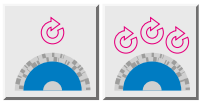
PRECISE, FLEXIBLE, VERSATILE



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 AFS and AFM60 SSI can be programmed via the same PC-based programming tool (PGT-08-S) or the hand-held PGT-10-Pro programming tool.

At a glance

- High-resolution absolute encoder with up to 30 bits (AFM60) or 18 bits (AFS60)
- Face mount flange, servo flange, blind hollow shaft or through hollow shaft
- SSI, SSI + incremental or SSI + sin/cos interface
- Resolution, offset, etc. can be programmed (depending on the type)
- Connectivity: M12 or M23 male connector or cable outlet
- Enclosure rating: IP67 (housing), IP65 (shaft)
- Operating temperature: –40 °C ... +100 °C (depending on the type)

Your benefits

- The programmability of the encoder results in reduced storage, high machine availability, and easy installation
- Precise positioning thanks to high resolutions
- Large selection of mechanical interfaces and electrical contacting options: suitable for all applications
- Suitable for applications with limited space (extremely short installation depth of 30 mm)
- Excellent concentricity properties due to long bearing distance
- Suitable programming tools are available as accessories for every application

More information

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8015560/2015-09-01
Subject to change without notice

Fields of application

- Measurement of absolute position using one or more revolutions in various machines and systems such as tool machines, packaging systems, wood processing machines, presses, printing machines

Detailed technical data

Performance

	Eco	Basic	Advanced
Max. number of steps per revolution (SSI interface)[1]	4,096	32,768	262,144
Max. number of revolutions			
Absolute singleturn	1		
Absolute multiturn	4,096		
Resolution			
Absolute singleturn	12 bit	15 bit	18 bit
Absolute multiturn	12 x 12 bit	15 x 12 bit	18 x 12 bit
Error limits	± 0.2°	± 0.05°	± 0.03°
Repeatability	0.002°		
Measurement increment deviation			
1 ... 399 (steps per revolution)	± 0.2°	± 0.08°	± 0.04°
400 ... 40,000 (steps per revolution)	± 0.2°	± 0.01°	± 0.008°
> 40,000 (steps per revolution)	–		± 0.002°
Measuring increment (360 °/ number of steps per revolution)	0.09°	0.01°	0.014°
Initialization time	50 ms [2]		
Position forming time	< 1 µs		

[1] See maximum viewing number of resolutions

[2] Position can be read after this period.

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Interfaces

	Eco	Basic	Advanced
Electrical interface	SSI		
Signal offset	2.5 V ± 10%		
Code type	Gray		
Configurable code sequence	CW/CCW		
Measurement increment			
360°/number of steps	0.09°	0.01°	0.0014°
Number of steps per revolution			
AFS60 and AFM60 [1]	4,096	32,768	262144
Number of revolutions (AFM60)	4,096		
Measurement increment deviation			
Number of steps per revolution			
1 ... 399	± 0.2°	± 0.08°	± 0.04°
400 ... 40,000	± 0.2°	± 0.01°	± 0.008°
> 40,000	–		± 0.002°
Clock+, Clock–, Data+, Data–			
SSI max. clock frequency 2 MHz, and 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)		
V/$\overline{R}$ (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		
Measurement increment	90° electric/number of lines		
Measurement increment deviation			
Number of steps per revolution 1 ... 99	± 0.2°	± 0.08°	± 0.04°
Number of steps per revolution 100 ... 10,000	± 0.2°	± 0.01°	± 0.008°
Number of steps per revolution > 10,000	–		± 0.002°
Interface signals A, $\overline{A}$, B, $\overline{B}$	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_{SS} (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 difference at 120 Ω load	0.5 V_{PP} ± 20%		
Signal offset before differential generation	2.5 V ± 10%		
Signal after difference at 120 Ω load	1 V_{SS} ± 20 %		

[1] See maximum viewing number of resolutions

Electrical data

	Eco	Basic	Advanced
Connection type	M23 male connector, 12-pin, radial M12 male connector, 8-pin, radial Cable, 8-wire, universal, 1.5 m [1] Cable, 8-wire, universal, 3 m [1] Cable, 8-wire, universal, 5 m [1] Cable, 8-wire, universal, 10 m [1] Cable, 12-wire, radial, 1.5 m [2] Cable, 12-wire, radial, 3 m [2] Cable, 12-wire, radial, 5 m [2]		
Power consumption	0.5 W (without load)		
Operating voltage range	4.5 V DC ... 32 V DC		
Min. load resistance	–		≥ 120 Ω
Maximum output frequency	–		≤ 200 kHz
Code type	Gray		
Code sequence	CW/CCW, configurable		
Reverse polarity protection	✔		
MTTFd: mean time to dangerous failure	250 years (EN ISO 13849-1) [3]		

[1] The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

[2] No UL certificate.

[3] 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 devices, average ambient temperature 40 °C, frequency of use 8,760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

Mechanical data

	Eco	Basic	Advanced
Shaft diameter			
Face mount flange	10 mm x 19 mm		
Servo flange	6 mm x 10 mm		
Blind hollow shaft, through hollow shaft	8, 10, 12, 14, 15 mm and 3/8", 1/2", 5/8" [1]		
Shaft material	Stainless steel		
Flange material	Aluminum		
Housing material	Aluminum die-cast		
Mass [2]			
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		
Permissible shaft movement, axial static/ dynamic			
Blind hollow shaft, through hollow shaft	± 0.5 mm, ± 0.2 mm		± 0.5 mm, ± 0.1 mm

[1] 5/8" not available for multiturn.

[2] Relates to devices with cable outlet.

[3] Take into account self-warming of 3.3 K per 1,000 rpm when designing operating temperature range

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	Eco	Basic	Advanced
Permissible shaft movement, radial static/ dynamic			
Blind hollow shaft, through hollow shaft	± 0.3 mm/ ± 0.1 mm		± 0.3 mm/ ± 0.05 mm
Permissible shaft loading			
Face mount flange, servo flange	80 N (radial) 40 N (axial)		
Maximum operating speed [3]			
Face mount flange, servo flange	9,000 rpm		
Blind hollow shaft	6,000 rpm		
Through hollow shaft	9,000 rpm		
Rotor moment of inertia			
Face mount flange, servo flange	6.2 gcm²		
Blind hollow shaft, through hollow shaft	40 gcm²		
Bearing lifetime	3.0 x 10^9 revolutions		
Max. angular acceleration	≤ 500,000 rad/s²		

[1] 5/8" not available for multiturn.

[2] Relates to devices with cable outlet.

[3] Take into account self-warming of 3.3 K per 1,000 rpm when designing operating temperature range

Ambient data

	Eco	Basic	Advanced
EMC	According to EN 61000-6-2 and EN 61000-6-3 [1]		
Enclosure rating			
On the shaft	IP 65		
On the housing, male connector outlet [2]	IP 67		
On the housing, cable outlet	IP 67		
Permissible relative humidity	90% (condensation of optical surfaces not permitted)		
Operating temperature range	0 °C ... +85 °C	–40 °C [3] ... +100 °C	
Storage temperature range	–40 °C ... +100 °C, without packaging		
Resistance to shocks (according to EN 60068-2-27)	50 g/ 6 ms	70 g/ 6 ms	60 g/ 6 ms
Resistance to vibration (according to EN 60068-2-6)	20 g/ 10 Hz ... 2,000 Hz	30 g/ 10 Hz ... 2,000 Hz	20 g/ 10 Hz ... 2,000 Hz

[1] The EMC according to the standards quoted is achieved if shielded cables are used.

[2] In an assembled male connector.

[3] When cables are fixed in place.

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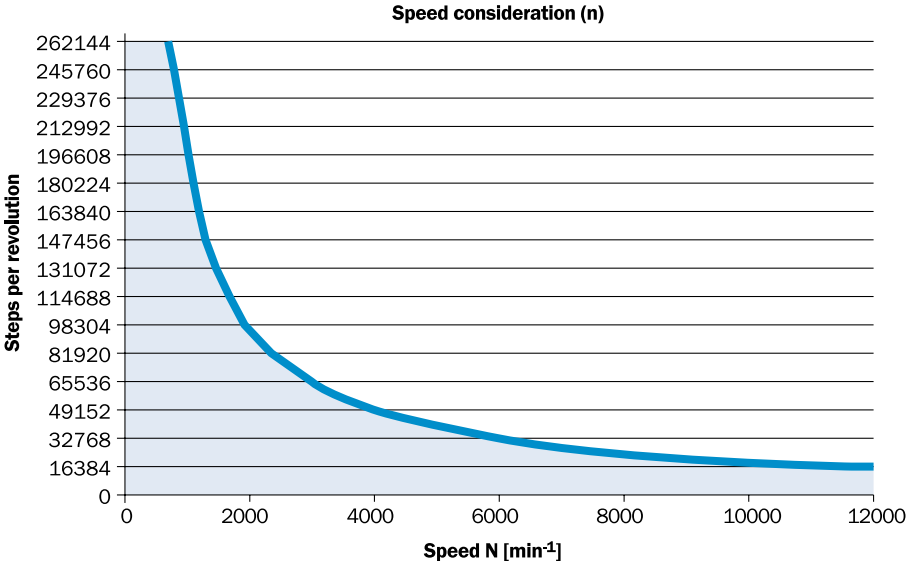
Maximum viewing number of resolutions depends on the selected number of steps per revolution



The maximum speed depends on the type of shaft.

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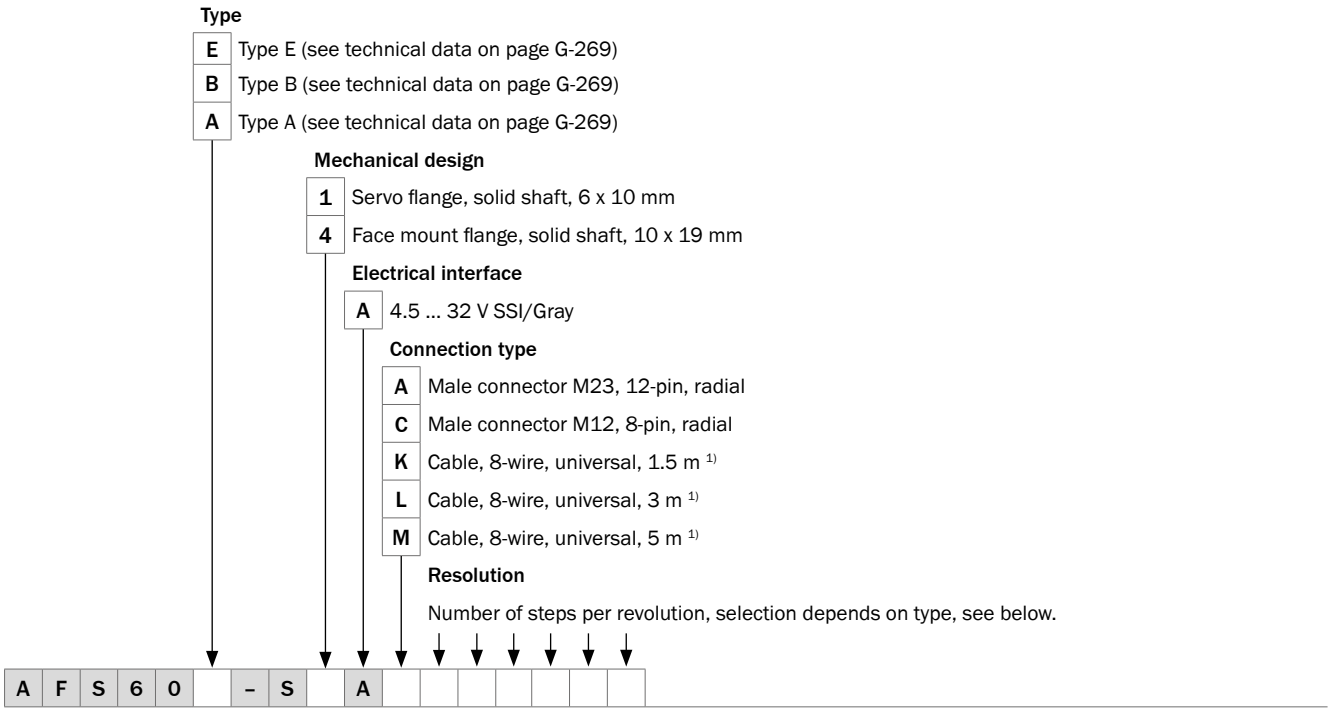
Ordering information

Type code AFS60 SSI absolute encoder, singleturn, solid shaft



1) The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Number of steps per revolution

- Type E 1)

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 available 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 available on request.

