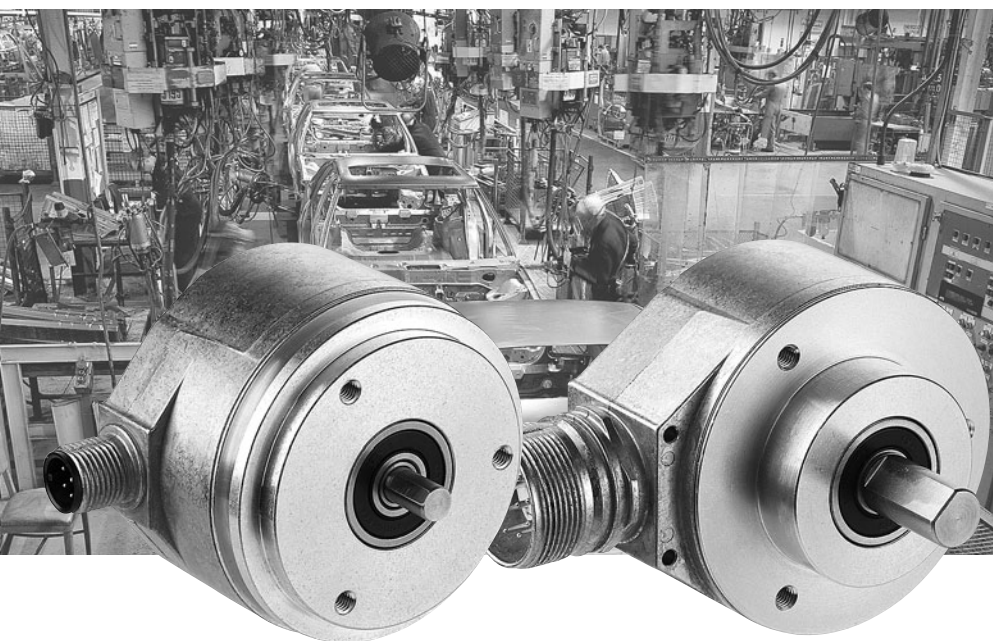


# AFS60: Absolute Encoders Singleturn, SSI

## AFM60: Absolute Encoders Multi- turn, SSI und SSI + Incremental



With the addition of a 12-bit multiturn resolution, the encoder reaches a class leading resolution totalling 30 bits.

Thanks to the 30 mm separation of the shaft bearings, the AFM/AFS60 product range offers users a substantially more robust solution than encoders with more conventional bearing arrangements. Even at maximum operating speeds, the increased bearing separation leads to exceptionally smooth operation as well as optimum runout. Despite the large bearing separation, the AFS/AFM60 product ranges have an extremely compact construction enabling use in applications with very limited space.

Both the AFM60 and the AFS60 can be programmed using the same programming tool as used with the DFS60 series of incremental encoders from SICK. For the very first time, incremental, singleturn Absolute and multiturn Absolute Encoders can be parametrised using just one universal programming tool.

Product options:

Face mount flange and servo flange, blind hollow shaft and through hollow shaft

M12 or M23 Connector outlet  
1.5 m, 3 m or 5 m cable outlet, radial or axial  
Resolution: Singleturn 18 bits max. Multiturn 12 bits

	<b>Resolution up to 18 bits</b>
<b>Absolute Encoders Singleturn</b>	

	<b>Resolution up to 30 bits</b>
<b>Absolute Encoders Multiturn</b>	

	<b>Number of lines 1 up to 65,536</b>
<b>Incremental Encoders</b>	

With a 30-bit resolution and an extremely robust construction, the new AFM60 Absolute Encoders Multiturn sets a new benchmark. Even its small brother, the AFS60 Absolute Encoders Singleturn, is impressive, with its high resolution of 18 bits. Consequently, both new product ranges are particularly suitable for harsh operating conditions in all industrial applications where high levels of accuracy and reliability are paramount.

With a maximum singleturn resolution of 18 bits, the AFM60 is among the highest performing encoders in its market segment.



	<b>Resolution up to 18 bits</b>
<b>Absolute Encoders Singleturn</b>	
	<b>Resolution up to 30 bits</b>
<b>Absolute Encoders Multiturn</b>	
	<b>Number of lines 1 up to 65,536</b>
<b>Incremental Encoders</b>	

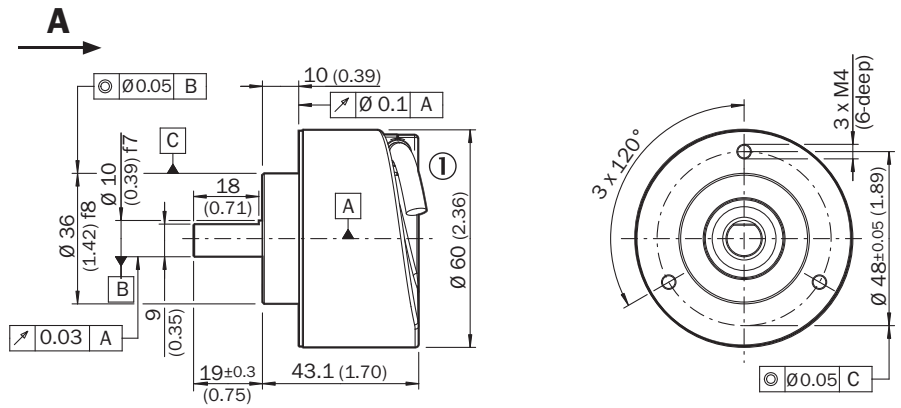
- Connector or cable outlet
- Protection class IP 67
- Electrical interface SSI or SSI + Incremental
- Resolution, number of incremental lines, TTL- or HTL-signal and offset programmable



Product may differ from illustration



**Dimensional drawing face mount flange, cable outlet**

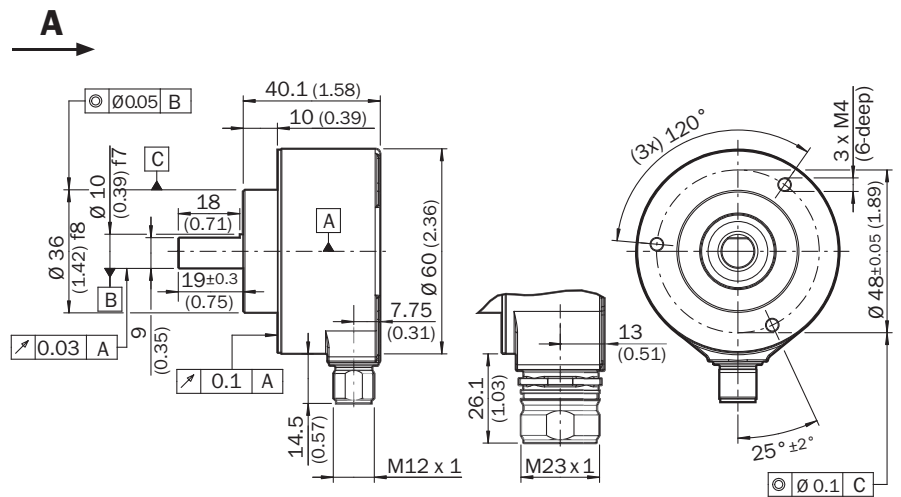


All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

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

**Dimensional drawing face mount flange, connector outlet M12 and M23**



All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

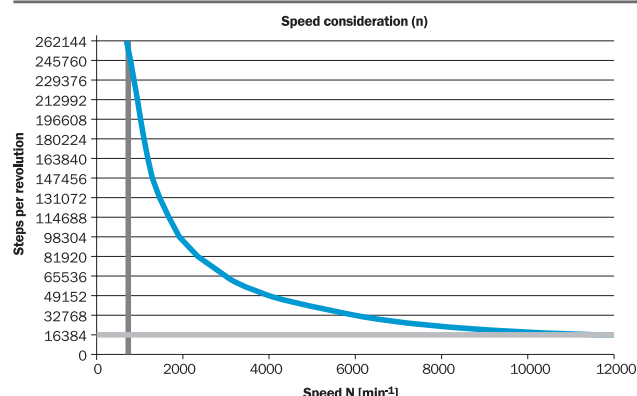
<b>Accessories</b>
Connection systems (page 28)
Mounting systems (page 30)
Programming Tool (page 27)

<b>Pin allocation (page 26)</b>
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Technical data to DIN 32878		AFS60/AFM60 face mount flange			E	B	A
<b>Mechanical data</b>							
Shaft diameter	10 x 19 mm						
Mass <sup>1)</sup>	0.26 kg						
Moment of inertia to the rotor	6.2 gcm <sup>2</sup>						
Operating speed <sup>2)</sup>	9,000 min <sup>-1</sup>						
Angular acceleration max.	5 x 10 <sup>5</sup> rad/s <sup>2</sup>						
Operating torque at 20 °C	0.3 Ncm						
Starting torque at 20 °C	0.5 Ncm						
Permissible shaft movement	Radial	80 N	80 N	80 N			
	Axial	40 N	40 N	40 N			
Bearing lifetime	3 x 10 <sup>9</sup> revolutions						
Resistance	To shocks <sup>3)</sup>	50 g/6 ms	70 g/6 ms	60 g/6 ms			
	To vibration <sup>4)</sup>	20 g/10 ... 2,000 Hz	30 g/10 ... 2,000 Hz	20 g/10 ... 2,000 Hz			
<b>Electrical data</b>							
Code type	Gray						
Code sequence adjustable	CW/CCW						
Measuring step	360° number of lines	0.09°	0.01°	0.0014°			
Number of steps per revolution max.	Singleturn and Multiturn	4096	32768 ①	262144 ①			
Number of lines	4096 Multiturn (AFM60)						
<b>Error limits</b>							
Measuring step deviation	Number of lines per revolution 1 ... 399	± 0.2°	± 0.05°	± 0.03°			
	Number of lines per revolution 400 ... 40000	± 0.2°	± 0.08°	± 0.04°			
	Number of lines per revolution > 40000		± 0.01°	± 0.008°			
Repeatability	0.002°						
Position sample time	< 1 µs						
<b>EMC <sup>5)</sup></b>							
Operating voltage	4.5 ... 32 V						
Power consumption, no load	0.5 W						
Initialisation time <sup>6)</sup>	50 ms						
<b>Signal line SSI <sup>7)</sup></b>							
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 <sub>S</sub> V)						
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1.5 V; H = 2.0 - U <sub>S</sub> V)						
<b>Incremental interface TTL/HTL/programmable (AFM60 SSI + Incremental)</b>							
Number of lines per revolution	1/4 of number of SSI steps per revolution						
Measuring step	90° electric/number of lines						
Reference signal	90° electric, gated with A and B						
Max. output frequency		300 kHz	600 kHz	820 kHz			
Load current	30 mA						
<b>Environmental data</b>							
<b>Working temperature range</b>							
		0 ... +85 °C	-30 ... +100 °C	-30 ... +100 °C			
<b>Storage temperature range (without package)</b>							
		-40 ... +100 °C	-40 ... +100 °C	-40 ... +100 °C			
Permissible relative humidity <sup>8)</sup>	90 %						
<b>Protection class to IEC 60529</b>							
	Shaft side	IP 65	IP 65	IP 65			
	Housing side connector outlet <sup>9)</sup>	IP 67	IP 67	IP 67			
	Housing side cable outlet	IP 67	IP 67	IP 67			

<sup>1)</sup> Based on encoders with a connector outlet  
<sup>2)</sup> Self-warming 3.3 k/1,000 min<sup>-1</sup>, when applying, note working temperature range  
<sup>3)</sup> To EN 60068-2-27  
<sup>4)</sup> To EN 60068-2-6  
<sup>5)</sup> To EN 61000-6-2 and EN 61000-6-3  
<sup>6)</sup> Valid positional data can be read once this time has elapsed  
<sup>7)</sup> Signal lines via 12-pin encoder connector, electrically isolated from the housing, ie. 12-core cable  
<sup>8)</sup> Condensation of the optical scanning not permitted  
<sup>9)</sup> With mating connector fitted

① Maximum speed consideration AFS60/AFM6



## Order information

### AFS60 Absolute Encoders Singleturn, face mount flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0		-	S									

Type (cp. technical data page 3)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Solid shaft, 10 x 19 mm = <b>4</b>	4.5 ... 32 V, SSI/Gray = <b>A</b>	Connector M23, 12-pin, radial = <b>A</b>	Steps per rev.
B			Connector M12, 8-pin, radial = <b>C</b>	Selection depending on the type, see below.
A			Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b>	
			Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b>	
			Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	

<sup>1)</sup> 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.

