

AFS60/AFM60 SSI Absolute Encoders

Precise, flexible, versatile

Precise, flexible, versatile



Product description

With a high resolution of 18 bits (AFS60) or 30 bits (AFM60) and a large selection of programmable parameters, the AFS60 absolute singleturn encoder and the AFM60 absolute multiturn encoder set new standards when it comes to rotary encoders. The high resolution combined with the high IP protection class enables use in a multitude of industrial applications. Both encoders are equipped with the SSI interface while the AFM60 is also available with the SSI + Incremental and SSI + Sin/Cos combined interfaces.

A shaft bearing distance of 30 mm means the AFS60/AFM60 product family has significantly better rotation accuracy than encoders with blocked ball bearings. Yet despite their large bearing distance, the AFS60/AFM60 have a compact design.

The AFS60 and AFM60 can be programmed via the same programming tool (PGT-08-S) as the DFS60 product family from SICK.

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



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Detailed technical data

Performance

| | E | B | A |
|---|----------------|---------|---------|
| Number of steps per revolution (SSI Interface) | | | |
| Max. Singleturn and Multiturn ¹⁾ | 4096 | 32768 | 262144 |
| Number of revolutions (AFM60) | 4096 Multiturn | | |
| Error limits | ± 0.2° | ± 0.05° | ± 0.03° |
| Repeatability | 0.002° | | |
| Initialization time ²⁾ | 50 ms | | |
| Position sample time (SSI) | < 1 µs | | |

¹⁾ See "Maximum speed consideration" on page 5.

²⁾ Valid positional data can be read once this time has elapsed.

Mechanical data

| | | | |
|---|---|---|--|
| Shaft diameter | | | |
| Face mount flange | 10 x 19 mm | | |
| Servo flange | 6 x 10 mm | | |
| Blind hollow shaft, through hollow shaft | 8, 10, 12, 14, 15 mm and 3/8", 1/2", 5/8" | | |
| Material shaft | Stainless steel | | |
| Material flange | Aluminium | | |
| Material housing | Aluminium | | |
| Mass ¹⁾ | | | |
| Face mount flange, servo flange | 0.3 kg | | |
| Blind hollow shaft, through hollow shaft | 0.2 kg | | |
| Start up torque at 20 °C | | | |
| Face mount flange, servo flange | 0.5 Ncm | | |
| Blind hollow shaft, through hollow shaft | 0.8 Ncm | | |
| Operating torque at 20 °C | | | |
| Face mount flange, servo flange | 0.3 Ncm | | |
| Blind hollow shaft, through hollow shaft | 0.6 Ncm | | |
| Max. shaft loading | | | |
| Face mount flange, servo flange | 80 N radial 40 N axial | | |
| Permissible shaft movement of the drive element static/dynamic | | | |
| Blind hollow shaft, through hollow shaft | ± 0.3/± 0.1 mm radial ± 0.5/± 0.2 mm axial | ± 0.3/± 0.05 mm radial ± 0.5/± 0.01 mm axial | |
| Max. angular acceleration | 5 x 10 ⁵ rad/s ² | | |
| Max. operating speed ²⁾ | | | |
| Face mount flange, servo flange | 9,000 min ⁻¹ | | |
| Blind hollow shaft | 6,000 min ⁻¹ | | |
| Through hollow shaft | 9,000 min ⁻¹ | | |
| Moment of inertia of the rotor | | | |
| Face mount flange, servo flange | 6.2 gcm ² | | |
| Blind hollow shaft, through hollow shaft | 40 gcm ² | | |
| Bearing lifetime | 3 x 10 ⁹ revolutions | | |

¹⁾ Based on encoders with a connector outlet.

²⁾ Self-warming. 3.3 K/1,000 min⁻¹, when applying note working temperature range.

Electrical data

| | E | B | A |
|----------------------------|--------------|---|---|
| Power consumption, no load | 0.7 W | | |
| Operating voltage | 4.5 ... 32 V | | |
| Reverse voltage protection | ✓ | | |

Interfaces

| | | | |
|---|--|---------|----------|
| SSI Interface | | | |
| Code type | Gray | | |
| Code sequence adjustable | CW/ $\overline{\text{CCW}}$ | | |
| Measuring step | | | |
| 360°/number of lines | 0.09° | 0.01° | 0.0014° |
| Number of steps per revolution | | | |
| Max. Singleturn and Multiturn ¹⁾ | 4096 | 32768 | 262144 |
| Number of revolutions (AFM60) | 4096 Multiturn | | |
| Measuring step deviation | | | |
| Number of steps per revolution | | | |
| 1 ... 399 | ± 0.2° | ± 0.08° | ± 0.04° |
| 400 ... 40000 | ± 0.2° | ± 0.01° | ± 0.008° |
| > 40000 | - | | ± 0.002° |
| Clock+, Clock-, Data+, Data- | | | |
| SSI clock frequency 2 MHz, or min. LOW level (Clock+): 500 ns | 1 MHz | 2 MHz | 2 MHz |
| SET (electronic adjustment) | H-active (L = 0 - 3 V; H = 4 - U _s V) | | |
| CW/$\overline{\text{CCW}}$ (Counting sequence when turning) | L-active (L = 0 - 1.5 V; H = 2.0 - U _s V) | | |
| Incremental interface TTL/HTL/programmable (AFM60 SSI + Incremental) | | | |
| Number of lines per revolution | 1/4 of number of SSI steps per revolution | | |
| Measuring step | 90° electric/number of lines | | |
| Measuring step deviation | | | |
| Number of lines per revolution 1 ... 99 | ± 0.2° | ± 0.08° | ± 0.04° |
| Number of lines per revolution 100 ... 10000 | ± 0.2° | ± 0.01° | ± 0.008° |
| Number of lines per revolution > 10000 | - | | ± 0.002° |
| Interface signals A, $\overline{\text{A}}$, B, $\overline{\text{B}}$ | Digital differential | | |
| Max. output frequency | 300 kHz | 600 kHz | 820 kHz |
| Load current | 30 mA | | |
| Incremental interface sine/cosine 4.5 V ... 5.5 V, sine 0.5 V_{pp} (AFM60 SSI + Sin/Cos) | | | |
| Number of lines per revolution | 1.024 | | |
| Max. output frequency | 200 kHz | | |
| Load resistance | Min. 120 Ω | | |
| Interface signals Sin+, Sin-, Cos+, Cos- | Analog differential | | |
| Signal before differential generation at load 120 Ω | 0.5 V _{pp} ± 20 % | | |
| Signal offset | 2.5 V ± 10 % | | |

¹⁾ See "Maximum speed consideration" on page 5.

Ambient data

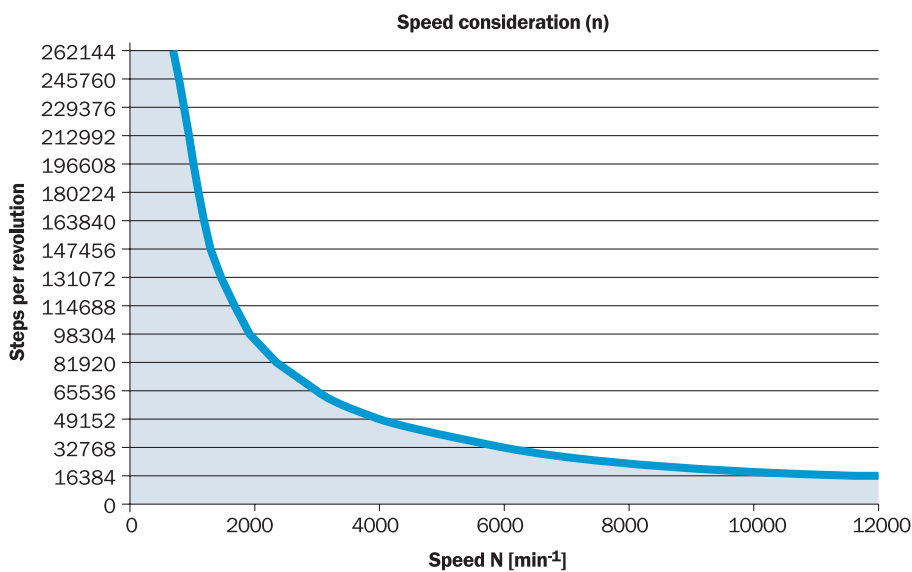
| | E | B | A |
|--|---------------------------------------|----------------------|----------------------|
| EMC ¹⁾ | acc. to EN 61000-6-2 and EN 61000-6-3 | | |
| Protection class acc. IEC 60529 | | | |
| Shaft side | IP 65 | | |
| Housing side connector outlet ²⁾ | IP 67 | | |
| Housing side cable outlet | IP 67 | | |
| Permissible relative humidity ³⁾ | 90 % | | |
| Working temperature range | 0 ... +85 °C | -30 ... +100 °C | |
| Storage temperature range (without packaging) | -40 ... +100 °C | | |
| Resistance | | | |
| to shocks (EN 60068-2-27) | 50 g/6 ms | 70 g/6 ms | 60 g/6 ms |
| to vibration (EN 60068-2-6) | 20 g/10 ... 2,000 Hz | 30 g/10 ... 2,000 Hz | 20 g/10 ... 2,000 Hz |

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

²⁾ When the mating connector is fitted.

³⁾ Condensation of the optical scanning not permitted.

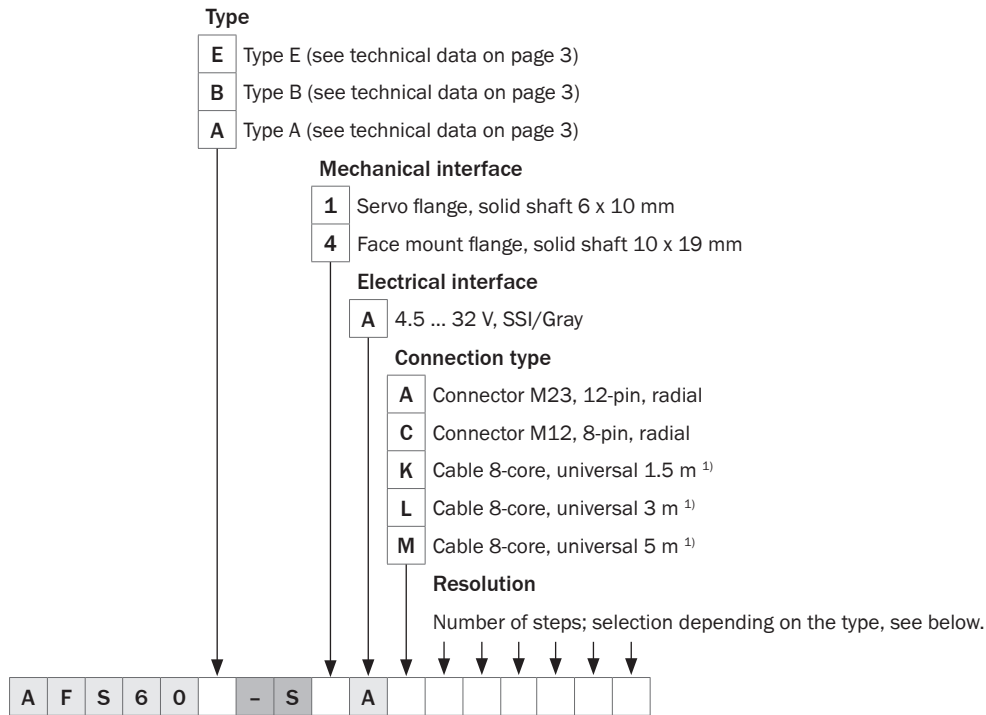
Maximum speed consideration dependent on the selected number of steps per revolution.



The maximum speed is also dependent on the shaft type. See "Mechanical data" on page 3.

Ordering information

Type code AFS60 SSI Absolute Encoder Singleturn, solid shaft



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.

Number of lines per revolution

- Type E

| | | | | | |
|---------------|-------|---------------|--------|---------------|--------|
| 000256 | 8 Bit | 001024 | 10 Bit | 004096 | 12 Bit |
| 000512 | 9 Bit | 002048 | 11 Bit | | |

- Type B ¹⁾

| | | | | | |
|---------------|--------|---------------|--------|---------------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | | |

¹⁾ Others on request

- Type A ¹⁾

| | | | | | | | |
|---------------|--------|---------------|--------|---------------|--------|---------------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit | 131072 | 17 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit | 262144 | 18 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | 065536 | 16 Bit | | |

¹⁾ Others on request

Ordering examples

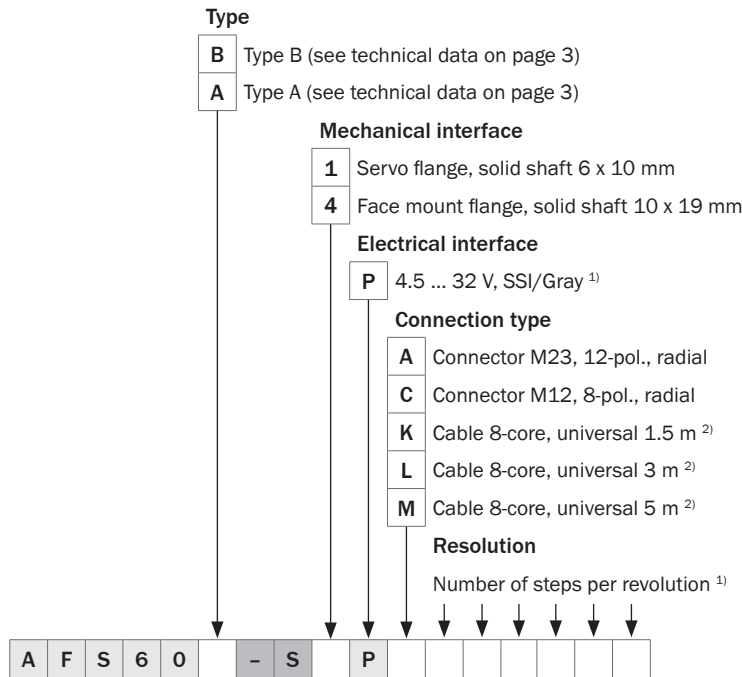
- Servo flange

| Mechanical interface servo flange | Model name |
|--|-------------------|
| Type E, connector M12, 8-pin, radial, number of lines per revolution 1024 (10 Bit) | AFS60E-S1AC001024 |

- Face mount flange

| Mechanical interface face mount flange | Model name |
|--|-------------------|
| Type E, connector M12, 8-pin, radial, number of lines per revolution 1024 (10 Bit) | AFS60E-S4AC001024 |

Type code AFS60 SSI Absolut-Encoder Singleturn, solid shaft, **programmable**



¹⁾ Number of steps of 2 to 262144 freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144.

²⁾ 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.

