



# AFS60A-S4AC016384

AFS/AFM60 SSI

**ABSOLUTE ENCODERS**

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Sensor Intelligence.



Illustration may differ



### Ordering information

Type	part no.
AFS60A-S4AC016384	1053457

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

### Detailed technical data

#### Safety-related parameters

<b>MTTF<sub>D</sub> (mean time to dangerous failure)</b>	250 years (EN ISO 13849-1) <sup>1)</sup>
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<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.

#### Performance

<b>Number of steps per revolution (max. resolution)</b>	16,384 (14 bit)
<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>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)

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

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

## Electronics

<b>Connection type</b>	Male connector, M12, 8-pin, radial
<b>Supply voltage</b>	4.5 ... 32 V
<b>Power consumption</b>	≤ 0.7 W (without load)
<b>Reverse polarity protection</b>	✓

## Mechanics

<b>Mechanical design</b>	Solid shaft, face mount flange
<b>Shaft diameter</b>	10 mm
<b>Shaft length</b>	19 mm
<b>Characteristics of the shaft</b>	With flat
<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> 2)
<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.

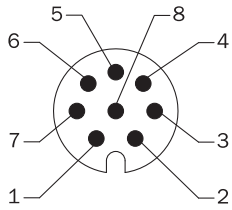
<sup>3)</sup> Stationary position of the cable.

## Certificates

<b>EU declaration of conformity</b>	✓
<b>UK declaration of conformity</b>	✓
<b>ACMA declaration of conformity</b>	✓
<b>Moroccan declaration of conformity</b>	✓



## Anschlussbelegung M12 male connector, 8-pin and cable, 8-wire, SSI/Gray



view of M12 male device connector on encoder

PIN	Wire colors (cable connection)	Signal	Explanation
1	Brown	Data -	Interface signals
2	White	Data +	Interface signals
3	Black	V/R	Sequence in direction of rotation
4	Pink	SET	Electronic adjustment Interface signals
5	Yellow	Clock +	Interface signals
6	Purple	Clock -	Interface signals
7	Blue	GND	Ground connection
8	Red	U <sub>S</sub>	Operating voltage
-	-	Shielding	Shielding 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.
shaft adaptation			
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> 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</li> </ul>	KUP-0610-B	5312982
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> 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</li> </ul>	KUP-0610-D	5326697
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> 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</li> </ul>	KUP-0610-F	5312985
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial ± 0,3 mm, axial ± 0,3 mm, angular ± 3°; max. speed 10.000 rpm, -10° to +80 °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub</li> </ul>	KUP-0610-S	2056407
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> 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</li> </ul>	KUP-0610-J	2127056
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially +/- 0,25 mm, axially +/- 0,4 mm, angle +/- 4 degrees; max. speed 10.000 rpm, -30 to +120 degrees Celsius, torsional spring stiffness of 150 Nm/rad</li> </ul>	KUP-0810-D	5326704
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial ± 0,3 mm, axial ± 0,3 mm, angular ± 3°; max. speed 10.000 rpm, -10° to +80 °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub</li> </ul>	KUP-0810-S	5314178
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs</li> </ul>	KUP-1010-B	5312983
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial +/- 2.5 mm, axial +/- 3 mm, angular +/- 10°; max. speed 3,000 rpm, -30° to +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange</li> </ul>	KUP-1010-D	5326703
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle ± 2.5°, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin</li> </ul>	KUP-1010-F	5312986
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular ± 3°; speed 10,000 rpm, -10° to +80° Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub</li> </ul>	KUP-1010-S	2056408
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Spring coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial ± 1.5 mm, axial ± 1.0 mm, angular ± 5°, max. speed 3,000 rpm, -30° to +120 °Celsius, nominal torque 150 Ncm, rotational angle at half nominal torque, direction of rotation right viewed on</li> </ul>	KUP-1010-W	5319914

	Brief description	Type	part no.
	driving shaft 40°, left viewed on driving shaft 60°, material: spring steel 1.0600 nickel plated, zinc die cast hubs		
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> 10 mm / 12 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs</li> </ul>	KUP-1012-B	5312984
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial +/- 2.5 mm, axial +/- 3 mm, angular +/- 10°; max. speed 3,000 rpm, -30° to +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange</li> </ul>	KUP-1012-D	5326702
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 8 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</li> </ul>	KUP-0810-J	2128267
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 10 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</li> </ul>	KUP-1010-J	2127054
	<ul style="list-style-type: none"> <li><b>Product segment:</b> Shaft adaptation</li> <li><b>Product:</b> Shaft couplings</li> <li><b>Description:</b> Claw coupling, shaft diameter 10 mm / 12 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</li> </ul>	KUP-1012-J	2128265
<b>Mounting systems</b>			
	<ul style="list-style-type: none"> <li><b>Description:</b> Servo clamps, large, for servo flange (clamps, eccentric fastener), 3 pcs, without mounting material</li> <li><b>Items supplied:</b> Without mounting hardware</li> </ul>	BEF-WK-SF	2029166
	<ul style="list-style-type: none"> <li><b>Description:</b> Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum</li> <li><b>Material:</b> Aluminum</li> <li><b>Details:</b> Aluminum</li> </ul>	BEF-FA-036-100	2029161

	Brief description	Type	part no.
connectors and cables			
	<ul style="list-style-type: none"> <li><b>Description:</b> SSI, shielded, Incremental, HIPERFACE®</li> <li><b>Connection type head A:</b> Flying leads</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> SSI, Incremental, HIPERFACE®</li> <li><b>Items supplied:</b> By the meter</li> <li><b>Cable:</b> 8-wire, PUR, halogen-free</li> </ul>	LTG-2308-MWENC	6027529
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 2 m, 8-wire, PUR, halogen-free</li> <li><b>Connection systems:</b> Flying leads</li> <li><b>Application:</b> Drag chain operation, Zones with oils and lubricants</li> </ul>	DOL-1208-G02MAC1	6032866
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 5 m, 8-wire, PUR, halogen-free</li> <li><b>Connection systems:</b> Flying leads</li> <li><b>Application:</b> Drag chain operation, Zones with oils and lubricants</li> </ul>	DOL-1208-G05MAC1	6032867
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 10 m, 8-wire, PUR, halogen-free</li> <li><b>Connection systems:</b> Flying leads</li> <li><b>Application:</b> Drag chain operation, Zones with oils and lubricants</li> </ul>	DOL-1208-G10MAC1	6032868
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 20 m, 8-wire, PUR, halogen-free</li> <li><b>Connection systems:</b> Flying leads</li> <li><b>Application:</b> Drag chain operation, Zones with oils and lubricants</li> </ul>	DOL-1208-G20MAC1	6032869
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight</li> <li><b>Connection type head B:</b> Flying leads</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> 25 m, 8-wire, PUR, halogen-free</li> <li><b>Connection systems:</b> Flying leads</li> <li><b>Application:</b> Drag chain operation, Zones with oils and lubricants</li> </ul>	DOL-1208-G25MAC1	6067859
	<ul style="list-style-type: none"> <li><b>Description:</b> Incremental, shielded, SSI</li> <li><b>Connection type head A:</b> Female connector, M12, 8-pin, straight, A-coded</li> <li><b>Signal type:</b> Incremental, SSI</li> <li><b>Cable:</b> CAT5, CAT5e</li> <li><b>Connection systems:</b> IDC quick connection</li> <li><b>Permitted cross-section:</b> 0.14 mm² ... 0.34 mm²</li> </ul>	DOS-1208-GA01	6045001

## SICK AT A GLANCE

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