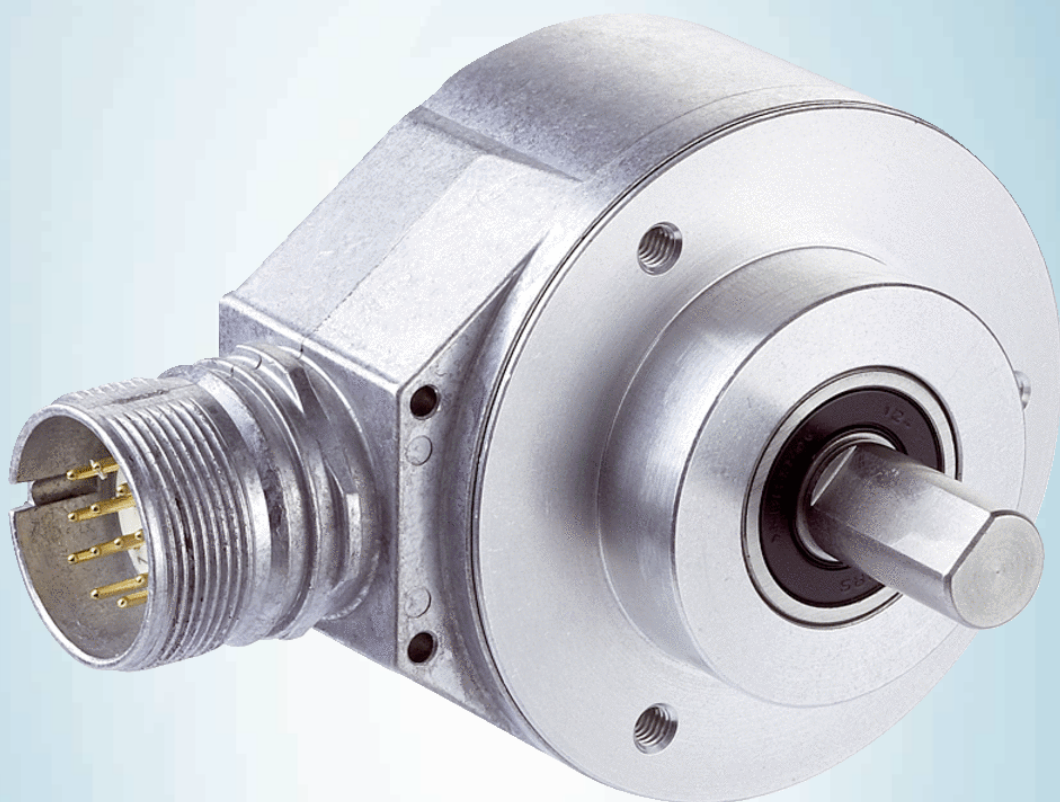




AFM60B-S4LZ000S14

AFS/AFM60 SSI

ABSOLUTE ENCODERS

SICK
Sensor Intelligence.

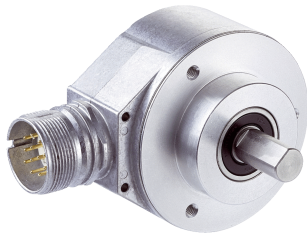


Illustration may differ



Ordering information

Type	Part no.
AFM60B-S4LZ000S14	1084124

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

Detailed technical data

Features

Special device	✓
Specialty	Connector M23, 12-pin, radial with customer specific pin allocation (cw numbering at M23 connector) Customer specific Encoder flange: face mount flange with servo slot Shaft sealing: IP67 on the shaft, starting torque < 1 Ncm
Standard reference device	AFM60B-S4LA004096, 1053513

Performance

Max. resolution (number of steps per revolution x number of revolutions)	12 bit x 12 bit (4,096 x 4,096)
Error limits G	0.05° 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
Communication Interface detail	SSI + incremental HTL
Initialization time	50 ms ¹⁾
Position forming time	< 1 μ s
SSI	
Code sequence parameter adjustable	CW/CCW (V/R) parameter adjustable
Clock frequency	≤ 2 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)
Incremental	
Output frequency	≤ 600 kHz
Load current	≤ 30 mA

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

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

Sin/Cos	
Load resistance	$\geq 120 \Omega$

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

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.

Mechanical data

Mechanical design	Customized
Shaft diameter	10 mm
Wavelength	19 mm
Weight	0.3 kg
Start up torque	$< 1 \text{ Ncm}$ ¹⁾ ¹⁾
Operating torque	$< 0.5 \text{ Ncm}$ ¹⁾ ¹⁾
Permissible Load capacity of shaft	80 N / radial 40 N / axial
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⁾ At 20 °C.

Ambient data

EMC	According to EN 61000-6-2 and EN 61000-6-3 ¹⁾
Enclosure rating	IP65, shaft side (according to IEC 60529) IP67, housing side (according to IEC 60529) ²⁾
Permissible relative humidity	90 % (condensation of the optical scanning not permitted)
Operating temperature range	-40 °C ... +100 °C ³⁾
Storage temperature range	-40 °C ... +100 °C, without package
Resistance to shocks	70 g, 6 ms (according to EN 60068-2-27)
Resistance to vibration	30 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)

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

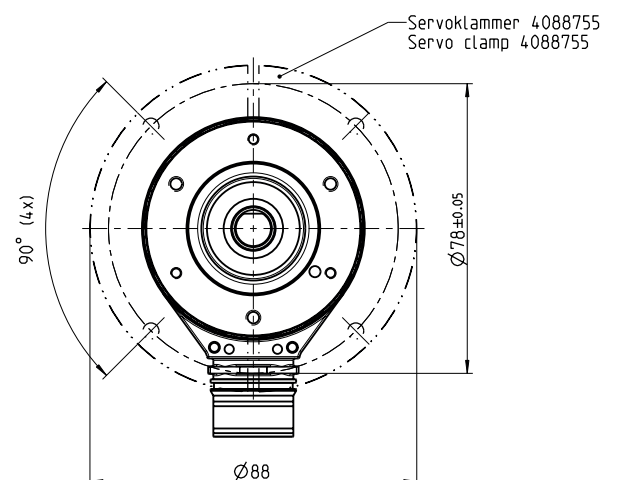
²⁾ For devices with male connector: With mating connector mounted.

