



Absolute encoders AFS/AFM60 SSI

AFS60A-S1AM262144

Model Name > [AFS60A-S1AM262144](#)
Part No. > [1037646](#)

At a glance

- High-resolution absolute encoders with up to 30 bits (AFM60) or up to 18 bits (AFS60)
- Face mount flange, servo flange, blind or through hollow shaft
- SSI, SSI + Incremental or SSI + Sin/Cos interface
- Programmable resolution and offset (dependent on type)
- Connection system: M12, M23 connector or cable outlet
- Enclosure rating: IP 67 (housing), IP 65 (shaft)
- Operating temperature: -30 °C to +100 °C (depends on type)

Your benefits

- Programmability of the encoders means less storage, greater machine availability and easy installation
- Precise positioning due to high resolutions
- Large selection of mechanical interfaces and electrical contacting possibilities: Suitable for all applications
- Suitable for applications with limited space requirements (extremely short installation depth of 30 mm)
- Very good rotation accuracy due to increased bearing distance
- One programming tool and software with automatic encoder detection for AFS60/AFM60/DFS60



Performance

Max. number of steps per revolution:	262,144
Max. number of revolutions:	1
Resolution power:	262,144 x 1
Error limits:	± 0.03 °
Repeatability (Ta not constant):	0.002 °
Measuring step deviation:	± 0.002 °
Measuring step:	0.014 °
Initialization time:	50 ms ¹⁾

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

Mechanical data

Mechanical interface:	Solid shaft, Servo flange
Shaft diameter:	6 mm
Start up torque:	0.5 Ncm (20 °C)

Operating torque:	0.3 Ncm (20 °C)
Permissible Load capacity of shaft:	40 N (axial), 80 N (radial)
Maximum operating speed:	9,000 /min ¹⁾
Moment of inertia of the rotor:	6.2 gcm ²
Bearing lifetime:	3.0 x 10 ⁹ revolutions
Max. angular acceleration:	500,000 rad/s ²

¹⁾ Self warming of 3.3 K per 1000 revolutions/min when applying note working temperature range

Electrical data

Power consumption:	0.5 W (without load)
Operating voltage range:	4.5 V DC ... 32 V DC
MTTFd: mean time to dangerous failure:	250 a (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.

Interfaces

Electrical interface:	Cable, 8-pin, universal, 5 m ¹⁾
Interface signals:	Clock +, Clock -, Data +, Data-
Clock frequency:	2 MHz ²⁾
SET (electronic adjustment):	H-active (L ≡ 0 - 1,5 V, H ≡ 2,0 - Us V)
CW/CCW (counting sequence when turning):	L-active (L ≡ 0 - 1,5 V, H ≡ 2,0 - Us V)

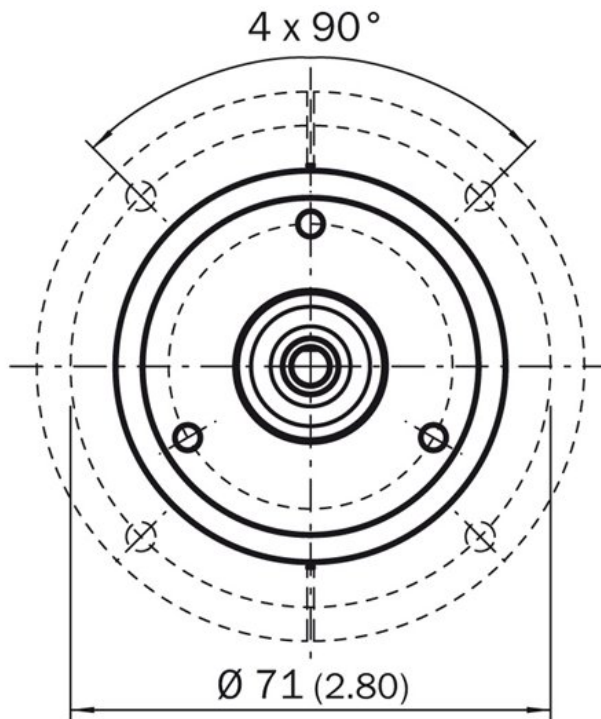
¹⁾ The universal cable outlet is positioned in such a way, that it is possible to lay the cable in a radial or axial direction without kinking it ²⁾

