



AFM60E-S1AA004096

AFS/AFM60 SSI

ABSOLUTE ENCODERS

SICK
Sensor Intelligence.



Illustration may differ



Ordering information

Type	Part no.
AFM60E-S1AA004096	1037438

Other models and accessories → www.sick.com/AFS_AFM60_SSI

Detailed technical data

Performance

Number of steps per revolution (max. resolution)	4,096 (12 bit)
Number of revolutions	4,096 (12 bit)
Max. resolution (number of steps per revolution x number of revolutions)	12 bit x 12 bit (4,096 x 4,096)
Error limits G	0.2° ¹⁾
Repeatability standard deviation σ_r	0.002° ²⁾

¹⁾ In accordance with DIN ISO 1319-1, position of the upper and lower error limit depends on the installation situation, specified value refers to a symmetrical position, i.e. deviation in upper and lower direction is the same.

²⁾ In accordance with DIN ISO 55350-13; 68.3% of the measured values are inside the specified area.

Interfaces

Communication interface	SSI
Initialization time	50 ms ¹⁾
Position forming time	< 1 μ s
Code type	Gray
Code sequence parameter adjustable	CW/CCW (V/R) parameter adjustable
Clock frequency	\leq 1 MHz ²⁾
Set (electronic adjustment)	H-active (L = 0 - 3 V, H = 4,0 - U _s V)
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1,5 V, H = 2,0 - U _s V)

¹⁾ Valid positional data can be read once this time has elapsed.

²⁾ Minimum, LOW level (Clock +): 250 ns.

Electrical data

Connection type	Male connector, M23, 12-pin, radial
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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.

Supply voltage	4.5 ... 32 V
Power consumption	≤ 0.7 W (without load)
Reverse polarity protection	✓
MTTFd: mean time to dangerous failure	250 years (EN ISO 13849-1) ¹⁾

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Mechanical data

Mechanical design	Solid shaft, Servo flange
Shaft diameter	6 mm
Shaft length	10 mm
Weight	0.3 kg ¹⁾
Shaft material	Stainless steel
Flange material	Aluminum
Housing material	Aluminum die cast
Start up torque	< 0.5 Ncm (+20 °C)
Operating torque	< 0.3 Ncm (+20 °C)
Permissible shaft loading	80 N (radial) 40 N (axial)
Operating speed	≤ 9,000 min ⁻¹ ²⁾
Moment of inertia of the rotor	6.2 gcm ²
Bearing lifetime	3.0 x 10 ⁹ revolutions
Angular acceleration	≤ 500,000 rad/s ²

¹⁾ Based on devices with male connector.

²⁾ 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 ¹⁾
Enclosure rating	IP65, shaft side (IEC 60529) IP67, housing side (IEC 60529) ²⁾
Permissible relative humidity	90 % (Condensation not permitted)
Operating temperature range	0 °C ... +85 °C
Storage temperature range	-40 °C ... +100 °C, without package
Resistance to shocks	50 g, 6 ms (EN 60068-2-27)
Resistance to vibration	20 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

¹⁾ EMC according to the standards quoted is achieved if shielded cables are used.

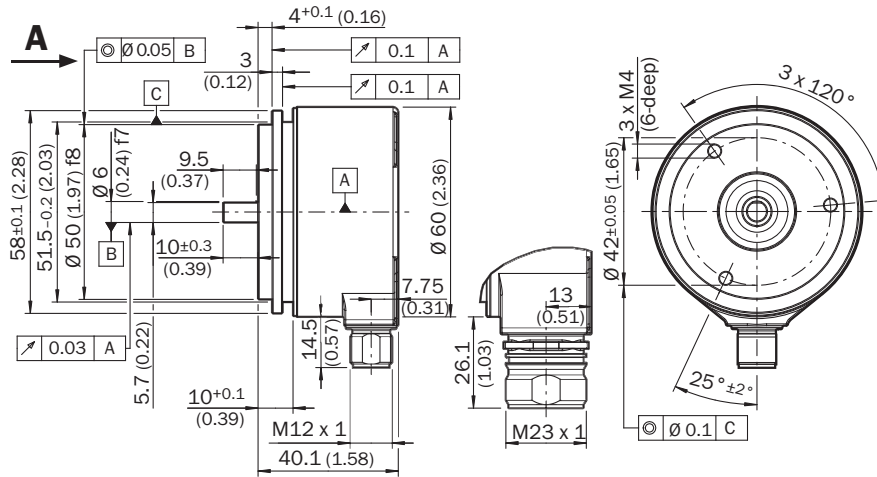
²⁾ For devices with male connector: with mounted mating connector.

Classifications

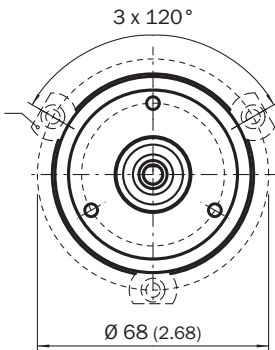
ECLASS 5.0	27270502
ECLASS 5.1.4	27270502
ECLASS 6.0	27270590
ECLASS 6.2	27270590
ECLASS 7.0	27270502

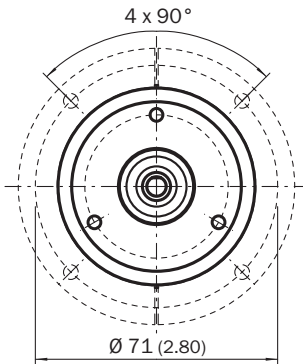
ECLASS 8.0	27270502
ECLASS 8.1	27270502
ECLASS 9.0	27270502
ECLASS 10.0	27270502
ECLASS 11.0	27270502
ECLASS 12.0	27270502
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

