



Absolute encoders AFS/AFM60 SSI

AFS60E-S1AK004096

Model Name > [AFS60E-S1AK004096](#)
Part No. > [1037627](#)



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:	4,096
Max. number of revolutions:	1
Resolution power:	4,096 x 1
Error limits:	± 0.2 °
Repeatability (Ta not constant):	0.002 °
Measuring step deviation:	± 0.2 °
Measuring step:	0.09 °
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) ¹⁾
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, 1.5 m ¹⁾
Interface signals:	Clock +, Clock -, Data +, Data-
Clock frequency:	1 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)

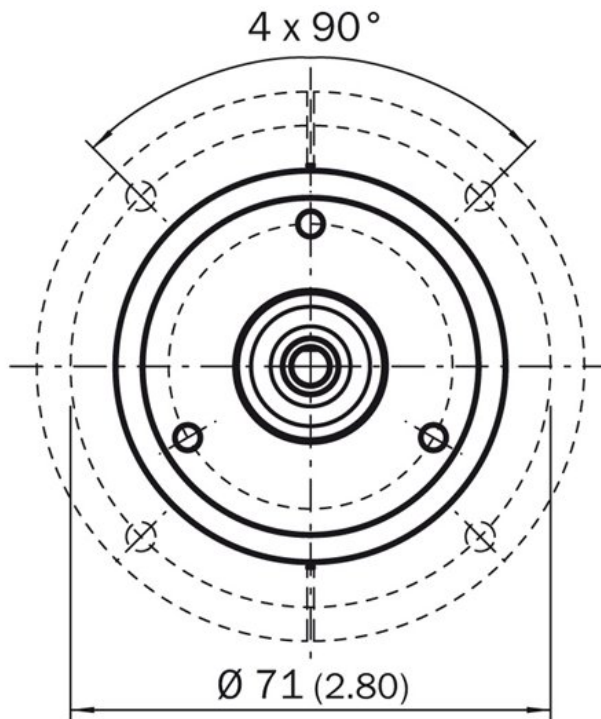
¹⁾ The universal cable outlet is positioned in such a way, that it is possible to lay the cable in a radial or axial direction without kinking it ²⁾

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:	0 °C ... 85 °C
Storage temperature range:	-40 °C ... 100 °C, without package
Resistance to shocks:	50 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.
- ERRSYN: 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.

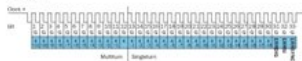
The provided error bits don't have to be used by the PLC compulsorily.

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.

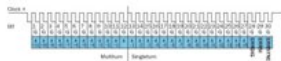
SSI data format multiturn

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.
- ERRSYN: 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.

Speed consideration (n)

Steps per revolution

Speed N [min⁻¹]

Speed N [min ⁻¹]	Steps per revolution
0	262144
1000	147456
2000	98304
4000	65536
6000	49152
8000	32768
10000	196608
12000	16384

Interfaces



SSI data format singlet

80 1-14. Position Bits

- **LSB** Least significant bit
- **MSB** Most significant bit

80 15-20. Error Bits

- **ERR0** Error message about an error that occurs during the position building procedure it will be indicated by the ERR0 bit.
- **ERR1** Error message monitoring fault.
- **ERR2** Error message about the error of scanning system. During the determination of the position, an error has occurred since the error bit is set to 1. The error will be detected during the next data transmission.

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

The provided error data has to be used by the PLC completely.

Example

If the transmission of the absolute encoder set on 27.78, 16 bits are provided by the encoder: 11 data bits and 5 error bits. The error bits E1, E2, E3, E4, E5 are provided by the encoder. The PLC has to set an evaluation of 13 bits. Then the error data has to be read out by the PLC.

SSI data format multibit

80 1-24. Position Bits multibit

80 25-26. Position Bits multibit

80 27-28. Error Bits multibit

80 29-30. Error Bits multibit

80 31-32. Error Bits multibit

80 33-34. Error Bits multibit

80 35-36. Error Bits multibit

80 37-38. Error Bits multibit

80 39-40. Error Bits multibit

80 41-42. Error Bits multibit

80 43-44. Error Bits multibit

80 45-46. Error Bits multibit

80 47-48. Error Bits multibit

80 49-50. Error Bits multibit

80 51-52. Error Bits multibit

80 53-54. Error Bits multibit

80 55-56. Error Bits multibit

80 57-58. Error Bits multibit

80 59-60. Error Bits multibit

80 61-62. Error Bits multibit

80 63-64. Error Bits multibit

80 65-66. Error Bits multibit

80 67-68. Error Bits multibit

80 69-70. Error Bits multibit

80 71-72. Error Bits multibit

80 73-74. Error Bits multibit

80 75-76. Error Bits multibit

80 77-78. Error Bits multibit

80 79-80. Error Bits multibit

80 81-82. Error Bits multibit

80 83-84. Error Bits multibit

80 85-86. Error Bits multibit

80 87-88. Error Bits multibit

80 89-90. Error Bits multibit

80 91-92. Error Bits multibit

80 93-94. Error Bits multibit

80 95-96. Error Bits multibit

80 97-98. Error Bits multibit

80 99-100. Error Bits multibit

80 101-102. Error Bits multibit

80 103-104. Error Bits multibit

80 105-106. Error Bits multibit

80 107-108. Error Bits multibit

80 109-110. Error Bits multibit

80 111-112. Error Bits multibit

80 113-114. Error Bits multibit

80 115-116. Error Bits multibit

80 117-118. Error Bits multibit

80 119-120. Error Bits multibit

80 121-122. Error Bits multibit

80 123-124. Error Bits multibit

80 125-126. Error Bits multibit

80 127-128. Error Bits multibit

80 129-130. Error Bits multibit

80 131-132. Error Bits multibit

80 133-134. Error Bits multibit

80 135-136. Error Bits multibit

80 137-138. Error Bits multibit

80 139-140. Error Bits multibit

80 141-142. Error Bits multibit

80 143-144. Error Bits multibit

80 145-146. Error Bits multibit

80 147-148. Error Bits multibit

80 149-150. Error Bits multibit

80 151-152. Error Bits multibit

80 153-154. Error Bits multibit

80 155-156. Error Bits multibit

80 157-158. Error Bits multibit

80 159-160. Error Bits multibit

80 161-162. Error Bits multibit

80 163-164. Error Bits multibit

80 165-166. Error Bits multibit

80 167-168. Error Bits multibit

80 169-170. Error Bits multibit

80 171-172. Error Bits multibit

80 173-174. Error Bits multibit

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80 193-194. Error Bits multibit

80 195-196. Error Bits multibit

80 197-198. Error Bits multibit

80 199-200. Error Bits multibit

80 201-202. Error Bits multibit

80 203-204. Error Bits multibit

80 205-206. Error Bits multibit

80 207-208. Error Bits multibit

80 209-210. Error Bits multibit

80 211-212. Error Bits multibit

80 213-214. Error Bits multibit

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80 239-240. Error Bits multibit

80 241-242. Error Bits multibit

80 243-244. Error Bits multibit

80 245-246. Error Bits multibit

80 247-248. Error Bits multibit

80 249-250. Error Bits multibit

80 251-252. Error Bits multibit

80 253-254. Error Bits multibit

80 255-256. Error Bits multibit

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80 261-262. Error Bits multibit

80 263-264. Error Bits multibit

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80 271-272. Error Bits multibit

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80 279-280. Error Bits multibit

80 281-282. Error Bits multibit

80 283-284. Error Bits multibit

80 285-286. Error Bits multibit

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