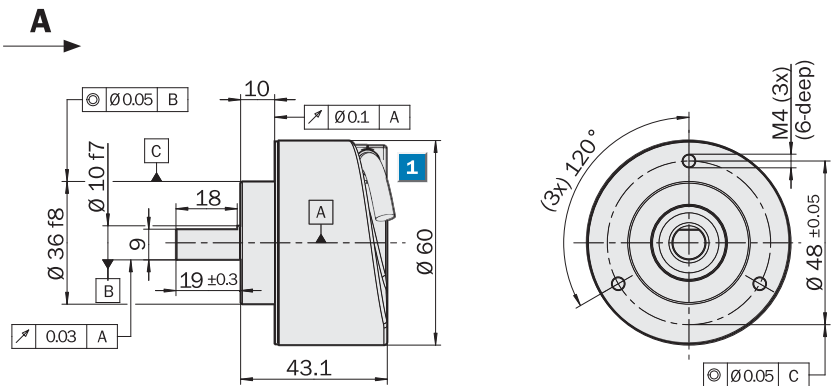
Number of lines
1 up to 65,536

Incremental Encoder

- Connector or cable outlet
- Protection class IP 65
- Electrical interfaces
  TTL, HTL
- Number of lines, level of output signal and zero pulse width freely programmable

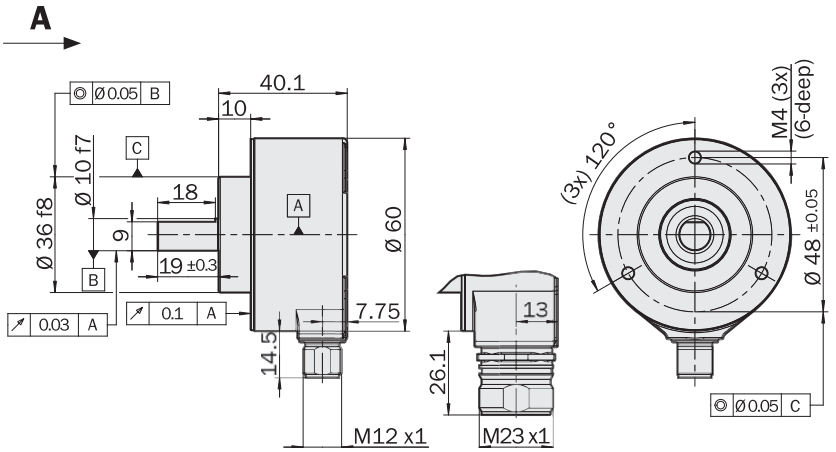
Dimensional drawing face mount flange, cable outlet



General tolerances according to DIN ISO 2768-mk

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

Dimensional drawing face mount flange, connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

RoHS 2002/95/EC

Accessories

Connection systems (page 24/25)
Mounting systems (page 26/27)
Programming Tool (page 23)

Pin assignment (page 22)