Ordering examples

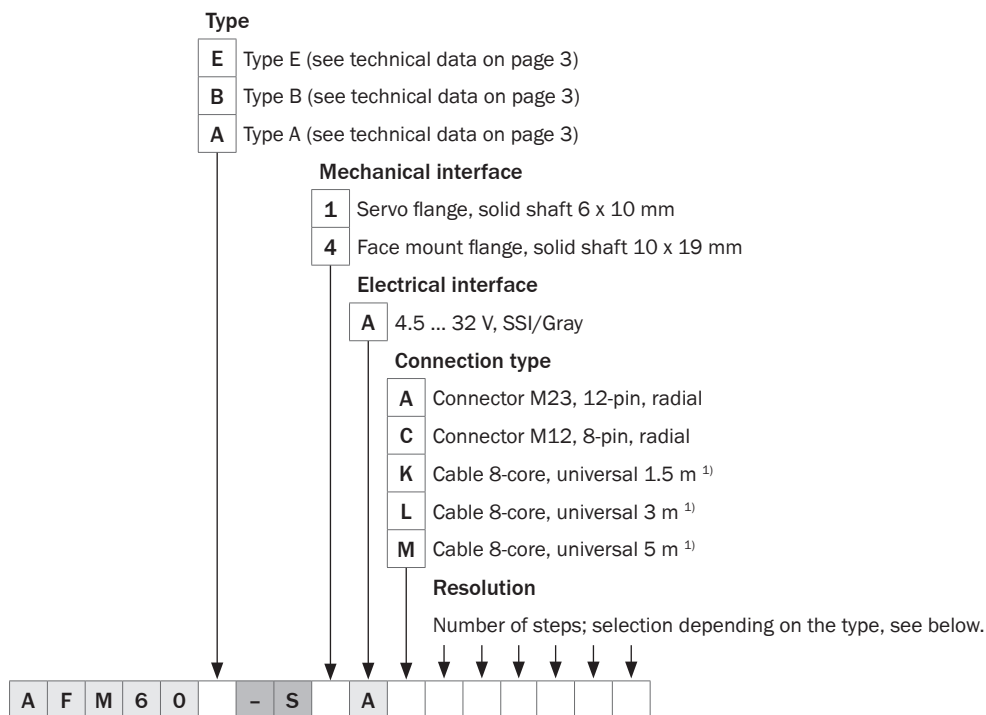
- Servo flange

| Mechanical interface servo flange | | Model name | Part no. |
|-----------------------------------|--|-------------------|----------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFS60B-S1PA032768 | 1037493 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFS60B-S1PC032768 | 1037494 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFS60B-S1PK032768 | 1037495 |
| | Cable 8-core, universal 3 m, number of lines per revolution 32768 | AFS60B-S1PL032768 | 1037496 |
| | Cable 8-core, universal 5 m, number of lines per revolution 32768 | AFS60B-S1PM032768 | 1037497 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFS60A-S1PA262144 | 1037498 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFS60A-S1PC262144 | 1037499 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFS60A-S1PK262144 | 1037500 |
| | Cable 8-core, universal 3 m, number of lines per revolution 262144 | AFS60A-S1PL262144 | 1037501 |
| | Cable 8-core, universal 5 m, number of lines per revolution 262144 | AFS60A-S1PM262144 | 1037502 |

- Face mount flange

| Mechanical interface face mount flange | | Model name | Part no. |
|--|--|-------------------|----------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFS60B-S4PA032768 | 1037483 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFS60B-S4PC032768 | 1037484 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFS60B-S4PK032768 | 1037485 |
| | Cable 8-core, universal 3 m, number of lines per revolution 32768 | AFS60B-S4PL032768 | 1037486 |
| | Cable 8-core, universal 5 m, number of lines per revolution 32768 | AFS60B-S4PM032768 | 1037487 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFS60A-S4PA262144 | 1037488 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFS60A-S4PC262144 | 1037489 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFS60A-S4PK262144 | 1037490 |
| | Cable 8-core, universal 3 m, number of lines per revolution 262144 | AFS60A-S4PL262144 | 1037491 |
| | Cable 8-core, universal 5 m, number of lines per revolution 262144 | AFS60A-S4PM262144 | 1037492 |

Type code AFM60 SSI/Gray Absolute Encoder Multiturn, 4,096 revolutions, solid shaft



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.

Number of lines per revolution x 4096 (12 Bit)

- Type E

| | | | | | |
|--------|-------|--------|--------|--------|--------|
| 000256 | 8 Bit | 001024 | 10 Bit | 004096 | 12 Bit |
| 000512 | 9 Bit | 002048 | 11 Bit | | |

- Type B

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | | |

- Type A

| | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit | 131072 | 17 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit | 262144 | 18 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | 065536 | 16 Bit | | |

Ordering examples

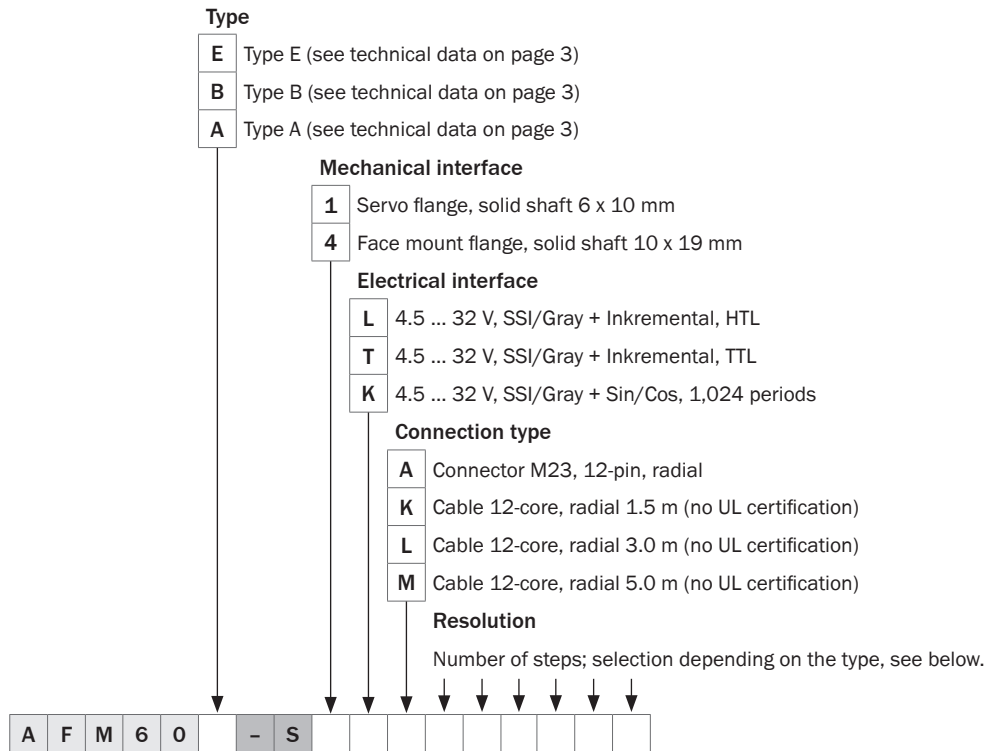
- Servo flange

| Mechanical interface servo flange | Model name |
|---|-------------------|
| Type E, cable 8-core, universal 1.5 m, number of lines per revolution 4096 (12 Bit) | AFM60E-S1AK004096 |

- Face mount flange

| Mechanical interface face mount flange | Model name |
|---|-------------------|
| Type E, cable 8-core, universal 1.5 m, number of lines per revolution 4096 (12 Bit) | AFM60E-S4AK004096 |

Type code AFM60 SSI/Gray + Incremental and SSI/Gray + Sin/Cos Absolute Encoder Multiturn, 4,096 revolutions, solid shaft



Number of lines per revolution x 4096 (12 Bit), number of incremental lines in brackets

- Type E

| | | | | | |
|--------|-------------|--------|--------------|--------|---------------|
| 000256 | 8 Bit (64) | 001024 | 10 Bit (256) | 004096 | 12 Bit (1024) |
| 000512 | 9 Bit (128) | 002048 | 11 Bit (512) | | |

- Type B

| | | | | | |
|--------|--------------|--------|---------------|--------|---------------|
| 000256 | 8 Bit (64) | 002048 | 11 Bit (512) | 016384 | 14 Bit (4096) |
| 000512 | 9 Bit (128) | 004096 | 12 Bit (1024) | 032768 | 15 Bit (8192) |
| 001024 | 10 Bit (256) | 008192 | 13 Bit (2048) | | |

- Type A

| | | | | | | | |
|--------|--------------|--------|---------------|--------|----------------|--------|----------------|
| 000256 | 8 Bit (64) | 002048 | 11 Bit (512) | 016384 | 14 Bit (4096) | 131072 | 17 Bit (32768) |
| 000512 | 9 Bit (128) | 004096 | 12 Bit (1024) | 032768 | 15 Bit (8192) | 262144 | 18 Bit (65536) |
| 001024 | 10 Bit (256) | 008192 | 13 Bit (2048) | 065536 | 16 Bit (16384) | | |

Ordering examples

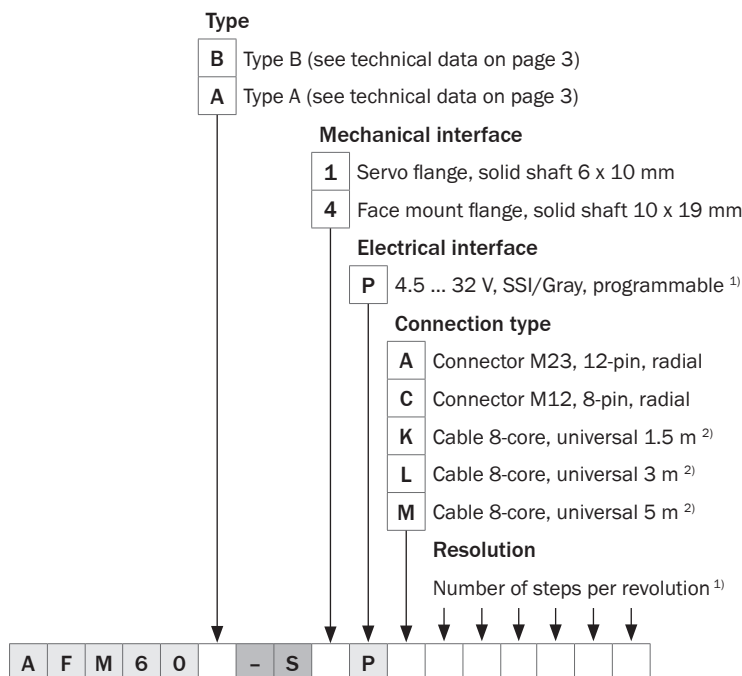
- Servo flange

| Mechanical interface servo flange | Model name |
|--|-------------------|
| Type E, 4.5 ... 32 V, SSI/Gray + Incremental, TTL, connector M23, 12-pin, radial, number of lines per revolution 2048 (11 Bit) | AFM60E-S1TA002048 |

- Face mount flange

| Mechanical interface face mount flange | Model name |
|--|-------------------|
| Type E, 4.5 ... 32 V, SSI/Gray + Incremental, TTL, connector M23, 12-pin, radial, number of lines per revolution 2048 (11 Bit) | AFM60E-S4TA002048 |

Type code AFM60 SSI/Gray Absolute Encoder Multiturn, 4,096 revolutions, solid shaft, **programmable**



¹⁾ Number of steps of 256 (8 Bit) to 262144 (18 Bit) freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144.

²⁾ 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.

Ordering examples

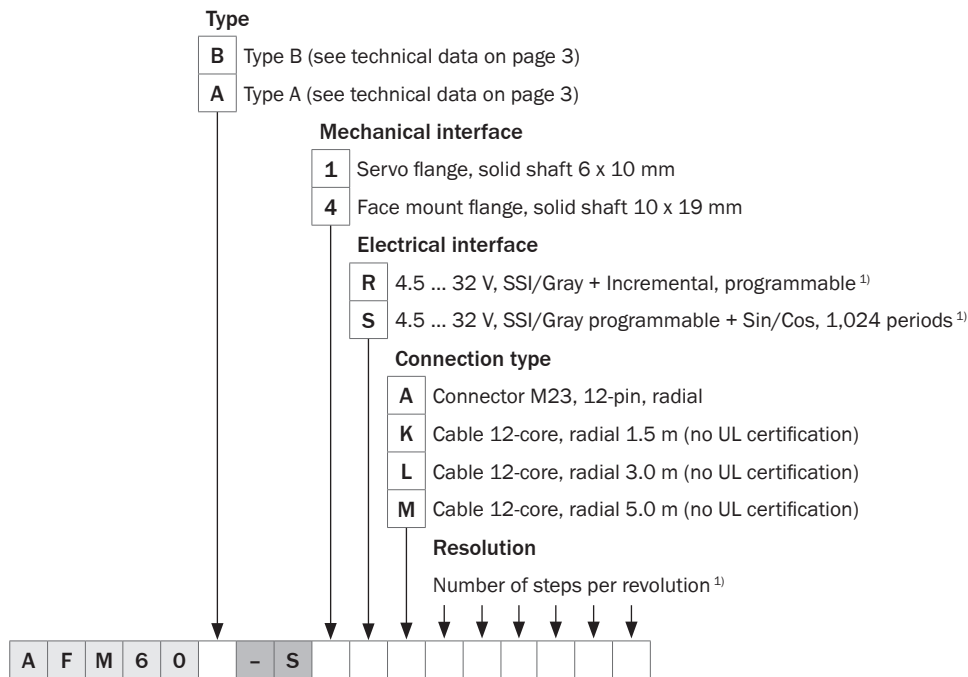
- Servo flange

| Mechanical interface servo flange | | Model name | Part no. |
|-----------------------------------|--|-------------------|----------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S1PA032768 | 1037513 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFM60B-S1PC032768 | 1037514 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFM60B-S1PK032768 | 1037515 |
| | Cable 8-core, universal 3 m, number of lines per revolution 32768 | AFM60B-S1PL032768 | 1037516 |
| | Cable 8-core, universal 5 m, number of lines per revolution 32768 | AFM60B-S1PM032768 | 1037517 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S1PA262144 | 1037518 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFM60A-S1PC262144 | 1037519 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFM60A-S1PK262144 | 1037520 |
| | Cable 8-core, universal 3 m, number of lines per revolution 262144 | AFM60A-S1PL262144 | 1037521 |
| | Cable 8-core, universal 5 m, number of lines per revolution 262144 | AFM60A-S1PM262144 | 1037522 |

- Face mount flange

| Mechanical interface face mount flange | | Model name | Part no. |
|--|--|-------------------|----------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S4PA032768 | 1037503 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFM60B-S4PC032768 | 1037504 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFM60B-S4PK032768 | 1037505 |
| | Cable 8-core, universal 3 m, number of lines per revolution 32768 | AFM60B-S4PL032768 | 1037506 |
| | Cable 8-core, universal 5 m, number of lines per revolution 32768 | AFM60B-S4PM032768 | 1037507 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S4PA262144 | 1037508 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFM60A-S4PC262144 | 1037509 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFM60A-S4PK262144 | 1037510 |
| | Cable 8-core, universal 3 m, number of lines per revolution 262144 | AFM60A-S4PL262144 | 1037511 |
| | Cable 8-core, universal 5 m, number of lines per revolution 262144 | AFM60A-S4PM262144 | 1037512 |

Type code AFM60 SSI/Gray + Incremental and SSI/Gray + Sin/Cos Absolute Encoder Multiturn, 4,096 revolutions, solid shaft, **programmable**



¹⁾ Number of steps of 256 (8 Bit) to 262144 (18 Bit) freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144. Number of incremental lines is always 1/4 of number of SSI/Gray steps.