Dimensional drawing (Dimensions in mm (inch))



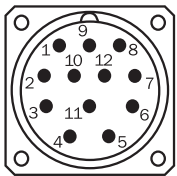
Attachment specifications





PIN assignment

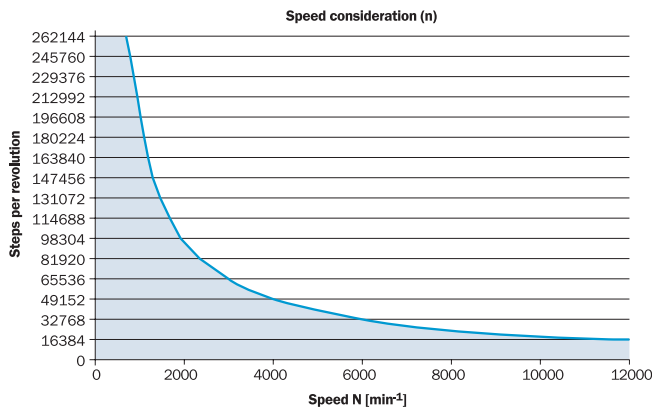
M23 male connector, 12-pin, SSI/Gray



View of M23 male device connector on encoder

PIN	Signal	Explanation
1	GND	Ground connection
2	Data +	Interface signals
3	Clock +	Interface signals
4	N.C.	Not assigned
5	N.C.	Not assigned
6	N.C.	Not assigned
7	N.C.	Not assigned
8	U _s	Operating voltage
9	SET	Electronic adjustment
10	Data -	Interface signals
11	Clock -	Interface signals
12	V/R	Sequence in direction of rotation
	Screen	Screen connected to housing on encoder side. Connected to ground on control side.








Diagrams




The maximum speed is also dependent on the shaft type.

Recommended accessories

Other models and accessories → www.sick.com/AFS_AFM60_SSI

	Brief description	Type	Part no.
Other mounting accessories			
	Servo clamps, large, for servo flange (clamps, eccentric fastener), 3 pcs, without mounting material, without mounting hardware	BEF-WK-SF	2029166
Shaft adaptation			
	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 to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub	KUP-0606-B	5312981
	Cross-slotted coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angle ± 3°; max. speed 10,000 rpm, -10° to +80 °C, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0606-S	2056406
	Bar coupling, shaft diameter 6 mm / 8 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle ± 3°, max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0608-S	5314179
	Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular +/- 4°; max. speed 10,000 rpm, -30 °C to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982
	Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially +/- 2,5 mm, axially +/- 3 mm, angle +/- 10 degrees; max. speed 3.000 rpm, -30 to +80 degrees Celsius, torsional spring stiffness of 25 Nm/rad	KUP-0610-D	5326697
	Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial +/- 0.3 mm, axial +/- 0.4 mm, angular +/- 2.5°; max. speed 12,000 rpm, -10° to +80 °C, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-0610-F	5312985
	Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0610-J	2127056

	Brief description	Type	Part no.
	Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial $\pm 0,3$ mm, axial $\pm 0,3$ mm, angular $\pm 3^\circ$; max. speed 10.000 rpm, -10° to $+80^\circ$ C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
Others			
	<ul style="list-style-type: none"> • Connection type head A: Flying leads • Connection type head B: Flying leads • Signal type: SSI, Incremental, HIPERFACE[®] • Items supplied: By the meter • Cable: 8-wire, PUR, halogen-free • Description: SSI, Incremental, HIPERFACE[®], shielded 	LTG-2308-MWENC	6027529
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, angled, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], 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 ... $+130^\circ$ C • Connection systems: Solder connection 	DOS-2312-W01	2072580
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], 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 ... $+125^\circ$ C • Connection systems: Solder connection 	DOS-2312-G02	2077057
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], 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: -20° C ... $+130^\circ$ C • Connection systems: Solder connection 	DOS-2312-G	6027538
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: SSI • Cable: 0.5 m, 8-wire, PUR, halogen-free • Description: SSI, shielded 	DOL-2308-G0M5AA6	2048595
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: SSI • Cable: 3 m, 8-wire, PUR, halogen-free • Description: SSI, shielded 	DOL-2308-G03MAA6	2048597
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: SSI • Cable: 5 m, 8-wire, PUR, halogen-free • Description: SSI, shielded 	DOL-2308-G05MAA6	2048598
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: SSI • Cable: 1.5 m, 8-wire, PUR, halogen-free • Description: SSI, shielded 	DOL-2308-G1M5AA6	2048596
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 12-pin, straight • Connection type head B: Flying leads • Signal type: SSI • Cable: 10 m, 8-wire, PUR, halogen-free • Description: SSI, shielded 	DOL-2308-G10MAA6	2048599

	Brief description	Type	Part no.
	<ul style="list-style-type: none"> • Connection type head A: Female connector, M23, 9-pin, straight, A-coded • Signal type: HIPERFACE[®], SSI, Incremental • Description: HIPERFACE[®], SSI, Incremental, shielded, Head A: female connector, M23, 9-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: Operating temperature: -20 °C ... +130 °C • Connection systems: Solder connection 	DOS-2309-G	6028533

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