Technical Data to DIN 32878		DFS60 face mount flange			
Type			**E**	**B**	**A**
Shaft diameter		10 x 19 mm			
Electrical interface		4.5 ... 5.5 V, TTL/RS422			
		10 ... 32 V, TTL/RS422			
		10 ... 32 V, HTL/push-pull			
		5 ... 32 V, TTL/HTL programmable			
Number of lines per revolution			100 ... 2048	1 ... 10000	1 ... 65536
Mass		0.3 kg			
Moment of inertia to the rotor		6.2 gcm^2			
Measuring step		90° electric/number of lines			
Reference signal	**Number**	1			
	Position	90° electr., gated with A and B			
Error limits			± 0.3°	± 0.05°	± 0.03°
Measuring step deviation		Number of lines 1 ... 99		± 0.08°	± 0.04°
		Number of lines 100 ... 10,000	± 0.2°	± 0.01°	± 0.008°
		Number of lines > 10,000			± 0.002°
Max. output frequency		TTL/RS422	300 kHz	600 kHz	820 kHz
		HTL/push-pull	300 kHz	600 kHz	820 kHz
		TTL/HTL programmable		600 kHz	820 kHz
Operating speed [1]			10,000 min^{-1}	10,000 min^{-1}	10,000 min^{-1}
Angular acceleration		5 x 10^5 rad/s^2			
Operating torque	**at 20 °C**	0.3 Ncm			
Starting torque	**at 20 °C**	0.5 Ncm			
Permissible shaft loading		radial	80 N	80 N	80 N
		axial	40 N	40 N	40 N
Bearing lifetime		3 x 10^9 revolutions			
Working temperature range			0 ... + 70 °C	–20 ... + 100 °C	–20 ... + 100 °C
Storage temperature range (without package)			–40 ... + 100 °C	–40 ... + 100 °C	–40 ... + 100 °C
Permissible relative humidity [2]		90 %			
EMC [3]					
Resistance		To shocks [4]	50 g/6 ms	70 g/6 ms	60 g/6 ms
		To vibration [5]	20 g/10 ... 2000 Hz	30 g/10 ... 2000 Hz	20 g/10 ... 2000 Hz
Protection class IEC 60529			IP 64	IP 65	IP 65
Load current		4.5 ... 5.5 V, TTL/RS422	30 mA	30 mA	30 mA
		10 ... 32 V, TTL/RS422	30 mA	30 mA	30 mA
		10 ... 32 V, HTL/push-pull	30 mA	30 mA	30 mA
		5 ... 32 V, TTL/HTL programmable		30 mA	30 mA
No-load operating current		4.5 ... 5.5 V, TTL/RS422	40 mA	40 mA	40 mA
		10 ... 32 V, TTL/RS422	40 mA	40 mA	40 mA
		10 ... 32 V, HTL/push-pull	40 mA	40 mA	40 mA
		5 ... 32 V, TTL/HTL programmable		60 mA	60 mA
Initialisation time after power on		4.5 ... 5.5 V, TTL/RS422	40 ms	40 ms	40 ms
		10 ... 32 V, TTL/RS422	40 ms	40 ms	40 ms
		10 ... 32 V, HTL/Push pull	40 ms	40 ms	40 ms
		5 ... 32 V, TTL/HTL programmable		1000 ms	1000 ms

[1] Self-warming 3.3k/1,000 min^{-1}
when applying, note working temperature range

[2] Condensation of the optical scanning not permitted

[3] To EN 61000-6-2 and EN 61000-6-4

[4] To EN 60068-2-27

[5] To EN 60068-2-6

Order information TTL and HTL interface

DFS60 Incremental Encoder, 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
D	**F**	**S**	**6**	**0**		**–**	**S**								

Type (cp. technical data page 3)

E
B
A

Mechanical interface

Solid shaft, 10 x 19 mm	= **4**

Electrical interface

4.5 ... 5.5 V, TTL/RS422	= **A**
10 ... 32 V, TTL/RS422	= **C**
10 ... 32 V, HTL/push-pull	= **E**

Connection type

Connector M23, 12-pin, radial	= **A**
Connector M12, 8-pin, radial	= **C**
Cable 8-core, universal 1.5 m [1]	= **K**
Cable 8-core, universal 3 m [1]	= **L**
Cable 8-core, universal 5 m [1]	= **M**

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

No. of lines

Always 5 characters in clear text

Selection depending on the type, see below.

Type E – Number of lines per revolution

00100	00314	00500	01000	02000
00200	00360	00512	01024	02048
00250		00720	01250	

Type B – Number of lines per revolution

00050	00300	00500	01000	02000	04000	07200
00100	00314	00512	01024	02048	04096	08192
00200	00360	00720	01250	02500	05000	10000
00250				03600		

Others on request

Type A – Number of lines per revolution

00100	00300	00500	01000	02000	04000	07200	16384
00200	00314	00512	01024	02048	04096	08192	32768
00250	00360	00720	01250	02500	05000	10000	65536
				03600			