Ordering examples

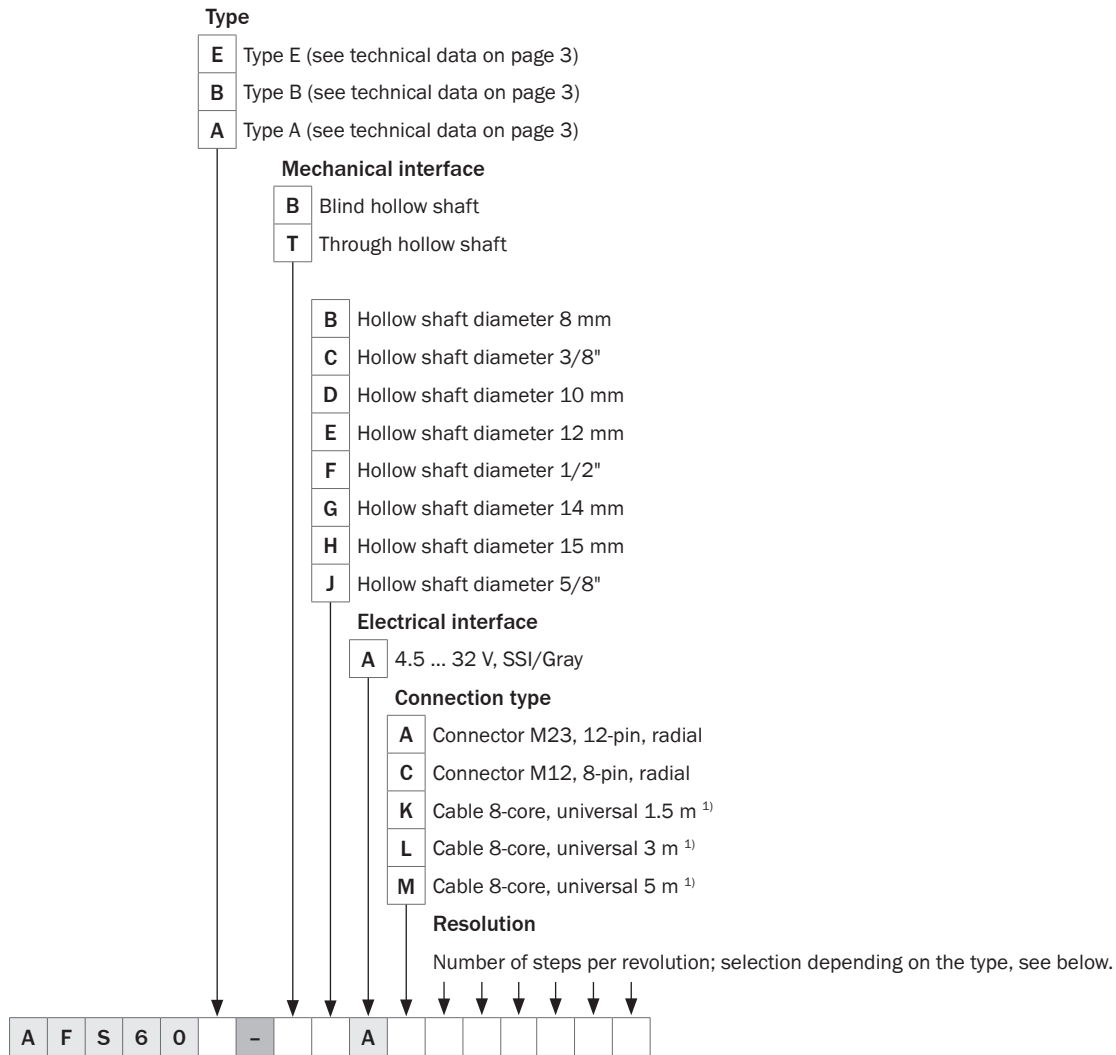
- Servo flange

| | Mechanical interface servo flange | Model name | Part no. |
|--------|--|-------------------|----------|
| Type B | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S1RA032768 | 1052835 |
| Type A | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S1RA262144 | 1052837 |
| Type B | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S1SA032768 | 1054220 |
| Type A | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S1SA262144 | 1054219 |

- Face mount flange

| | Mechanical interface face mount flange | Model name | Part no. |
|--------|--|-------------------|----------|
| Type B | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S4RA032768 | 1052833 |
| Type A | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S4RA262144 | 1052624 |
| Type B | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-S4SA032768 | 1054222 |
| Type A | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-S4SA262144 | 1054221 |

Type code AFS60 SSI Absolute Encoder Singleturn, hollow shaft



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.

Number of lines per revolution

- Type E

| | | | | | |
|--------|-------|--------|--------|--------|--------|
| 000256 | 8 Bit | 001024 | 10 Bit | 004096 | 12 Bit |
| 000512 | 9 Bit | 002048 | 11 Bit | | |

- Type B ¹⁾

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | | |

¹⁾ Others on request

- Type A ¹⁾

| | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit | 131072 | 17 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit | 262144 | 18 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | 065536 | 16 Bit | | |

¹⁾ Others on request

Ordering examples

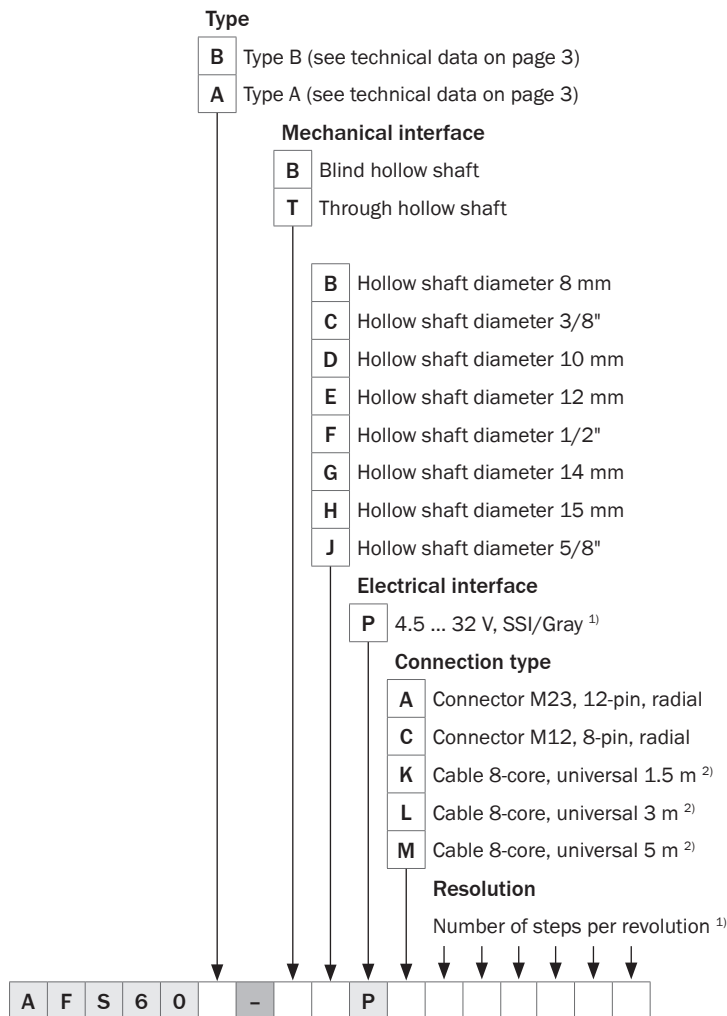
- Blind hollow shaft

| Mechanical interface blind hollow shaft | Model name |
|--|-------------------|
| Type E, hollow shaft diameter 8 mm, connector M12, 8-pin, radial, number of lines per revolution 1024 (10 Bit) | AFS60E-BBAC001024 |

- Through hollow shaft

| Mechanical interface through hollow shaft | Model name |
|--|-------------------|
| Type E, hollow shaft diameter 8 mm, connector M12, 8-pin, radial, number of lines per revolution 1024 (10 Bit) | AFS60E-TBAC001024 |

Type code AFS60 SSI Absolute Encoder Singleturn, hollow shaft, **programmable**



¹⁾ Number of steps of 2 to 262144 freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144.

²⁾ 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.

Ordering examples¹⁾

- Blind hollow shaft

| Mechanical interface blind hollow shaft | | Model name |
|---|--|-------------------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFS60B-BxPA032768 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFS60B-BxPC032768 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFS60B-BxPK032768 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFS60A-BxPA262144 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFS60A-BxPC262144 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFS60A-BxPK262144 |

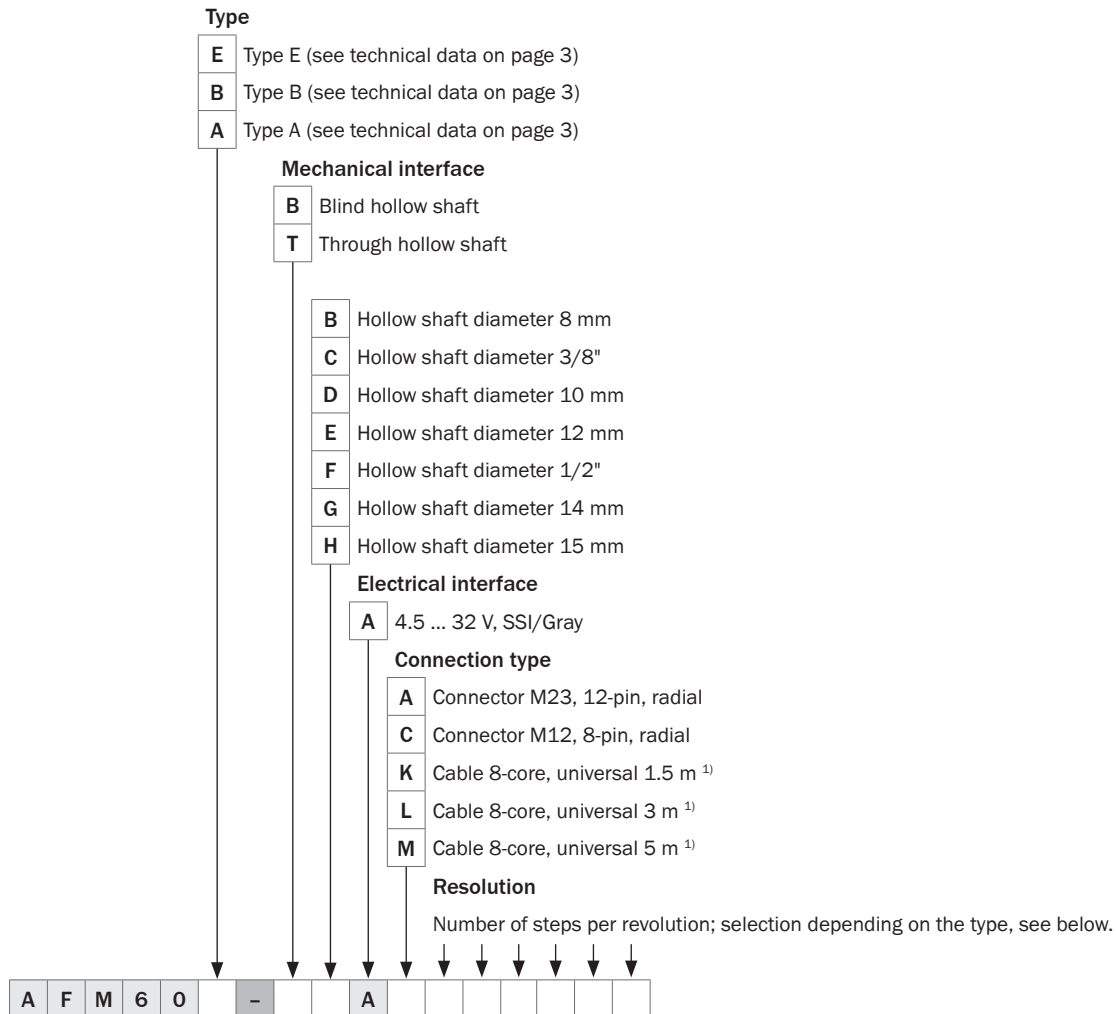
¹⁾ x stands for hollow shaft diameter B to J, put in the corresponding letter at point 9.

- Through hollow shaft

| Mechanical interface through hollow shaft | | Model name |
|---|--|-------------------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFS60B-TxPA032768 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFS60B-TxPC032768 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFS60B-TxPK032768 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFS60A-TxPA262144 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFS60A-TxPC262144 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFS60A-TxPK262144 |

¹⁾ x stands for hollow shaft diameter B to J, put in the corresponding letter at point 9.

Type code AFM60 SSI/Gray Absolute Encoder Multiturn, 4,096 revolutions, hollow shaft



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.

Number of lines per revolution x 4096 (12 Bit)

- Type E

| | | | | | |
|--------|-------|--------|--------|--------|--------|
| 000256 | 8 Bit | 001024 | 10 Bit | 004096 | 12 Bit |
| 000512 | 9 Bit | 002048 | 11 Bit | | |

- Type B

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | | |

- Type A

| | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|
| 000256 | 8 Bit | 002048 | 11 Bit | 016384 | 14 Bit | 131072 | 17 Bit |
| 000512 | 9 Bit | 004096 | 12 Bit | 032768 | 15 Bit | 262144 | 18 Bit |
| 001024 | 10 Bit | 008192 | 13 Bit | 065536 | 16 Bit | | |

