

DFS60S-BEOL01024

DFS60S Pro

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	Part no.
DFS60S-BEOL01024	1079337

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

Detailed technical data

Safety-related parameters

Safety integrity level	SIL 2 (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 bit ¹⁾
Integral non-linearity	Typ. ± 45" (without mechanical tension of the stator coupling)
Differential non-linearity	± 7"

¹⁾ Not safety-related.

Interfaces

Communication interface	Incremental
Communication Interface detail	Sin/Cos ¹⁾
Initialization time	50 ms ²⁾
Output frequency	≤ 153.6 kHz
Power consumption	≤ 0.7 W (without load)
Load resistance	≥ 120 Ω

¹⁾ 1.0 V_{SS} (differential).

²⁾ Valid signals can be read once this time has elapsed.

Electrical data

Connection type	Cable, 8-wire, universal, 3 m ¹⁾
Supply voltage	4.5 ... 32 V
Reference signal, number	1
Reference signal, position	90°, electronically, gated with Sinus and Cosinus
Reverse polarity protection	✓
Protection class	III (according to DIN EN 61140)
Short-circuit protection of the outputs	✓ ²⁾

¹⁾ The universal cable connection is positioned so that it can be laid in a radial or axial direction without any kinks. UL approval not available.

²⁾ Short-circuit to another channel or GND permitted for max. 30 s. In the case of $U_S \leq 12$ V additional short-circuit to U_S permitted for max. 30 s.

Mechanical data

Mechanical design	Blind hollow shaft
Shaft diameter	12 mm With feather key
Weight	Approx. 0.25 kg ¹⁾
Shaft material	Stainless steel
Flange material	Die-cast zinc
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	± 0.05 mm (radial) ± 0.1 mm (axial)
Operating speed	$\leq 6,000$ min ⁻¹ ²⁾
Moment of inertia of the rotor	56 gcm ²
Bearing lifetime	3.6×10^9 revolutions ³⁾
Angular acceleration	$\leq 500,000$ rad/s ²

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 ... +85 °C ²⁾
Storage temperature range	-30 °C ... +85 °C, without package
Resistance to shocks	100 g, 6 ms (EN 60068-2-27) ³⁾
Resistance to vibration	30 g, 10 Hz ... 1,000 Hz (EN 60068-2-6)

¹⁾ With male connector and mating connector fitted minimum IP65.

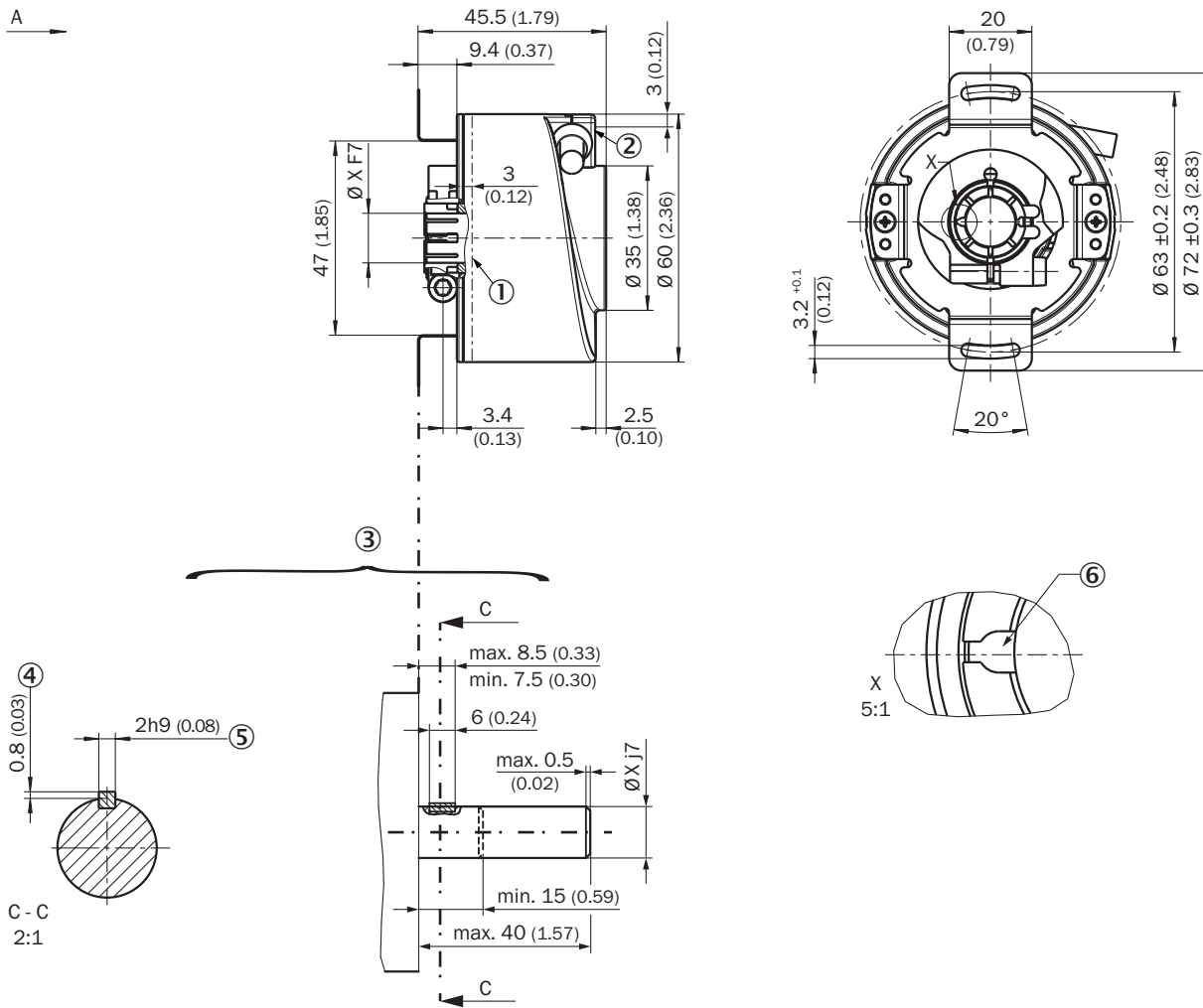
²⁾ Allow for self-heating of approx. 3.0 K per 1,000 rpm regarding the permissible operating temperature.