#### Type E – Number of lines per revolution

000256 = 8 bits	001024 = 10 bits	004096 = 12 bits
000512 = 9 bits	002048 = 11 bits	

#### Type B – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	Others on request
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	
001024 = 10 bits	008192 = 13 bits		

#### Type A – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	131072 = 17 bits
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	262144 = 18 bits
001024 = 10 bits	008192 = 13 bits	065536 = 16 bits	Others on request

#### Order example: AFS60 Absolute Encoders Singleturn, type E, solid shaft 10 x 19 mm,

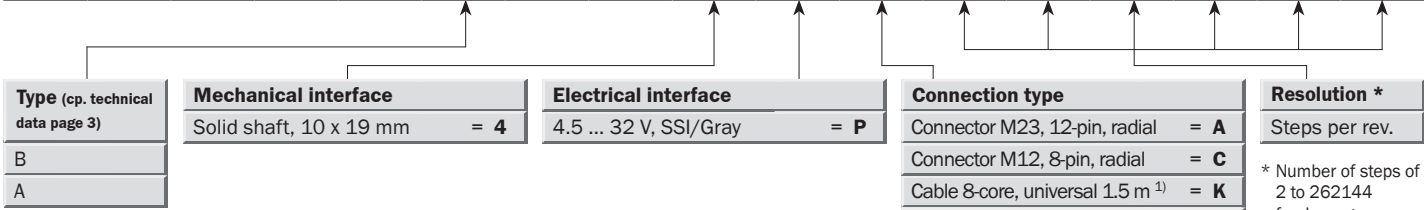
#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0	E	-	S	4	A	C	0	0	1	0	2	4

**Order information**

**AFS60 Absolute Encoders Singleturn, face mount flange, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0		-	S									



Type (cp. technical data page 3)	Mechanical interface	Electrical interface	Connection type	Resolution *
B	Solid shaft, 10 x 19 mm = <b>4</b>	4.5 ... 32 V, SSI/Gray = <b>P</b>	Connector M23, 12-pin, radial = <b>A</b>	Steps per rev.
A			Connector M12, 8-pin, radial = <b>C</b>	
			Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b>	
			Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b>	
			Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	

\* Number of steps of 2 to 262144 freely programmable by customer. Factory-programmed to Type B: 032768 Type A: 262144

<sup>1)</sup> 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.

Order information programmable version	
<b>AFS60 Absolute Encoders Singleturn</b>	
<b>Type B, face mount flange, solid shaft 10 x 19 mm</b>	
Model name	Part No.
AFS60B-S4PA032768	1037483
AFS60B-S4PC032768	1037484
AFS60B-S4PK032768	1037485
AFS60B-S4PL032768	1037486
AFS60B-S4PM032768	1037487

Order information programmable version	
<b>AFS60 Absolute Encoders Singleturn</b>	
<b>Type A, face mount flange, solid shaft 10 x 19 mm</b>	
Model name	Part No.
AFS60A-S4PA262144	1037488
AFS60A-S4PC262144	1037489
AFS60A-S4PK262144	1037490
AFS60A-S4PL262144	1037491
AFS60A-S4PM262144	1037492

## Order information

### AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray, face mount flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 3) E B A	<b>Mechanical interface</b> Solid shaft, 10 x 19 mm = <b>4</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>A</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution</b> Steps per rev. Selection depending on the type, see below.
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<sup>1)</sup> 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.

#### Type E – Number of lines per revolution x 4096 (12 bits)

000256 = 8 Bit	001024 = 10 Bit	004096 = 12 Bit
000512 = 9 Bit	002048 = 11 Bit	

#### Type B – Number of lines per revolution x 4096 (12 bits)

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 – Number of lines per revolution x 4096 (12 bits)

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	

### AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray + Incremental, face mount flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 3) E B A	<b>Mechanical interface</b> Solid shaft, 10 x 19 mm = <b>4</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray + Incremental, HTL = <b>L</b> 4.5 ... 32 V, SSI/Gray + Incremental, TTL = <b>T</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b>	<b>Resolution</b> Steps per rev. Selection depending on the type, see below.
--	---	---	--	--

#### Type E – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

#### Type B – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

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)	

#### Order example: AFM60 Absolute Encoders Multiturn, type E, solid shaft 10 x 19 mm,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits) x number of revolutions (12 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0	E	-	S	4	A	C	0	0	1	0	2	4

**Order information**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray, face mount flange, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 3) B A	<b>Mechanical interface</b> Solid shaft, 10 x 19 mm = <b>4</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>P</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution *</b> Steps per rev.
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\* Number of steps of 256 (8 bits) to 262144 (18 bits) freely programmable by customer. Factory-programmed to  
 Type B: 032768  
 Type A: 262144

<sup>1)</sup> 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.

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, Type B, face mount flange, solid shaft 10 x 19 mm**

Model name	Part No.
AFM60B-S4PA032768	1037503
AFM60B-S4PC032768	1037504
AFM60B-S4PK032768	1037505
AFM60B-S4PL032768	1037506
AFM60B-S4PM032768	1037507

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, Type A, face mount flange, solid shaft 10 x 19 mm**




Model name	Part No.
AFM60A-S4PA262144	1037508
AFM60A-S4PC262144	1037509
AFM60A-S4PK262144	1037510
AFM60A-S4PL262144	1037511
AFM60A-S4PM262144	1037512

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray + Incremental, face mount flange, programmable version**

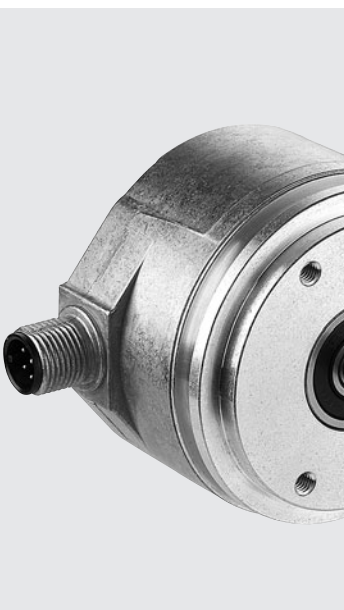
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 3) B A	<b>Mechanical interface</b> Solid shaft, 10 x 19 mm = <b>4</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray + Incremental, programmable = <b>R</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b>	<b>Resolution *</b> Steps per rev.
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\* Number of steps of 256 (8 bits) to 262144 (18 bits) 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.

	<b>Resolution up to 18 bits</b>
<b>Absolute Encoders Singleturn</b>	
	<b>Resolution up to 30 bits</b>
<b>Absolute Encoders Multiturn</b>	
	<b>Number of lines 1 up to 65,536</b>
<b>Incremental Encoders</b>	

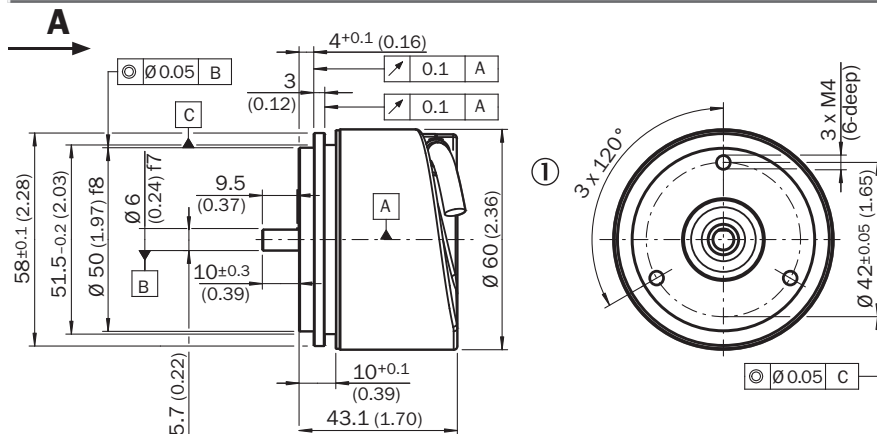
- Connector or cable outlet
- Protection class IP 67
- Electrical interface SSI or SSI + Incremental
- Resolution, number of incremental lines, TTL- or HTL-signal and offset programmable



Product may differ from illustration



**Dimensional drawing servo flange, cable outlet**



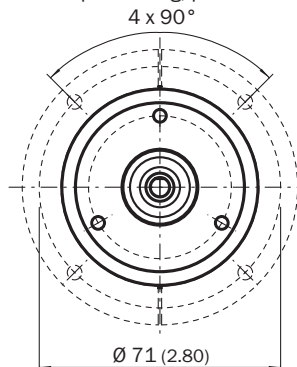
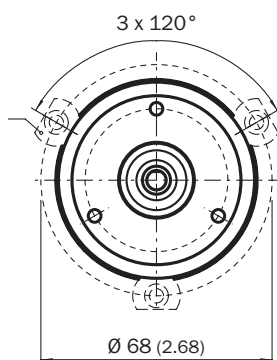
General tolerances according to DIN ISO2768 -mk

- ① Cable-Ø = 5.6 ± 0.2 mm
- Bending radius R = 30 mm

All dimensions in mm (inch)

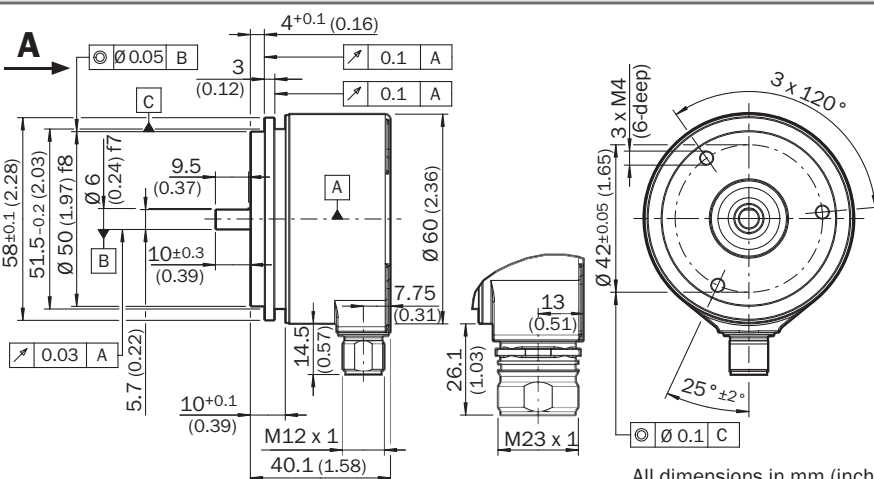
Proposed customer fitting for servo clamps small, part no. 2029166

Proposed customer fitting for servo clamps half ring, part no. 2029165



All dimensions in mm (inch)

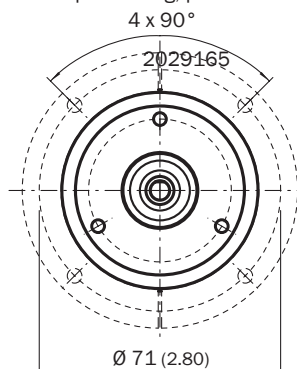
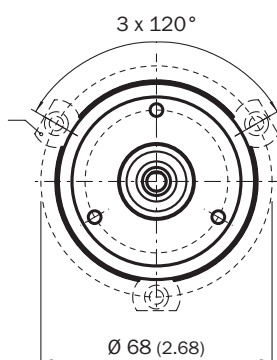
**Dimensional drawing servo flange, connector outlet M12 and M23**



General tolerances according to DIN ISO2768 -mk

Proposed customer fitting for servo clamps small, part no. 2029166

Proposed customer fitting for servo clamps half ring, part no. 2029165



All dimensions in mm (inch)

<b>Accessories</b>
Connection systems (page 28)
Mounting systems (page 30)
Programming Tool (page 27)