Others on request

DFS60 Incremental Encoder, type E, solid shaft 10 x 19 mm, Electrical interface 10 ... 32 V, HTL/push-pull, connector M12, 8-pin, radial, number of lines 1024

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
D	**F**	**S**	**6**	**0**	**E**	**–**	**S**	**4**	**E**	**C**	**0**	**1**	**0**	**2**	**4**

Order information TTL or HTL programmable

DFS60 Incremental Encoder, 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
D	**F**	**S**	**6**	**0**		**–**	**S**								

Type (cp. technical data page 3)
B
A

Mechanical interface	
Solid shaft, 10 x 19 mm	= **4**

Electrical interface	
5 ... 32 V, TTL/HTL programmable [1]	= **P**

[1] Preset level of output signal: TTL

Connection type	
Connector M23, 12-pin, radial	= **A**
Connector M12, 8-pin, radial	= **C**
Cable 8-core, universal 1.5 m [2]	= **K**
Cable 8-core, universal 3 m [2]	= **L**
Cable 8-core, universal 5 m [2]	= **M**

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

No. of lines
Always 5 characters in clear text

Selection depending on the type, see below.

Order information	
DFS60 Incremental Encoder Type B	
Face mount flange	
Solid shaft 10 x 19 mm	
Type	**Part no.**
DFS60B-S4PA10000	1036720
DFS60B-S4PC10000	1036721
DFS60B-S4PK10000	1036722
DFS60B-S4PL10000	1036723
DFS60B-S4PM10000	1036724

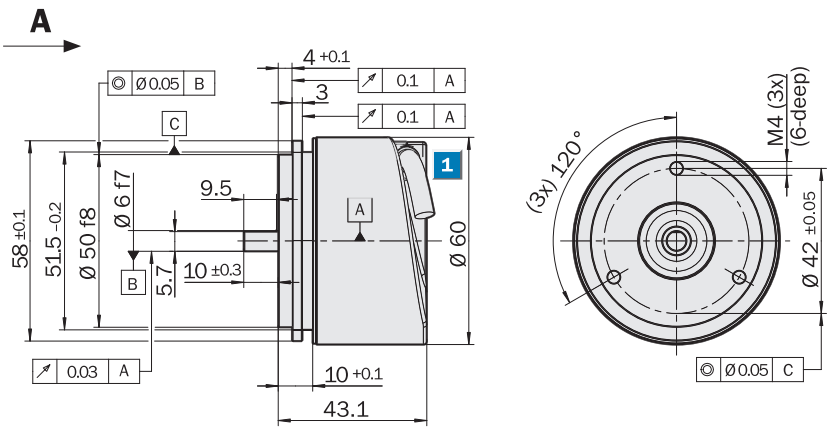
Order information	
DFS60 Incremental Encoder Type A	
Face mount flange	
Solid shaft 10 x 19 mm	
Type	**Part no.**
DFS60A-S4PA65536	1036725
DFS60A-S4PC65536	1036726
DFS60A-S4PK65536	1036727
DFS60A-S4PL65536	1036728
DFS60A-S4PM65536	1036729

Number of lines
1 up to 65,536

Incremental Encoder

- Connector or cable outlet
- Protection class IP 65
- Electrical interfaces
  TTL, HTL
- Number of lines, level of output signal and zero pulse width freely programmable

