



# AFM60A-S1TA065536

AFS/AFM60 SSI

**ABSOLUTE ENCODERS**

**SICK**  
Sensor Intelligence.



Illustration may differ



### Ordering information

Type	Part no.
AFM60A-S1TA065536	1082788

Other models and accessories → [www.sick.com/AFS\\_AFM60\\_SSI](http://www.sick.com/AFS_AFM60_SSI)

### Detailed technical data

#### Performance

<b>Number of steps per revolution (max. resolution)</b>	65,536 (16 bit)
<b>Number of revolutions</b>	4,096 (12 bit)
<b>Max. resolution (number of steps per revolution x number of revolutions)</b>	16 bit x 12 bit (65,536 x 4,096)
<b>Error limits G</b>	0.03° <sup>1)</sup>
<b>Repeatability standard deviation <math>\sigma_r</math></b>	0.002° <sup>2)</sup>

<sup>1)</sup> 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.

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

#### Interfaces

<b>Communication interface</b>	SSI
<b>Communication Interface detail</b>	SSI + incremental / TTL
<b>Initialization time</b>	50 ms <sup>1)</sup>
<b>Position forming time</b>	< 1 $\mu$ s
<b>Code type</b>	Gray
<b>Code sequence parameter adjustable</b>	CW/CCW (V/R) parameter adjustable
<b>Clock frequency</b>	$\leq$ 2 MHz <sup>2)</sup>
<b>Set (electronic adjustment)</b>	H-active (L = 0 - 3 V, H = 4,0 - U <sub>s</sub> V)
<b>CW/CCW (counting sequence when turning)</b>	L-active (L = 0 - 1,5 V, H = 2,0 - U <sub>s</sub> V)
<b>Pulses per revolution</b>	1/4 of number of SSI steps per revolution
<b>Output frequency</b>	$\leq$ 820 kHz
<b>Load current</b>	$\leq$ 30 mA

<sup>1)</sup> Valid positional data can be read once this time has elapsed.

<sup>2)</sup> Minimum, LOW level (Clock +): 250 ns.

## Electrical data

<b>Connection type</b>	Male connector, M23, 12-pin, radial
<b>Supply voltage</b>	4.5 ... 32 V
<b>Power consumption</b>	≤ 0.7 W (without load)
<b>Reverse polarity protection</b>	✓
<b>MTTFd: mean time to dangerous failure</b>	250 years (EN ISO 13849-1) <sup>1)</sup>

<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.

## Mechanical data

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

<sup>1)</sup> Based on devices with male connector.

<sup>2)</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 <sup>1)</sup>
<b>Enclosure rating</b>	IP65, shaft side (IEC 60529) IP67, housing side (IEC 60529) <sup>2)</sup>
<b>Permissible relative humidity</b>	90 % (Condensation not permitted)
<b>Operating temperature range</b>	-40 °C ... +100 °C <sup>3)</sup>
<b>Storage temperature range</b>	-40 °C ... +100 °C, without package
<b>Resistance to shocks</b>	60 g, 6 ms (EN 60068-2-27)
<b>Resistance to vibration</b>	20 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

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

<sup>2)</sup> For devices with male connector: with mounted mating connector.

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

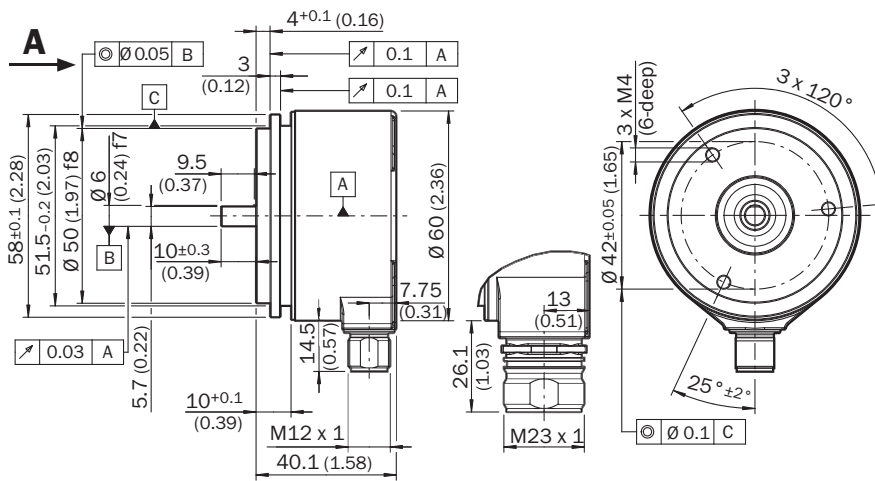
## Classifications

<b>eCI@ss 5.0</b>	27270502
<b>eCI@ss 5.1.4</b>	27270502

eCl@ss 6.0	27270590
eCl@ss 6.2	27270590
eCl@ss 7.0	27270502
eCl@ss 8.0	27270502
eCl@ss 8.1	27270502
eCl@ss 9.0	27270502
eCl@ss 10.0	27270502
eCl@ss 11.0	27270502
eCl@ss 12.0	27270502
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

