Product data sheet

AFM60E-S4AA000S15

AFS/AFM60 SSI

ABSOLUTE ENCODERS

SICK
Sensor Intelligence.

Illustration may differ

Ordering information

Type	Part no.
AFM60E-S4AA000S15	1081202

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

Detailed technical data

Features

Special device	✓
Specialty	Customer specific Encoder flange: face mount flange with servo slot Shaft sealing: IP67 on the shaft, starting torque < 1 Ncm Male connector, M23, 12-pin, radial, customized PIN assignment Optional accessory: customer specific half-shell servo clamps (please order separately: 2088848 BEF-WG-SF050S1)
Standard reference device	AFM60E-S4AA004096, 1037435

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	0.2° [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 µs
SSI	
Code type	Gray
Code sequence parameter adjustable	CW/CCW (V/R) parameter adjustable
Clock frequency	≤ 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 - Us V)
Incremental	
Output frequency	≤ 300 kHz
Sin/Cos	
Sine/cosine periods per revolution	1,024
Output frequency	≤ 200 kHz

[1] Valid positional data can be read once this time has elapsed.
[2] Minimum, LOW level (Clock +): 250 ns.

Load resistance	≥ 120 Ω
Signal before differential generation	0.5 V_{pp}, ± 20 %, 120 Ω
Signal offset before differential generation	2.5 V ± 10 %
Signal after differential generation	1 V_{pp}, ± 20 %

[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	≤ 0.7 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	Solid shaft, face mount flange with servo slot
Shaft diameter	10 mm
Shaft length	19 mm
Weight	0.3 kg
Start up torque	< 1 Ncm [1]
Operating torque	< 0.5 Ncm [1]
Permissible Load capacity of shaft	80 N / radial 40 N / axial
Moment of inertia of the rotor	6.2 gcm²
Bearing lifetime	3.0 x 10^9 revolutions
Angular acceleration	+ 500,000 rad/s²

[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	0 °C ... +85 °C
Storage temperature range	–40 °C ... +100 °C, without package
Resistance to shocks	50 g, 6 ms (according to EN 60068-2-27)
Resistance to vibration	20 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)

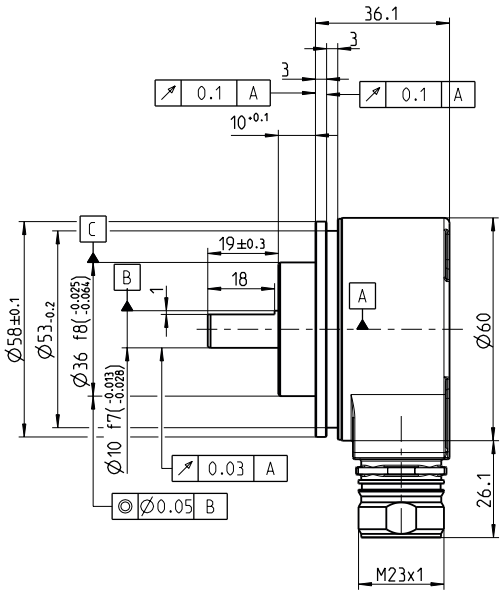
[1] EMC according to the standards quoted is achieved if shielded cables are used.
[2] For devices with connector connection: With mating connector mounted.

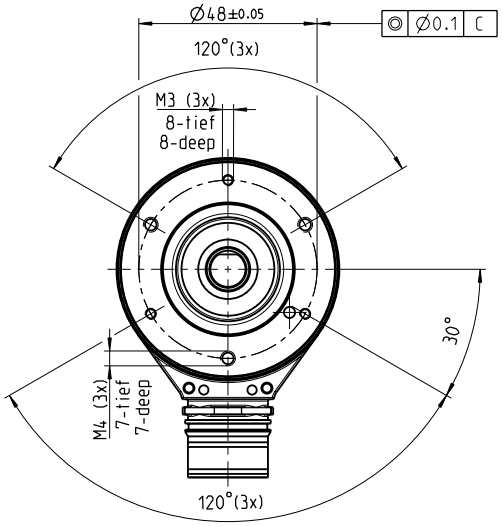
Classifications

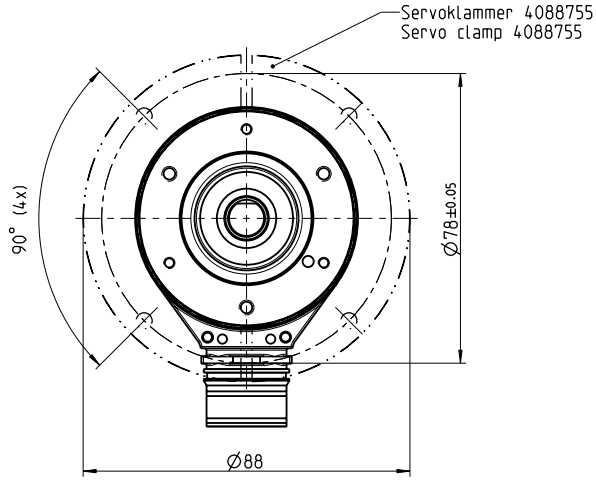
ECl@ss 5.0	27270502

ECl@ss 5.1.4	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
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
UNSPSC 16.0901	41112113