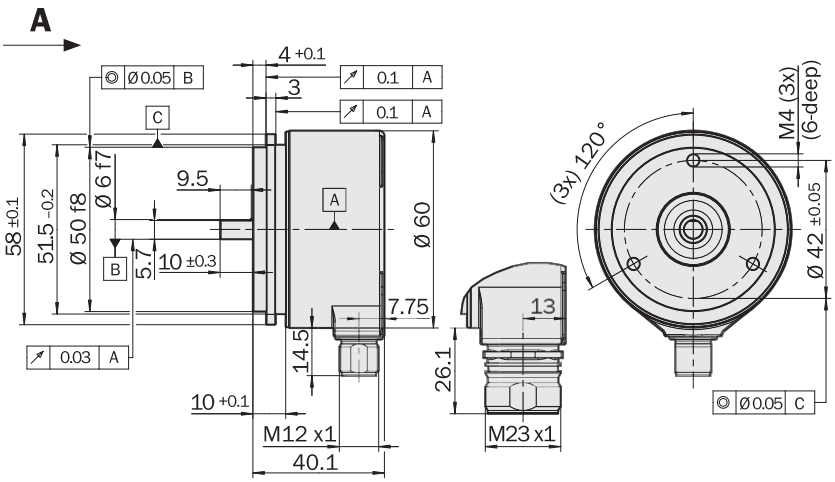
Dimensional drawing servo flange, cable outlet



General tolerances according to DIN ISO 2768-mk

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

Dimensional drawing servo flange, connector outlet M12 and M23



General tolerances according to DIN ISO 2768-mk

Accessories

Connection systems (page 24/25)
Mounting systems (page 26/27)
Programming Tool (page 23)

Pin assignment (page 22)

Technical Data to DIN 32878		DFS60 servo flange			
Type			**E**	**B**	**A**
Shaft diameter		6 x 10 mm			
Electrical interface		4.5 ... 5.5 V, TTL/RS422			
		10 ... 32 V, TTL/RS422			
		10 ... 32 V, HTL/push-pull			
		5 ... 32 V, TTL/HTL programmable			
Number of lines per revolution			100 ... 2048	1 ... 10000	1 ... 65536
Mass		0.3 kg			
Moment of inertia to the rotor		6.2 gcm^2			
Measuring step		90° electric/number of lines			
Reference signal	**Number**	1			
	Position	90° electr., gated with A and B			
Error limits			± 0.3°	± 0.05°	± 0.03°
Measuring step deviation		Number of lines 1 ... 99		± 0.08°	± 0.04°
		Number of lines 100 ... 10,000	± 0.2°	± 0.01°	± 0.008°
		Number of lines > 10,000			± 0.002°
Max. output frequency		TTL/RS422	300 kHz	600 kHz	820 kHz
		HTL/push-pull	300 kHz	600 kHz	820 kHz
		TTL/HTL programmable		600 kHz	820 kHz
Operating speed [1]			10,000 min^{-1}	10,000 min^{-1}	10,000 min^{-1}
Angular acceleration		5 x 10^5 rad/s^2			
Operating torque	**at 20 °C**	0.3 Ncm			
Starting torque	**at 20 °C**	0.5 Ncm			
Permissible shaft loading		radial	80 N	80 N	80 N
		axial	40 N	40 N	40 N
Bearing lifetime		3 x 10^9 revolutions			
Working temperature range			0 ... + 70 °C	–20 ... + 100 °C	–20 ... + 100 °C
Storage temperature range (without package)			–40 ... + 100 °C	–40 ... + 100 °C	–40 ... + 100 °C
Permissible relative humidity [2]		90 %			
EMC [3]					
Resistance		To shocks [4]	50 g/6 ms	70 g/6 ms	60 g/6 ms
		To vibration [5]	20 g/10 ... 2000 Hz	30 g/10 ... 2000 Hz	20 g/10 ... 2000 Hz
Protection class IEC 60529			IP 64	IP 65	IP 65
Load current		4.5 ... 5.5 V, TTL/RS422	30 mA	30 mA	30 mA
		10 ... 32 V, TTL/RS422	30 mA	30 mA	30 mA
		10 ... 32 V, HTL/push-pull	30 mA	30 mA	30 mA
		5 ... 32 V, TTL/HTL programmable		30 mA	30 mA
No-load operating current		4.5 ... 5.5 V, TTL/RS422	40 mA	40 mA	40 mA
		10 ... 32 V, TTL/RS422	40 mA	40 mA	40 mA
		10 ... 32 V, HTL/push-pull	40 mA	40 mA	40 mA
		5 ... 32 V, TTL/HTL programmable		60 mA	60 mA
Initialisation time after power on		4.5 ... 5.5 V, TTL/RS422	40 ms	40 ms	40 ms
		10 ... 32 V, TTL/RS422	40 ms	40 ms	40 ms
		10 ... 32 V, HTL/Push pull	40 ms	40 ms	40 ms
		5 ... 32 V, TTL/HTL programmable		1000 ms	1000 ms