Example orders

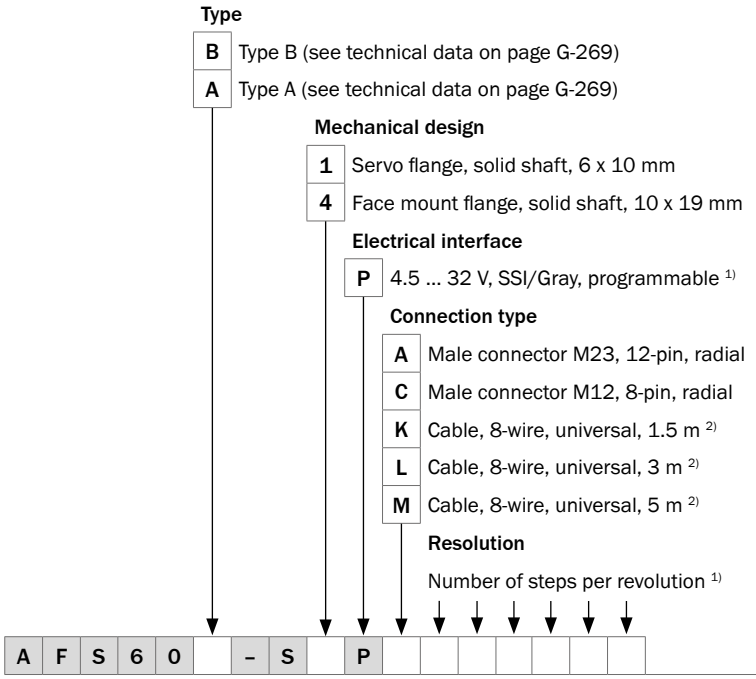
- Servo flange

Servo flange design	Type
Type E, M12 male connector, 8-pin , radial, number of steps per revolution 1,024 (10 bit)	AFS60E-S1AC001024

- Face mount flange

Face mount flange design	Type
Type E, M12 male connector, 8-pin , radial, number of steps per revolution 1,024 (10 bit)	AFS60E-S4AC001024

Type code AFS60 SSI absolute encoder, singleturn, solid shaft, **programmable**



1) Number of steps from 256 to 262144 can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144.

2) The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Example orders

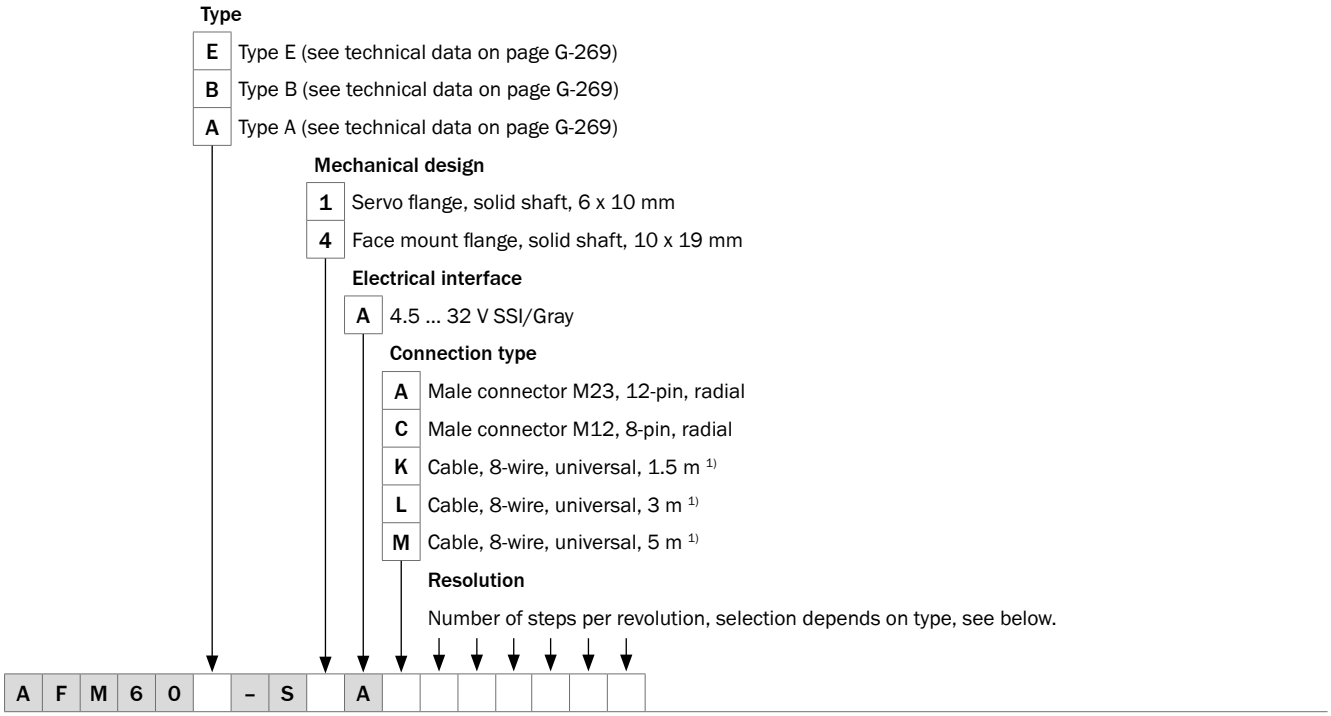
- Servo flange

	Servo flange design	Type	Part no.
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFS60B-S1PA032768	1037493
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFS60B-S1PC032768	1037494
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFS60B-S1PK032768	1037495
	Cable, 8-wire, universal, 3 m, number of steps per revolution 32,768	AFS60B-S1PL032768	1037496
	Cable, 8-wire, universal, 5 m, number of steps per revolution 32,768	AFS60B-S1PM032768	1037497
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFS60A-S1PA262144	1037498
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFS60A-S1PC262144	1037499
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFS60A-S1PK262144	1037500
	Cable, 8-wire, universal, 3 m, number of steps per revolution 262144	AFS60A-S1PL262144	1037501
	Cable, 8-wire, universal, 5 m, number of steps per revolution 262144	AFS60A-S1PM262144	1037502

- Face mount flange

	Face mount flange design	Type	Part no.
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFS60B-S4PA032768	1037483
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFS60B-S4PC032768	1037484
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFS60B-S4PK032768	1037485
	Cable, 8-wire, universal, 3 m, number of steps per revolution 32,768	AFS60B-S4PL032768	1037486
	Cable, 8-wire, universal, 5 m, number of steps per revolution 32,768	AFS60B-S4PM032768	1037487
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFS60A-S4PA262144	1037488
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFS60A-S4PC262144	1037489
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFS60A-S4PK262144	1037490
	Cable, 8-wire, universal, 3 m, number of steps per revolution 262144	AFS60A-S4PL262144	1037491
	Cable, 8-wire, universal, 5 m, number of steps 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 so that it is possible to lay it without bends in a radial or axial direction.

Number of steps per revolution x 4,096 (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		

Example orders

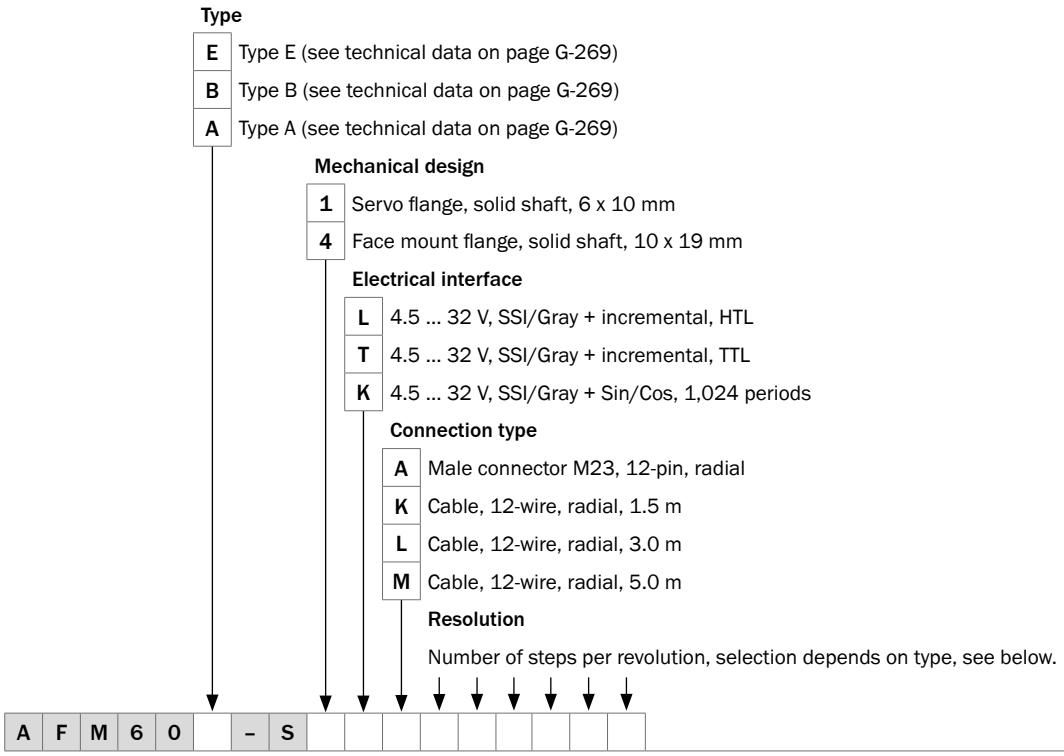
- Servo flange

Servo flange design	Type
Type E, cable, 8-wire, universal, 1.5 m, number of steps per revolution 4,096 (12 bits)	AFM60E-S1AK004096

- Face mount flange

Face mount flange design	Type
Type E, cable, 8-wire, universal, 1.5 m, number of steps per revolution 4,096 (12 bits)	AFM60E-S4AK004096

Type code AFM60 SSI/gray + incremental and SSI/gray + sin/cos, absolute encoder, multiturn, 4,096 revolutions, solid shaft



Number of steps per revolution x 4,096 (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)		