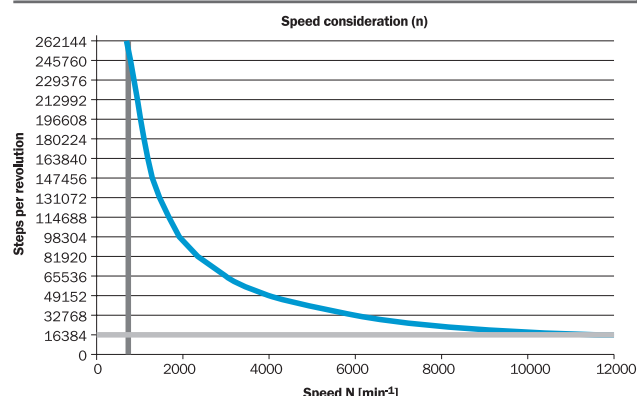
**Pin allocation (page 26)**



Technical data to DIN 32878		AFS60/AFM60 servo flange			E	B	A
<b>Mechanical data</b>							
Shaft diameter	6 x 10 mm						
Mass <sup>1)</sup>	0.26 kg						
Moment of inertia to the rotor	6.2 gcm <sup>2</sup>						
Operating speed <sup>2)</sup>	9,000 min <sup>-1</sup>						
Angular acceleration max.	5 x 10 <sup>5</sup> rad/s <sup>2</sup>						
Operating torque at 20 °C	0.3 Ncm						
Starting torque at 20 °C	0.5 Ncm						
Permissible shaft movement	Radial	80 N	80 N	80 N			
	Axial	40 N	40 N	40 N			
Bearing lifetime	3 x 10 <sup>9</sup> revolutions						
Resistance	To shocks <sup>3)</sup>	50 g/6 ms	70 g/6 ms	60 g/6 ms			
	To vibration <sup>4)</sup>	20 g/10 ... 2,000 Hz	30 g/10 ... 2,000 Hz	20 g/10 ... 2,000 Hz			
<b>Electrical data</b>							
Code type	Gray						
Code sequence adjustable	CW/CCW						
Measuring step	360° number of lines	0.09°	0.01°	0.0014°			
Number of steps per revolution max.	Singleturn and Multiturn	4096	32768 ①	262144 ①			
Number of lines	4096 Multiturn (AFM60)						
Error limits		± 0.2°	± 0.05°	± 0.03°			
Measuring step deviation	Number of lines per revolution 1 ... 399	± 0.2°	± 0.08°	± 0.04°			
	Number of lines per revolution 400 ... 40000	± 0.2°	± 0.01°	± 0.008°			
	Number of lines per revolution > 40000			± 0.002°			
Repeatability	0.002°						
Position sample time	< 1 µs						
<b>EMC <sup>5)</sup></b>							
Operating voltage	4.5 ... 32 V						
Power consumption, no load	0.5 W						
Initialisation time <sup>6)</sup>	50 ms						
<b>Signal line SSI <sup>7)</sup></b>							
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 <sub>S</sub> V)						
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1.5 V; H = 2.0 - U <sub>S</sub> V)						
<b>Incremental interface TTL/HTL/programmable (AFM60 SSI + Incremental)</b>							
Number of lines per revolution	1/4 of number of SSI steps per revolution						
Measuring step	90° electric/number of lines						
Reference signal	90° electric, gated with A and B						
Max. output frequency		300 kHz	600 kHz	820 kHz			
Load current	30 mA						
<b>Environmental data</b>							
Working temperature range		0 ... +85 °C	-30 ... +100 °C	-30 ... +100 °C			
Storage temperature range (without package)		-40 ... +100 °C	-40 ... +100 °C	-40 ... +100 °C			
Permissible relative humidity <sup>8)</sup>	90 %						
Protection class to IEC 60529	Shaft side	IP 65	IP 65	IP 65			
	Housing side connector outlet <sup>9)</sup>	IP 67	IP 67	IP 67			
	Housing side cable outlet	IP 67	IP 67	IP 67			

1) Based on encoders with a connector outlet  
 2) Self-warming 3.3 k/1,000 min<sup>-1</sup>, when applying, note working temperature range  
 3) To EN 60068-2-27  
 4) To EN 60068-2-6  
 5) To EN 61000-6-2 and EN 61000-6-3  
 6) Valid positional data can be read once this time has elapsed  
 7) Signal lines via 12-pin encoder connector, electrically isolated from the housing, ie. 12-core cable  
 8) Condensation of the optical scanning not permitted  
 9) With mating connector fitted

① Maximum speed consideration AFS60/AFM6



## Order information

### AFS60 Absolute Encoders Singleturn, servo flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0		-	S									

Type (cp. technical data page 9)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Solid shaft, 6 x 10 mm = <b>1</b>	4.5 ... 32 V, SSI/Gray = <b>A</b>	Connector M23, 12-pin, radial = <b>A</b>	Steps per rev.
B			Connector M12, 8-pin, radial = <b>C</b>	Selection depending on the type, see below.
A			Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b>	
			Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b>	
			Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	

<sup>1)</sup> 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.

#### Type E – Number of lines per revolution

000256 = 8 bits	001024 = 10 bits	004096 = 12 bits
000512 = 9 bits	002048 = 11 bits	

#### Type B – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	Others on request
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	
001024 = 10 bits	008192 = 13 bits		

#### Type A – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	131072 = 17 bits
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	262144 = 18 bits
001024 = 10 bits	008192 = 13 bits	065536 = 16 bits	Others on request

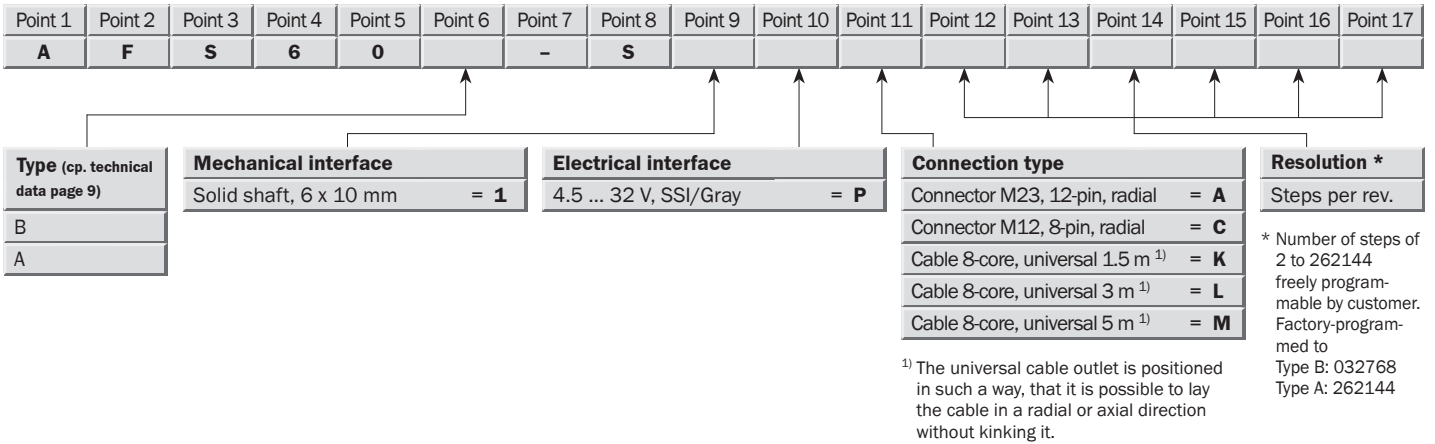
#### Order example: AFS60 Absolute Encoders Singleturn, type E, solid shaft 6 x 10 mm,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0	E	-	S	1	A	C	0	0	1	0	2	4

**Order information**

**AFS60 Absolute Encoders Singleturn, servo flange, programmable version**



Order information programmable version	
<b>AFS60 Absolute Encoders Singleturn</b>	
<b>Type B, servo flange, solid shaft 6 x 10 mm</b>	
Model name	Part No.
AFS60B-S1PA032768	1037493
AFS60B-S1PC032768	1037494
AFS60B-S1PK032768	1037495
AFS60B-S1PL032768	1037496
AFS60B-S1PM032768	1037497

Order information programmable version	
<b>AFS60 Absolute Encoders Singleturn</b>	
<b>Type A, servo flange, solid shaft 6 x 10 mm</b>	
Model name	Part No.
AFS60A-S1PA262144	1037498
AFS60A-S1PC262144	1037499
AFS60A-S1PK262144	1037500
AFS60A-S1PL262144	1037501
AFS60A-S1PM262144	1037502

## Order information

### AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray, servo flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 9) E B A	<b>Mechanical interface</b> Solid shaft, 6 x 10 mm = <b>1</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>A</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution</b> Steps per rev. Selection depending on the type, see below.
--	--	--	---	--

<sup>1)</sup> 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.

#### Type E – Number of lines per revolution x 4096 (12 bits)

000256 = 8 Bit	001024 = 10 Bit	004096 = 12 Bit
000512 = 9 Bit	002048 = 11 Bit	

#### Type B – Number of lines per revolution x 4096 (12 bits)

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 – Number of lines per revolution x 4096 (12 bits)

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	

### AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray + Incremental, servo flange

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 9) E B A	<b>Mechanical interface</b> Solid shaft, 6 x 10 mm = <b>4</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray + Incremental, HTL = <b>L</b> 4.5 ... 32 V, SSI/Gray + Incremental, TTL = <b>T</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b>	<b>Resolution</b> Steps per rev. Selection depending on the type, see below.
--	--	---	--	--

#### Type E – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

#### Type B – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

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)	

#### Order example: AFM60 Absolute Encoders Multiturn, type E, solid shaft 6 x 10 mm,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits) x number of revolutions (12 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0	E	-	S	1	A	C	O	O	1	0	2	4

**Order information**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray, servo flange, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 9) B A	<b>Mechanical interface</b> Solid shaft, 6 x 10 mm = <b>1</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>P</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution *</b> Steps per rev.
---	--	--	---	---------------------------------------

\* Number of steps of 256 (8 bits) to 262144 (18 bits) freely programmable by customer. Factory-programmed to  
 Type B: 032768  
 Type A: 262144

<sup>1)</sup> 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.

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, Type B, servo flange, solid shaft 6 x 10 mm**

Model name	Part No.
AFM60B-S1PA032768	1037513
AFM60B-S1PC032768	1037514
AFM60B-S1PK032768	1037515
AFM60B-S1PL032768	1037516
AFM60B-S1PM032768	1037517

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, Type A, servo flange, solid shaft 6 x 10 mm**




Model name	Part No.
AFM60A-S1PA262144	1037518
AFM60A-S1PC262144	1037519
AFM60A-S1PK262144	1037520
AFM60A-S1PL262144	1037521
AFM60A-S1PM262144	1037522

**AFM60 Absolute Encoders Multiturn, 4096 revolutions, SSI/Gray + Incremental, servo flange, programmable version**

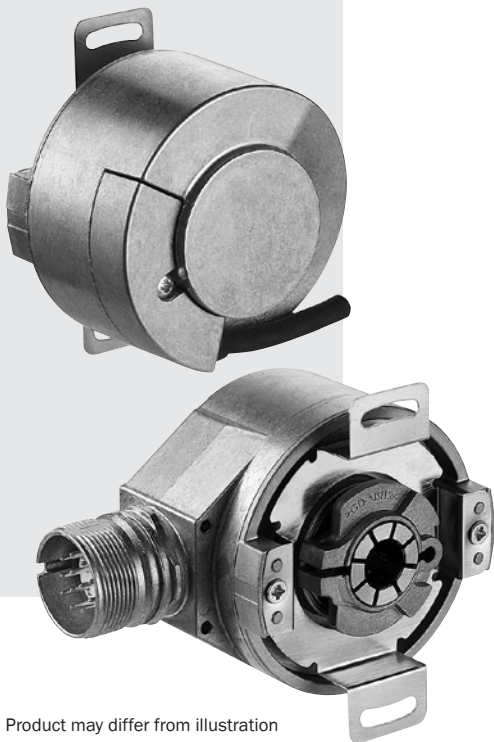
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	S									

<b>Type</b> (cp. technical data page 9) B A	<b>Mechanical interface</b> Solid shaft, 6 x 10 mm = <b>1</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray + Incremental, programmable = <b>R</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b>	<b>Resolution *</b> Steps per rev.
---	--	--	--	---------------------------------------

\* Number of steps of 256 (8 bits) to 262144 (18 bits) 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.

	<b>Resolution up to 18 bits</b>
<b>Absolute Encoders Singleturn</b>	
	<b>Resolution up to 30 bits</b>
<b>Absolute Encoders Multiturn</b>	
	<b>Number of lines 1 up to 65,536</b>
<b>Incremental Encoders</b>	

- Connector or cable outlet
- Protection class IP 67
- Electrical interface SSI or SSI + Incremental
- Resolution, number of incremental lines, TTL- or HTL-signal and offset programmable



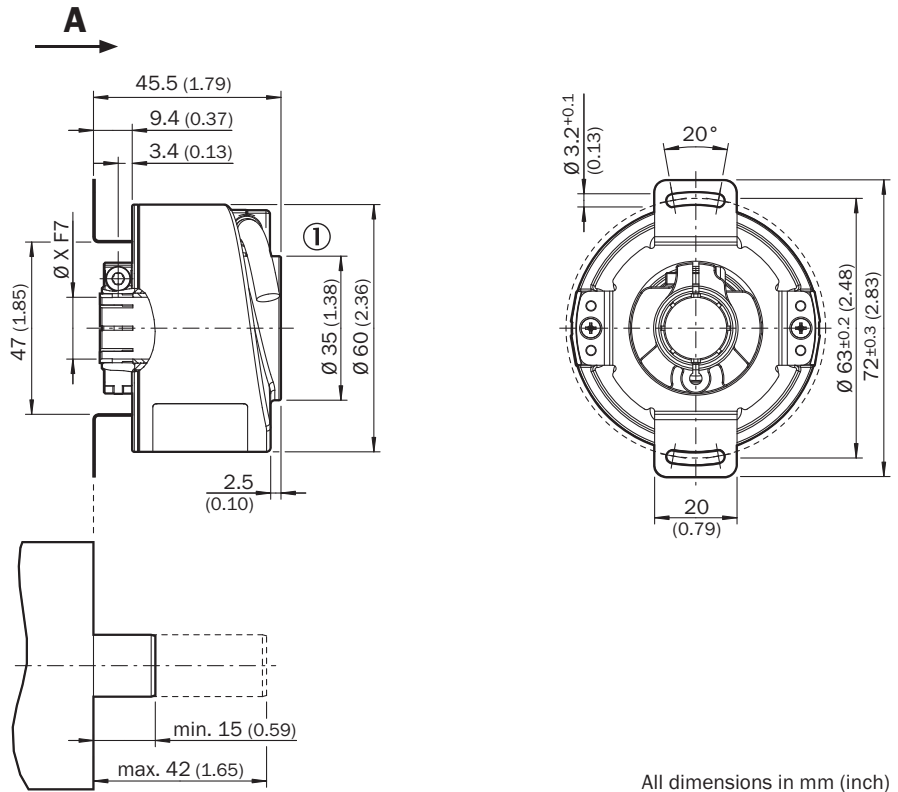
Product may differ from illustration



<b>Accessories</b>
Connection systems (page 28)
Mounting systems (page 30)
Programming Tool (page 27)