Ordering examples

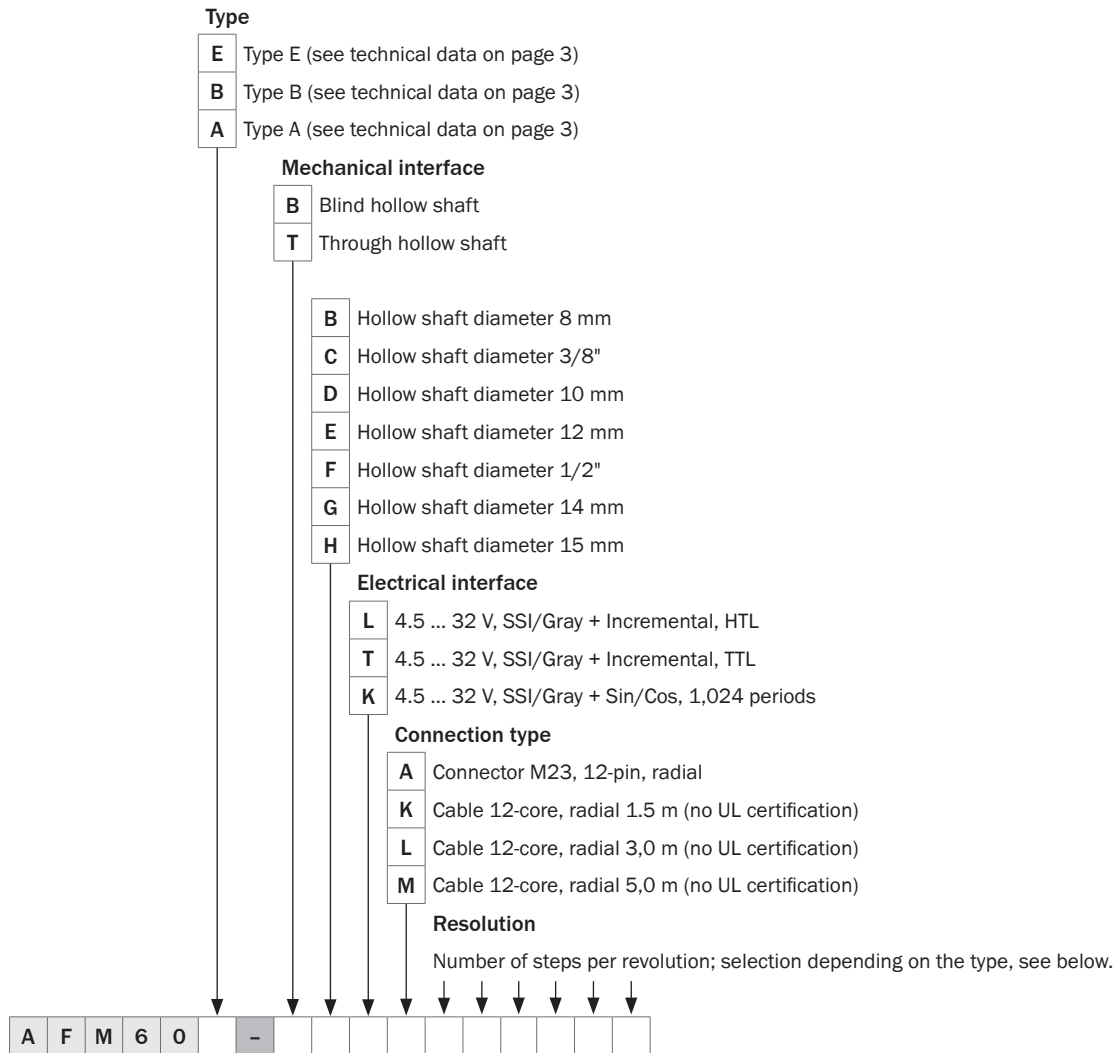
- Blind hollow shaft

| Mechanical interface blind hollow shaft | Model name |
|---|-------------------|
| Type E, hollow shaft diameter 8 mm, cable 8-core, universal 1.5 m, number of lines per revolution 4096 (12 Bit) | AFM60E-BBAK004096 |

- Through hollow shaft

| Mechanical interface through hollow shaft | Model name |
|---|-------------------|
| Type E, hollow shaft diameter 8 mm, cable 8-core, universal 1.5 m, number of lines per revolution 4096 (12 Bit) | AFM60E-TBAK004096 |

Type code AFM60 SSI/Gray + Incremental and SSI/Gray + Sin/Cos Absolute Encoder Multiturn, 4,096 revolutions, hollow shaft



Number of lines per revolution x 4096 (12 Bit), number of incremental lines in brackets

• Type E

| | | | | | |
|---------------|-------------|---------------|--------------|---------------|---------------|
| 000256 | 8 Bit (64) | 001024 | 10 Bit (256) | 004096 | 12 Bit (1024) |
| 000512 | 9 Bit (128) | 002048 | 11 Bit (512) | | |

• Type B

| | | | | | |
|---------------|--------------|---------------|---------------|---------------|---------------|
| 000256 | 8 Bit (64) | 002048 | 11 Bit (512) | 016384 | 14 Bit (4096) |
| 000512 | 9 Bit (128) | 004096 | 12 Bit (1024) | 032768 | 15 Bit (8192) |
| 001024 | 10 Bit (256) | 008192 | 13 Bit (2048) | | |

• Type A

| | | | | | | | |
|---------------|--------------|---------------|---------------|---------------|----------------|---------------|----------------|
| 000256 | 8 Bit (64) | 002048 | 11 Bit (512) | 016384 | 14 Bit (4096) | 131072 | 17 Bit (32768) |
| 000512 | 9 Bit (128) | 004096 | 12 Bit (1024) | 032768 | 15 Bit (8192) | 262144 | 18 Bit (65536) |
| 001024 | 10 Bit (256) | 008192 | 13 Bit (2048) | 065536 | 16 Bit (16384) | | |

Ordering examples

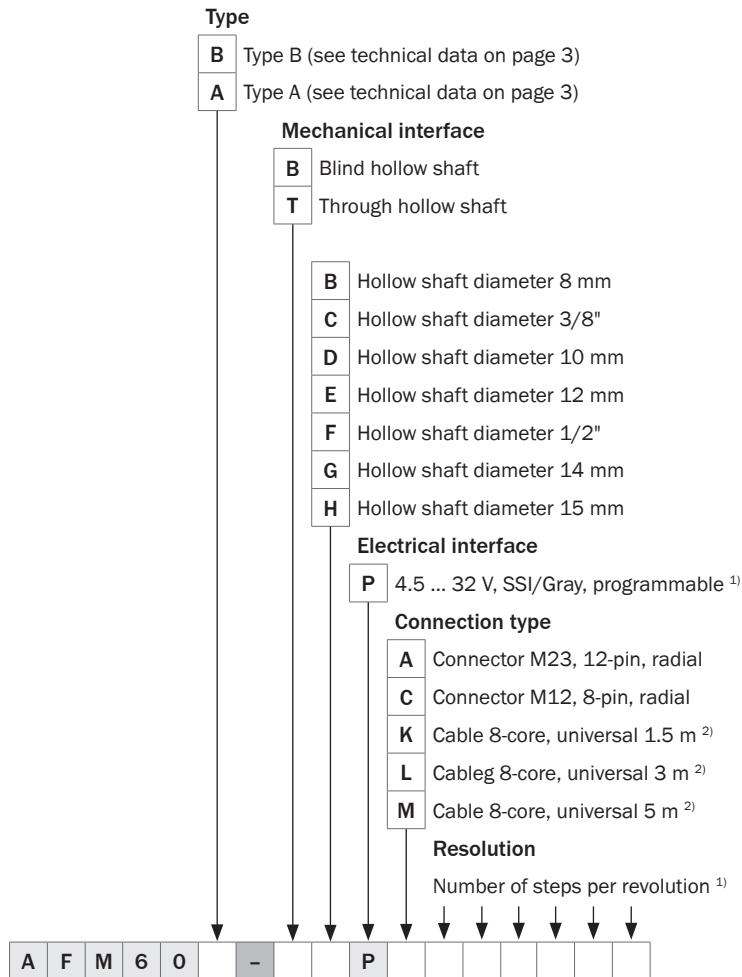
- Blind hollow shaft

| Mechanical interface blind hollow shaft | Model name |
|--|-------------------|
| Type E, hollow shaft diameter 8 mm, 4.5 ... 32 V, SSI/Gray + Incremental, TTL, connector M23, 12-pin, radial, number of lines per revolution 2048 (11 Bit) | AFM60E-BBTA002048 |

- Through hollow shaft

| Mechanical interface through hollow shaft | Model name |
|--|-------------------|
| Type E, hollow shaft diameter 8 mm, 4.5 ... 32 V, SSI/Gray + Incremental, TTL, connector M23, 12-pin, radial, number of lines per revolution 2048 (11 Bit) | AFM60E-TBTA002048 |

Type code AFM60 SSI/Gray Absolute Encoder Multiturn, 4,096 revolutions, hollow shaft, **programmable**



¹⁾ Number of steps of 256 (8 Bit) to 262144 (18 Bit) freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144.

²⁾ 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.

Ordering examples¹⁾

- Blind hollow shaft

| Mechanical interface blind hollow shaft | | Model name |
|---|--|-------------------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-BxPA032768 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFM60B-BxPC032768 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFM60B-BxPK032768 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-BxPA262144 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFM60A-BxPC262144 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFM60A-BxPK262144 |

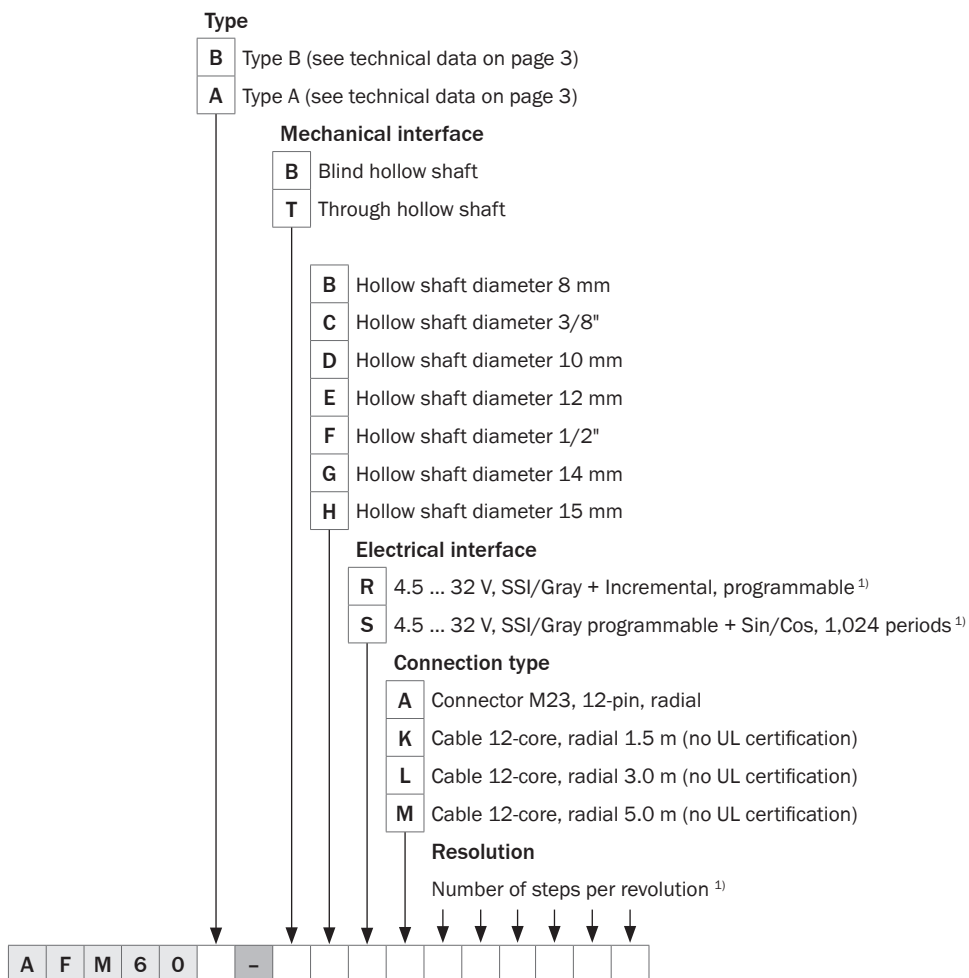
¹⁾ x stands for hollow shaft diameter B to H, put in the corresponding letter at point 9.

- Through hollow shaft

| Mechanical interface through hollow shaft | | Model name |
|---|--|-------------------|
| Type B | Connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-TxPA032768 |
| | Connector M12, 8-pin, radial, number of lines per revolution 32768 | AFM60B-TxPC032768 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 32768 | AFM60B-TxPK032768 |
| Type A | Connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-TxPA262144 |
| | Connector M12, 8-pin, radial, number of lines per revolution 262144 | AFM60A-TxPC262144 |
| | Cable 8-core, universal 1.5 m, number of lines per revolution 262144 | AFM60A-TxPK262144 |

¹⁾ x stands for hollow shaft diameter B to H, put in the corresponding letter at point 9.

Type code AFM60 SSI/Gray + Incremental and SSI/Gray + Sin/Cos Absolute Encoder Multiturn, 4,096 revolutions, hollow shaft, **programmable**



¹⁾ Number of steps of 256 (8 Bit) to 262144 (18 Bit) freely programmable by customer. Factory-programmed to Type B: 032768; Type A: 262144. Number of incremental lines is always 1/4 of number of SSI/Gray steps.

Ordering examples¹⁾

- Blind hollow shaft

| Mechanical interface blind hollow shaft | | Model name |
|---|--|-------------------|
| Type B | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-BxRA032768 |
| Type A | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-BxRA262144 |
| Type B | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-BxSA032768 |
| Type A | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-BxSA262144 |

¹⁾ x stands for hollow shaft diameter B to H, put in the corresponding letter at point 9.

- Through hollow shaft

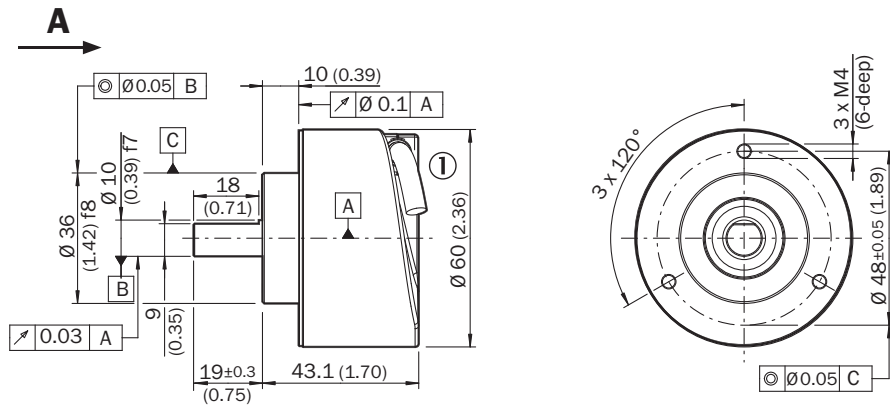
| Mechanical interface through hollow shaft | | Model name |
|---|--|-------------------|
| Type B | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-TxRA032768 |
| Type A | 4.5 ... 32 V, SSI/Gray + Incremental, programmable, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-TxRA262144 |
| Type B | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 32768 | AFM60B-TxSA032768 |
| Type A | 4.5 ... 32 V, SSI/Gray programmable + Sin/Cos, 1,024 periods, connector M23, 12-pin, radial, number of lines per revolution 262144 | AFM60A-TxSA262144 |

¹⁾ x stands for hollow shaft diameter B to H, put in the corresponding letter at point 9.