Example orders

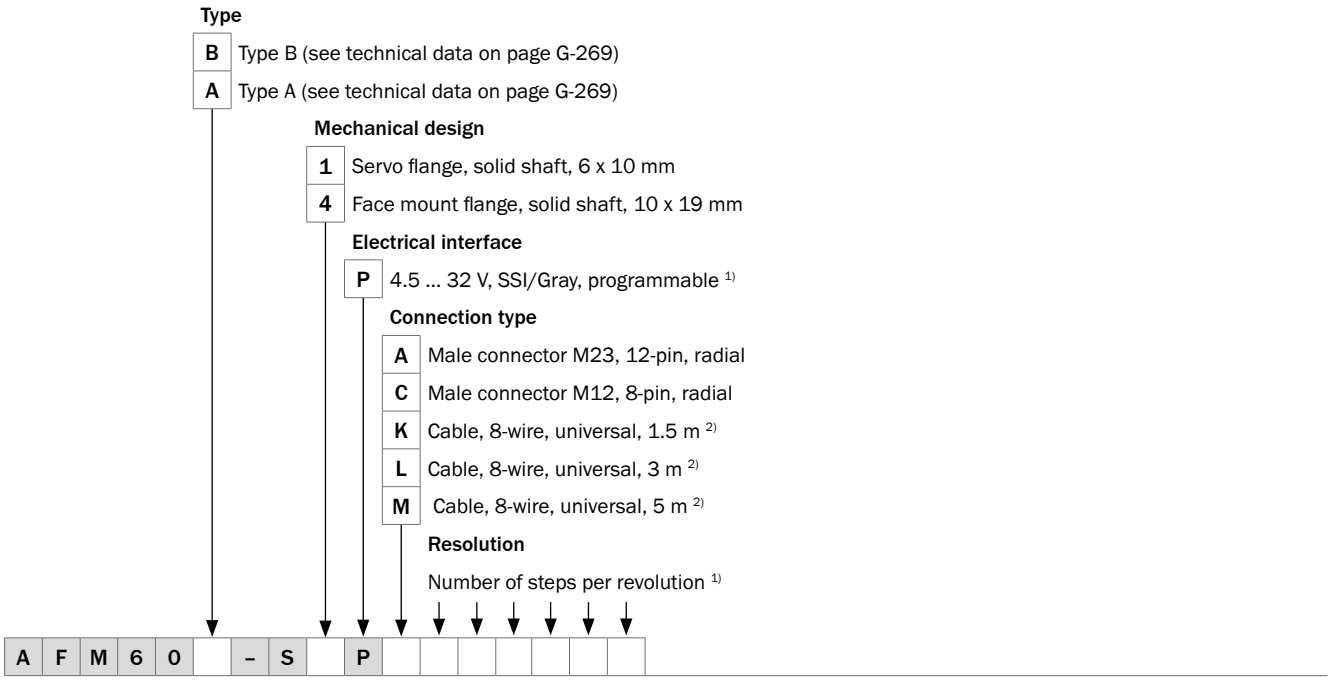
- Servo flange

Servo flange design	Type
Type E, 4.5 ... 32 V, SSI/gray + incremental, TTL, M23 male connector, 12-pin , radial, number of steps per revolution 2,048 (11 bit)	AFM60E-S1TA002048

- Face mount flange

Face mount flange design	Type
Type E, 4.5 ... 32 V, SSI/gray + incremental, TTL, M23 male connector, 12-pin , radial, number of steps per revolution 2,048 (11 bit)	AFM60E-S4TA002048

Type code AFM60 SSI/gray absolute encoder, multiturn, 4,096 revolutions, solid shaft, **programmable**



1) Number of steps from 256 (8 bit) to 262144 (18 bit) can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144.

2) The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Example orders

- Servo flange

Servo flange design		Type	Part no.
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S1PA032768	1037513
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFM60B-S1PC032768	1037514
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFM60B-S1PK032768	1037515
	Cable, 8-wire, universal, 3 m, number of steps per revolution 32,768	AFM60B-S1PL032768	1037516
	Cable, 8-wire, universal, 5 m, number of steps per revolution 32,768	AFM60B-S1PM032768	1037517
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S1PA262144	1037518
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFM60A-S1PC262144	1037519
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFM60A-S1PK262144	1037520
	Cable, 8-wire, universal, 3 m, number of steps per revolution 262144	AFM60A-S1PL262144	1037521
	Cable, 8-wire, universal, 5 m, number of steps per revolution 262144	AFM60A-S1PM262144	1037522

- Face mount flange

Face mount flange design		Type	Part no.
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S4PA032768	1037503
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFM60B-S4PC032768	1037504
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFM60B-S4PK032768	1037505
	Cable, 8-wire, universal, 3 m, number of steps per revolution 32,768	AFM60B-S4PL032768	1037506
	Cable, 8-wire, universal, 5 m, number of steps per revolution 32,768	AFM60B-S4PM032768	1037507
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S4PA262144	1037508
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFM60A-S4PC262144	1037509
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFM60A-S4PK262144	1037510
	Cable, 8-wire, universal, 3 m, number of steps per revolution 262144	AFM60A-S4PL262144	1037511
	Cable, 8-wire, universal, 5 m, number of steps per revolution 262144	AFM60A-S4PM262144	1037512

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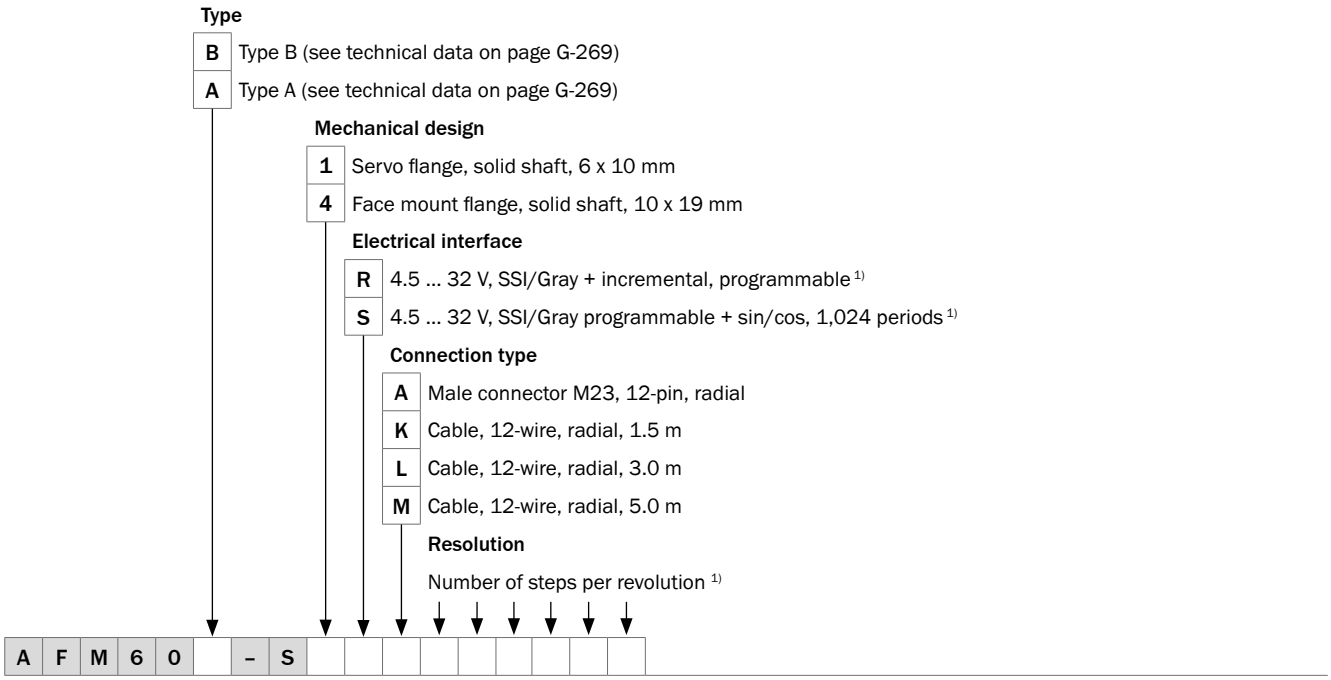
Type code AFM60 SSI/gray + incremental and SSI/gray + sin/cos, absolute encoder, multiturn, 4,096 revolutions, solid shaft, **programmable**



1) Number of steps from 256 (8 bit) to 262144 (18 bit) can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144. Number of incremental lines is always 1/4 of the number of SSI/gray lines.

Example orders

- Servo flange

Servo flange design		Type	Part no.
Type B	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S1RA032768	1052835
Type A	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S1RA262144	1052837
Type B	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S1SA032768	1054220
Type A	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S1SA262144	1054219

- Face mount flange

Face mount flange design		Type	Part no.
Type B	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S4RA032768	1052833
Type A	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S4RA262144	1052624
Type B	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-S4SA032768	1054222
Type A	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-S4SA262144	1054221

Type code AFS60 SSI absolute encoder, singleturn, hollow shaft

Type

- **E** Type E (see technical data on page G-269)
- **B** Type B (see technical data on page G-269)
- **A** Type A (see technical data on page G-269)

Mechanical design

- **B** Blind hollow shaft
- **T** Through hollow shaft

- **B** Hollow shaft diameter 8 mm
- **C** Hollow shaft diameter 3/8"
- **D** Hollow shaft diameter 10 mm
- **E** Hollow shaft diameter 12 mm
- **F** Hollow shaft diameter 1/2"
- **G** Hollow shaft diameter 14 mm
- **H** Hollow shaft diameter 15 mm
- **J** Hollow shaft diameter 5/8"

Electrical interface

- **A** 4.5 ... 32 V SSI/Gray

Connection type

- **A** Male connector M23, 12-pin, radial
- **C** Male connector M12, 8-pin, radial
- **K** Cable, 8-wire, universal, 1.5 m [1)]
- **L** Cable, 8-wire, universal, 3 m [1)]
- **M** Cable, 8-wire, universal, 5 m [1)]

Resolution

Number of steps per revolution, selection depends on type, see below.

A	F	S	6	0		–			A							

[1)] The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Number of steps per revolution

- Type E [1)]

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 available 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 available on request.

8015560/2015-09-01

Example orders

- Blind hollow shaft

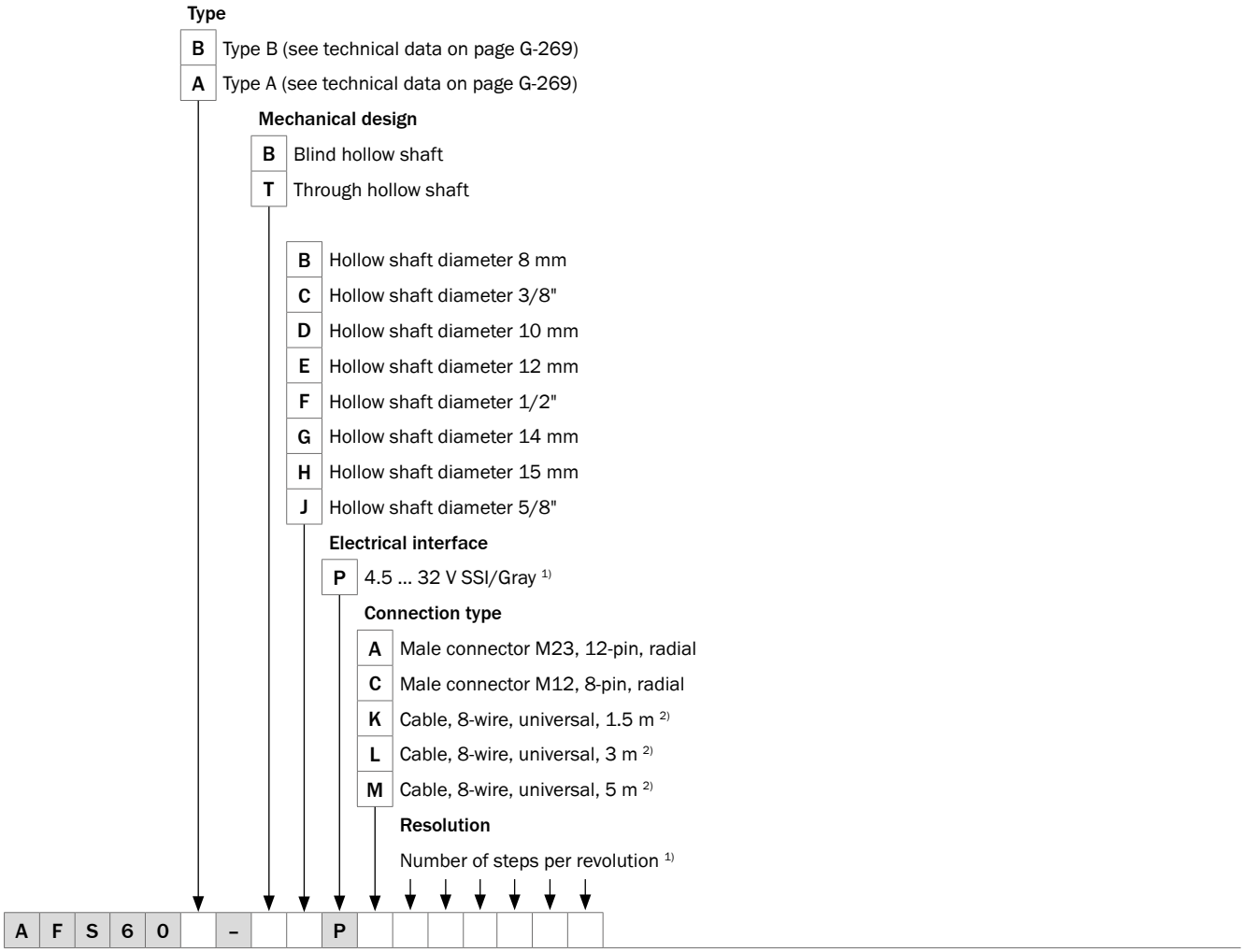
Blind hollow shaft design	Type
Type E, hollow shaft design 8 mm, M12 male connector, 8-pin , radial, number of steps per revolution 1,024 (10 bit)	AFS60E-BBAC001024