**Pin allocation (page 26)**

**Dimensional drawing blind hollow shaft, cable outlet**



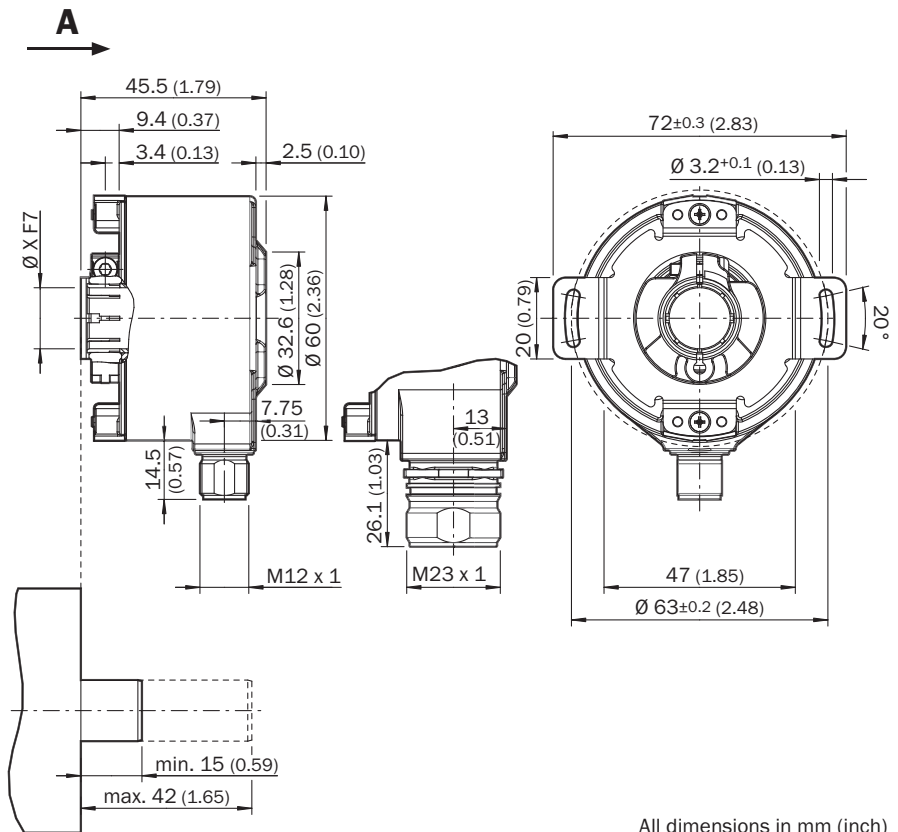
All dimensions in mm (inch)

**Customer-side**

General tolerances according to DIN ISO 2768-mk

- ① Cable-Ø = 5.6 ± 0.2 mm
- Bending radius R = 30 mm

**Dimensional drawing blind hollow shaft, connector outlet M12 and M23**



All dimensions in mm (inch)

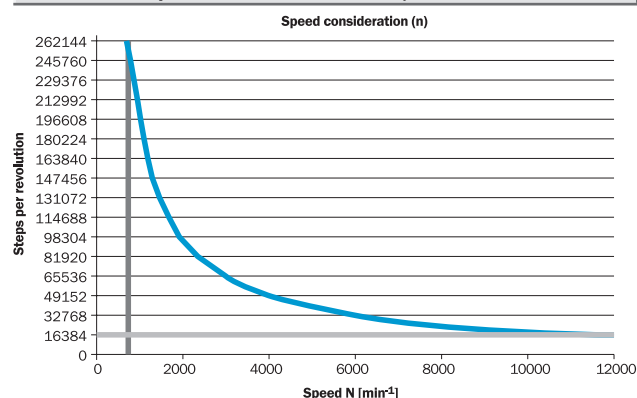
**Customer-side**

General tolerances according to DIN ISO 2768-mk

Technical data to DIN 32878		AFS60/AFM60 blind hollow shaft			E	B	A
<b>Mechanical data</b>							
Shaft diameter	8, 10, 12, 14, 15 mm and 3/8", 1/2", 5/8"						
Mass <sup>1)</sup>	0.2 kg						
Moment of inertia to the rotor	40 gcm <sup>2</sup>						
Operating speed <sup>2)</sup>	6,000 min <sup>-1</sup>						
Angular acceleration max.	5 x 10 <sup>5</sup> rad/s <sup>2</sup>						
Operating torque at 20 °C	0.6 Ncm						
Starting torque at 20 °C	0.8 Ncm						
<b>Permissible movement of the drive element</b>							
Radial	Static/dynamic			± 0.3 / ± 0.1 mm	± 0.3 / ± 0.1 mm	± 0.3 / ± 0.05 mm	
Axial	Static/dynamic			± 0.5 / ± 0.2 mm	± 0.5 / ± 0.2 mm	± 0.5 / ± 0.01 mm	
Bearing lifetime	3 x 10 <sup>9</sup> revolutions						
Resistance	To shocks <sup>3)</sup>			50 g/6 ms	70 g/6 ms	60 g/6 ms	
	To vibration <sup>4)</sup>			20 g/10 ... 2,000 Hz	30 g/10 ... 2,000 Hz	20 g/10 ... 2,000 Hz	
<b>Electrical data</b>							
Code type	Gray						
Code sequence adjustable	CW/CCW						
Measuring step	360° number of lines			0.09°	0.01°	0.0014°	
Number of steps per revolution max.	Singleturn and Multiturn			4096	32768 ①	262144 ①	
Number of lines	4096 Multiturn (AFM60)						
<b>Error limits</b>							
Measuring step deviation	Number of lines per revolution 1 ... 399			± 0.3°	± 0.05°	± 0.03°	
	Number of lines per revolution 400 ... 40000			± 0.2°	± 0.08°	± 0.04°	
	Number of lines per revolution > 40000			± 0.2°	± 0.01°	± 0.008°	
Repeatability	0.002°					± 0.002°	
Position sample time	< 1 µs						
<b>EMC <sup>5)</sup></b>							
Operating voltage	4.5 ... 32 V						
Power consumption, no load	0.5 W						
Initialisation time <sup>6)</sup>	50 ms						
<b>Signal line SSI <sup>7)</sup></b>							
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 <sub>S</sub> V)						
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1.5 V; H = 2.0 - U <sub>S</sub> V)						
<b>Incremental interface TTL/HTL/programmable (AFM60 SSI + Incremental)</b>							
Number of lines per revolution	1/4 of number of SSI steps per revolution						
Measuring step	90° electric/number of lines						
Reference signal	90° electric, gated with A and B						
Max. output frequency				300 kHz	600 kHz	820 kHz	
Load current	30 mA						
<b>Environmental data</b>							
<b>Working temperature range</b>							
Storage temperature range (without package)	-40 ... +100 °C			0 ... +85 °C	-30 ... +100 °C	-30 ... +100 °C	
Permissible relative humidity <sup>8)</sup>	90 %						
<b>Protection class to IEC 60529</b>							
Protection class to IEC 60529	Shaft side			IP 65	IP 65	IP 65	
	Housing side connector outlet <sup>9)</sup>			IP 67	IP 67	IP 67	
	Housing side cable outlet			IP 67	IP 67	IP 67	

- <sup>1)</sup> Based on encoders with a connector outlet
- <sup>2)</sup> Self-warming 3.3 k/1,000 min<sup>-1</sup>, when applying, note working temperature range
- <sup>3)</sup> To EN 60068-2-27
- <sup>4)</sup> To EN 60068-2-6
- <sup>5)</sup> AFS60: To EN 61000-6-2 and EN 61000-6-3; AFM60: Device of class A
- <sup>6)</sup> Valid positional data can be read once this time has elapsed
- <sup>7)</sup> Signal lines via 12-pin encoder connector, electrically isolated from the housing, ie. 12-core cable
- <sup>8)</sup> Condensation of the optical scanning not permitted
- <sup>9)</sup> With mating connector fitted

① Maximum speed consideration AFS60/AFM6



## Order information

### AFS60 Absolute Encoders Singleturn, blind hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
<b>A</b>	<b>F</b>	<b>S</b>	<b>6</b>	<b>0</b>		<b>-</b>	<b>B</b>									

Type (cp. technical data page 15)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Blind hollow shaft 8 mm = <b>B</b>	4.5 ... 32 V, SSI/Gray = <b>A</b>	Connector M23, 12-pin, radial = <b>A</b>	Steps per rev. Selection depending on the type, see below.
B	Blind hollow shaft 3/8" = <b>C</b>		Connector M12, 8-pin, radial = <b>C</b>	
	Blind hollow shaft 10 mm = <b>D</b>		Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b>	
	Blind hollow shaft 12 mm = <b>E</b>		Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b>	
	Blind hollow shaft 1/2" = <b>F</b>		Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	
	Blind hollow shaft 14 mm = <b>G</b>			
	Blind hollow shaft 15 mm = <b>H</b>			
	Blind hollow shaft 5/8" = <b>J</b>			

<sup>1)</sup> 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.

#### Type E – Number of lines per revolution

000256 = 8 bits	001024 = 10 bits	004096 = 12 bits
000512 = 9 bits	002048 = 11 bits	

#### Type B – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	Others on request
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	
001024 = 10 bits	008192 = 13 bits		

#### Type A – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	131072 = 17 bits
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	262144 = 18 bits
001024 = 10 bits	008192 = 13 bits	065536 = 16 bits	Others on request

#### Order example: AFS60 Absolute Encoders Singleturn, type E, blind hollow shaft,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

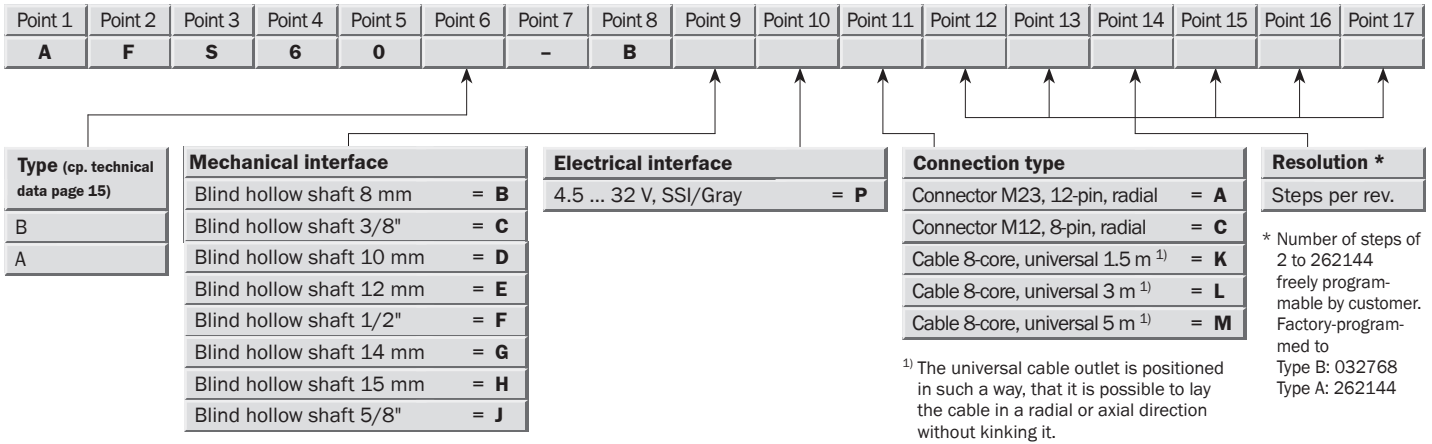
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
<b>A</b>	<b>F</b>	<b>S</b>	<b>6</b>	<b>0</b>	<b>E</b>	<b>-</b>	<b>B</b>	<b>x</b>	<b>A</b>	<b>C</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>4</b>

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



**Order information**

**AFS60 Absolute Encoders Singleturn, blind hollow shaft, programmable version**



Order information programmable version	
AFS60 Absolute Encoders Singleturn	
Type B, blind hollow shaft	
Model name	
AFS60B-BxPA032768	
AFS60B-BxPC032768	
AFS60B-BxPK032768	
AFS60B-BxPL032768	
AFS60B-BxPM032768	

Order information programmable version	
AFS60 Absolute Encoders Singleturn	
Type A, blind hollow shaft	
Model name	
AFS60A-BxPA262144	
AFS60A-BxPC262144	
AFS60A-BxPK262144	
AFS60A-BxPL262144	
AFS60A-BxPM262144	

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

## Order information

### AFM60 Absolute Encoders Multiturn, SSI/Gray, blind hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	B									

Type (cp. technical data page 15)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Blind hollow shaft 8 mm = B	4.5 ... 32 V, SSI/Gray = A	Connector M23, 12-pin, radial = A	Steps per rev.
B	Blind hollow shaft 3/8" = C		Connector M12, 8-pin, radial = C	Selection depending on the type, see below.
A	Blind hollow shaft 10 mm = D		Cable 8-core, universal 1.5 m <sup>1)</sup> = K	
	Blind hollow shaft 12 mm = E		Cable 8-core, universal 3 m <sup>1)</sup> = L	
	Blind hollow shaft 1/2" = F		Cable 8-core, universal 5 m <sup>1)</sup> = M	
	Blind hollow shaft 14 mm = G			
	Blind hollow shaft 15 mm = H			

<sup>1)</sup> 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.