Dimensional drawings

Face mount flange

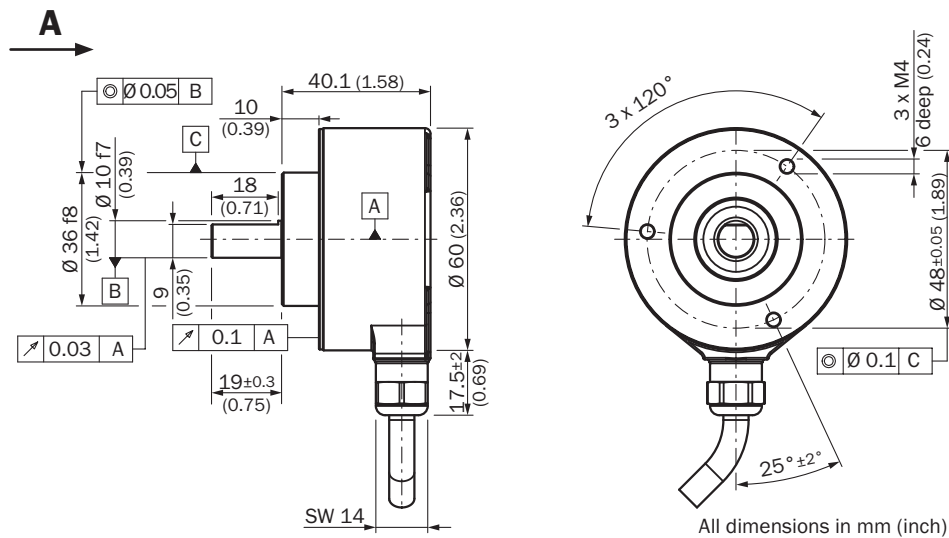
Cable outlet universal



All dimensions in mm (inch)

① Cable- $\varnothing = 5.6 \pm 0.2$ mm, bending radius $R = 30$ mm
 General tolerances according to DIN ISO 2768-mk

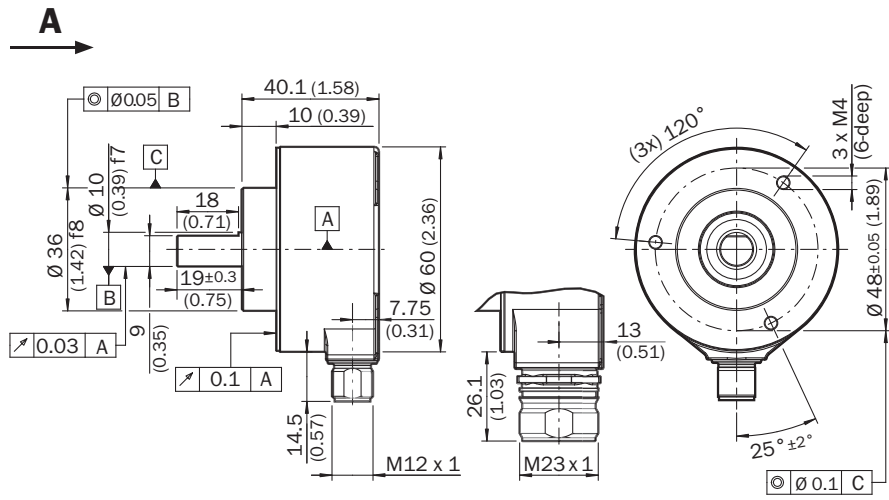
Cable outlet radial for AFM60 SSI + Incremental and AFM60 SSI + Sin/Cos



All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

Connector outlet M12 and M23

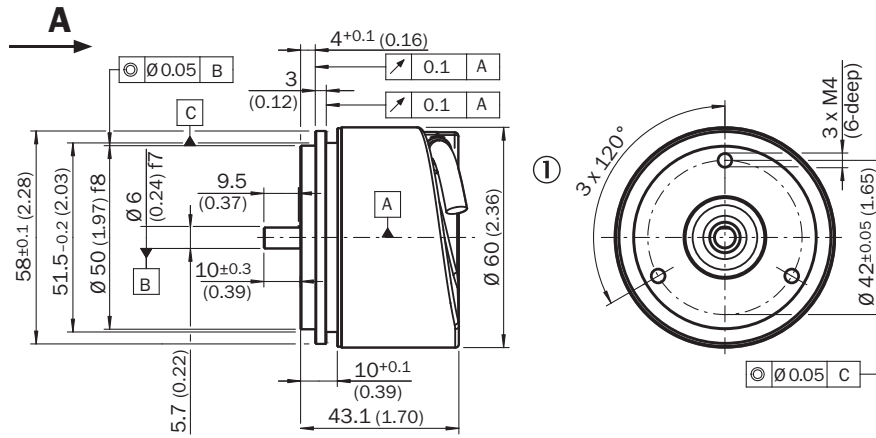


All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

Servo flange

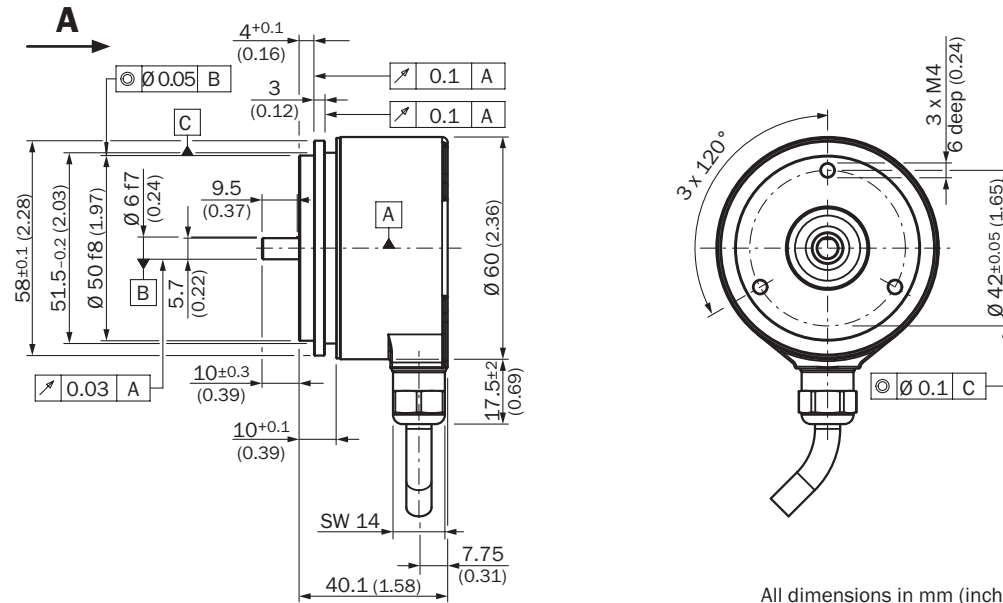
Cable outlet universal



All dimensions in mm (inch)

① Cable- $\varnothing = 5.6 \pm 0.2$ mm, bending radius R = 30 mm
 General tolerances according to DIN ISO 2768-mk

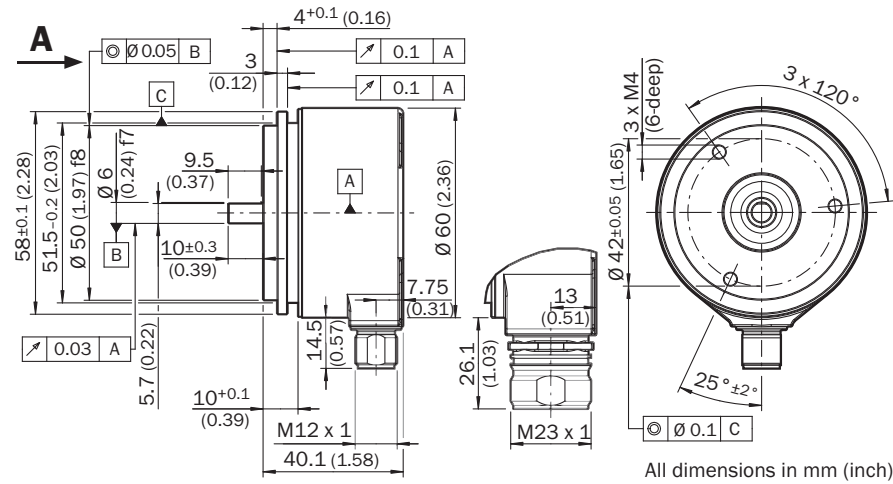
Cable outlet radial for AFM60 SSI + Incremental and AFM60 SSI + Sin/Cos



All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

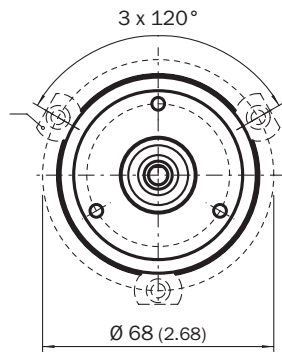
Connector outlet M12 and M23



All dimensions in mm (inch)

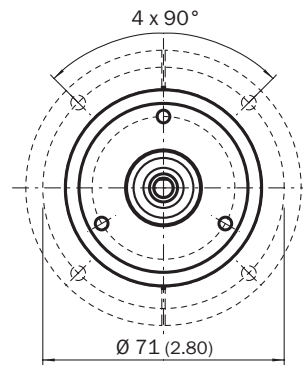
General tolerances according to DIN ISO 2768-mk

Proposed customer fitting for servo clamp small (part no. 2029166)



All dimension in mm (inch)

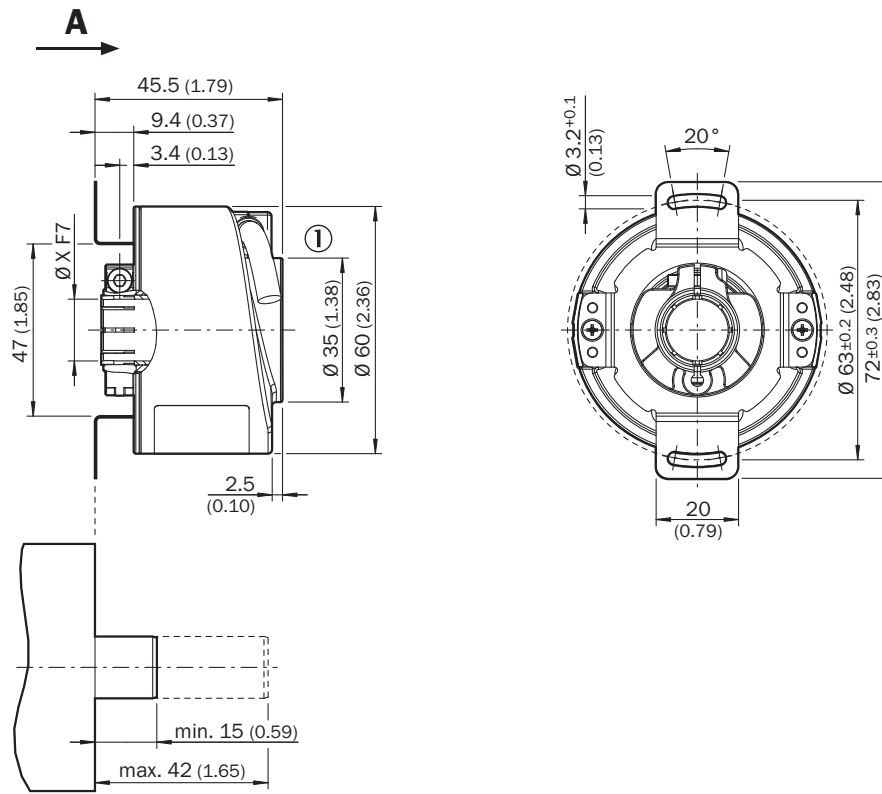
Proposed customer fitting for servo clamp half-shell (part no. 2029165)



All dimensions in mm (inch)

Blind hollow shaft

Cable outlet universal



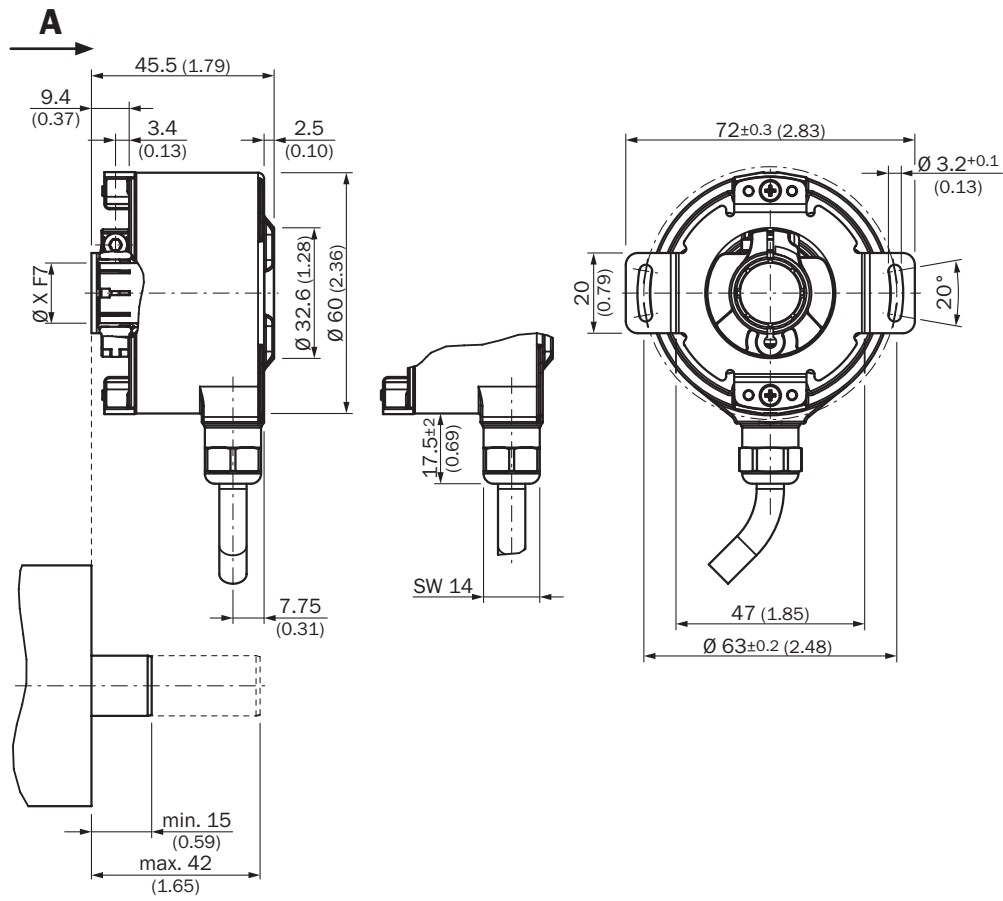
Customer-side

General tolerances according to DIN ISO 2768-mk

① Cable- $\varnothing = 5.6 \pm 0.2$ mm, bending radius R = 30 mm

All dimensions in mm (inch)