- Through hollow shaft

Through hollow shaft design	Type
Type E, hollow shaft design 8 mm, M12 male connector, 8-pin , radial, number of steps per revolution 1,024 (10 bit)	AFS60E-TBAC001024

G

Type code AFS60 SSI absolute encoder, singleturn, hollow shaft, **programmable**



1) Number of steps from 256 to 262144 can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144.

2) The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

8015560/2015-09-01
Subject to change without notice

Example orders [1)]

- Blind hollow shaft

Blind hollow shaft design		Type
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFS60B-BxPA032768
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFS60B-BxPC032768
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFS60B-BxPK032768
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFS60A-BxPA262144
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFS60A-BxPC262144
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFS60A-BxPK262144

[1)] x stands for hollow shaft diameters B to J, please enter corresponding letters in position 9.

- Through hollow shaft

Through hollow shaft design		Type
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFS60B-TxPA032768
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFS60B-TxPC032768
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFS60B-TxPK032768
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFS60A-TxPA262144
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFS60A-TxPC262144
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFS60A-TxPK262144

[1)] x stands for hollow shaft diameters B to J, please enter corresponding letters in position 9.

Type code AFM60 SSI/gray absolute encoder, multiturn, 4,096 revolutions, hollow shaft

Type

- **E** Type E (see technical data on page G-269)
- **B** Type B (see technical data on page G-269)
- **A** Type A (see technical data on page G-269)

Mechanical design

- **B** Blind hollow shaft
- **T** Through hollow shaft

- **B** Hollow shaft diameter 8 mm
- **C** Hollow shaft diameter 3/8"
- **D** Hollow shaft diameter 10 mm
- **E** Hollow shaft diameter 12 mm
- **F** Hollow shaft diameter 1/2"
- **G** Hollow shaft diameter 14 mm
- **H** Hollow shaft diameter 15 mm

Electrical interface

- **A** 4.5 ... 32 V SSI/Gray

Connection type

- **A** Male connector M23, 12-pin, radial
- **C** Male connector M12, 8-pin, radial
- **K** Cable, 8-wire, universal, 1.5 m [1)]
- **L** Cable, 8-wire, universal, 3 m [1)]
- **M** Cable, 8-wire, universal, 5 m [1)]

Resolution

Number of steps per revolution, selection depends on type, see below.

A	F	M	6	0		–			A							

[1)] The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Number of steps per revolution x 4,096 (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		

Example orders

- Blind hollow shaft

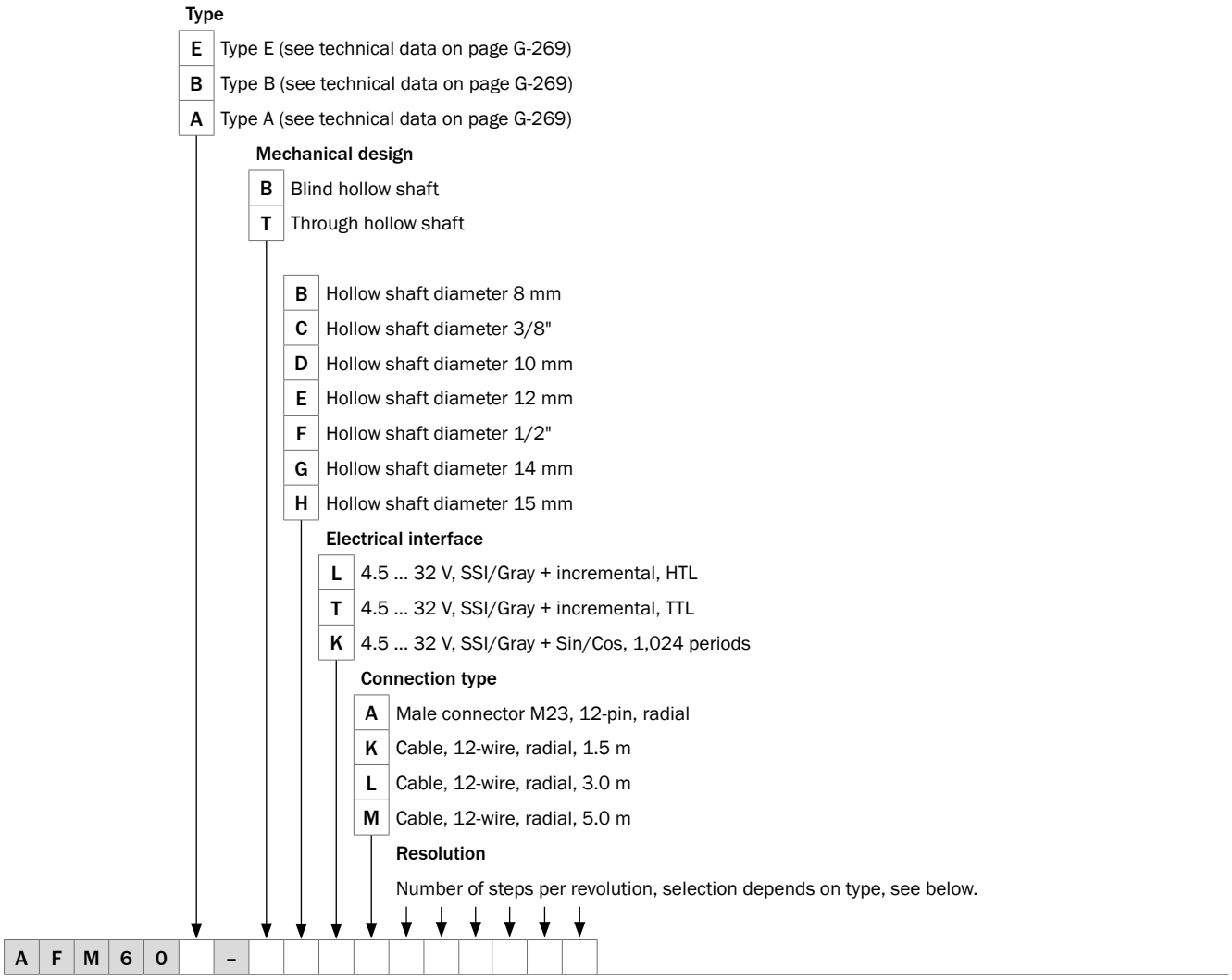
Blind hollow shaft design	Type
Type E, hollow shaft diameter 8 mm cable, 8-wire, universal, 1.5 m, number of steps per revolution 4,096 (12 bits)	AFM60E-BBAK004096

- Through hollow shaft

Through hollow shaft design	Type
Type E, hollow shaft diameter 8 mm cable, 8-wire, universal, 1.5 m, number of steps per revolution 4,096 (12 bits)	AFM60E-TBAK004096

G

Type code AFM60 SSI/gray + incremental and SSI/gray + sin/cos, absolute encoder, multiturn, 4,096 revolutions, hollow shaft



Number of steps per revolution x 4,096 (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)		

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Example orders

- Blind hollow shaft

Blind hollow shaft design	Type
Type E, hollow shaft diameter 8 mm, 4.5 ... 32 V, SSI/gray + incremental, TTL, M23 male connector, 12-pin , radial, number of steps per revolution 2,048 (11 bit)	AFM60E-BBTA002048

- Through hollow shaft

Through hollow shaft design	Type
Type E, hollow shaft diameter 8 mm, 4.5 ... 32 V, SSI/gray + incremental, TTL, M23 male connector, 12-pin , radial, number of steps per revolution 2,048 (11 bit)	AFM60E-TBTA002048

Type code AFM60 SSI/gray absolute encoder, multiturn, 4,096 revolutions, hollow shaft, **programmable**

Type

- **B** Type B (see technical data on page G-269)
- **A** Type A (see technical data on page G-269)

Mechanical design

- **B** Blind hollow shaft
- **T** Through hollow shaft

- **B** Hollow shaft diameter 8 mm
- **C** Hollow shaft diameter 3/8"
- **D** Hollow shaft diameter 10 mm
- **E** Hollow shaft diameter 12 mm
- **F** Hollow shaft diameter 1/2"
- **G** Hollow shaft diameter 14 mm
- **H** Hollow shaft diameter 15 mm

Electrical interface

- **P** 4.5 ... 32 V, SSI/Gray, programmable [1]

Connection type

- **A** Male connector M23, 12-pin, radial
- **C** Male connector M12, 8-pin, radial
- **K** Cable, 8-wire, universal, 1.5 m [2]
- **L** Cable, 8-wire, universal, 3 m [2]
- **M** Cable, 8-wire, universal, 5 m [2]

Resolution

Number of steps per revolution [1]

A	F	M	6	0		–			P							

[1] Number of steps from 256 (8 bit) to 262144 (18 bit) can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144.

[2] The universal cable outlet is positioned so that it is possible to lay it without bends in a radial or axial direction.

Example orders [1)]

- Blind hollow shaft

Blind hollow shaft design		Type
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-BxPA032768
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFM60B-BxPC032768
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFM60B-BxPK032768
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-BxPA262144
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFM60A-BxPC262144
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFM60A-BxPK262144

[1)] x stands for hollow shaft diameters B to H, please enter corresponding letters in position 9.

- Through hollow shaft

Through hollow shaft design		Type
Type B	M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-TxPA032768
	M12 male connector, 8-pin, radial, number of steps per revolution 32,768	AFM60B-TxPC032768
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 32,768	AFM60B-TxPK032768
Type A	M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-TxPA262144
	M12 male connector, 8-pin, radial, number of steps per revolution 262144	AFM60A-TxPC262144
	Cable, 8-wire, universal, 1.5 m, number of steps per revolution 262144	AFM60A-TxPK262144

[1)] x stands for hollow shaft diameters B to H, please enter corresponding letters in position 9.