### Type E – Number of lines per revolution x 4096 (12 bits)

000256 = 8 Bit	001024 = 10 Bit	004096 = 12 Bit
000512 = 9 Bit	002048 = 11 Bit	

### Type B – Number of lines per revolution x 4096 (12 bits)

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 – Number of lines per revolution x 4096 (12 bits)

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	

### AFM60 Absolute Encoders Multiturn, SSI/Gray + Incremental, blind hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	B									

Type (cp. technical data page 15)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Blind hollow shaft 8 mm = B	4.5 ... 32 V, SSI/Gray + Incremental, HTL = L	Connector M23, 12-pin, radial = A	Steps per rev.
B	Blind hollow shaft 3/8" = C			Selection depending on the type, see below.
A	Blind hollow shaft 10 mm = D	4.5 ... 32 V, SSI/Gray + Incremental, TTL = T		
	Blind hollow shaft 12 mm = E			
	Blind hollow shaft 1/2" = F			
	Blind hollow shaft 14 mm = G			
	Blind hollow shaft 15 mm = H			

### Type E – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

### Type B – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

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)	

### Order example: AFM60 Absolute Encoders Multiturn, type E, blind hollow shaft,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0	E	-	B	x	A	C	O	O	1	0	2	4

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

**Order information**

**AFM60 Absolute Encoders Multiturn, SSI/Gray, blind hollow shaft, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	B									

<b>Type</b> (cp. technical data page 15) B A	<b>Mechanical interface</b> Blind hollow shaft 8 mm = <b>B</b> Blind hollow shaft 3/8" = <b>C</b> Blind hollow shaft 10 mm = <b>D</b> Blind hollow shaft 12 mm = <b>E</b> Blind hollow shaft 1/2" = <b>F</b> Blind hollow shaft 14 mm = <b>G</b> Blind hollow shaft 15 mm = <b>H</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>P</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution *</b> Steps per rev. * Number of steps of 256 (8 bits) to 262144 (18 bits) freely programmable by customer. Factory-programmed to Type B: 032768 Type A: 262144
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<sup>1)</sup> 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.

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn**

**Type B, blind hollow shaft**

Model name
AFM60B-BxPA032768
AFM60B-BxPC032768
AFM60B-BxPK032768
AFM60B-BxPL032768
AFM60B-BxPM032768

**Order information programmable version**

**AFM60 Absolute Encoders Multiturn**

**Type A, blind hollow shaft**




Model name
AFM60A-BxPA262144
AFM60A-BxPC262144
AFM60A-BxPK262144
AFM60A-BxPL262144
AFM60A-BxPM262144

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

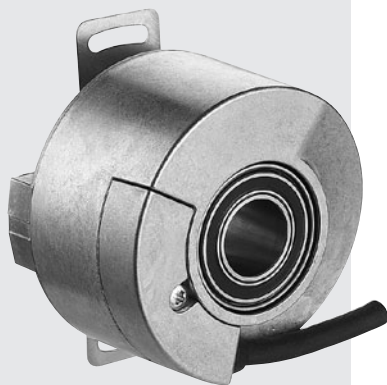
**AFM60 Absolute Encoders Multiturn, SSI/Gray + Incremental, blind hollow shaft, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	0		-	B									

<b>Type</b> (cp. technical data page 15) B A	<b>Mechanical interface</b> Blind hollow shaft 8 mm = <b>B</b> Blind hollow shaft 3/8" = <b>C</b> Blind hollow shaft 10 mm = <b>D</b> Blind hollow shaft 12 mm = <b>E</b> Blind hollow shaft 1/2" = <b>F</b> Blind hollow shaft 14 mm = <b>G</b> Blind hollow shaft 15 mm = <b>H</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray + Incremental, programmable = <b>R</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b>	<b>Resolution *</b> Steps per rev. * Number of steps of 256 (8 bits) to 262144 (18 bits) 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.
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	<b>Resolution up to 18 bits</b>
<b>Absolute Encoders Singleturn</b>	
	<b>Resolution up to 30 bits</b>
<b>Absolute Encoders Multiturn</b>	
	<b>Number of lines 1 up to 65,536</b>
<b>Incremental Encoders</b>	

- Connector or cable outlet
- Protection class IP 65
- Electrical interface SSI or SSI + Incremental
- Resolution, number of incremental lines, TTL- or HTL-signal and offset programmable



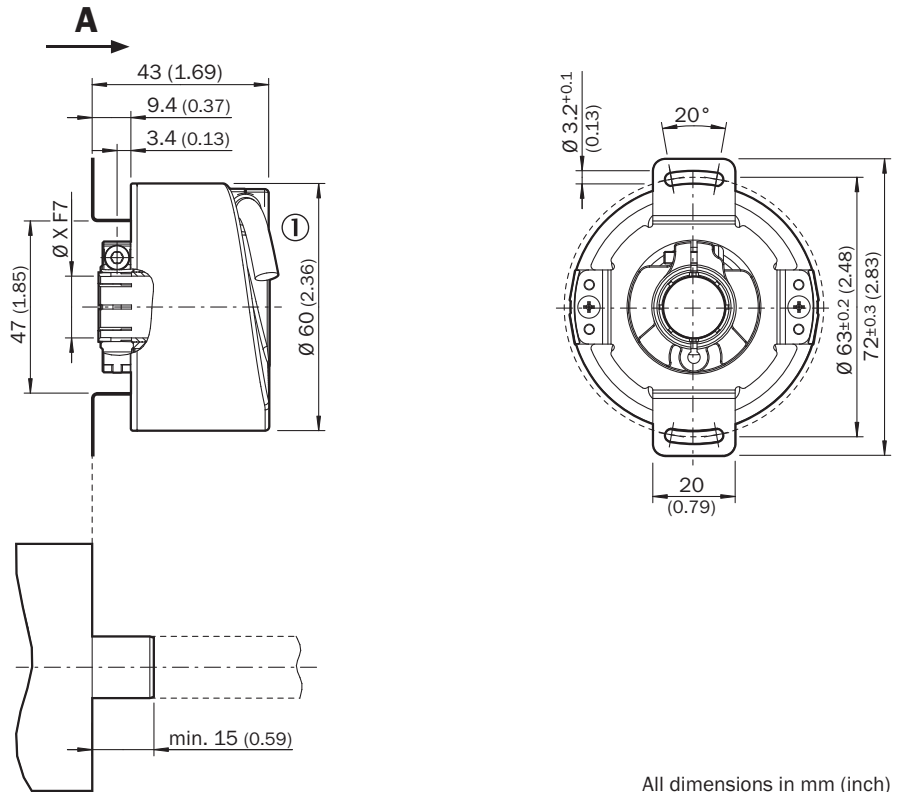
Product may differ from illustration



<b>Accessories</b>
Connection systems (page 28)
Mounting systems (page 30)
Programming Tool (page 27)

**Pin allocation (page 26)**

**Dimensional drawing through hollow shaft, cable outlet**



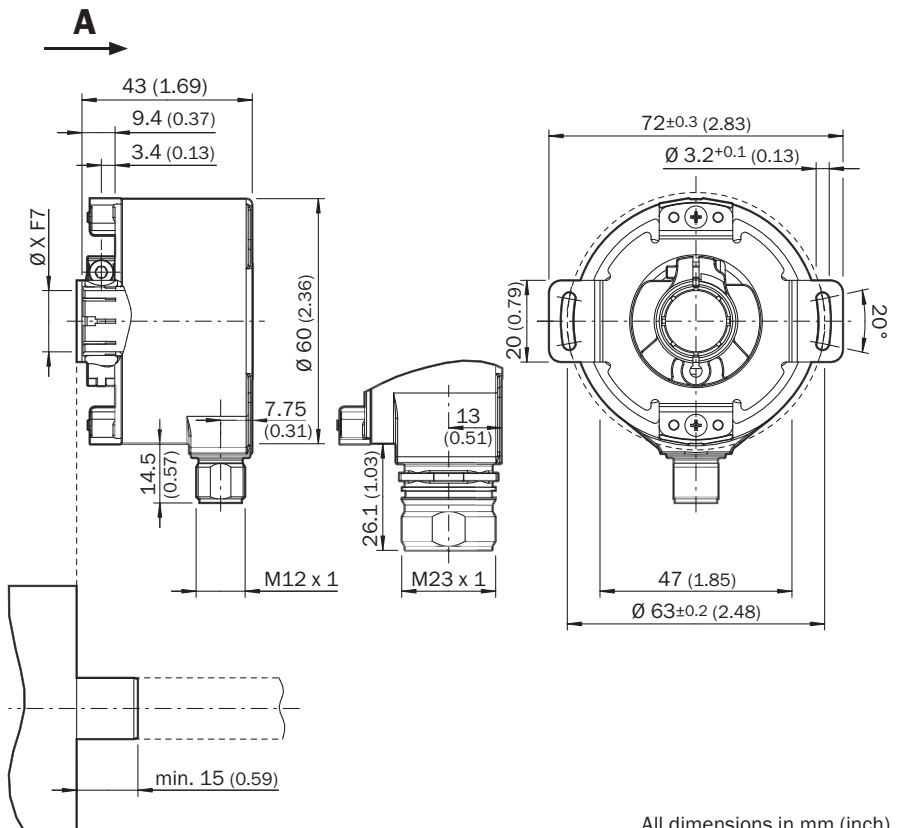
All dimensions in mm (inch)

**Customer-side**

General tolerances according to DIN ISO 2768-mk

- ① Cable-Ø = 5.6 ± 0.2 mm  
Bending radius R = 30 mm

**Dimensional drawing through hollow shaft, connector outlet M12 and M23**



All dimensions in mm (inch)

**Customer-side**

General tolerances according to DIN ISO 2768-mk

Technical data to DIN 32878		AFS60/AFM60 through hollow shaft			E	B	A
<b>Mechanical data</b>							
Shaft diameter	8, 10, 12, 14, 15 mm and 3/8", 1/2", 5/8"						
Mass <sup>1)</sup>	0.2 kg						
Moment of inertia to the rotor	40 gcm <sup>2</sup>						
Operating speed <sup>2)</sup>	9,000 min <sup>-1</sup>						
Angular acceleration max.	5 x 10 <sup>5</sup> rad/s <sup>2</sup>						
Operating torque at 20 °C	0.6 Ncm						
Starting torque at 20 °C	0.8 Ncm						
<b>Permissible movement of the drive element</b>							
Radial	Static/dynamic			± 0.3 / ± 0.1 mm	± 0.3 / ± 0.1 mm	± 0.3 / ± 0.05 mm	
Axial	Static/dynamic			± 0.5 / ± 0.2 mm	± 0.5 / ± 0.2 mm	± 0.5 / ± 0.01 mm	
Bearing lifetime	3 x 10 <sup>9</sup> revolutions						
Resistance	To shocks <sup>3)</sup>			50 g/6 ms	70 g/6 ms	60 g/6 ms	
	To vibration <sup>4)</sup>			20 g/10 ... 2,000 Hz	30 g/10 ... 2,000 Hz	20 g/10 ... 2,000 Hz	
<b>Electrical data</b>							
Code type	Gray						
Code sequence adjustable	CW/CCW						
Measuring step	360° number of lines			0.09°	0.01°	0.0014°	
Number of steps per revolution max.	Singleturn and Multiturn			4096	32768 ①	262144 ①	
Number of lines	4096 Multiturn (AFM60)						
Error limits				± 0.3°	± 0.05°	± 0.03°	
Measuring step deviation	Number of lines per revolution 1 ... 399			± 0.2°	± 0.08°	± 0.04°	
	Number of lines per revolution 400 ... 40000			± 0.2°	± 0.01°	± 0.008°	
	Number of lines per revolution > 40000					± 0.002°	
Repeatability	0.002°						
Position sample time	< 1 µs						
<b>EMC <sup>5)</sup></b>							
Operating voltage	4.5 ... 32 V						
Power consumption, no load	0.5 W						
Initialisation time <sup>6)</sup>	50 ms						
<b>Signal line SSI <sup>7)</sup></b>							
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 <sub>S</sub> V)						
CW/CCW (counting sequence when turning)	L-active (L = 0 - 1.5 V; H = 2.0 - U <sub>S</sub> V)						
<b>Incremental interface TTL/HTL/programmable (AFM60 SSI + Incremental)</b>							
Number of lines per revolution	1/4 of number of SSI steps per revolution						
Measuring step	90° electric/number of lines						
Reference signal	90° electric, gated with A and B						
Max. output frequency				300 kHz	600 kHz	820 kHz	
Load current	30 mA						
<b>Environmental data</b>							
Working temperature range				0 ... +85 °C	-30 ... +100 °C	-30 ... +100 °C	
Storage temperature range (without package)				-40 ... +100 °C	-40 ... +100 °C	-40 ... +100 °C	
Permissible relative humidity <sup>8)</sup>	90 %						
Protection class to IEC 60529	Shaft side			IP 65	IP 65	IP 65	
	Housing side connector outlet <sup>9)</sup>			IP 65	IP 65	IP 65	
	Housing side cable outlet			IP 65	IP 65	IP 65	