Cable outlet radial for AFM60 SSI + Incremental and AFM60 SSI + Sin/Cos

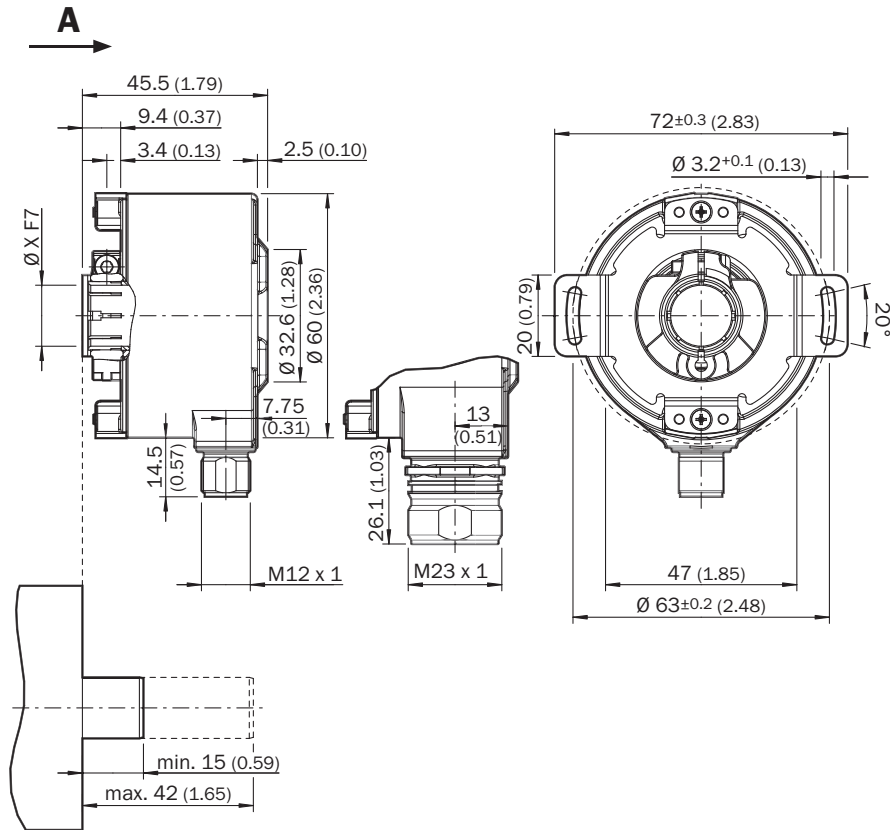


Customer-side

General tolerances according to DIN ISO 2768-mk

All dimensions in mm (inch)

Connector outlet M12 and M23



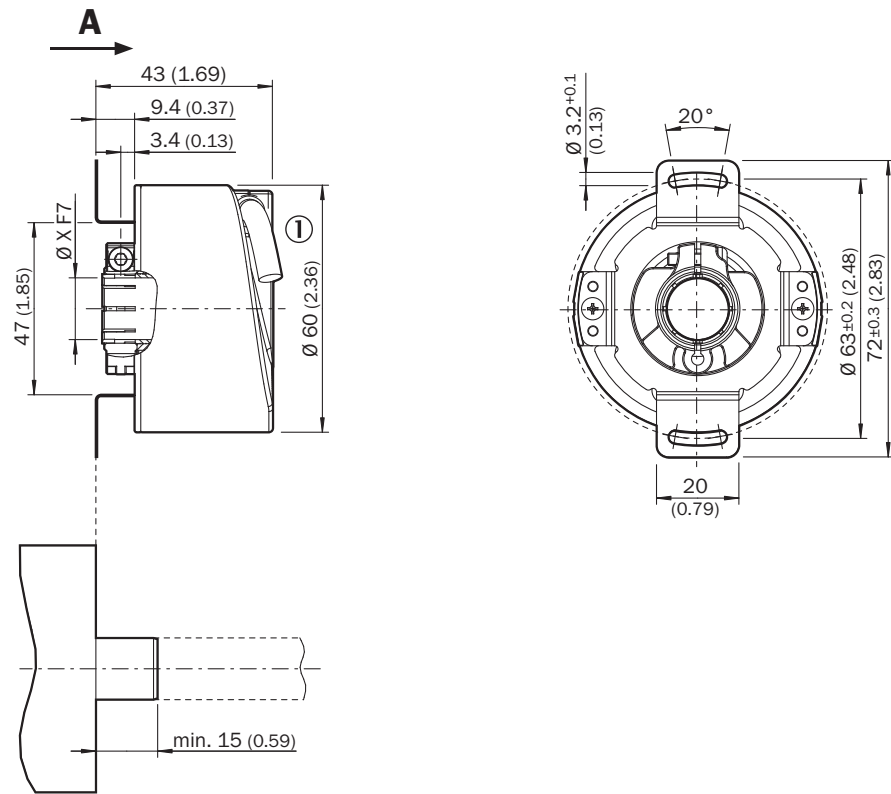
Customer-side

General tolerances according to DIN ISO 2768-mk

All dimensions in mm (inch)

Through hollow shaft

Cable outlet universal



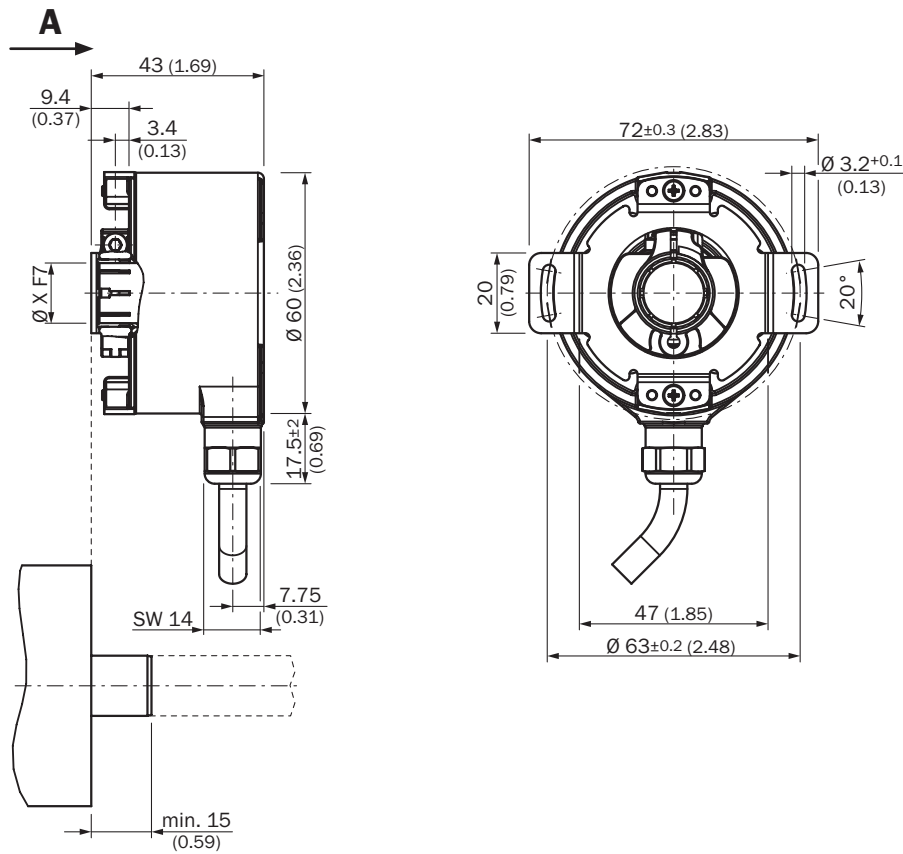
Customer-side

General tolerances according to DIN ISO 2768-mk

① Cable- $\varnothing = 5.6 \pm 0.2$ mm, bending radius $R = 30$ mm

All dimensions in mm (inch)

Cable outlet radial for AFM60 SSI + Incremental and AFM60 SSI + Sin/Cos

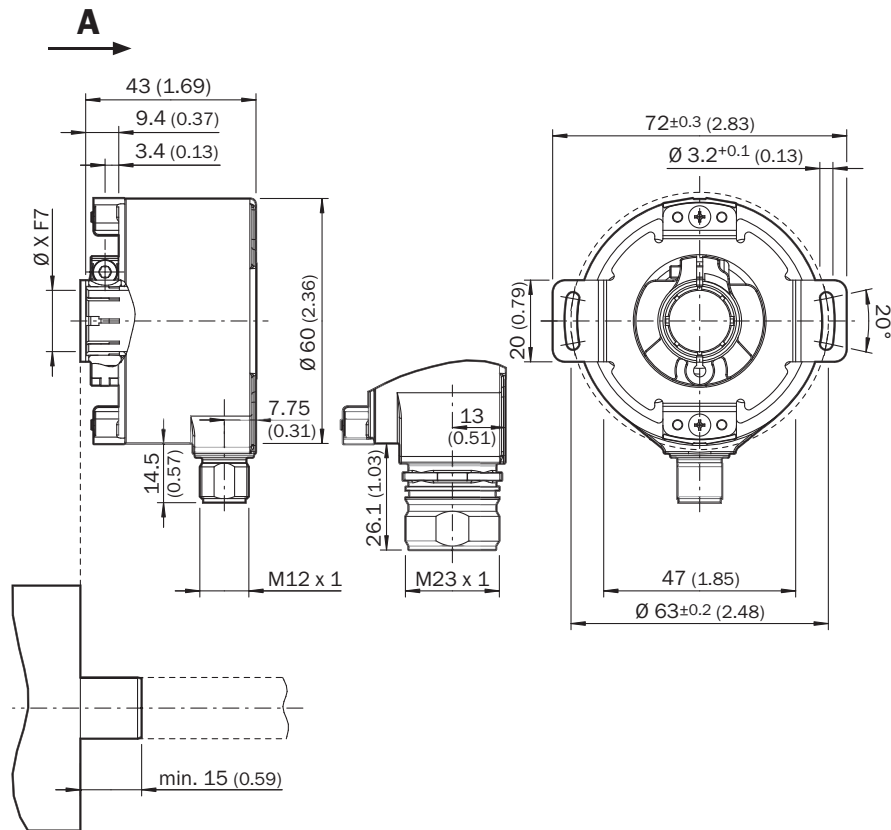


Customer-side

General tolerances according to DIN ISO 2768-mk

All dimensions in mm (inch)

Connector outlet M12 and M23



Customer-side

General tolerances according to DIN ISO 2768-mk

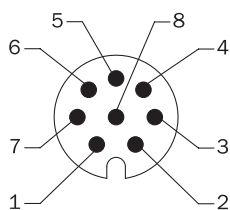
All dimensions in mm (inch)

Pin and wire allocation

CW/ $\overline{\text{CCW}}$ Forward/reverse: This input programs the counting direction of the encoder. If not connected, this input is "HIGH". If the encoder shaft, as viewed on the drive shaft, rotates in the clockwise direction, it counts in an increasing sequence. If it should count upwards when the shaft rotates in the anti-clockwise direction, this connection must be connected permanently to "LOW" level (zero volts).

SET This input activates the electronic zero set. When the SET line is connected to US for more than 250 ms, after it was not connected for at least 1000 ms or connected to GND, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

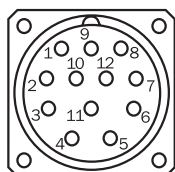
Connector M12, 8-pin and cable outlet, cable 8-core SSI/Gray



View to the connector M12 fitted to the encoder body

| Pin | Color wires | Signal SSI | Explanation |
|-----|-------------|-----------------------------|--|
| 1 | Brown | Data- | Interface signals |
| 2 | White | Data+ | Interface signals |
| 3 | Black | CW/ $\overline{\text{CCW}}$ | Counting sequence when turning |
| 4 | Pink | SET | Electronic adjustment |
| 5 | Yellow | Clock+ | Interface signals |
| 6 | Lilac | Clock- | Interface signals |
| 7 | Blue | GND | Ground connection |
| 8 | Red | +U _s | Supply voltage |
| | | Screen | Screen on the encoder side connected to the housing. On the control side connected to earth. |

Connector M23, 12-pin SSI/Gray



View to the connector M23 fitted to the encoder body

| 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 |

| Pin | Signal | Explanation |
|-----|-----------------------------|--|
| 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**

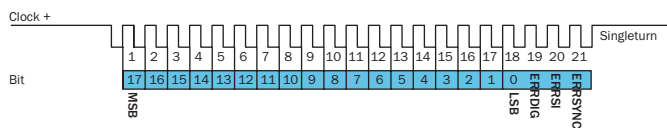
| Pin | Color wires | Signal | Explanation |
|-----|--------------|-----------------------------|--|
| 1 | Red | +U _s | Supply voltage |
| 2 | Blue | GND | Ground connection |
| 3 | Yellow | Clock+ | Interface signal |
| 4 | White | Data+ | Interface signal |
| 5 | Orange | SET | Electronic adjustment |
| 6 | Brown | Data- | Interface signal |
| 7 | Violet | Clock- | Interface signal |
| 8 | Black | $\overline{\text{B}}$ | Signal line |
| 9 | Orange/black | CW/ $\overline{\text{CCW}}$ | Counting sequence when turning |
| 10 | Green | $\overline{\text{A}}$ | 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. |

Output signals

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.

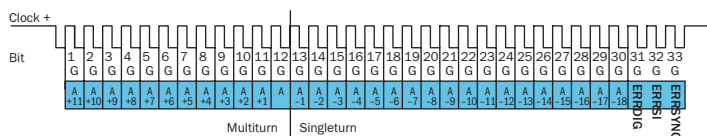
The provided error bits don't have to be used by the PLC compulsorily.

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.

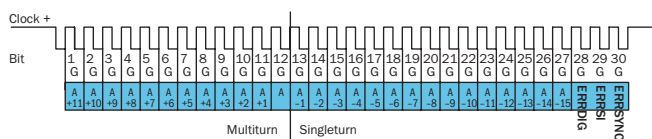
SSI data format Multiturn

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.

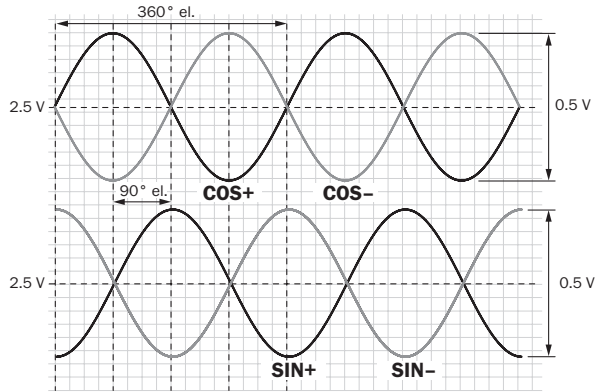
Interfaces

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 $U_s = 5 V$

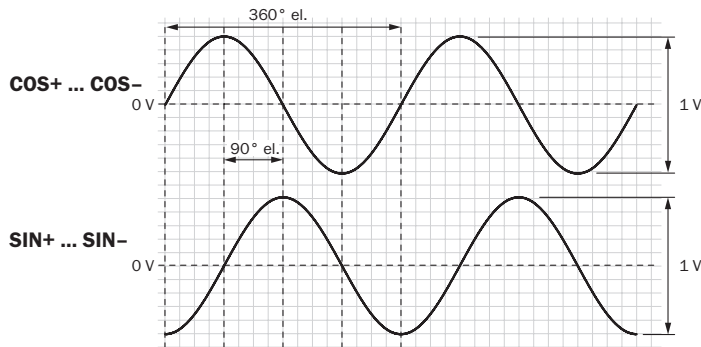
Signal diagram for clockwise rotation of the shaft looking in direction "A" (shaft)



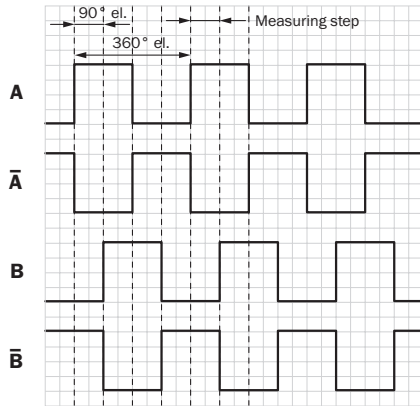
| Interface signals $\text{Sin}, \overline{\text{Sin}}, \text{Cos}, \overline{\text{Cos}}$ | Signal before differential generation at load 120Ω | Signal offset |
|--|--|-------------------|
| Analog differential | $0.5 V_{pp} \pm 20 \%$ | $2.5 V \pm 10 \%$ |