Type code AFM60 SSI/gray + incremental and SSI/gray + sin/cos, absolute encoder, multiturn, 4,096 revolutions, hollow shaft, **programmable**

Type

- **B** Type B (see technical data on page G-269)
- **A** Type A (see technical data on page G-269)

Mechanical design

- **B** Blind hollow shaft
- **T** Through hollow shaft

- **B** Hollow shaft diameter 8 mm
- **C** Hollow shaft diameter 3/8"
- **D** Hollow shaft diameter 10 mm
- **E** Hollow shaft diameter 12 mm
- **F** Hollow shaft diameter 1/2"
- **G** Hollow shaft diameter 14 mm
- **H** Hollow shaft diameter 15 mm

Electrical interface

- **R** 4.5 ... 32 V, SSI/Gray + incremental, programmable [1)]
- **S** 4.5 ... 32 V, SSI/Gray programmable + sin/cos, 1,024 periods [1)]

Connection type

- **A** Male connector M23, 12-pin, radial
- **K** Cable, 12-wire, radial, 1.5 m
- **L** Cable, 12-wire, radial, 3.0 m
- **M** Cable, 12-wire, radial, 5.0 m

Resolution

Number of steps per revolution [1)]

A	F	M	6	0		–										

[1)] Number of steps from 256 (8 bit) to 262144 (18 bit) can be programmed by the customer. Factory setting for Type B: 032768; Type A: 262144. Number of incremental lines is always 1/4 of the number of SSI/gray lines.

Example orders [1)]

- Blind hollow shaft

Blind hollow shaft design		Type
Type B	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-BxRA032768
Type A	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-BxRA262144
Type B	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-BxSA032768
Type A	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-BxSA262144

[1)] x stands for hollow shaft diameters B to H, please enter corresponding letters in position 9.

- Through hollow shaft

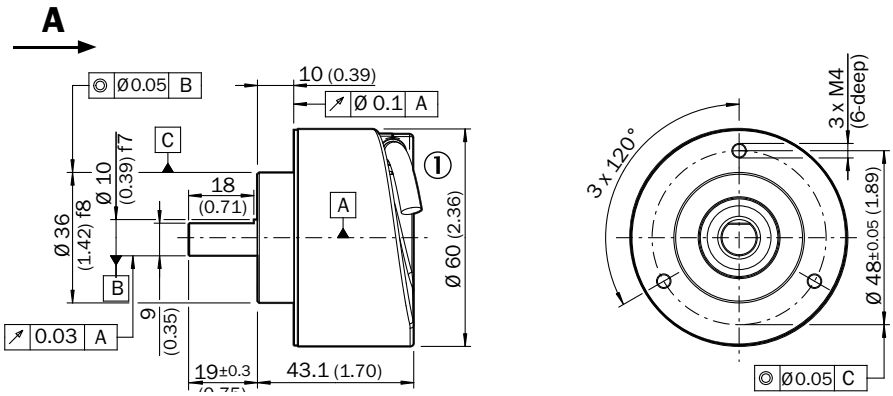
Through hollow shaft design		Type
Type B	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-TxRA032768
Type A	4.5 ... 32 V, SSI/gray + incremental, programmable, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-TxRA262144
Type B	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin, radial, number of steps per revolution 32,768	AFM60B-TxSA032768
Type A	4.5 ... 32 V, SSI/gray, programmable, + sin/cos, 1,024 periods, M23 male connector, 12-pin , radial, number of steps per revolution 262144	AFM60A-TxSA262144

[1)] x stands for hollow shaft diameters B to H, please enter corresponding letters in position 9.

Dimensional drawings (dimensions in mm)

Face mount flange

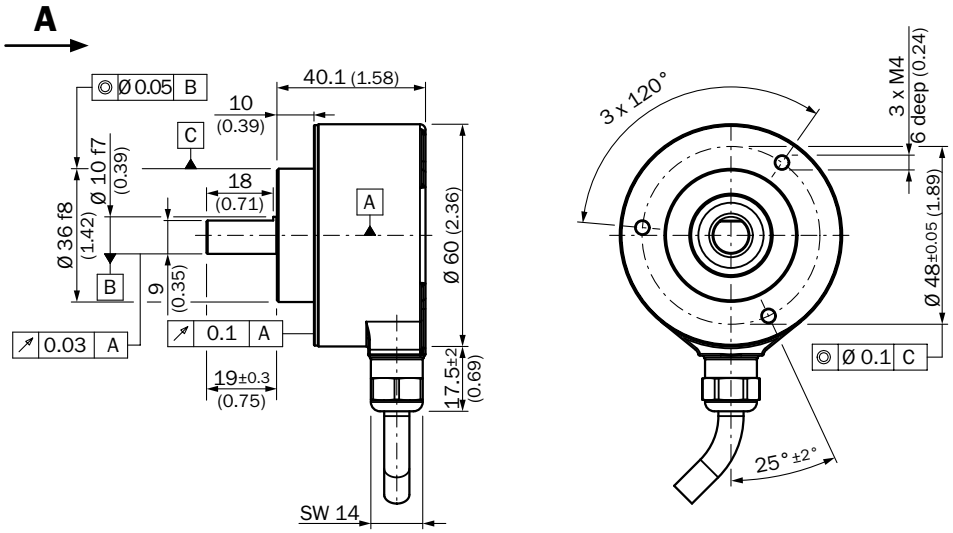
Universal cable outlet



General tolerances according to DIN ISO 2768-mk

① Cable Ø = 5.6 mm ± 0.2 mm bend radius R = 30 mm

Radial cable outlet for AFM60 SSI + incremental and AFM60 SSI + sin/cos



General tolerances according to DIN ISO 2768-mk

G

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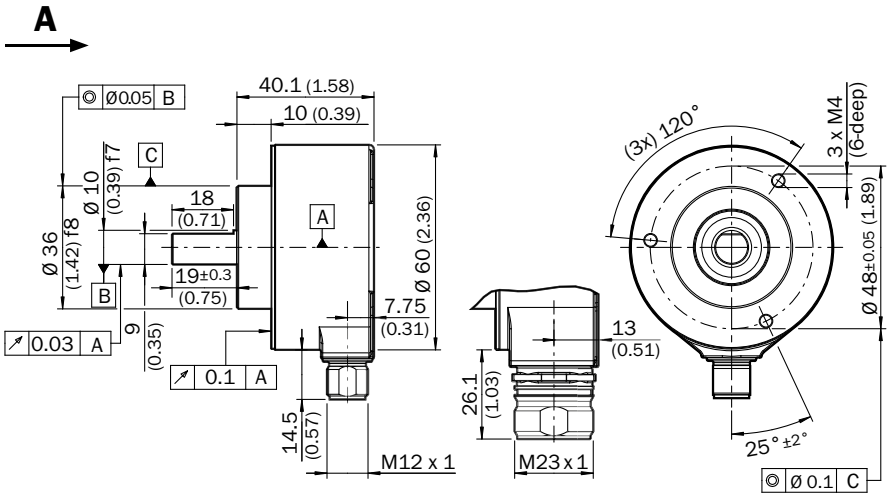
M12 and M23 cable outlet

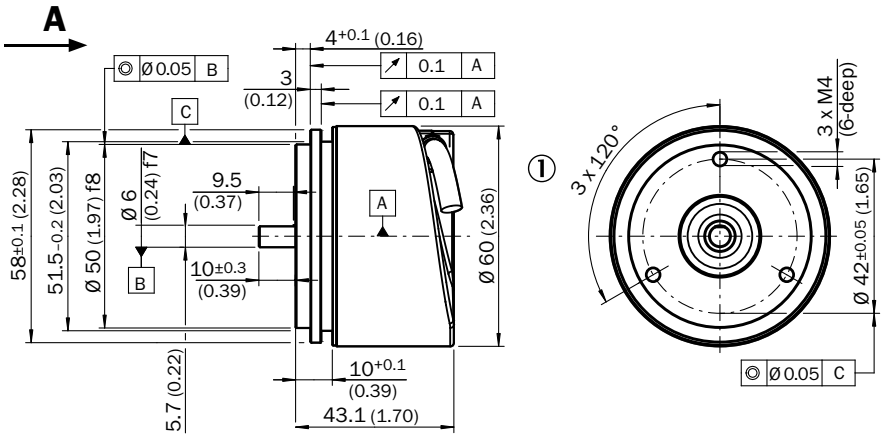


General tolerances according to DIN ISO 2768-mk

G

Servo flange

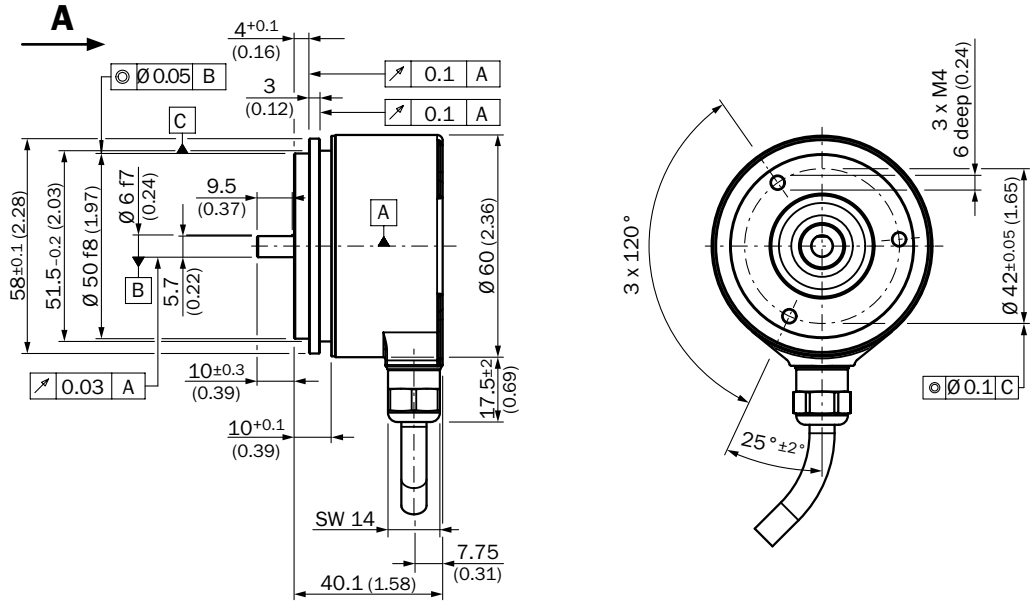
Universal cable outlet



General tolerances according to DIN ISO 2768-mk

① Cable Ø = 5.6 mm ± 0.2 mm bend radius R = 30 mm

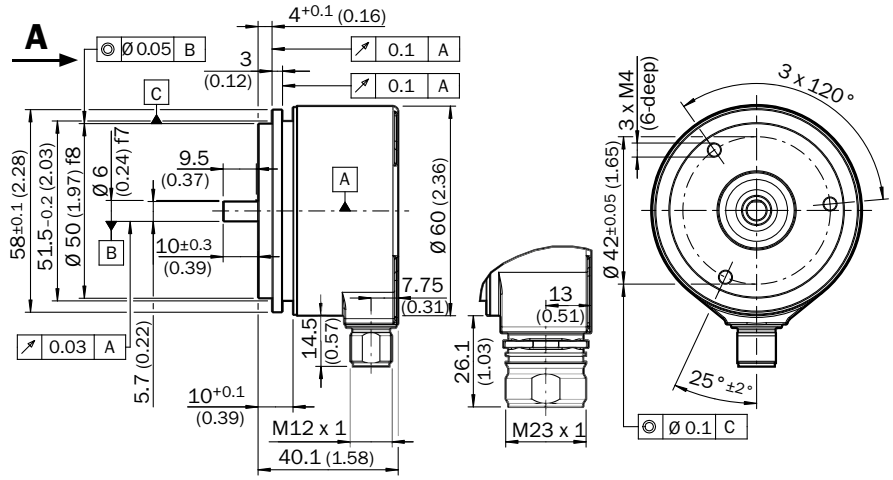
Radial cable outlet for AFM60 SSI + incremental and AFM60 SSI + sin/cos



