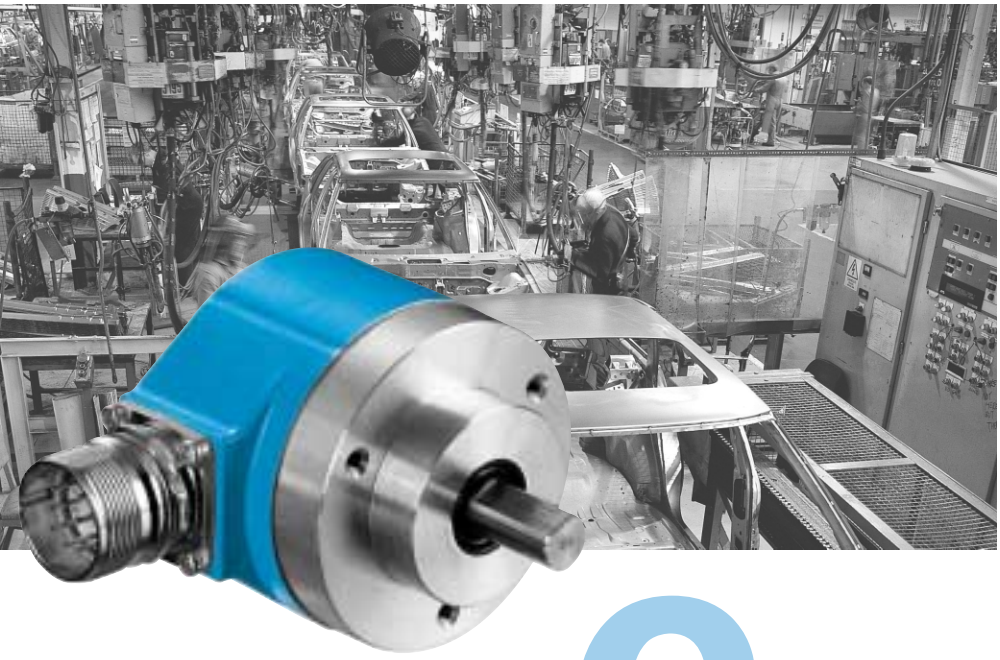
ARS 60: Singleturn Absolute Encoders. Modular Design for tailor-made solutions.

DATA SHEET



Number of steps
2 to 32.768

Absolute Encoder Singleturn

CoreTech® by SICK|STEGMANN

CoreTech technology permits tailor-made solutions for every application, due to its modular design. ARS 60 absolute singleturn encoders are available with any desired number of steps between 2 und 32,768. Further highlights of this generation of encoders:

- Simple zero adjustment by pressing a button located under a cap on the rear of the encoder or remotely via a signal line.
- Excellent price/performance ratio
- Long LED lifetime as a result of automatic light regulation
- Maximum reliability as a result of opto-ASICSs with Chip-on-Board technology
- Interchangeable collets for hollow shaft diameters from 6 to 15 mm and 1/4, 3/8, 1/2 inch.

Whether with face mount flange, servo flange, blind or through hollow shaft with connector or cable outlet, SSI or Parallel interface - ARS 60 absolute singleturn encoders will meet virtually any application profile.

Thanks to this wide variety of products, there are numerous possible uses, for example in:

- machine tools
- textile machines
- woodworking machines
- packaging machines

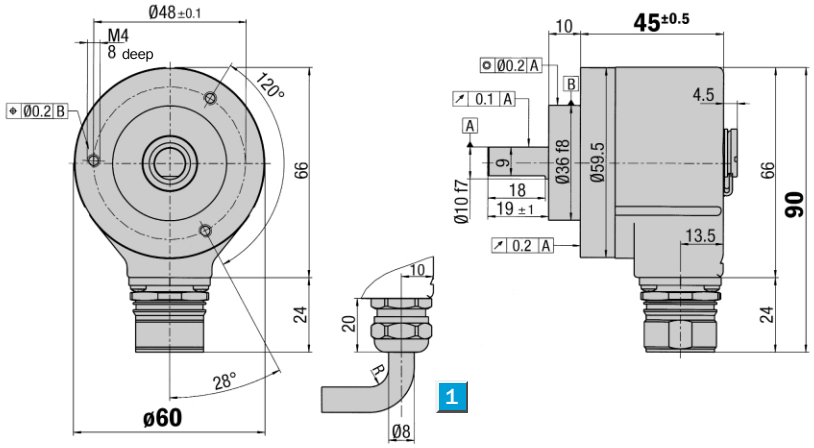
SICK|STEGMANN

Number of steps
2 to 32.768

Absolute Encoder Singleturn

- Connector or cable outlet
- Protection class up to IP 66
- Electrical Interfaces
  SSI or Parallel
- Zero adjustment directly on
  the encoder or via a remote line