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)




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



Accessories

Programming Tools

| | Description | Model name | Part no. |
|---|---|------------|----------|
|  | Programming Tool for AFS60/AFM60 (connection to commercially available PCs or notebooks) | PGT-08-S | 1036616 |

Adapter cable for Programming Tools

For programming SICK Absolute Encoders with M12 or M23 connectors the following adapter cables are appropriate:

CAUTION: Attempting to programme an AFS/AFM60 Absolute Encoder with the adapter cables intended for use with the DFS60 incremental encoder will cause damage to the Absolute Encoder. Please ensure the correct adapter cable is used!

| Description | Model name | Part no. |
|---|------------------|----------|
| Adapter cable absolute SSI – PGT-08-S consists of male 9-pin SUB-D connector and M12 8-pin inline cable connector, pre-assembled using 8-core cable, 4 x 2 x 0.08 mm ² , screened, cable length 0.5 m | DSL-2D08-G0M5AC2 | 2048439 |
| Adapter cable absolute SSI – PGT-08-S consists of male 9-pin SUB-D connector and M23 12-pin inline cable connector, pre-assembled using 8-core cable, 4 x 2 x 0.15 mm ² , screened, cable length 0.5 m | DSL-3D08-G0M5AC2 | 2048440 |
| Adapter cable absolute SSI + incremental and SSI + Sin/Cos – PGT-08-S consists of male 9-pin SUB-D connector and M23 12-pin inline cable connector, pre-assembled using 8-core cable, 4 x 2 x 0.15 mm ² , screened, cable length 0.5 m | DSL-3D08-G0M5AC4 | 2059270 |

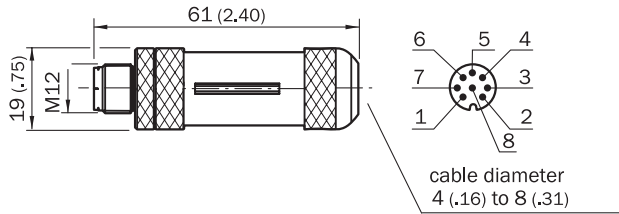
Plug connector and cables

Round screw system M12

- Straight, screened, for field assembly (adapter side)

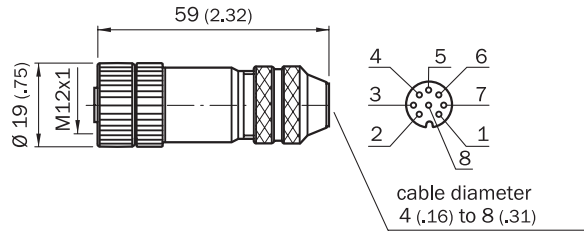
| Contacts | Cable diameter | Description | Model name | Part no. |
|----------|----------------|-----------------|---------------|----------|
| 8 | 4 ... 8 mm | Cable connector | STE-1208-GA01 | 6044892 |
| | | Cable socket | DOS-1208-GA01 | 6045001 |

STE-1208-GA01



All dimensions in mm (inch)

DOS-1208-GA01

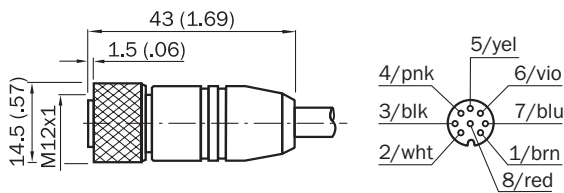


All dimensions in mm (inch)

- Straight, screened

| Description | Cable length | Model name | Part no. |
|---|--------------|------------------|----------|
| Cable socket, 8-pin straight, fitted with 8-core cable, 4 x 2 x 0.25 mm ² , shielded, carrier-capable (on adapter) | 2.0 m | DOL-1208-G02MAC1 | 6032866 |
| | 5.0 m | DOL-1208-G05MAC1 | 6032867 |
| | 10.0 m | DOL-1208-G10MAC1 | 6032868 |
| | 20.0 m | DOL-1208-G20MAC1 | 6032869 |

DOL-1208-GxxMAC1



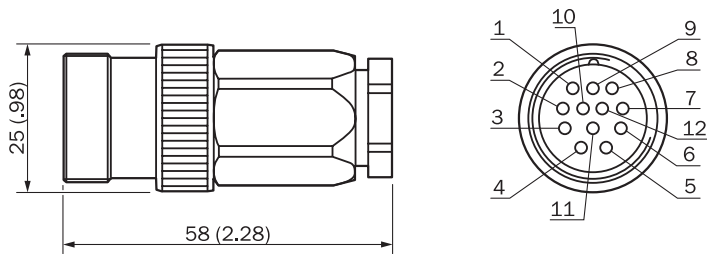
All dimensions in mm (inch)

Round screw system M23

- Straight, screened

| Kontakte | Description | Model name | Part no. |
|----------|-----------------|------------|----------|
| 12 | Cable connector | STE-2312-G | 6027537 |
| | Cable socket | DOS-2312-G | 6027538 |

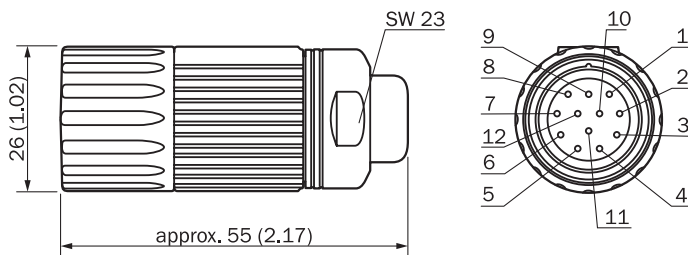
STE-2312-G



All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

DOS-2312-G

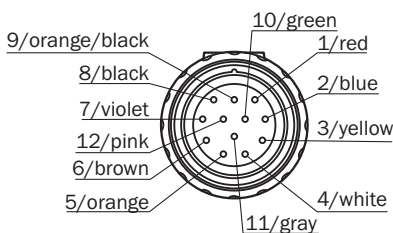


All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

| Description | Cable length | Model name | Part no. |
|---|--------------|------------------|----------|
| Cable socket M23, 8-pin, 4 x 2 x 0.15 mm ² , cable diameter 5.6 mm | 0.5 m | DOL-2308-G0M5AA6 | 2048595 |
| | 1.5 m | DOL-2308-G1M5AA6 | 2048596 |
| | 3.0 m | DOL-2308-G03MAA6 | 2048597 |
| | 5.0 m | DOL-2308-G05MAA6 | 2048598 |
| | 10.0 m | DOL-2308-G10MAA6 | 2048599 |

| Description | Cable length | Model name | Part no. |
|---|--------------|------------------|----------|
| Cable socket M23, 12-pin, straight, 12-core cable, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm ² shielded, carrier capable, cable diameter 7.8 mm for the electrical interfaces AFM60 SSI + Incremental and AFM60 SSI + Sin/Cos | 1.5 m | DOL-2312-G1M5MD2 | 2062284 |
| | 3.0 m | DOL-2312-G03MMD2 | 2062300 |
| | 5.0 m | DOL-2312-G05MMD2 | 2062301 |
| | 10.0 m | DOL-2312-G10MMD2 | 2062302 |
| | 20.0 m | DOL-2312-G20MMD2 | 2062303 |
| | 30.0 m | DOL-2312-G30MMD2 | 2062304 |



Cables

- With screening

| Cores | Cable diameter | Description | Cable length | Model name | Part no. |
|-------|----------------|---|--------------|----------------|----------|
| 8 | 5.6 mm | Cable, 4 x 2 x 0.15 mm ² , carrier-capable | Bulk goods | LTG-2308-MWENC | 6027529 |
| 12 | 7.8 mm | Cable 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm ² , carrier-capable, UV- and salt water resistant | Bulk goods | LTG-2612-MW | 6028516 |



Attention!

The flexible wires twisted in pairs must be assigned in accordance with the signals.

See “Pin and wire allocation” on page 34.

Female connectors

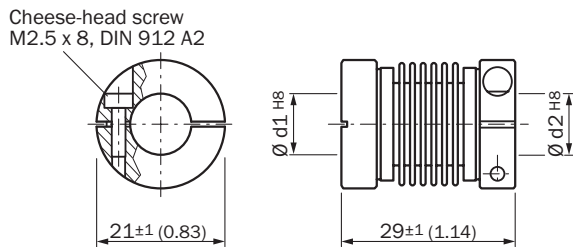
| Description | Cable length | Model name | Part no. |
|---|--------------|------------------|----------|
| Cable connector female JST inc. sealing, 8-core, 4 x 2 x 0.15 mm ² , with screening, cable diameter 5.6 mm for AFS60 SSI and AFM60 SSI with cable outlet | 0.5 m | DOL-0J08-G0M5AA6 | 2048589 |
| | 1.5 m | DOL-0J08-G1M5AA6 | 2048590 |
| | 3.0 m | DOL-0J08-G03MAA6 | 2048591 |
| | 5.0 m | DOL-0J08-G05MAA6 | 2048593 |
| | 10.0 m | DOL-0J08-G10MAA6 | 2048594 |

Couplings

- Bellows coupling, max. shaft offset radial ± 0.3 mm, axial 0.4 mm, angle ± 4 degrees, torsion spring stiffness 120 Nm/rad, bellows of stainless steel, hubs of aluminium.

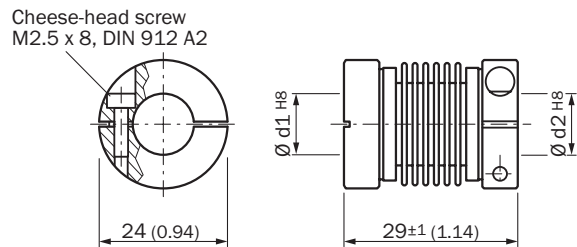
| Shaft diameter | Model name | Part no. |
|-----------------|------------|----------|
| 6 mm ... 6 mm | KUP-0606-B | 5312981 |
| 6 mm ... 10 mm | KUP-0610-B | 5312982 |
| 10 mm ... 10 mm | KUP-1010-B | 5312983 |
| 10 mm ... 12 mm | KUP-1012-B | 5312984 |

KUP-0606-B
KUP-0610-B
KUP-1010-B



All dimensions in mm (inch)

KUP-1012-B

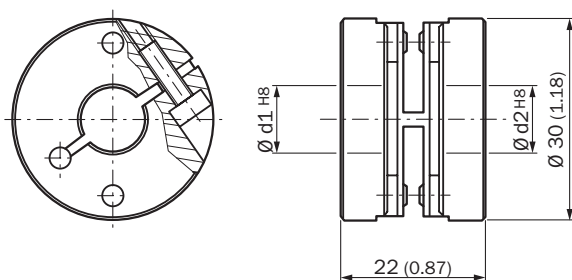


All dimensions in mm (inch)

- Spring-disc coupling, max. shaft offset radial ± 0.3 mm, axial 0.4 mm, angle ± 2.5 degrees, torsion spring stiffness 50 Nm/rad, flange of aluminium, spring-discs of glass-fibre-reinforced plastic

| Shaft diameter | Model name | Part no. |
|-----------------|------------|----------|
| 6 mm ... 10 mm | KUP-0610-F | 5312985 |
| 10 mm ... 10 mm | KUP-1010-F | 5312986 |

KUP-0610-F
KUP-1010-F



All dimensions in mm (inch)

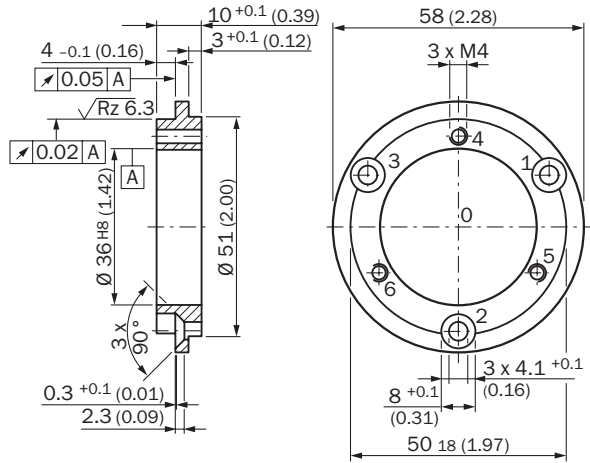
Mechanical adapters

Adapter flanges

- Adapter flange of aluminium for face mount flange, spigot 36 mm.

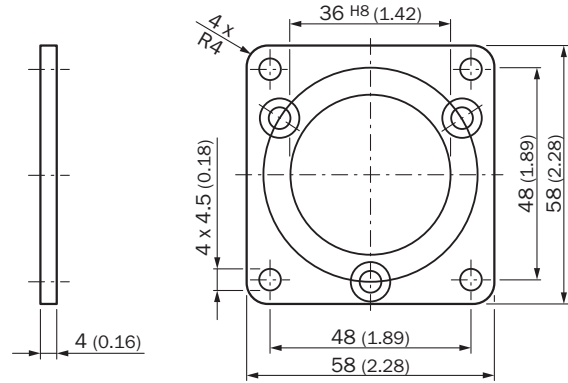
| Adaption | Model name | Part no. |
|---|-------------------|----------|
| To 50 mm servo flange | BEF-FA-036-050 | 2029160 |
| To 60 mm square mounting plate | BEF-FA-036-060REC | 2029162 |
| To 60 mm square mounting plate with shock absorbers | BEF-FA-036-060RSA | 2029163 |
| To 63 mm square mounting plate | BEF-FA-036-063REC | 2034225 |

BEF-FA-036-050



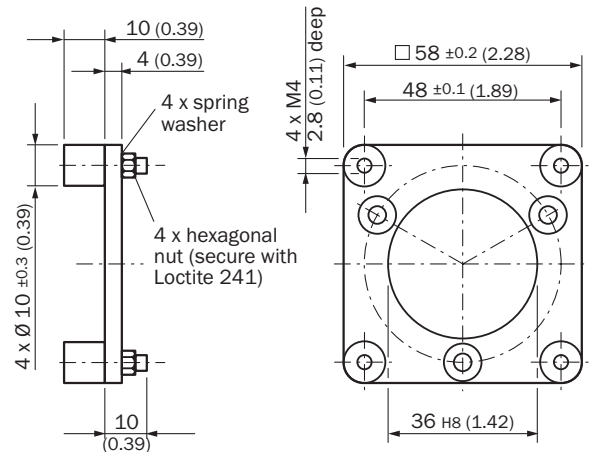
All dimensions in mm (inch)

BEF-FA-036-060REC



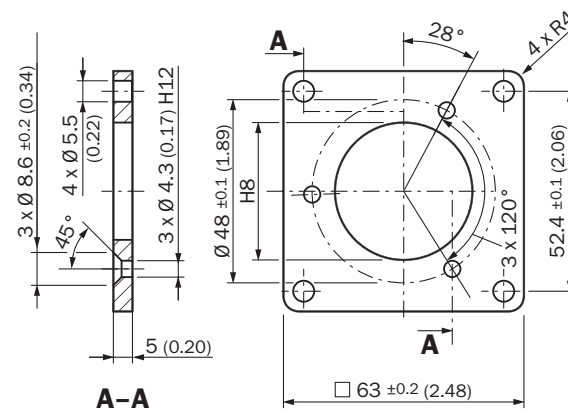
All dimensions in mm (inch)