<sup>1)</sup> Based on encoders with a connector outlet

<sup>2)</sup> Self-warming 3.3 k/1,000 min<sup>-1</sup>, when applying, note working temperature range

<sup>3)</sup> To EN 60068-2-27

<sup>4)</sup> To EN 60068-2-6

<sup>5)</sup> AFS60: To EN 61000-6-2 and EN 61000-6-3; AFM60: Device of class A

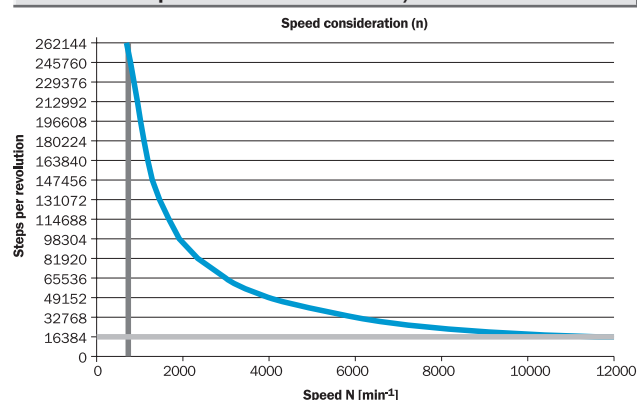
<sup>6)</sup> Valid positional data can be read once this time has elapsed

<sup>7)</sup> Signal lines via 12-pin encoder connector, electrically isolated from the housing, ie. 12-core cable

<sup>8)</sup> Condensation of the optical scanning not permitted

<sup>9)</sup> With mating connector fitted

### ① Maximum speed consideration AFS60/AFM6



## Order information

### AFS60 Absolute Encoders Singleturn, through hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0		-	T									

Type (cp. technical data page 27)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Through hollow shaft 8 mm = B	4.5 ... 32 V, SSI/Gray = A	Connector M23, 12-pin, radial = A	Steps per rev. Selection depending on the type, see below.
B	Through hollow shaft 3/8" = C		Connector M12, 8-pin, radial = C	
B	Through hollow shaft 10 mm = D		Cable 8-core, universal 1.5 m <sup>1)</sup> = K	
A	Through hollow shaft 12 mm = E		Cable 8-core, universal 3 m <sup>1)</sup> = L	
	Through hollow shaft 1/2" = F		Cable 8-core, universal 5 m <sup>1)</sup> = M	
	Through hollow shaft 14 mm = G			
	Through hollow shaft 15 mm = H			
	Through hollow shaft 5/8" = J			

<sup>1)</sup> 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.

#### Type E – Number of lines per revolution

000256 = 8 bits	001024 = 10 bits	004096 = 12 bits
000512 = 9 bits	002048 = 11 bits	

#### Type B – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	Others on request
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	
001024 = 10 bits	008192 = 13 bits		

#### Type A – Number of lines per revolution

000256 = 8 bits	002048 = 11 bits	016384 = 14 bits	131072 = 17 bits
000512 = 9 bits	004096 = 12 bits	032768 = 15 bits	262144 = 18 bits
001024 = 10 bits	008192 = 13 bits	065536 = 16 bits	Others on request

#### Order example: AFS60 Absolute Encoders Singleturn, type E, through hollow shaft,

##### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	S	6	0	E	-	T	x	A	C	O	O	1	0	2	4

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

**Order information**

**AFS60 Absolute Encoders Singleturn, through hollow shaft, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
<b>A</b>	<b>F</b>	<b>S</b>	<b>6</b>	<b>0</b>		<b>-</b>	<b>T</b>									

<b>Type</b> (cp. technical data page 27) B A	<b>Mechanical interface</b> Through hollow shaft 8 mm = <b>B</b> Through hollow shaft 3/8" = <b>C</b> Through hollow shaft 10 mm = <b>D</b> Through hollow shaft 12 mm = <b>E</b> Through hollow shaft 1/2" = <b>F</b> Through hollow shaft 14 mm = <b>G</b> Through hollow shaft 15 mm = <b>H</b> Through hollow shaft 5/8" = <b>J</b>	<b>Electrical interface</b> 4.5 ... 32 V, SSI/Gray = <b>P</b>	<b>Connection type</b> Connector M23, 12-pin, radial = <b>A</b> Connector M12, 8-pin, radial = <b>C</b> Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b> Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b> Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	<b>Resolution *</b> Steps per rev.
	* Number of steps of 2 to 262144 freely programmable by customer. Factory-programmed to Type B: 032768 Type A: 262144			
	<sup>1)</sup> 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.			

Order information programmable version	
AFS60 Absolute Encoders Singleturn	
Type B, through hollow shaft	
Model name	
AFS60B-TxPA032768	
AFS60B-TxPC032768	
AFS60B-TxPK032768	
AFS60B-TxPL032768	
AFS60B-TxPM032768	

Order information programmable version	
AFS60 Absolute Encoders Singleturn	
Type A, through hollow shaft	
Model name	
AFS60A-TxPA262144	
AFS60A-TxPC262144	
AFS60A-TxPK262144	
AFS60A-TxPL262144	
AFS60A-TxPM262144	

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

## Order information

### AFM60 Absolute Encoders Multiturn, SSI/Gray, through hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	O		-	T									

Type (cp. technical data page 21)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Through hollow shaft 8 mm = B	4.5 ... 32 V, SSI/Gray = A	Connector M23, 12-pin, radial = A	Steps per rev.
B	Through hollow shaft 3/8" = C		Connector M12, 8-pin, radial = C	Selection depending on the type, see below.
	Through hollow shaft 10 mm = D		Cable 8-core, universal 1.5 m <sup>1)</sup> = K	
	Through hollow shaft 12 mm = E		Cable 8-core, universal 3 m <sup>1)</sup> = L	
A	Through hollow shaft 1/2" = F		Cable 8-core, universal 5 m <sup>1)</sup> = M	
	Through hollow shaft 14 mm = G			
	Through hollow shaft 15 mm = H			

<sup>1)</sup> 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.

### Type E – Number of lines per revolution x 4096 (12 bits)

000256 = 8 Bit	001024 = 10 Bit	004096 = 12 Bit
000512 = 9 Bit	002048 = 11 Bit	

### Type B – Number of lines per revolution x 4096 (12 bits)

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 – Number of lines per revolution x 4096 (12 bits)

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	

### AFM60 Absolute Encoders Multiturn, SSI/Gray + Incremental, through hollow shaft

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	O		-	T									

Type (cp. technical data page 21)	Mechanical interface	Electrical interface	Connection type	Resolution
E	Through hollow shaft 8 mm = B	4.5 ... 32 V, SSI/Gray + Incremental, HTL = L	Connector M23, 12-pin, radial = A	Steps per rev.
B	Through hollow shaft 3/8" = C			Selection depending on the type, see below.
	Through hollow shaft 10 mm = D	4.5 ... 32 V, SSI/Gray + Incremental, TTL = T		
	Through hollow shaft 12 mm = E			
A	Through hollow shaft 1/2" = F			
	Through hollow shaft 14 mm = G			
	Through hollow shaft 15 mm = H			

### Type E – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

### Type B – Number of lines per revolution x 4096 (12 Bit), incremental resolution in brackets

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

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)	

### Order example: AFM60 Absolute Encoders Multiturn, type E, through hollow shaft,

#### Electrical interface 4.5 ... 32 V, SSI/Gray, connector M12, 8-pin., radial, number of lines 1024 (10 bits)

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
A	F	M	6	O	E	-	T	x	A	C	O	O	1	0	2	4

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



**Order information**

**AFM60 Absolute Encoders Multiturn, SSI/Gray, through hollow shaft, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
<b>A</b>	<b>F</b>	<b>M</b>	<b>6</b>	<b>0</b>		<b>-</b>	<b>T</b>									

<b>Type</b> (cp. technical data page 21)	<b>Mechanical interface</b>	<b>Electrical interface</b>	<b>Connection type</b>	<b>Resolution *</b>
B	Through hollow shaft 8 mm = <b>B</b>	4.5 ... 32 V, SSI/Gray = <b>P</b>	Connector M23, 12-pin, radial = <b>A</b>	Steps per rev.
A	Through hollow shaft 3/8" = <b>C</b>		Connector M12, 8-pin, radial = <b>C</b>	* Number of steps of 256 (8 bits) to 262144 (18 bits) freely programmable by customer. Factory-programmed to Type B: 032768 Type A: 262144
	Through hollow shaft 10 mm = <b>D</b>		Cable 8-core, universal 1.5 m <sup>1)</sup> = <b>K</b>	
	Through hollow shaft 12 mm = <b>E</b>		Cable 8-core, universal 3 m <sup>1)</sup> = <b>L</b>	
	Through hollow shaft 1/2" = <b>F</b>		Cable 8-core, universal 5 m <sup>1)</sup> = <b>M</b>	
	Through hollow shaft 14 mm = <b>G</b>			
	Through hollow shaft 15 mm = <b>H</b>			

<sup>1)</sup> 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.

<b>Order information programmable version</b>
<b>AFM60 Absolute Encoders Multiturn</b>
<b>Type B, through hollow shaft</b>
<b>Model name</b>
AFM60B-TxPA032768
AFM60B-TxPC032768
AFM60B-TxPK032768
AFM60B-TxPL032768
AFM60B-TxPM032768

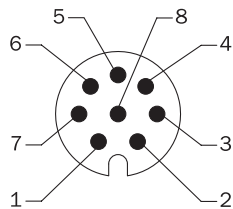
<b>Order information programmable version</b>
<b>AFM60 Absolute Encoders Multiturn</b>
<b>Type A, through hollow shaft</b>
<b>Model name</b>
AFM60A-TxPA262144
AFM60A-TxPC262144
AFM60A-TxPK262144
AFM60A-TxPL262144
AFM60A-TxPM262144

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

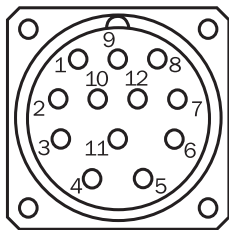
**AFM60 Absolute Encoders Multiturn, SSI/Gray + Incremental, through hollow shaft, programmable version**

Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17
<b>A</b>	<b>F</b>	<b>M</b>	<b>6</b>	<b>0</b>		<b>-</b>	<b>T</b>									

<b>Type</b> (cp. technical data page 21)	<b>Mechanical interface</b>	<b>Electrical interface</b>	<b>Connection type</b>	<b>Resolution *</b>
B	Through hollow shaft 8 mm = <b>B</b>	4.5 ... 32 V, SSI/Gray + Incremental, programmable = <b>R</b>	Connector M23, 12-pin, radial = <b>A</b>	* Number of steps of 256 (8 bits) to 262144 (18 bits) 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.
A	Through hollow shaft 3/8" = <b>C</b>			
	Through hollow shaft 10 mm = <b>D</b>			
	Through hollow shaft 12 mm = <b>E</b>			
	Through hollow shaft 1/2" = <b>F</b>			
	Through hollow shaft 14 mm = <b>G</b>			
	Through hollow shaft 15 mm = <b>H</b>			



View to the connector M12 fitted to the encoder body



View to the connector M23 fitted to the encoder body

**Pin and wire allocation, connector M12, 8-pin**

PIN, 8-pin M12 connector	Signal SSI	Explanation
1	Data -	Interface signals
2	Data +	Interface signals
3	CW/ $\overline{\text{CCW}}$	Counting sequence when turning
4	SET	Electronic adjustment
5	Clock +	Interface signals
6	Clock -	Interface signals
7	GND	Ground connection
8	+U <sub>s</sub>	Supply voltage
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

**Pin and wire allocation, SSI/Gray, connector M23, 12-pin**

PIN	Signal	Explanation
1	GND	Earth 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 <sub>s</sub>	Supply voltage
9	SET	Electronic adjustment
10	Data -	Interface signals
11	Clock -	Interface signals
12	CW/ $\overline{\text{CCW}}$	Counting sequence when turning
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

**Pin and wire allocation, SSI/Gray + Incremental, connector M23, 12-pin**

PIN	Signal	Explanation
1	+U <sub>s</sub>	Supply voltage
2	GND	Earth connection
3	Clock +	Interface signals
4	Data +	Interface signals
5	SET	Electronic adjustment
6	Data -	Interface signals
7	Clock -	Interface signals
8	$\overline{\text{B}}$	Signal line
9	CW/ $\overline{\text{CCW}}$	Counting sequence when turning
10	$\overline{\text{A}}$	Signal line
11	A	Signal line
12	B	Signal line

**Allocation cable outlet, cable 8-core**

Colour of wires	Signal	Explanation
Brown	Data -	Interface signals
White	Data +	Interface signals
Black	CW/ $\overline{\text{CCW}}$	Counting sequence when turning
Pink	SET	Electronic adjustment
Yellow	Clock +	Interface signals
Lilac	Clock -	Interface signals
Blue	GND	Earth connection
Red	+ U <sub>s</sub>	Supply voltage
	Screen	Screen on the encoder side connected to the housing. On the control side connected to earth.

