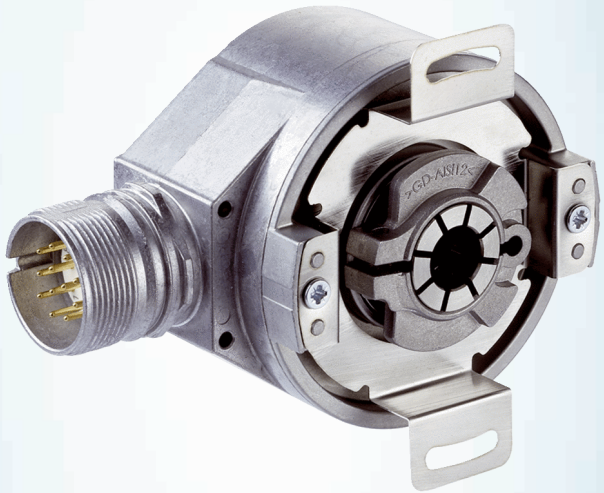
Online data sheet



AFM60B-BDTA008192

AFS/AFM60 SSI

ABSOLUTE ENCODERS

SICK
Sensor Intelligence.

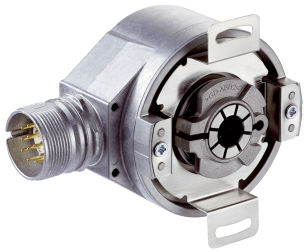


Illustration may differ

Ordering information

Type	Part no.
AFM60B-BDTA008192	1062805

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

Detailed technical data

Performance

Max. number of steps per revolution	8,192
Max. number of revolutions	4,096
Max. resolution (single turn, multi turn)	8,192 (13 bit), 4,096 (12 bit)
Error limits	± 0.05°
Repeatability	0.002°

Interfaces

Electrical interface	SSI/Gray + Incremental, TTL
Initialization time	50 ms [1]
Position forming time	< 1 µs
SSI	
Code type	Gray
Code sequence parameter adjustable	CW/CCW parameter adjustable
Clock frequency	2 MHz [2]
Set (electronic adjustment)	H-active (L = 0 - 3 V, H = 4,0 - Us V)
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1,5 V, H = 2,0 - Us V)
Incremental	
Maximum load current	≤ 30 mA

[1] Valid positional data can be read once this time has elapsed.
[2] Minimum, LOW level (Clock +): 500 ns.

Electrical data

Connection type	Male connector M23, 12-pin, radial
Supply voltage range	4.5 V DC ... 32 V DC
Power consumption	0.5 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 interface	Blind hollow shaft
Shaft diameter	10 mm
Weight	0.2 kg
+20 °C	0.8 Ncm
+20 °C	0.6 Ncm
Permissible shaft movement, axial static/dynamic	± 0.5 mm, ± 0.2 mm
Permissible shaft movement, radial static/dynamic	± 0.3 mm, ± 0.1 mm
Moment of inertia of the rotor	40 gcm²
Bearing lifetime	3.0 x 10^9 revolutions
Angular acceleration	≤ 500,000 rad/s²

Ambient data

EMC	According to EN 61000-6-2 and EN 61000-6-3 [1]
Enclosure rating	IP65, shaft side (according to IEC 60529) [2] IP67, housing side (according to IEC 60529)
Permissible relative humidity	90 % (condensation of the optical scanning not permitted)
Operating temperature range	–40 °C ... +100 °C
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.