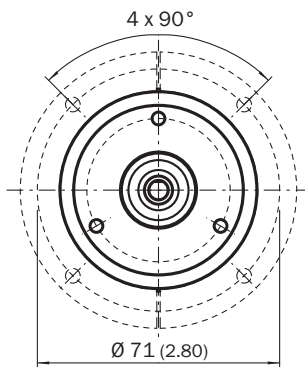
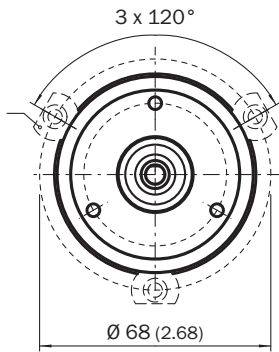
### Dimensional drawing (Dimensions in mm (inch))

Servo flange, M12 and M23 radial male connector



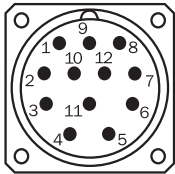
General tolerances according to DIN ISO 2768-mk

Attachment specifications



PIN assignment

M23 male connector, 12-pin and cable, 12-wire, SSI/Gray + incremental

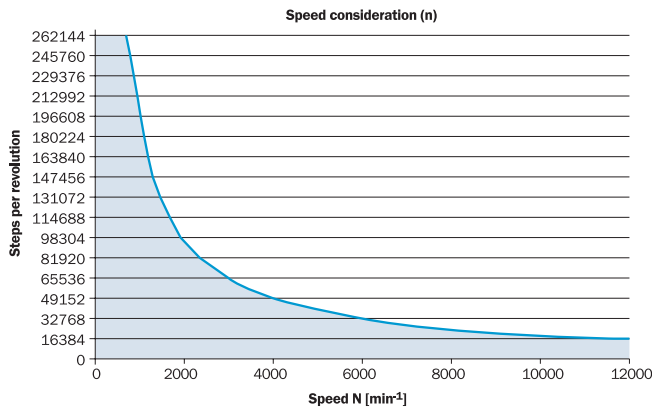


View of M23 male device connector on encoder

PIN	Wire colors (cable connection)	Signal Sin/Cos	Explanation
1	Red	U <sub>S</sub>	Operating voltage
2	Blue	GND	Ground connection
3	Yellow	Clock +	Interface signals
4	White	Data +	Interface signals
5	Orange	SET	Electronic adjustment
6	Brown	Data -	Interface signals
7	Violet	Clock -	Interface signals
8	Black	$\bar{B}$	Signal wire
9	Orange-black	CW/CCW (V/R)	Sequence in direction of rotation
10	Green	$\bar{A}$	Signal wire
11	Gray	A	Signal wire

PIN	Wire colors (cable connection)	Signal Sin/Cos	Explanation
12	Pink	B	Signal wire
		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](http://www.sick.com/AFS_AFM60_SSI)

	Brief description	Type	Part no.
<b>Other mounting accessories</b>			
	Servo clamps, large, for servo flange (clamps, eccentric fastener), 3 pcs, without mounting material, without mounting hardware	BEF-WK-SF	2029166
<b>Plug connectors and cables</b>			
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: shielded, 3 m	DOL-2312-G03MMD2	2062300
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: shielded, 5 m	DOL-2312-G05MMD2	2062301
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: shielded, 10 m	DOL-2312-G10MMD2	2062302
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: unshielded, 1.5 m	DOL-2312-G1M5MD2	2062284
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: shielded, 20 m	DOL-2312-G20MMD2	2062303

	Brief description	Type	Part no.
	Head A: female connector, M23, 12-pin, straight Head B: Flying leads Cable: shielded, 30 m	DOL-2312-G30MMD2	2062304
	Head A: female connector, M23, 9-pin, straight Cable: HIPERFACE <sup>®</sup> , SSI, Incremental, shielded	DOS-2309-G	6028533
	Head A: female connector, M23, 12-pin, straight Cable: HIPERFACE <sup>®</sup> , SSI, Incremental, shielded	DOS-2312-G DOS-2312-G02	6027538 2077057
	Head A: female connector, M23, 12-pin, angled Cable: HIPERFACE <sup>®</sup> , SSI, Incremental, shielded	DOS-2312-W01	2072580
<b>Shaft adaptation</b>			
	Bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial $\pm$ 0.25 mm, axial $\pm$ 0.4 mm, angular $\pm$ 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 $\pm$ 0.3 mm, axial $\pm$ 0.2 mm, angle $\pm$ 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 $\pm$ 0.3 mm, axial $\pm$ 0.2 mm, angle $\pm$ 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 $\pm$ 0.25 mm, axial $\pm$ 0.4 mm, angular $\pm$ 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 $\pm$ 2,5 mm, axially $\pm$ 3 mm, angle $\pm$ 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 $\pm$ 0.3 mm, axial $\pm$ 0.4 mm, angular $\pm$ 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 $\pm$ 0.22 mm, axial $\pm$ 1 mm angular $\pm$ 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
	Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial $\pm$ 0,3 mm, axial $\pm$ 0,3 mm, angular $\pm$ 3°; max. speed 10.000 rpm, -10° to +80 °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407

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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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For us, that is “Sensor Intelligence.”

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