Incremental, shielded	STE-1208-GA01	6044892
Shaft adaptation			
	Bellows coupling, shaft diameter 6 mm / 10 mm, bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. speed 10,000 rpm, –30 °C ... +120° C, max. torque 120 Ncm; material: stainless steel bellows, fixed with two setscrews each	KUP-0610-BS	2075377
	Bellows coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. speed 10,000 rpm, –30° ... +120° C, max. torque 120 Ncm; material: stainless steel bellows, fixed with two setscrews each	KUP-1010-BS	2075376

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.

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