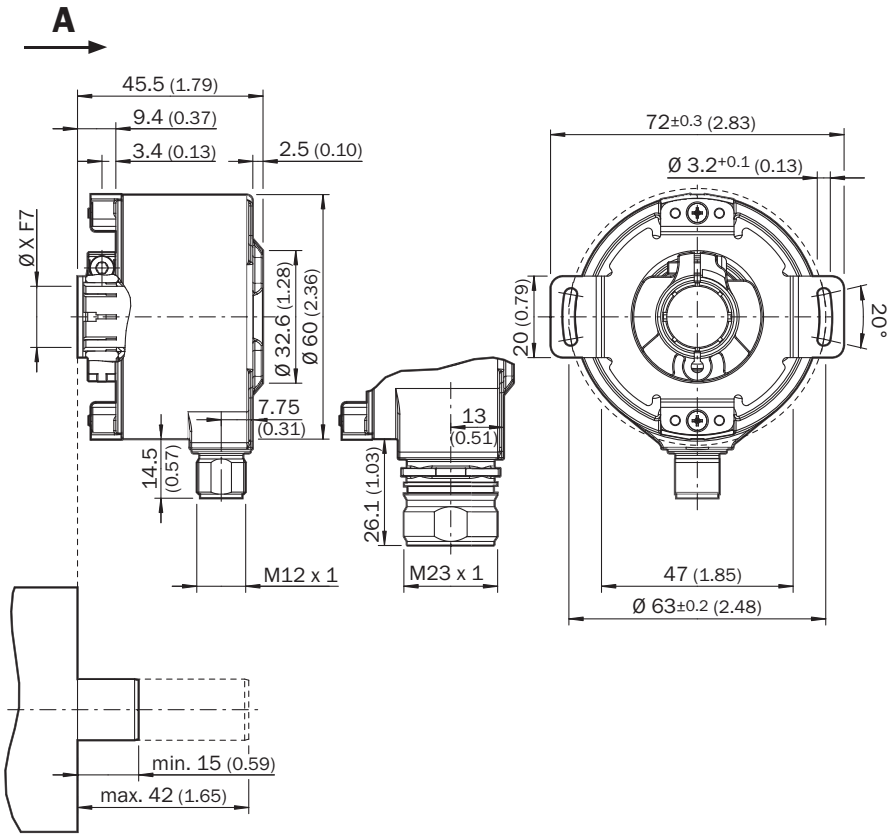
[2] With mating connector fitted.

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
ETIM 5.0	EC001486
ETIM 6.0	EC001486
UNSPSC 16.0901	41112113

Dimensional drawing (Dimensions in mm (inch))

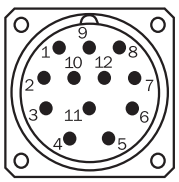
Blind hollow shaft, radial plug connection M12 and M23



General tolerances according to DIN ISO 2768-mk

PIN assignment

View of the M23 male connector plug-in face



Connector M23, 12-pin
SSI/Gray

Pin	Signal	Explanation
1	GND	Ground connection
2	Data+	Interface signals
3	Clock+	Interface signals
4	N. C.	Not connected
5	N. C.	Not connected
6	N. C.	Not connected
7	N. C.	Not connected
8	U_s	Supply voltage
9	SET	Electronic adjustment
10	Data–	Interface signals
11	Clock–	Interface signals
12	CW/$\overline{\text{CCW}}$	Counting sequence when turning
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

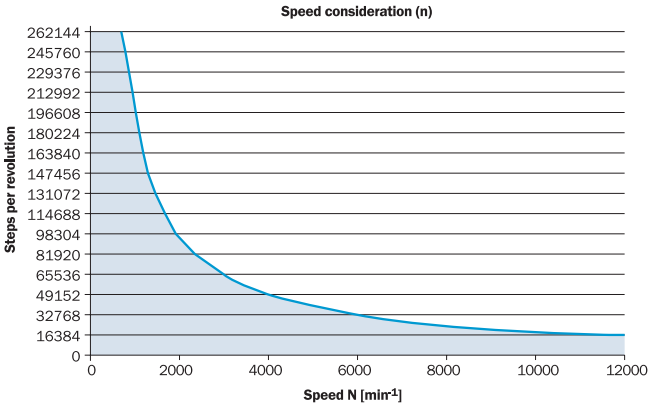
Connector M23, 12-pin and cable outlet, cable 12-core
SSI/Gray + Incremental

Pin	Color wires	Signal	Explanation
1	Red	$+U_s$	Supply voltage
2	Blue	GND	Ground connection
3	Yellow	Clock+	Interface signal
4	White	Data+	Interface signal
5	Orange	SET	Electronic adjustment
6	Brown	Data–	Interface signal
7	Violet	Clock–	Interface signal
8	Black	$\overline{\ }$ B	Signal line
9	Orange/black	CW/$\overline{\text{CCW}}$	Counting sequence when turning
10	Green	$\overline{\ }$A	Signal line
11	Gray	A	Signal line
12	Pink	B	Signal line
		Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