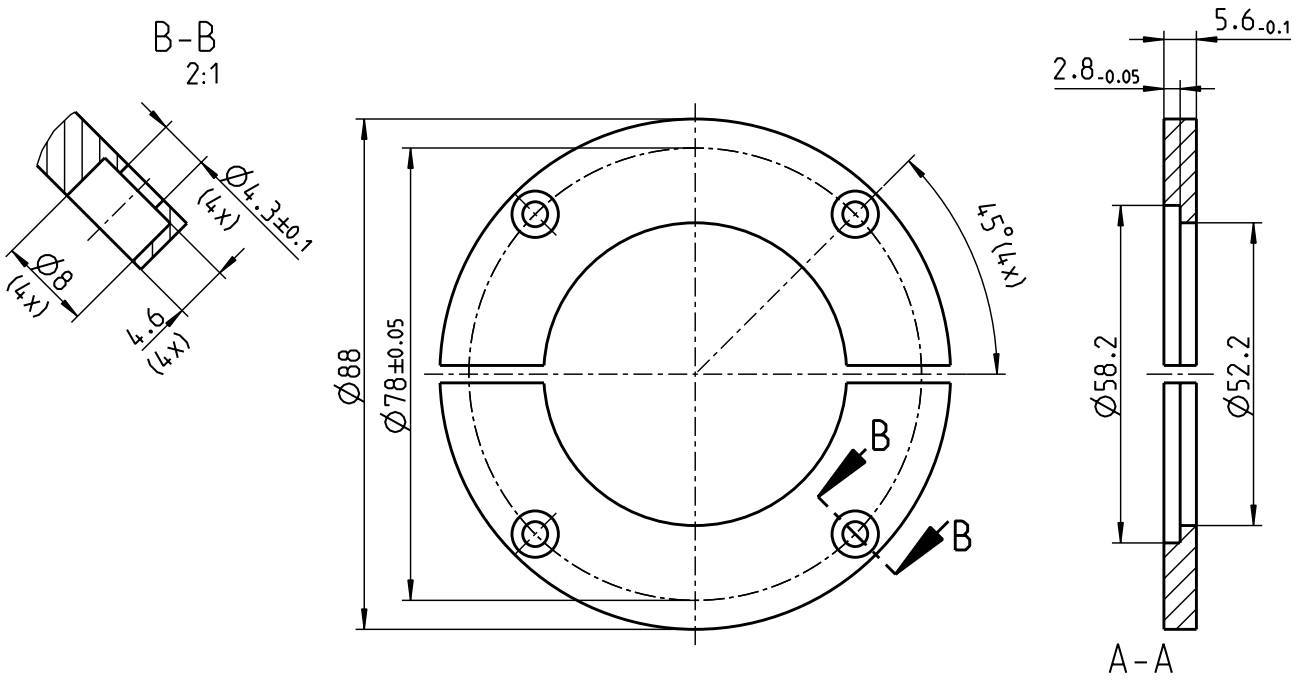
Dimensional drawing (Dimensions in mm (inch))







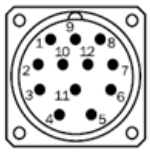
Half-shell servo clamps, 2088848 BEF-WG-SF050S1 (not included in scope of delivery of the Encoder, please order separately)



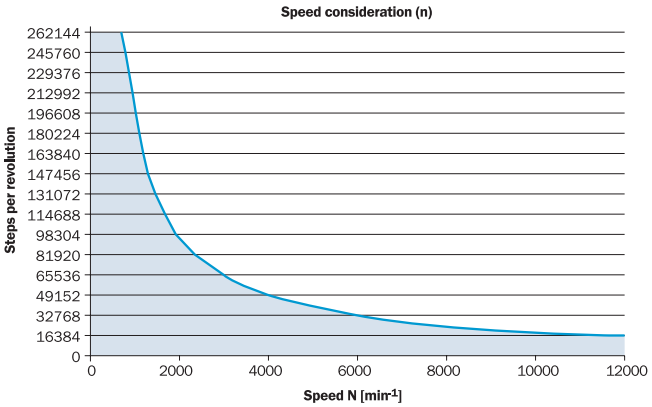
PIN assignment

Connector M23, 12-pin Ssi/Gray

PIN	Signal	Explanation
1	GND	Ground connection
2	Data +	Interface signal
3	Clock +	Interface signal
4	N.C.	Not connected
5	CW/CCW_	Counting sequence when turning
6	N.C.	Not connected
7	N.C.	Not connected
8	U_S	Supply voltage
9	N.C.	Not connected
10	Data-	Interface signal
11	Clock -	Interface signal
12	SET	Electronic adjustment
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth



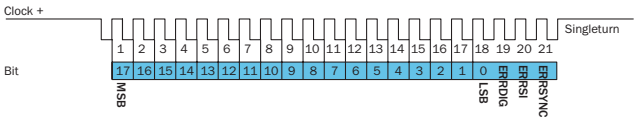
Maximum revolution range



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.

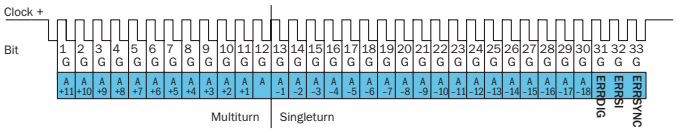
The provided error bits don't have to be used by the PLC compulsorily.

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.

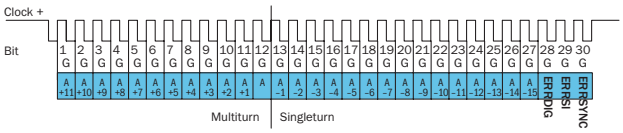
SSI data format multiturn

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.

SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

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.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

WORLDWIDE PRESENCE:

Contacts and other locations –www.sick.com