**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 U<sub>s</sub> for more than 250 ms, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

**Programming Tool for AFS60/AFM60**

**Programming Tool**

<b>Type</b>	<b>Part No.</b>
PGT-08-S	1036616



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

**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<sup>2</sup>, screened, cable length 0.5 m**

<b>Model name</b>	<b>Part No.</b>
DSL-2DQ8-GOM5AC2	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<sup>2</sup>, screened, cable length 0.5 m**

<b>Model name</b>	<b>Part No.</b>
DSL-3DQ8-GOM5AC2	2048440

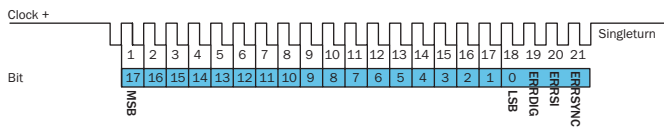
**Adapter cable absolute SSI + incremental and SSI + sin/cos – PGT-08-S consists of male 9-pin SUB-D connector and M23 12-pin inline cable connector, pre assembled using 8 core cable, 4 x 2 x 0,15 mm<sup>2</sup>, screened, cable length 0.5 m**

<b>Model name</b>	<b>Part No.</b>
DSL-3DQ8-GOM5AC4	2059270

**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!

**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.**

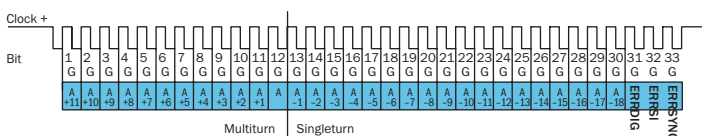
The provided error bits don't have to be used by the PLC compulsorily.

**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** | **27 Bits**



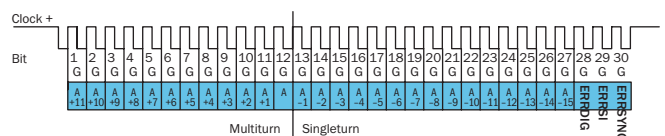
**Bit 1–12: Position Bits Multiturn**

**Bit 13–27: Position Bits Singleturn**

**Bit 31–33: 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.



**Bit 1–12: Position Bits Multiturn**

**Bit 13–27: Position Bits Singleturn**

**Bit 28–30: Error Bits**

**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**

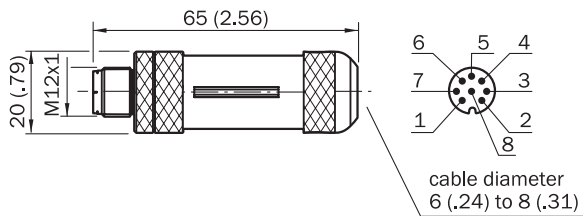
If the resolution of the absolute encoder is set on 27 bits, 30 bits are provided by the encoder: 27 data bits and 3 error bits. If the PLC is not able to evaluate the error bits, the PLC has to be set on a resolution of 27 bits. Then the error bits have to be masked out by the PLC.

Dimensional drawings and ordering information

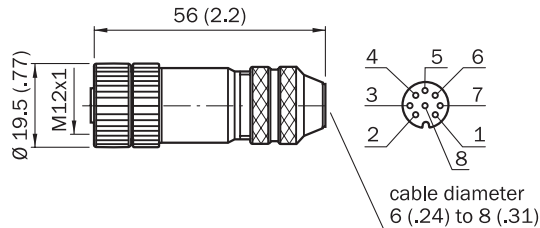
Round screw system M12

Cable connector M12 male, 8-pin, straight, screened, for field assembly (adapter side)		
Model name	Part No.	Contacts/cable diameter
STE-1208-GA	6028370	8 / 4 ... 8 mm

Cable connector M12 female, 8-pin, straight, screened, for field assembly (adapter side)		
Model name	Part No.	Contacts/cable diameter
DOS-1208-GA	6028369	8 / 4 ... 8 mm



All dimensions in mm (inch)

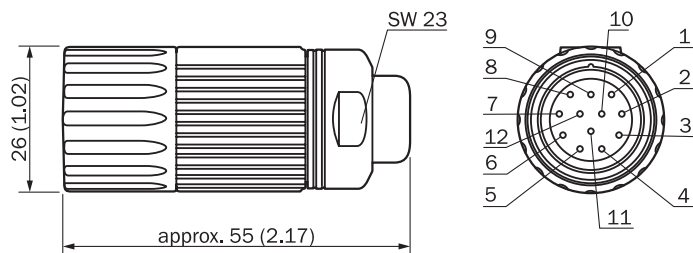


All dimensions in mm (inch)

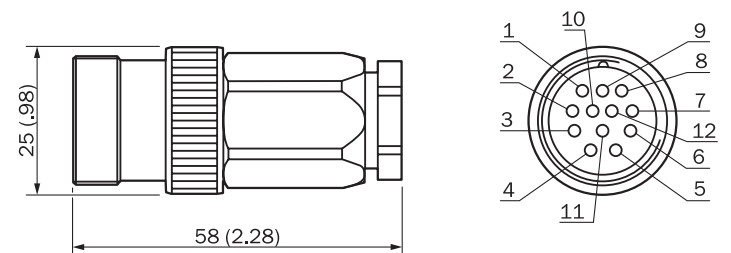
Screw-in system M23, 12-pin

Cable connector M23 female, 12-pin, straight, screened		
Model name	Part No.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12-pin, straight, screened		
Model name	Part No.	Contacts
STE-2312-G	6027537	12



All dimensions in mm (inch)



All dimensions in mm (inch)

General tolerances according to DIN ISO 2768-mk

General tolerances according to DIN ISO 2768-mk

Cables

Cable 8-core, per metre, 4 x 2 x 0.15 mm<sup>2</sup>, with screening, cable diameter 5.6 mm

Model name	Part No.	Wires
LTG-2308-MWENC	6027529	8

Cable 12-core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm<sup>2</sup>, with screening, capable of being dragged, cable diameter 7.8 mm

Model name	Part No.	Wires	Explanation
LTG-2612-MW	6028516	12	UV and salt water resistant

## Dimensional drawings and ordering information

## Female connectors

Cable connector female JST inc. sealing, 8-core, 4 x 2 x 0.15 mm<sup>2</sup>, with screening, cable diameter 5.6 mm

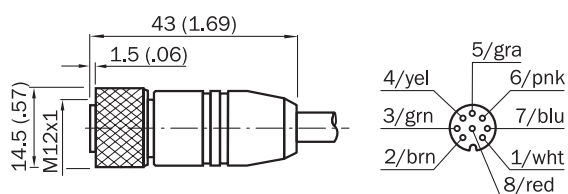
Model name	Part No.	Cable length
DOL-0J08-G0M5AA6	2048589	0.5 m
DOL-0J08-G1M5AA6	2048590	1.5 m
DOL-0J08-G03MAA6	2048591	3.0 m
DOL-0J08-G05MAA6	2048593	5.0 m
DOL-0J08-G10MAA6	2048594	10.0 m

Cable connector female M23, 8-core, 4 x 2 x 0.15 mm<sup>2</sup>, cable diameter 5.6 mm

Model name	Part No.	Cable length
DOL-2308-G0M5AA6	2048595	0.5 m
DOL-2308-G1M5AA6	2048596	1.5 m
DOL-2308-G03MAA6	2048597	3.0 m
DOL-2308-G05MAA6	2048598	5.0 m
DOL-2308-G10MAA6	2048599	10.0 m

Female connector M12, 8-pin, straight, pre-wired with cable 8-wire, 4 x 2 x 0.25 mm<sup>2</sup>, screened, flexible (adapter side)

Model name	Part No.	Contacts	Cable length
DOL-1208-G02MAC1	6032866	8	2.0 m
DOL-1208-G05MAC1	6032867	8	5.0 m
DOL-1208-G10MAC1	6032868	8	10.0 m
DOL-1208-G20MAC1	6032869	8	20.0 m



All dimensions in mm (inch)

## Dimensional drawings and ordering information

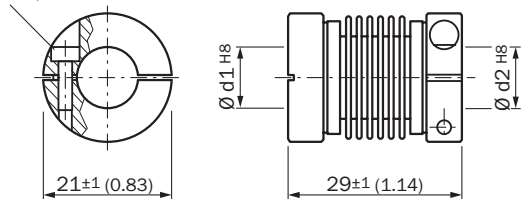
### Couplings

**Bellows coupling, max. shaft offset radial  $\pm 0.3$  mm, axial 0.4 mm, angle  $\pm 4$  degrees, torsion spring stiffness 120 Nm/rad,**

**bellows of stainless steel, hubs of aluminium**

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

Cheese-head screw  
M2.5 x 8, DIN 912 A2

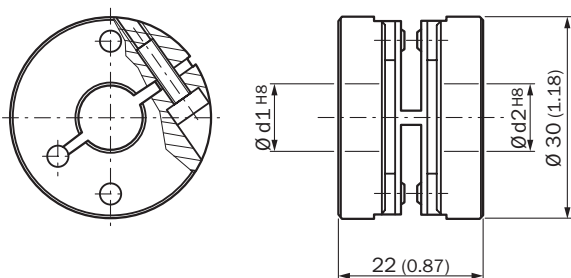


All dimensions in mm (inch)

**Spring-disc coupling, max. shaft offset radial  $\pm 0.3$  mm, axial 0.4 mm, angle  $\pm 2.5$  degrees, torsion spring stiffness 50 Nm/rad,**

**flange of aluminium, spring-discs of glass-fibre-reinforced plastic**

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

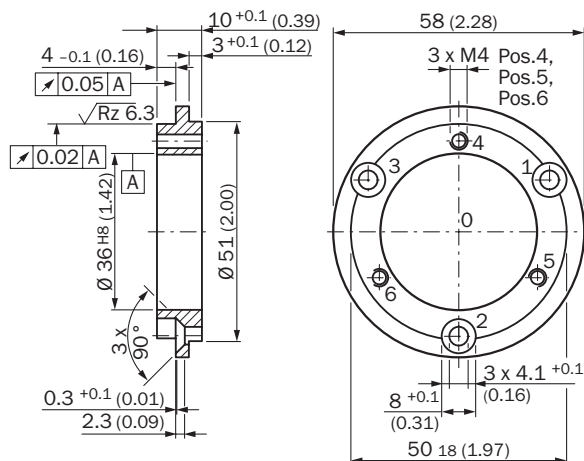


All dimensions in mm (inch)

### Mechanical Adapters

**Adapter flange of aluminium for face mount flange, spigot 36 mm**

Model name	Part No.	Adaption
BEF-FA-036-050	2029160	To 50 mm servo flange



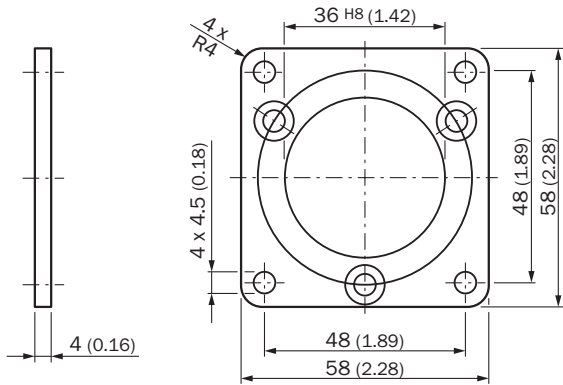
All dimensions in mm (inch)