³⁾ Checked to operation with vector length monitoring.

Classifications

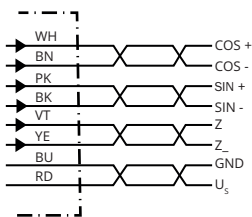
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eCl@ss 8.0	27270501
eCl@ss 8.1	27270501
eCl@ss 9.0	27270501
eCl@ss 10.0	27270501
eCl@ss 11.0	27270501
eCl@ss 12.0	27270501
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

Dimensional drawing (Dimensions in mm (inch))



- 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 Attachment specifications
- ④ Max. 0.4 at $\emptyset 5/8"$
- ⑤ Feather key DIN 6885-A 2x2x6
- ⑥ Feather key groove

PIN assignment

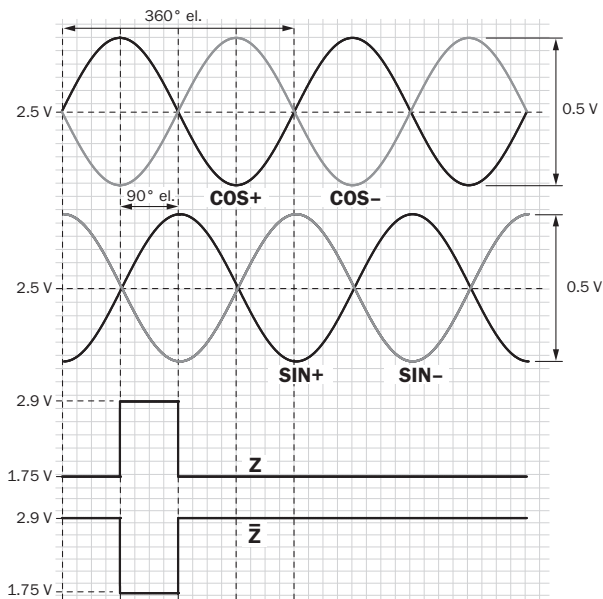


PIN Male connector M12, 8-pin	PIN Male connector M23, 12-pin	Wire colors (cable connection)	Signal	Explanation
1	6	Brown	- COS	Signal wire

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

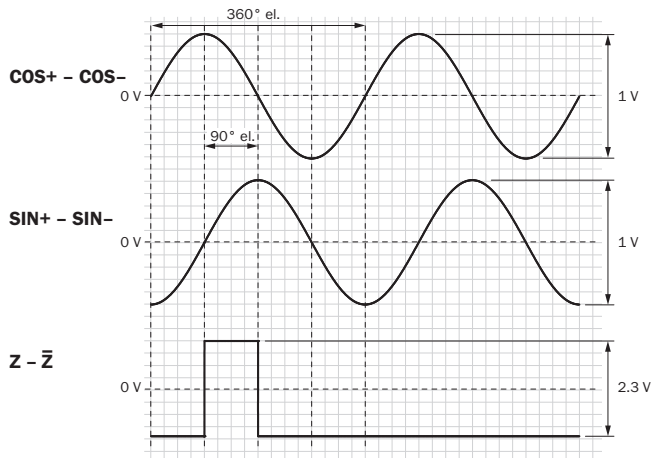


For clockwise shaft rotation, looking in direction "A" (see dimensional drawing)

Signal	Interface signals	Signal before differential generation At load 120 Ω	Signal offset
+ SIN	Analog, differential	0,5 V _{SS} ± 20 %	2,5 V ± 10 %

Signal	Interface signals	Signal before differential generation At load 120 Ω	Signal offset
- SIN + COS - COS			
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}

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