General tolerances according to DIN ISO 2768-mk

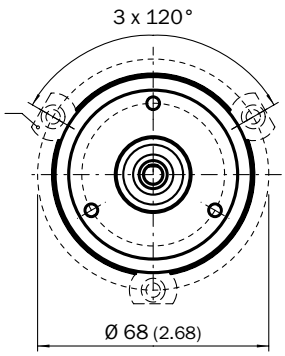
G

M12 and M23 cable outlet

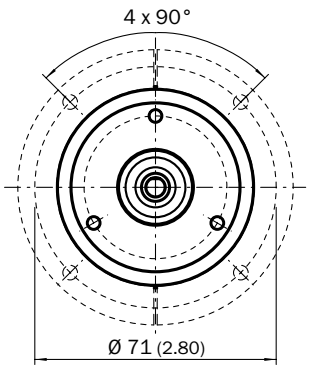


General tolerances according to DIN ISO 2768-mk

Mounting suggestion for small servo clamp
part number 2029166



Mounting suggestion for half-shell servo clamp
part number 2029165

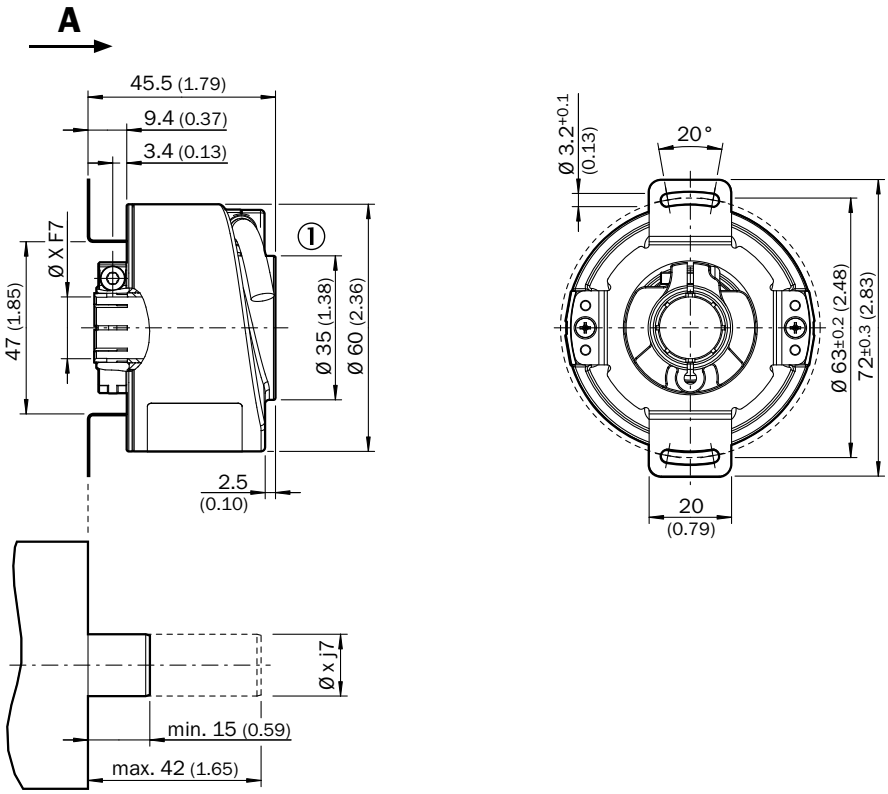


General tolerances according to DIN ISO 2768-mk

G

Blind hollow shaft

Universal cable outlet



Customer-side

General tolerances according to DIN ISO 2768-mk

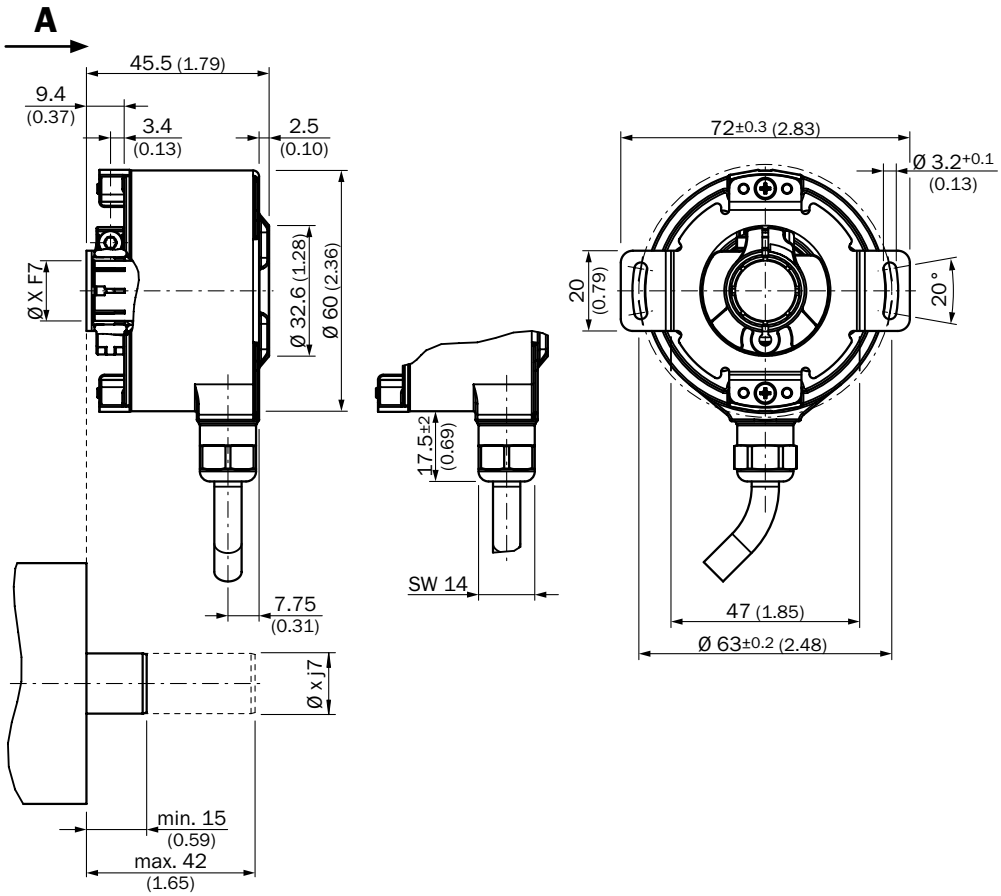
① Cable Ø = 5.6 mm ± 0.2 mm bend radius R = 30 mm

XF7 = Encoder shaft diameter, see type code

xj7 = Shaft diameter, on the customer side

G

Radial cable outlet for AFM60 SSI + incremental and AFM60 SSI + sin/cos

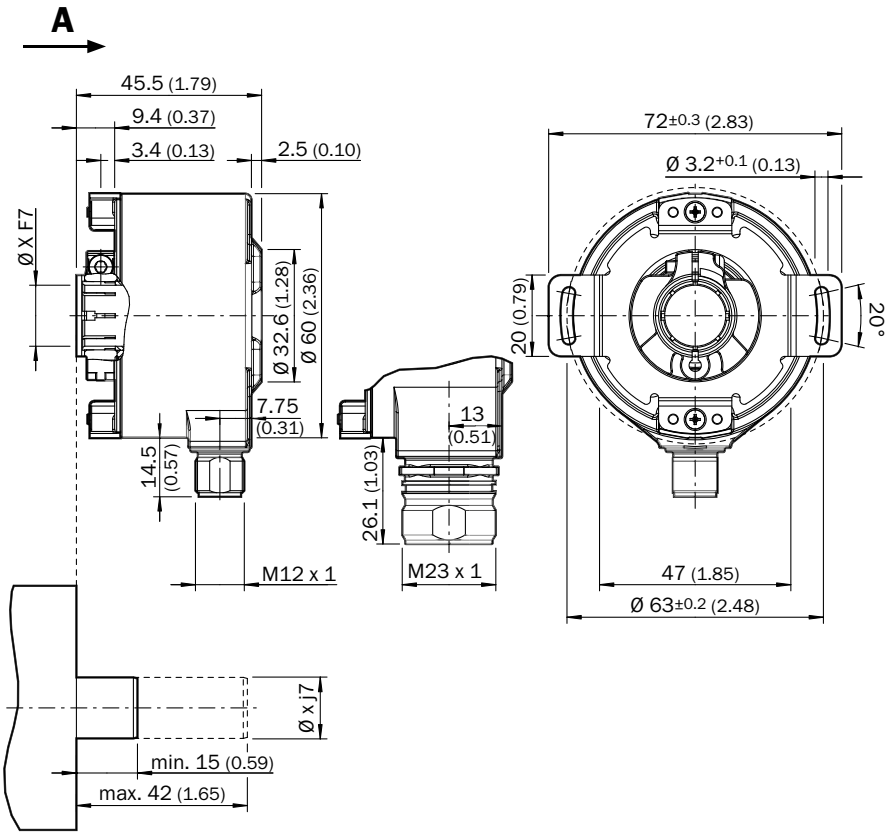


Customer-side

General tolerances according to DIN ISO 2768-mk
XF7 = Encoder shaft diameter, see type code
xj7 = Shaft diameter, on the customer side

G

M12 and M23 cable outlet



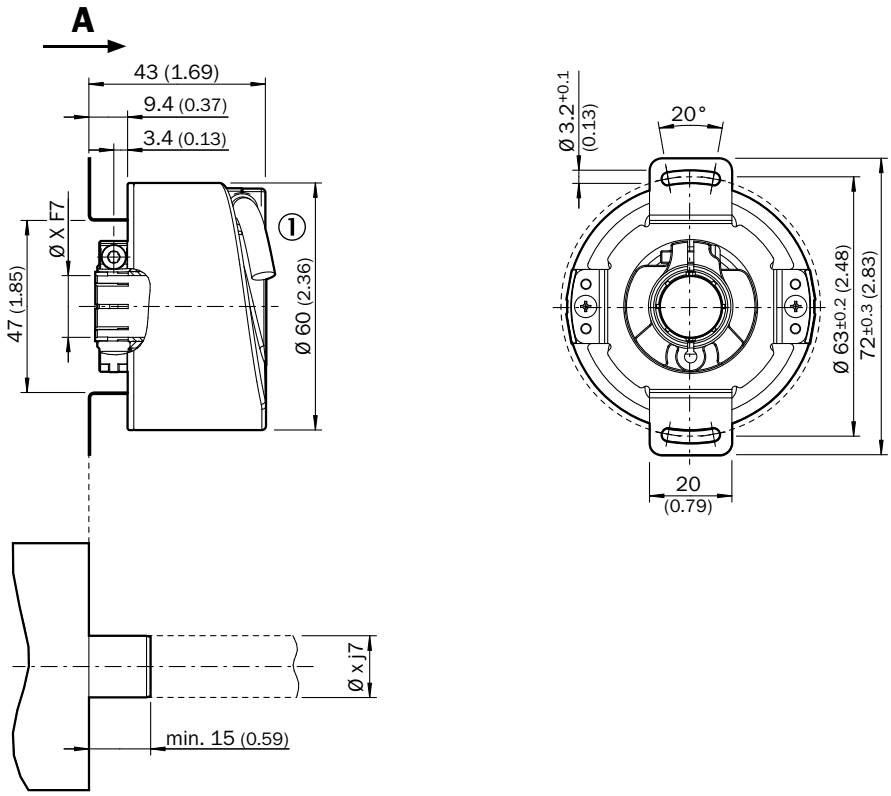
Customer-side

General tolerances according to DIN ISO 2768-mk
XF7 = Encoder shaft diameter, see type code
xj7 = Shaft diameter, on the customer side