[1] Self-warming 3.3k/1,000 min^{-1}
when applying, note working temperature range

[2] Condensation of the optical scanning not permitted

[3] To EN 61000-6-2 and EN 61000-6-4

[4] To EN 60068-2-27

[5] To EN 60068-2-6

Order information TTL and HTL interface

DFS60 Incremental Encoder, 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
D	**F**	**S**	**6**	**0**		**–**	**S**								

Type (cp. technical data page 7)
E
B
A

Mechanical interface	
Solid shaft, 6 x 10 mm	= **1**

Electrical interface	
4.5 ... 5.5 V, TTL/RS422	= **A**
10 ... 32 V, TTL/RS422	= **C**
10 ... 32 V, HTL/push-pull	= **E**

Connection type	
Connector M23, 12-pin, radial	= **A**
Connector M12, 8-pin, radial	= **C**
Cable 8-core, universal 1.5 m [1]	= **K**
Cable 8-core, universal 3 m [1]	= **L**
Cable 8-core, universal 5 m [1]	= **M**

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

No. of lines
Always 5 characters in clear text

Selection depending on the type, see below.

Type E – Number of lines per revolution

00100	00314	00500	01000	02000
00200	00360	00512	01024	02048
00250		00720	01250	

Type B – Number of lines per revolution

00050	00300	00500	01000	02000	04000	07200
00100	00314	00512	01024	02048	04096	08192
00200	00360	00720	01250	02500	05000	10000
00250				03600		

Others on request

Type A – Number of lines per revolution

00100	00300	00500	01000	02000	04000	07200	16384
00200	00314	00512	01024	02048	04096	08192	32768
00250	00360	00720	01250	02500	05000	10000	65536
				03600			

Others on request

DFS60 Incremental Encoder, type E, solid shaft 6 x 10 mm, Electrical interface 10 ... 32 V, HTL/push-pull, connector M12, 8-pin, radial, number of lines 1024

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
D	**F**	**S**	**6**	**0**	**E**	**–**	**S**	**1**	**E**	**C**	**0**	**1**	**0**	**2**	**4**

Order information TTL or HTL programmable

DFS60 Incremental Encoder, 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
D	**F**	**S**	**6**	**0**		**–**	**S**								

Type (cp. technical data page 7)
B
A

Mechanical interface	
Solid shaft, 6 x 10 mm	= **1**

Electrical interface	
5 ... 32 V, TTL/HTL programmable [1]	= **P**

[1] Preset level of output signal: TTL

Connection type	
Connector M23, 12-pin, radial	= **A**
Connector M12, 8-pin, radial	= **C**
Cable 8-core, universal 1.5 m [2]	= **K**
Cable 8-core, universal 3 m [2]	= **L**
Cable 8-core, universal 5 m [2]	= **M**

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

No. of lines
Always 5 characters in clear text

Selection depending on the type, see below.

Order information	
DFS60 Incremental Encoder Type B	
Servo flange	
Solid shaft 6 x 10 mm	
Type	**Part no.**
DFS60B-S1PA10000	1036755
DFS60B-S1PC10000	1036756
DFS60B-S1PK10000	1036757
DFS60B-S1PL10000	1036758
DFS60B-S1PM10000	1036759

Order information	
DFS60 Incremental Encoder Type A	
Servo flange	
Solid shaft 6 x 10 mm	
Type	**Part no.**
DFS60A-S1PA65536	1036760
DFS60A-S1PC65536	1036761
DFS60A-S1PK65536	1036762
DFS60A-S1PL65536	1036763
DFS60A-S1PM65536	1036764