**Dimensional drawings and ordering information**

**Mechanical Adapters**

**Adapter flange of aluminium for face mount flange, spigot 36 mm**

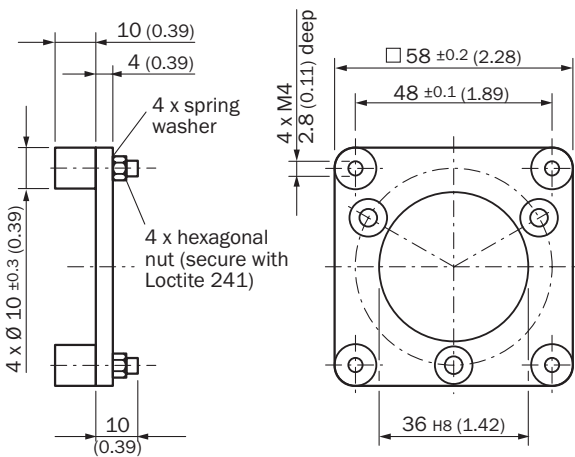
Model name	Part No.	Adaption
BEF-FA-036-060REC	2029162	To 60 mm square mounting plate



All dimensions in mm (inch)

**Adapter flange of aluminium for face mount flange, spigot 36 mm**

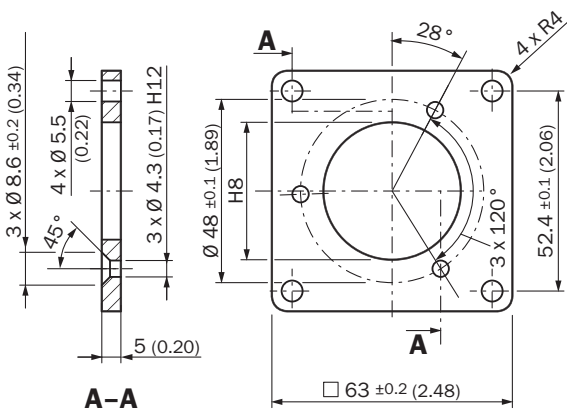
Model name	Part No.	Adaption
BEF-FA-036-060RSA	2029163	To 60 mm square mounting plate with shock absorbers



All dimensions in mm (inch)

**Adapter flange of aluminium for face mount flange, spigot 36 mm**

Model name	Part No.	Adaption
BEF-FA-036-063REC	2034225	To 63 mm square mounting plate



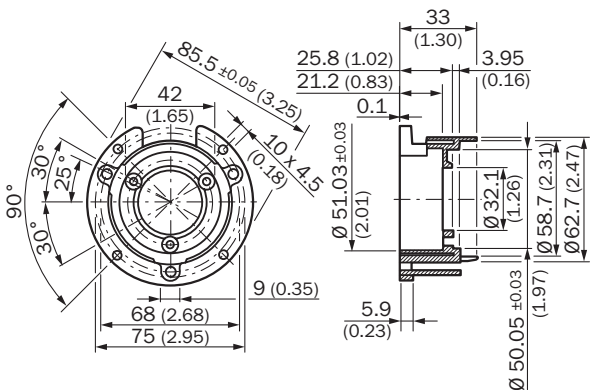
All dimensions in mm (inch)

Dimensional drawings and ordering information

Mechanical Adapters

Mounting bell incl. fixing set for encoder with servo flange

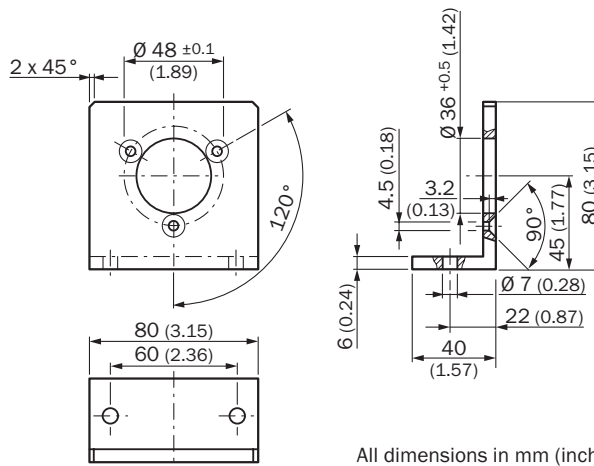
Model name	Part No.	Flange spigot
BEF-MG-50	5312987	Diameter 50 mm



All dimensions in mm (inch)

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

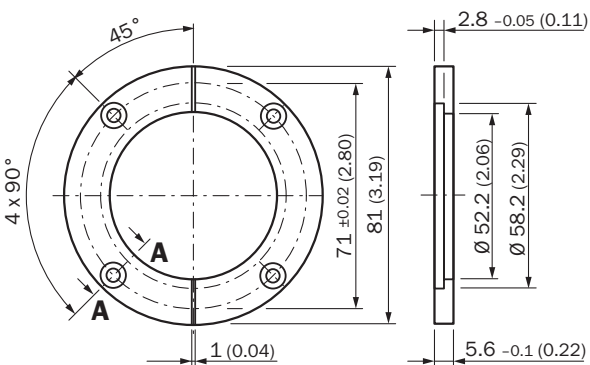
Model name	Part No.	Flange spigot
BEF-WF-36	2029164	Diameter 36 mm



All dimensions in mm (inch)

Servo clamps half ring, Set (comprises 2 pieces) for servo flanges with spigot diameter 50 mm

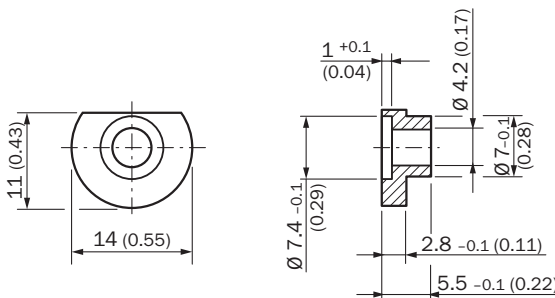
Model name	Part No.
BEF-WG-SF050	2029165



All dimensions in mm (inch)

Servo clamps small, Set (comprises 3 pieces) for servo flanges

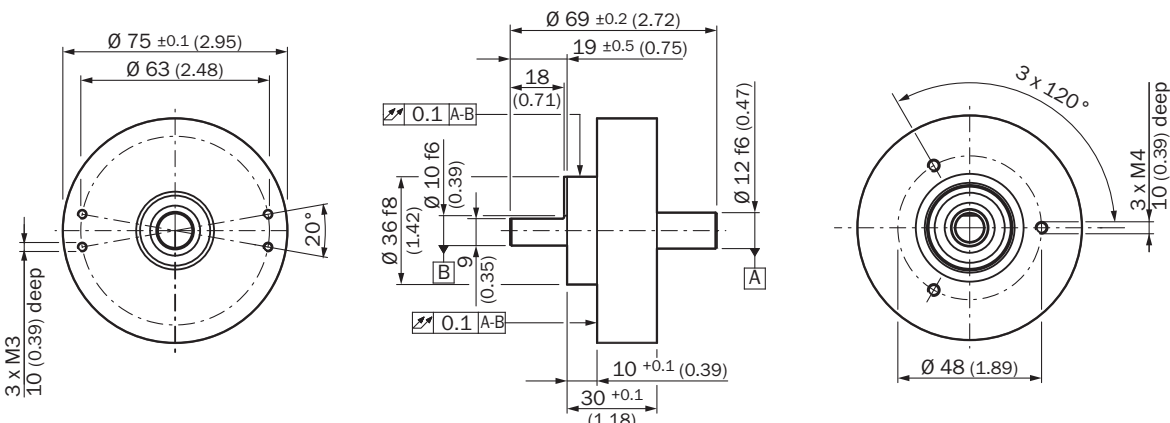
Model name	Part No.
BEF-WK-SF	2029166



All dimensions in mm (inch)

Heavy duty bearing block for very large radial and axial shaft loads

Model name	Part No.
BEF-FA-B12-010	2042728



All dimensions in mm (inch)

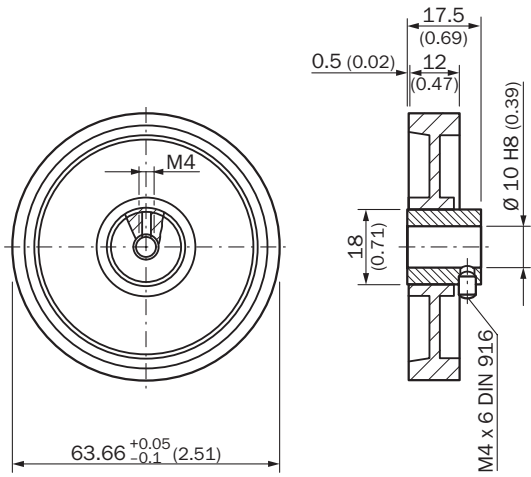


**Dimensional drawings and ordering information**

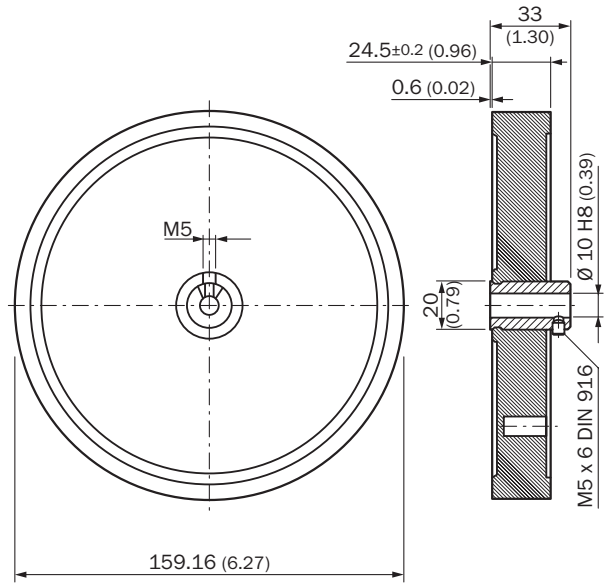
**Measuring wheels**

Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub			
Model name	Part No.	Circumference	Surface
BEF-MR-010020	5312988	0.2 m	Smooth
BEF-MR-010020G	5318678	0.2 m	Knurled

Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub			
Model name	Part No.	Circumference	Surface
BEF-MR-010050	5312989	0.5 m	Smooth



All dimensions in mm (inch)



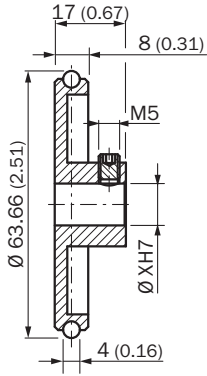
All dimensions in mm (inch)

Dimensional drawings and ordering information

Measuring wheels

Measuring wheel, circumference 200 mm, for encoder shafts with 6, 8 or 10 mm

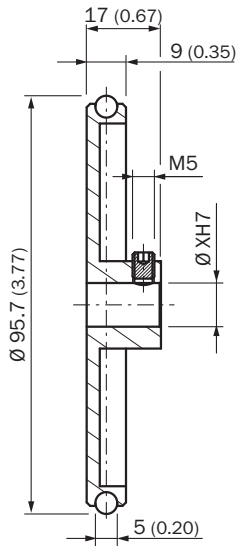
Model name	Part No.	Bore Ø	Circumference	Surface
BEF-MR006020R	2055222	6 mm	200 mm	O ring NBR70
BEF-MR008020R	2055223	8 mm	200 mm	O ring NBR70
BEF-MR010020R	2055224	10 mm	200 mm	O ring NBR70



All dimensions in mm (inch)

Measuring wheel, circumference 300 mm, for encoder shafts with 6, 8 or 10 mm

Model name	Part No.	Bore Ø	Circumference	Surface
BEF-MR006030R	2055634	6 mm	300 mm	O ring NBR70
BEF-MR008030R	2055635	8 mm	300 mm	O ring NBR70
BEF-MR010030R	2049278	10 mm	300 mm	O ring NBR70



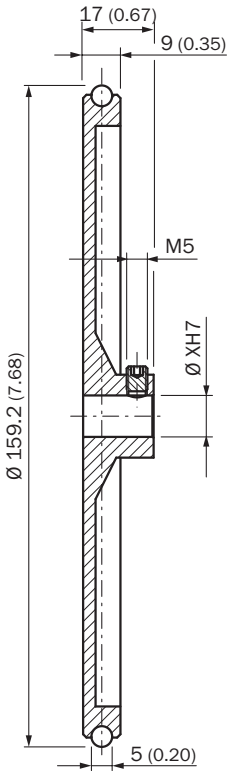
All dimensions in mm (inch)

## Dimensional drawings and ordering information

## Measuring wheels

## Measuring wheel, circumference 500 mm, for encoder shafts with 6, 8 or 10 mm

Model name	Part No.	Bore Ø	Circumference	Surface
BEF-MR006050R	2055225	6 mm	500 mm	O ring NBR70
BEF-MR008050R	2055226	8 mm	500 mm	O ring NBR70
BEF-MR010050R	2055227	10 mm	500 mm	O ring NBR70



All dimensions in mm (inch)

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