G

Through hollow shaft

Universal cable outlet



Customer-side

General tolerances according to DIN ISO 2768-mk

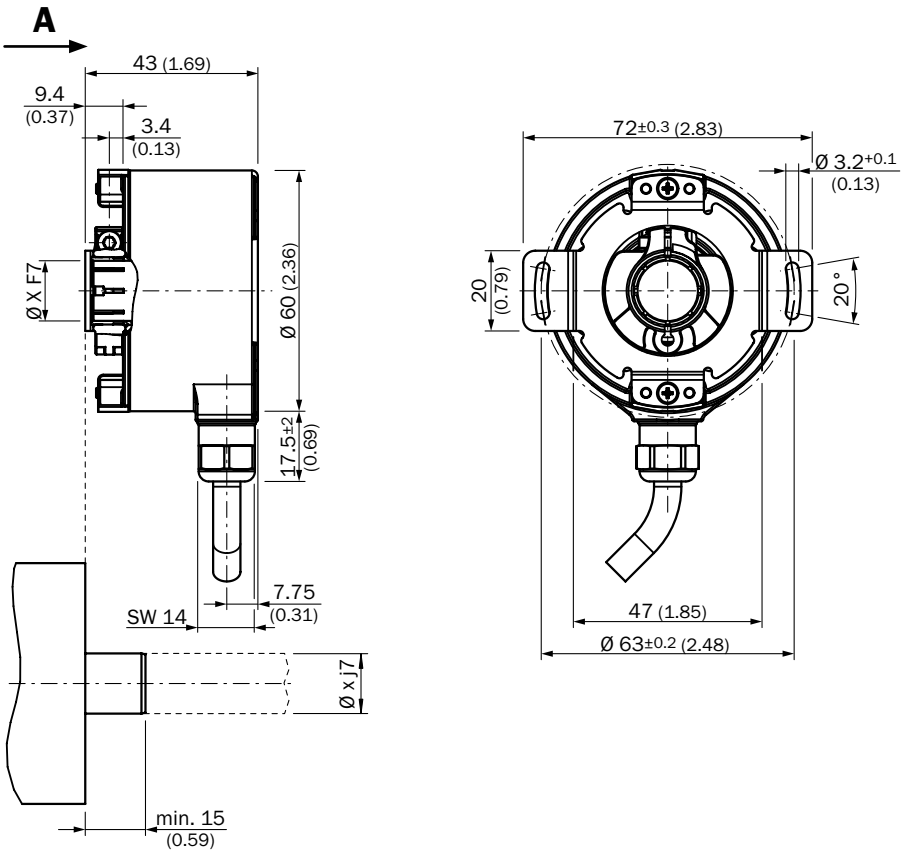
① Cable Ø = 5.6 mm ± 0.2 mm bend radius R = 30 mm

XF7 = Encoder shaft diameter, see type code

xj7 = Shaft diameter, on the customer side

G

Radial cable outlet for AFM60 SSI + incremental and AFM60 SSI + sin/cos



Customer-side

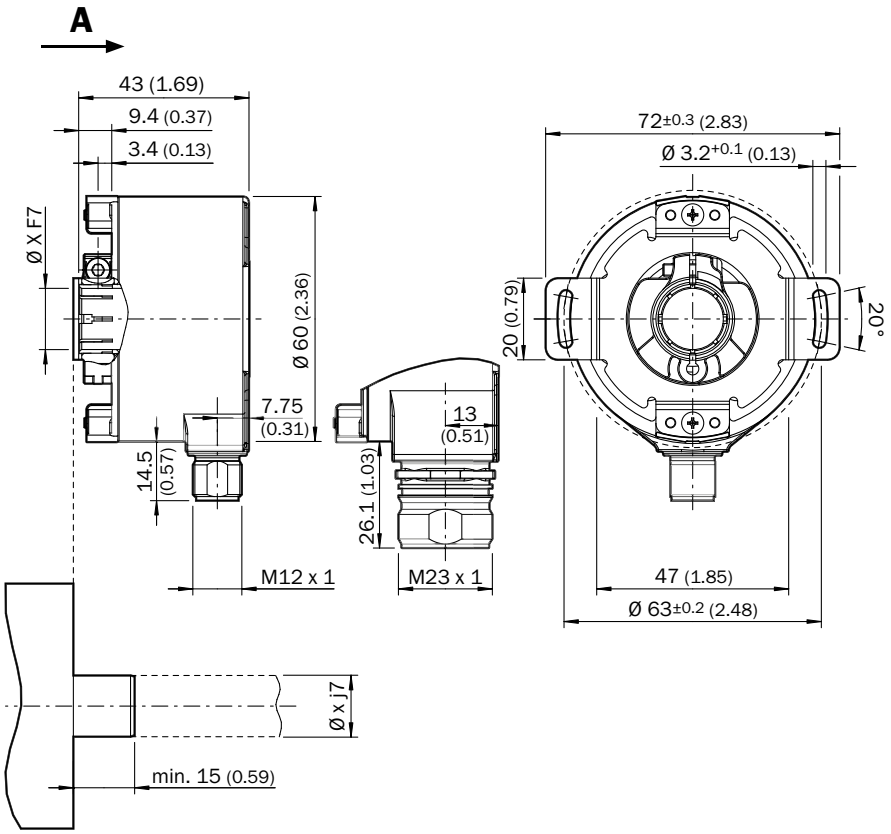
General tolerances according to DIN ISO 2768-mk

XF7 = Encoder shaft diameter, see type code

xj7 = Shaft diameter, on the customer side

G

M12 and M23 cable outlet



Customer-side

General tolerances according to DIN ISO 2768-mk
XF7 = Encoder shaft diameter, see type code
xj7 = Shaft diameter, on the customer side

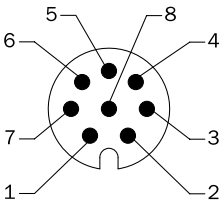
G

PIN assignment

V/$\overline{R}$ Forwards/Reverse: This input programs the counting direction for the encoder. When it is not connected, this input is set to HIGH. If the encoder shaft is rotated clockwise (to the right) as viewed when facing the shaft, it counts in ascending order. If it should count in ascending order when the shaft is rotated counterclockwise (to the left), then this connection must be permanently set to LOW level (GND).

SET This input is for electronic zeroing. If the SET cable is set to U_S for more than 250 ms after it had previously been unassigned for at least 1,000 ms or had been connected to GND, the mechanical position corresponds to the 0 value, i.e., the predetermined SET value.

M12 male connector, 8-pin and cable outlet, cable, 8-wire SSI/gray

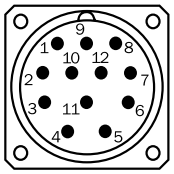


View of M12 male device connector on encoder

Pin	Wire colors	SSI signal	Explanation
1	Brown	Data–	Interface signals
2	White	Data+	Interface signals
3	Black	V/$\overline{R}$	Sequence in direction of rotation
4	Pink	SET	Electronic adjustment
5	Yellow	Clock+	Interface signals
6	Violet	Clock -	Interface signals
7	Blue	GND	Ground connection
8	Red	+U_S	Operating voltage
		Screen	Screen connected to housing on encoder side. Connected to ground on control side.

G

M23 male connector, 12-pin SSI/gray



View of M23 male device connector on encoder

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	Operating voltage
9	SET	Electronic adjustment
10	Data–	Interface signals
11	Clock–	Interface signals
12	V/$\overline{R}$	Sequence in direction of rotation
	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

M23 male connector, 12-pin and cable outlet, cable, 12-wire SSI/gray + incremental

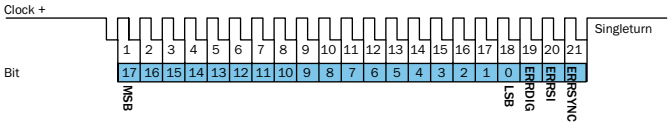
Pin	Wire colors	Signal	Explanation
1	Red	$+U_S$	Operating voltage
2	Blue	GND	Ground connection
3	Yellow	Clock+	Interface signal
4	White	Data+	Interface signal
5	Orange	SET	Electronic adjustment
6	Brown	Data–	Interface signal
7	Violet	Clock–	Interface signal
8	Black	$\overline{B}$	Signal wire
9	Orange/black	V/$\overline{R}$	Sequence in direction of rotation
10	Green	$\overline{A}$	Signal wire
11	Gray	A	Signal wire
12	Pink	B	Signal wire
		Screen	Screen connected to housing on encoder side. Connected to ground on control side.

M23 male connector, 12-pin and cable outlet, cable, 12-wire SSI/gray + sin/cos

Pin	Wire colors	Signal	Explanation
1	Red	$+U_S$	Operating 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 wire
9	Orange/black	V/$\overline{R}$	Sequence in direction of rotation
10	Green	Cos–	Signal wire
11	Gray	Cos+	Signal wire
12	Pink	Sin+	Signal wire
		Screen	Screen connected to housing on encoder side. Connected to ground on control side.

Signal outputs

Singleturn SSI data format



Bit 1–18: Position bits

- LSB: Least significant bit
- MSB: Most significant bit

Bit 19-21: Errorbits

- ERRDIG: Error message concerning speed. If this error occurs during the position forming process, it is displayed through the ERRDIG bit.
- ERRSI: Light source error.
- ERRSYNC: Contamination of the code disk or read system. A error has occurred during the position detection process since the last SSI data transmission. The errorbit is deleted during the next data transmission.

Evaluation of the error bits must be realized in the PLC.

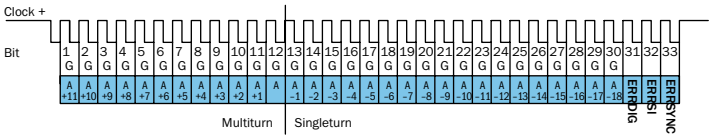
The error bits output do not have to be used by the PLC.

Example

If the absolute value encoder is adjusted to a resolution of 13 bits, 16 bits are output: 13 databits and 3 errorbits.
If the errorbits cannot be evaluated in the PLC, the control unit must be set to an encoder resolution of 13 bits. The errorbits must then be masked out at the control.

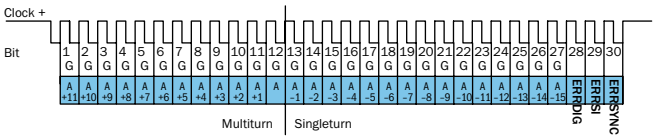
Multiturn SSI data format

30 bits



Bits 1–12: Multiturn position bits
Bits 13–30: Singleturn position bits
Bits 31–33: Errorbits

27 bits



Bit 1–12: Multiturn position bits
Bits 13–27: Singleturn position bits
Bits 28–30: Errorbits

Errorbits

- ERRDIG: Error message concerning speed. If this error occurs during the position forming process, it is displayed through the ERRDIG bit.
- ERRSI: Light source error.
- ERRSYNC: Contamination of the code disk or read system. A error has occurred during the position detection process since the last SSI data transmission. The errorbit is deleted during the next data transmission.

Evaluation of the error bits must be realized in the PLC.

The error bits output do not have to be used by the PLC. The multiturn resolution is fixed to 12 bits.

Example

If the absolute value encoder is adjusted to a resolution of 27 bits, 30 bits are output: 27 databits and 3 errorbits.
If the errorbits cannot be evaluated in the PLC, the control unit must be set to an encoder resolution of 27 bits. The errorbits must then be masked out at the control.