BEF-FA-036-060RSA



All dimensions in mm (inch)

BEF-FA-036-063REC



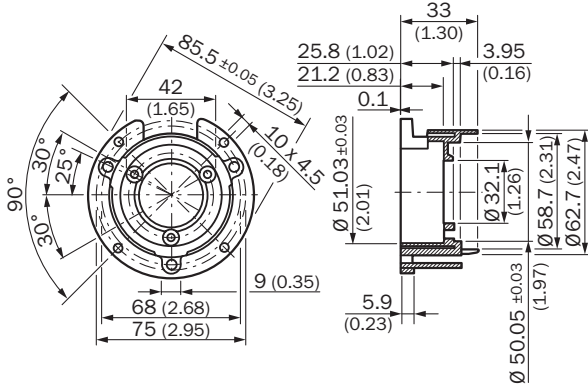
All dimensions in mm (inch)

Mounting bells

- Mounting bell incl. fixing set for encoder with servo flange.

| Flange spigot | Model name | Part no. |
|----------------|------------|----------|
| Diameter 50 mm | BEF-MG-50 | 5312987 |

BEF-MG-50



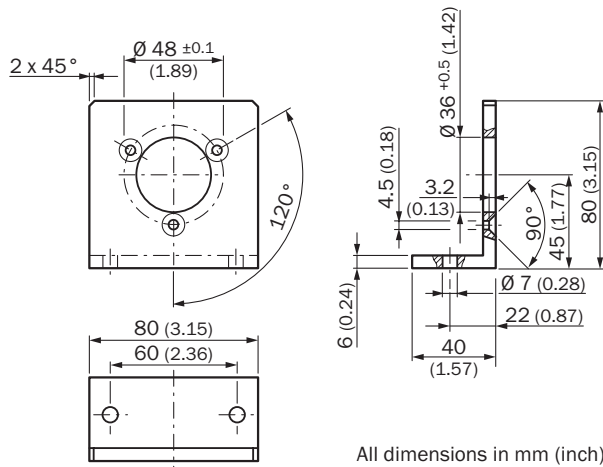
All dimensions in mm (inch)

Mounting angles

- Mounting angle incl. fixing set for encoder with face mount flange.

| Flange spigot | Model name | Part no. |
|----------------|------------|----------|
| Diameter 36 mm | BEF-WF-36 | 2029164 |

BEF-WF-36

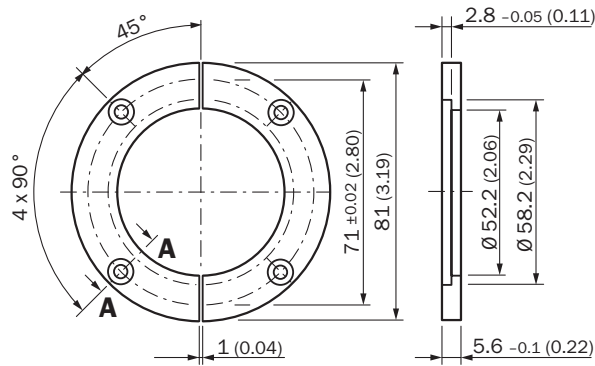


All dimensions in mm (inch)

Servo clamps

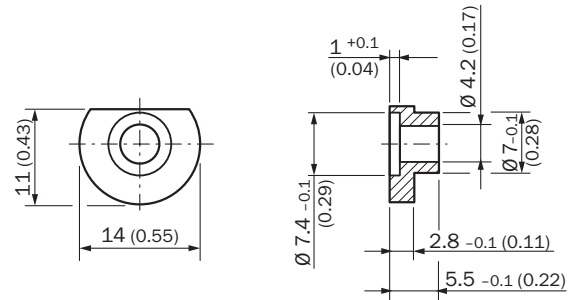
| Description | Model name | Part no. |
|---|--------------|----------|
| Servo clamps half ring, Set (comprises 2 pieces) for servo flanges with spigot diameter 50 mm | BEF-WG-SF050 | 2029165 |
| Servo clamps small, Set (comprises 3 pieces) for servo flanges | BEF-WK-SF | 2029166 |

BEF-WG-SF050



All dimensions in mm (inch)

BEF-WK-SF

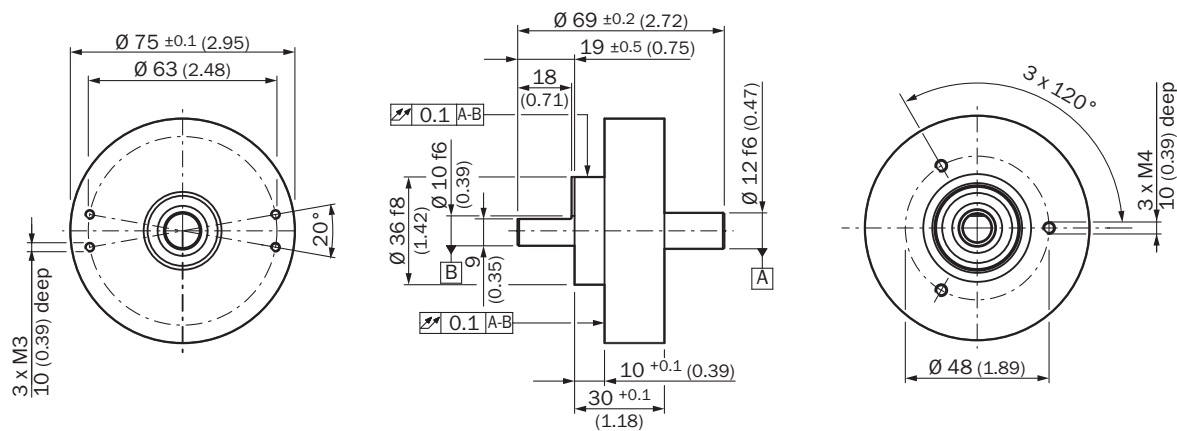


All dimensions in mm (inch)

Bearing blocks

| Description | Model name | Part no. |
|--|----------------|----------|
| Heavy duty bearing block for very large radial and axial shaft loads | BEF-FA-B12-010 | 2042728 |

BEF-FA-B12-010



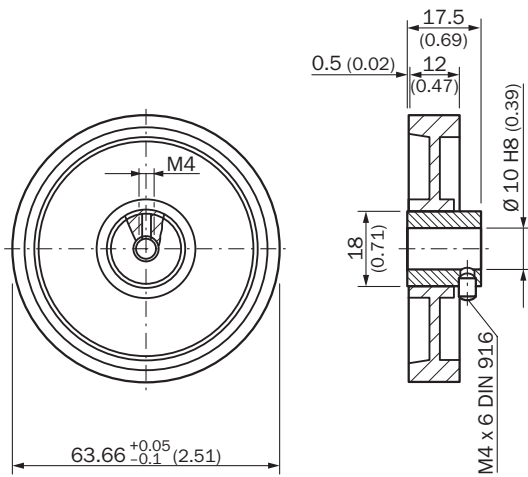
All dimensions in mm (inch)

Measuring wheels

- Circumference 0.2 m

| Description | Model name | Part no. |
|--|----------------|----------|
| Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub, smooth surface | BEF-MR-010020 | 5312988 |
| Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub, knurled surface | BEF-MR-010020G | 5318678 |

BEF-MR-010020
BEF-MR-010020G

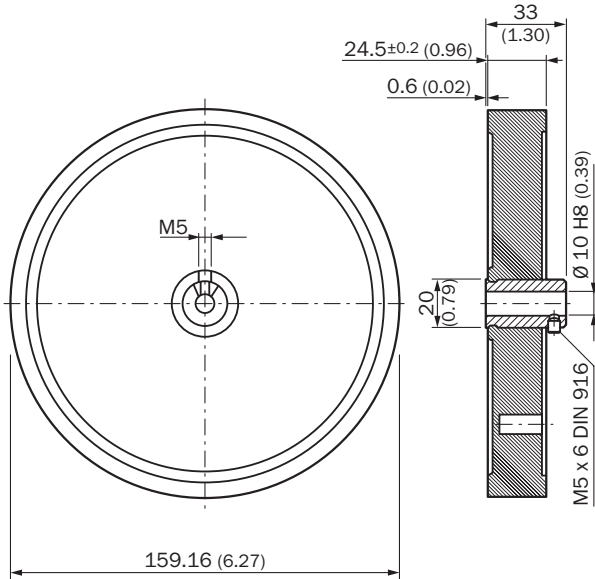


All dimensions in mm (inch)

- Circumference 0.5 m

| Description | Model name | Part no. |
|---|---------------|----------|
| Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub, smooth surface | BEF-MR-010050 | 5312989 |

BEF-MR-010050

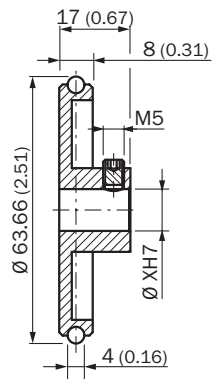


All dimensions in mm (inch)

- Circumference 200 mm

| Description | Model name | Part no. |
|--|---------------|----------|
| Measuring wheel for encoder shafts with diameter 6 mm, surface O ring NBR70 | BEF-MR006020R | 2055222 |
| Measuring wheel for encoder shafts with diameter 8 mm, surface O ring NBR70 | BEF-MR008020R | 2055223 |
| Measuring wheel for encoder shafts with diameter 10 mm, surface O ring NBR70 | BEF-MR010020R | 2055224 |

BEF-MR006020R
BEF-MR008020R
BEF-MR010020R

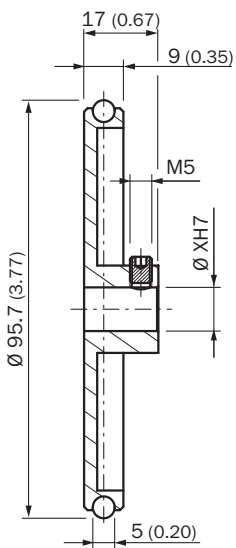


All dimensions in mm (inch)

- Circumference 300 mm

| Description | Model name | Part no. |
|--|---------------|----------|
| Measuring wheel for encoder shafts with diameter 6 mm, surface O ring NBR70 | BEF-MR006030R | 2055634 |
| Measuring wheel for encoder shafts with diameter 8 mm, surface O ring NBR70 | BEF-MR008030R | 2055635 |
| Measuring wheel for encoder shafts with diameter 10 mm, surface O ring NBR70 | BEF-MR010030R | 2049278 |

BEF-MR006030R
BEF-MR008030R
BEF-MR010030R

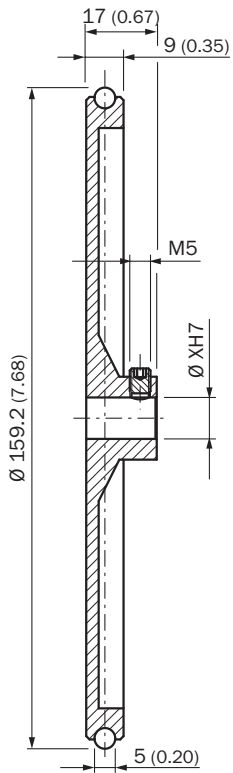


All dimensions in mm (inch)

- Circumference 500 mm

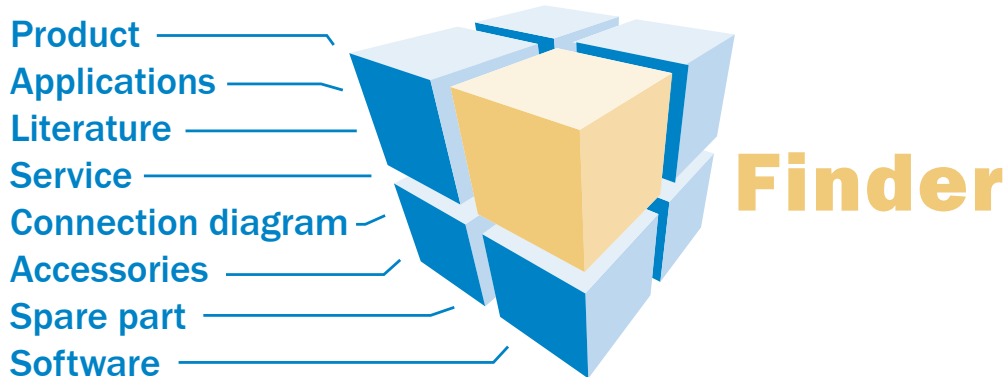
| Description | Model name | Part no. |
|--|---------------|----------|
| Measuring wheel for encoder shafts with diameter 6 mm, surface O ring NBR70 | BEF-MR006050R | 2055225 |
| Measuring wheel for encoder shafts with diameter 8 mm, surface O ring NBR70 | BEF-MR008050R | 2055226 |
| Measuring wheel for encoder shafts with diameter 10 mm, surface O ring NBR70 | BEF-MR010050R | 2055227 |

BEF-MR006050R
BEF-MR008050R
BEF-MR010050R



All dimensions in mm (inch)

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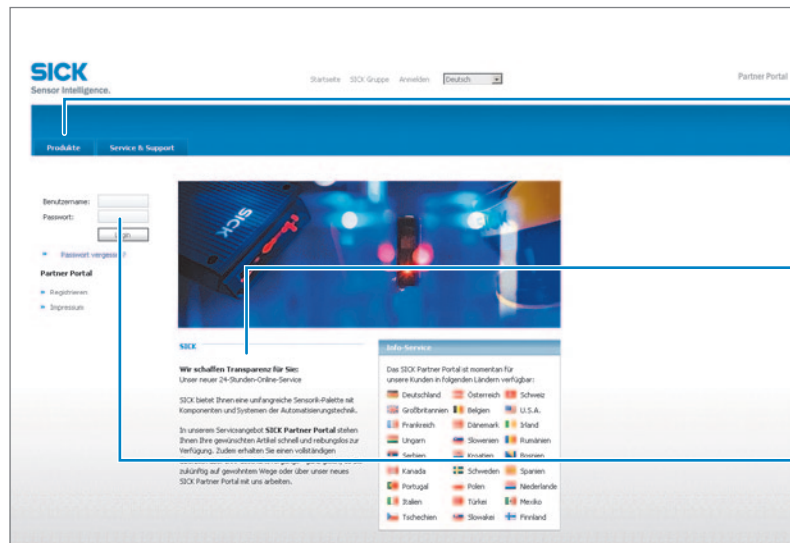
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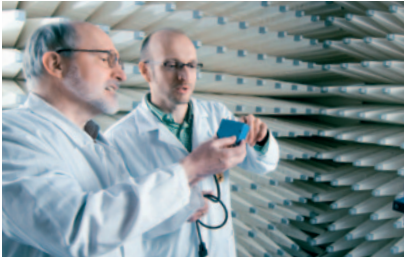
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