³⁾ Stationary position of the cable.

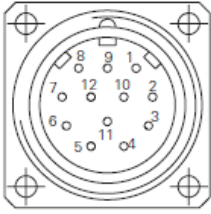
Classifications

ECI@ss 5.0	27270502
ECI@ss 5.1.4	27270502
ECI@ss 6.0	27270590

Dimensional drawing (Dimensions in mm (inch))

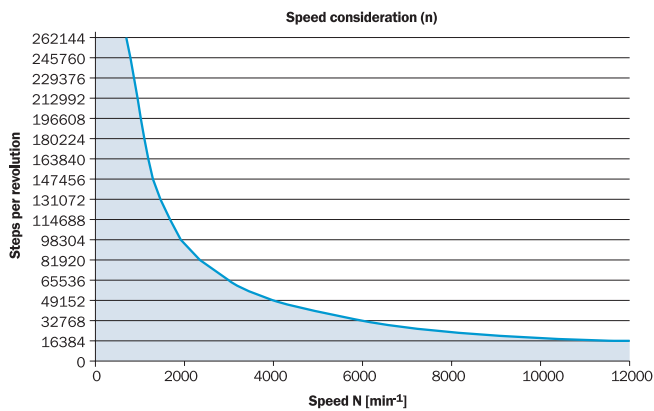


PIN assignment



PIN	Signal	Explanation
1	U _S	Supply voltage
2	GND	Ground connection
3	Clock +	Interface signal
4	Data +	Interface signal
5	SET	Electronic adjustment
6	Data -	Interface signal
7	Clock -	Interface signal
8	A	Signal wire
9	B	Signal wire
10	U _S	Supply voltage (jumper between pin 1 and 10)
11	A ₋	Signal wire
12	B ₋	Signal wire
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth

Maximum revolution range



The maximum speed is also dependent on the shaft type.

Diagrams

SSI data format singleturn



Bit 1–18: Position Bits

- LSB: Least significant Bit
- MSB: Most significant Bit

Bit 19–21: Error Bits

- ERRDIG: Failure message about speed. If this failure occurs during the position building procedure it will be indicated by the ERRDIG-Bit.
- ERRSI: Light source monitoring failure.
- ERRSYNC: Contamination of the disc or scanning system. During the determination of the position, an error has occurred since the last SSI transmission. The error bit will be deleted during the next data transmission.

The evaluation of the error bits has to be realized in the PLC.

The provided error bits don't have to be used by the PLC compulsorily.

Example

If the resolution of the absolute encoder is set on 13 bits, 16 bits are provided by the encoder: 13 data bits and 3 error bits. If the PLC is not able to evaluate the error bits, the PLC has to be set on a resolution of 13 bits. Then the error bits have to be masked out by the PLC.

SSI data format multiturn

30 Bits



Bit 1–12: Position Bits multiturn
Bit 13–30: Position Bits singleturn
Bit 31–33: Error Bits

27 Bits



Bit 1–12: Position Bits multiturn
Bit 13–27: Position Bits singleturn
Bit 28–30: Error Bits

Error Bits

- ERRDIG: Failure message about speed. If this failure occurs during the position building procedure it will be indicated by the ERRDIG-Bit.
- ERRSI: Light source monitoring failure.
- ERRSYNC: Contamination of the disc or scanning system. During the determination of the position, an error has occurred since the last SSI transmission. The error bit will be deleted during the next data transmission.

The evaluation of the error bits has to be realized in the PLC.

The provided error bits don't have to be used by the PLC compulsorily. The multiturn resolution is fixed on 12 bits.

Example

If the resolution of the absolute encoder is set on 27 bits, 30 bits are provided by the encoder: 27 data bits and 3 error bits. If the PLC is not able to evaluate the error bits, the PLC has to be set on a resolution of 27 bits. Then the error bits have to be masked out by the PLC.

Electrical interfaces sine $0.5 V_{pp}$

Power supply	Output
4.5 ... 5.5 V	Sine $0.5 V_{pp}$

Signal before differential generation at load 120Ω at $U_s = 5 V$

Signal diagram for clockwise rotation of the shaft looking in direction "A" (shaft)



Interface signals Sin , $\overline{\text{Sin}}$, Cos , $\overline{\text{Cos}}$	Signal before differential generation at load 120Ω	Signal offset
Analog differential	$0.5 V_{pp} \pm 20 \%$	$2.5 V \pm 10 \%$

Signal after differential generation at load 120Ω at $U_s = 5 V$

Signal diagram for clockwise rotation of the shaft looking in direction "A" (shaft)



Electrical interfaces HTL/TTL

Incremental pulse diagram for clockwise rotation of the shaft looking in direction "A", see dimensional drawing



SICK AT A GLANCE

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