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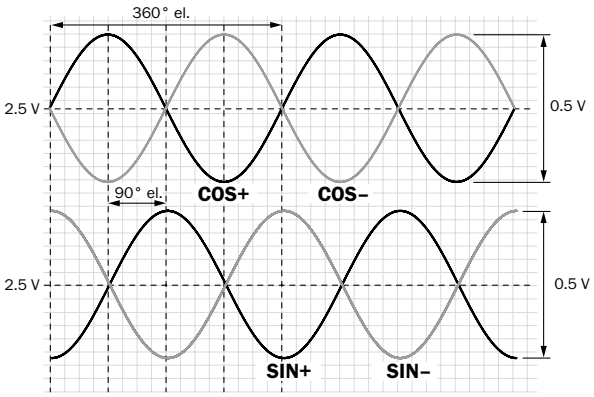
Interfaces

Electrical interfaces sin/cos 1.0 V_{SS}

Supply voltage	Output
4.5 ... 32 V	Sine 0.5 V_{SS}

Signals **before** difference at 120 Ω load

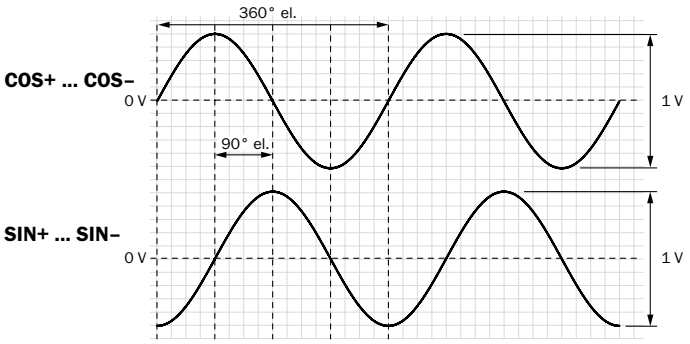
Signal diagram for clockwise shaft rotation, looking in direction "A" (shaft)



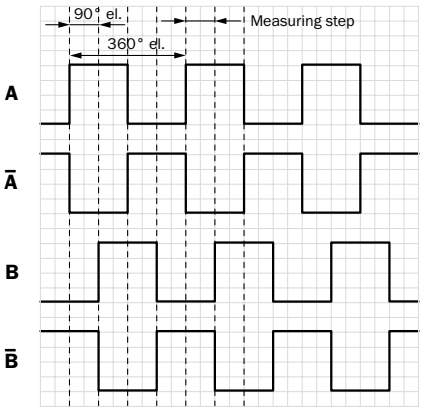
Interface signals Sin, $\overline{Sin}$, Cos, $\overline{Cos}$	Signals before difference at 120 Ω load	Signal offset
Differential analog	0.5 V_{SS} ± 20%	2.5 V ± 10%

Signal **after** difference at 120 Ω load

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



Incremental signal outputs for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)



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Recommended accessories

Mounting systems

Mounting brackets and plates

Mounting bracket

Figure	Brief description	Type	Part no.
	Mounting bracket for encoder with centering hub 36 mm, including mounting kit for face mount flange	BEF-WF-36	2029164

Dimensional drawings ➜ page K-725

Flanges

Flange plate

Figure	Brief description	Type	Part no.
	Standard stator coupling	BEF-DS00XFX	2056812
	Stator coupling, 16.5 mm high	BEF-DS05XFX	2057423
	Stator coupling with hole circle diameter 63 mm	BEF-DS07XFX	2059368
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-050	2029160
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-060REC	2029162
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum	BEF-FA-036-060RSA	2029163
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-063REC	2034225
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum	BEF-FA-036-100	2029161

Dimensional drawings ➜ page K-725

Other mounting accessories

Measuring wheels and measuring wheel systems

Figure	Brief description	Type	Part no.
	Measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020	5312988
	Measuring wheel with ridged plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020G	5318678
	Measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 500 mm	BEF-MR-010050	5312989

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Figure	Brief description	Type	Part no.
	Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 200 mm	BEF-MR006020R	2055222
	Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 300 mm	BEF-MR006030R	2055634
	Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 500 mm	BEF-MR006050R	2055225
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227
	O-ring for measuring wheels (circumference 200 mm)	BEF-OR-053-040	2064061
	O-ring for measuring wheels (circumference 300 mm)	BEF-OR-083-050	2064076

Dimensional drawings ➜ page K-725

Modular measuring wheel system

Brief description	Type	Part no.
Measuring wheel system, desired mounting position: left, for DBS60-S4, DFS60-S4, AFS60-S4, and AFM60-S4	BEF-MRS-10-1	2071958
Measuring wheel system, desired mounting position: right, for DBS60-S4, DFS60-S4, AFS60-S4, and AFM60-S4	BEF-MRS-10-2	2071957

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Mounting bell

Figure	Brief description	Type	Part no.
	Mounting bell for encoders with a servo flange, centering hub 50 mm, including mounting kit	BEF-MG-50	5312987

Dimensional drawings ➜ page K-725

Servo clamps

Figure	Brief description	Type	Part no.
	Half-shell servo clamps (2 pcs.) for servo flanges with a 50 mm centering hub	BEF-WG-SF050	2029165
	Servo clamps, large, for servo flanges (clamps, eccentric fastener), 3 pcs., without mounting material	BEF-WK-SF	2029166

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Miscellaneous

Figure	Brief description	Type	Part no.
	Mounting kit for servo flange encoder on the bearing block, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911	BEF-MK-LB	5320872
	Bearing block for hollow shaft encoder, including fixing screws	BEF-FA-B12-010	2042728
	Bearing block for servo and face mount flange encoder	BEF-FA-LB1210	2044591

Dimensional drawings ➜ page K-725

Shaft adaptation

Shaft couplings

Figure	Brief description	Type	Part no.
	Bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. speed 10,000 rpm, –30 °C ... +120 °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub	KUP-0606-B	5312981
	Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. speed 10,000 rpm, –30 °C ... +120 °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982
	Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. revolutions 10,000 rpm, –30° ... +120 °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1010-B	5312983
	Bellows coupling, shaft diameter 10 mm/12 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular ± 4°; max. revolutions 10,000 rpm, –30 °C ... +120 °C, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1012-B	5312984
	Bar coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angle ± 3°; max. speed 10,000 rpm, –10 °C ... +80 °C, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0606-S	2056406
	Bar coupling, shaft diameter 6 mm / 8 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle ± 3°; max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0608-S	5314179
	Bar coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular ± 3°; max. speed 10,000 rpm, –10 °C ... +80 °C, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
	Bar coupling, shaft diameter 8 mm / 10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular ± 3°; torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0810-S	5314178
	Bar coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle ± 3°; max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-1010-S	2056408
	Double-loop coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular ± 10°; max. speed 3,000 rpm, –30 °C ... +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-0610-D	5326697
	Double-loop coupling, shaft diameter 8 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular ± 10°; max. speed 3,000 rpm, –30 °C ... +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-0810-D	5326704
	Double-loop coupling, shaft diameter 10 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular ± 10°; max. speed 3,000 rpm, –30 °C ... +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1010-D	5326703
	Double-loop coupling, shaft diameter 10 mm/12 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular ± 10°; max. speed 3,000 rpm, –30 °C ... +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1012-D	5326702
	Spring washer coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular ± 2.5°; max. speed 12,000 rpm, –10 °C ... +80 °C, max. torque 60 Ncm; material: aluminum flange, fiber-glass reinforced polyamide membrane and tempered steel coupling pin	KUP-0610-F	5312985
	Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular ± 2.5°; max. speed 12,000 rpm, –10° ... +80° C, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-F	5312986

Dimensional drawings ➜ page K-725

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Connectivity

Plug connectors and cables

Connecting cables with female connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm	2 m	DOL-1208-G02MAC1	6032866
		5 m	DOL-1208-G05MAC1	6032867
		10 m	DOL-1208-G10MAC1	6032868
		20 m	DOL-1208-G20MAC1	6032869
	Head A: female connector, JST, 8-pin, straight Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm², Ø 5.6 mm	0.5 m	DOL-0J08-G0M5AA6	2048589
		1.5 m	DOL-0J08-G1M5AA6	2048590
		3 m	DOL-0J08-G3M0AA6	2048591
		5 m	DOL-0J08-G5M0AA6	2048593
		10 m	DOL-0J08-G10MAA6	2048594
	Head A: female connector, M23, 12-pin, straight Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm², Ø 5.6 mm [1]	0.5 m	DOL-2308-G0M5AA6	2048595
		1.5 m	DOL-2308-G1M5AA6	2048596
		3 m	DOL-2308-G03MAA6	2048597
		5 m	DOL-2308-G05MAA6	2048598
		10 m	DOL-2308-G10MAA6	2048599
	Head A: female connector, M23, 12-pin, straight Head B: cable Cable: suitable for drag chain, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm [2]	1.5 m	DOL-2312-G1M5MD2	2062284
		3 m	DOL-2312-G03MMD2	2062300
		5 m	DOL-2312-G05MMD2	2062301
		10 m	DOL-2312-G10MMD2	2062302
		20 m	DOL-2312-G20MMD2	2062303
		30 m	DOL-2312-G30MMD2	2062304

[1] Suitable for SSI interfaces, not suitable for SSI + Incremental or SSI + Sin/Cos interfaces.

[2] Suitable for SSI + Incremental and SSI + Sin/Cos interfaces.

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Female connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: –40 °C ... +85 °C	DOS-1208-GA01	6045001
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –20 °C ... +130 °C	DOS-2312-G	6027538
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –40 °C ... +125 °C	DOS-2312-G02	2077057
	Head A: female connector, M23, 12-pin, angled, shielded, for cable diameter 4.2 mm ... 6.6 mm Head B: - Operating temperature: –20 °C ... +130 °C	DOS-2312-W01	2072580
	Head A: female connector, M23, 21-pin, straight, shielded, for cable diameter 5.5 mm ... 12 mm Head B: -	DOS-2321-G	6027539

Dimensional drawings ➜ page K-725

Cables (ready to assemble)

Figure	Brief description	Length of cable	Type	Part no.
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm², Ø 5.6 mm	By the meter	LTG-2308-MWENC	6027529
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, UV and saltwater-resistant, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 2 x 0.14 mm², Ø 7.8 mm	By the meter	LTG-2612-MW	6028516

Dimensional drawings ➜ page K-725

Male connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: male connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: –40 °C ... +85 °C	STE-1208-GA01	6044892
	Head A: male connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –20 °C ... +130 °C	STE-2312-G	6027537

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Connection cables with female and male connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 8-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: PUR, halogen-free, shielded, 4 x 2 x 0.15 mm²	0.5 m	DSL-2D08-G0M5AC2	2048439
	Head A: female connector, M23, 12-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm² [1]	0.5 m	DSL-3D08-G0M5AC2	2048440
	Head A: female connector, M23, 12-pin, straight Head B: male connector, D-Sub, 9-pin, straight, 8-wire[2]	0.5 m	DSL-3D08-G0M5AC4	2059270

[1] Suitable for use with SSI interfaces, not suitable for use with SSI + Incremental interface or SSI + Sin/Cos.

[2] Suitable for use with SSI + Incremental or SSI + Sin/Cos interfaces.

Dimensional drawings ➜ page K-725

Other accessories

Programming and configuration tools

Figure	Brief description	Type	Part no.
	Programming unit USB, for programmable SICK encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoder.	PGT-08-S	1036616
	Programming unit display for programmable SICK DFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoders with DFS60, AFS/AFM60, and AHS/AHM36. Compact dimensions, low weight, and intuitive operation.	PGT-10-Pro	1072254

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➜ For additional accessories, please see page K-668 onwards

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