Connector M23, 12-pin and cable outlet, cable 12-core
SSI/Gray + Sin/Cos

Pin	Color wires	Signal	Explanation
1	Red	$+U_s$	Supply voltage
2	Blue	GND	Ground connection
3	Yellow	Clock+	Interface signal
4	White	Data+	Interface signal
5	Orange	SET	Electronic adjustment
6	Brown	Data–	Interface signal
7	Violet	Clock–	Interface signal
8	Black	Sin–	Signal line
9	Orange/black	CW/$\overline{\text{CCW}}$	Counting sequence when turning
10	Green	Cos–	Signal line
11	Gray	Cos+	Signal line
12	Pink	Sin+	Signal line
		Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

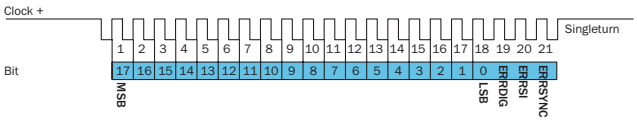
Maximum revolution range



The maximum speed is also dependent on the shaft type.

Diagram

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.

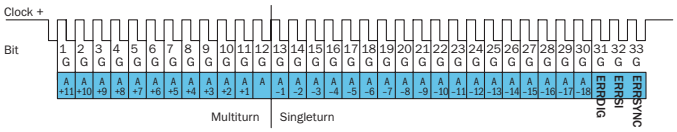
The provided error bits don't have to be used by the PLC compulsorily.

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.

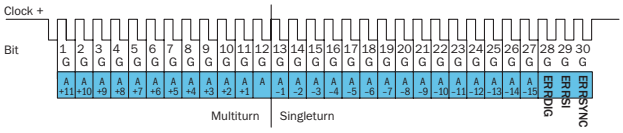
SSI data format multiturn

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

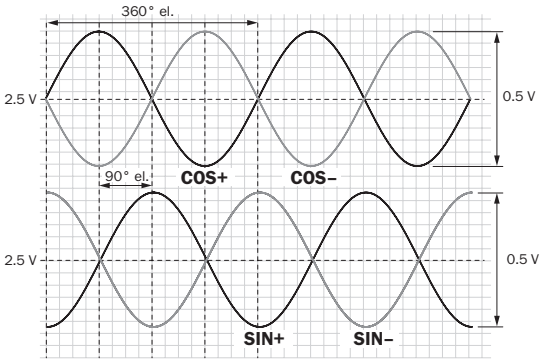
If the resolution of the absolute encoder is set on 27 bits, 30 bits are provided by the encoder: 27 data bits and 3 error bits.
If the PLC is not able to evaluate the error bits, the PLC has to be set on a resolution of 27 bits. Then the error bits have to be masked out by the PLC.

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 120 Ω at U_S = 5 V

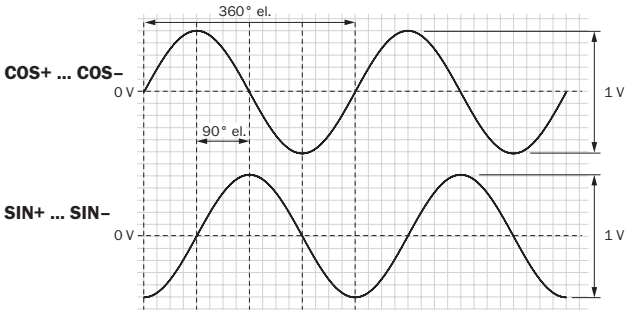
Signal diagram for clockwise rotation of the shaft looking in direction “A” (shaft)



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

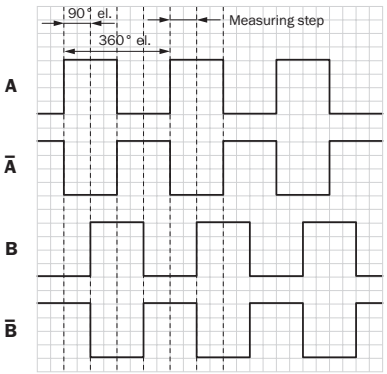
Signal **after** differential generation at load 120 Ω at U_S = 5 V

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



Recommended accessories

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

	Brief description	Type	Part no.
Plug connectors and cables			
	Head A: female connector, M23, 12-pin, straight Head B: open cable ends Cable: drag chain use, shielded, 10 m	DOL-2312-G10MMD2	2062302

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