Ambient data

EMC:	(according to EN 61000-6-2 and EN 61000-6-3) ¹⁾
Enclosure rating:	IP 65 (according to IEC 60529), shaft side, IP 67 (according to IEC 60529)
Permissible relative humidity:	90 % (condensation of the optical scanning not permitted)
Working temperature range:	-30 °C ... 100 °C
Storage temperature range:	-40 °C ... 100 °C, without package
Resistance to shocks:	60 g (according to EN 60068-2-27)
Resistance to vibration:	20 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)

¹⁾

Dimensional drawing



[1] Cable diameter = 5,6 mm
+/- 2 mm Bending radius = 30 mm

Signalausgänge

SSI data format singleturn



Bit 1-12: Position Bits

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

Bit 13-21: Error Bits

- ERRDIG: Failure message about speed. If this failure occurs during the position building procedure it will be indicated by the ERRDIG-Bit.
- ERRSL: 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.

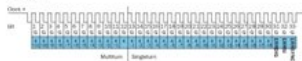
The provided error bits don't have to be used by the PLC compulsorily.

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.

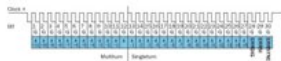
SSI data format multiturn

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.
- ERRSL: 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.

The graph illustrates the relationship between the speed of the motor (N in min^{-1}) and the number of steps per revolution. The y-axis represents 'Steps per revolution' with values ranging from 16,384 to 262,144. The x-axis represents 'Speed N [min^{-1}]' with values ranging from 0 to 12,000. The curve shows a sharp decrease in steps per revolution as speed increases, eventually leveling off at a constant value of 16,384 steps per revolution for speeds above approximately 8,000 min^{-1} .

Interfaces



SSI data format examples

80-13-25 Position Bits

- USB Laser segment bit
- MSB: Motor segment bit

80-19-23 Error Bits

- Error: Error message at speed. If this value occurs during the position building procedure it will be indicated by the ERROR bit.
- ErrorLOC: Local error monitoring bit.
- ErrorSNC: Error at the output of the sensing system. During the determination of the position, an error has occurred once the SSI transmission. The error bit will be detected during the next data transmission.

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

The procedure and error bits have to be realized in the PLC completely.

Example

- If the measurement of the absolute encoder is set at 13, 18, 15 bits are provided by the encoder: 13 data bits and 5 error bits. The error bits are not needed. The error bit has to be set on a measurement of 13 bits. Then the error bits have to be realized by the PLC.

SSI data format multimux

27 Bits

- Error bit 1
- Error bit 2
- Error bit 3
- Error bit 4
- Error bit 5
- Error bit 6
- Error bit 7
- Error bit 8
- Error bit 9
- Error bit 10
- Error bit 11
- Error bit 12
- Error bit 13
- Error bit 14
- Error bit 15
- Error bit 16
- Error bit 17
- Error bit 18
- Error bit 19
- Error bit 20
- Error bit 21
- Error bit 22
- Error bit 23
- Error bit 24
- Error bit 25
- Error bit 26
- Error bit 27

Error Bits

- ErrorLOC: Error message at speed. If this value occurs during the position building procedure it will be indicated by the ERROR bit.
- ErrorLOC: Local error monitoring bit.
- ErrorSNC: Error at the output of the sensing system. During the determination of the position, an error has occurred once the SSI transmission. The error bit will be detected during the next data transmission.

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

The procedure and error bits have to be realized by the PLC completely. The transmission resolution is fixed at 12 bits.

Example

- If the measurement of the absolute encoder is set at 27, 28, 15 bits are provided by the encoder: 27 data bits and 2 error bits. The error bits are not needed. The error bit has to be set on a measurement of 27 bits. Then the error bits have to be realized by the PLC.

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