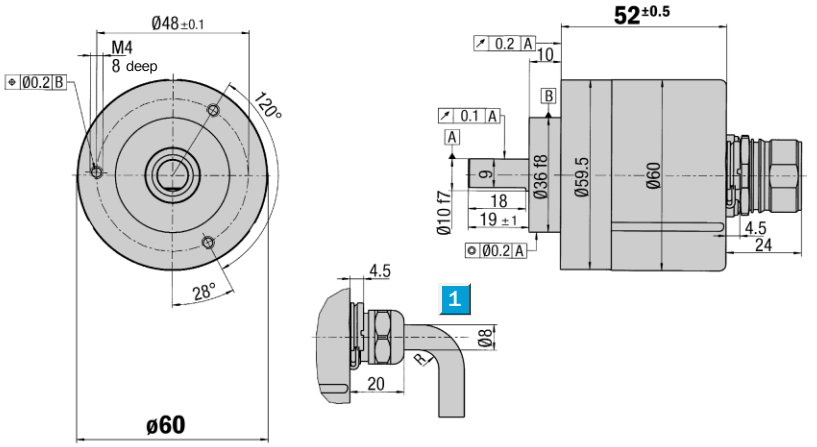
Dimensional drawing face mount flange radial exit



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

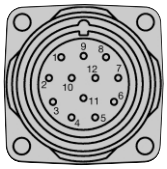
Dimensional drawing face mount flange axial exit



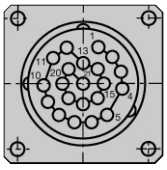
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation **see page 18**



View of the connector M 23 fitted to the encoder body SSI



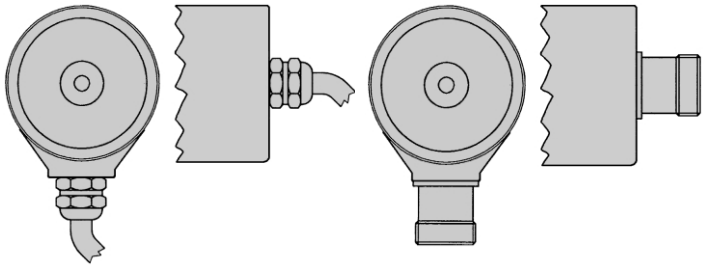
View of the connector M 23 fitted to the encoder body Single, Parallel

Accessories

- Connection systems
- Mounting systems
- Adapter modules

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical data	ARS 60 face mount flange	Flange type face m.
Solid shaft	10 mm	
Number of steps per revolution	00002…32.768 see ordering information	
Electrical interfaces	SSI or Parallel	
Mass [1]	approx. 0.3 kg	
Moment of inertia of the rotor	54 gcm^2	
Code direction [2]	CW	
Measurement range	1 revolution	
Measuring step	360° / number of steps	
Repeatability	0.005°	
Error limits		
binary number of steps	0.035°	
non-binary number of steps	0.046°	
Measuring step deviation		
binary number of steps	0.005°	
non-binary number of steps	0.016°	
Measured value backlash	0.005°	
Response threshold	0.003°	
Max. angular acceleration	5 x 10^5 rad/s^2	
Max. operating speed		
with shaft seal	6.000 min^{-1}	
without shaft seal [3]	10.000 min^{-1}	
Operating torque	typ. 0.3 Ncm	
Start up torque	typ. 0.4 Ncm	
Permissible shaft loading		
radial	20 N	
axial	10 N	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	- 20° … + 85° C	
Storage temperature range	- 40° … + 100° C	
Permissible relative humidity [4]	90 %	
EMC [5]		
Resistance		
to shocks [6]	50 / 11 g/ms	
to vibration [7]	20 / 10 … 150 g/Hz	
Protection class acc. IEC 60529		
connector outlet [8]	IP 65	
calble outlet	IP 66	
Operating voltage range (Us)	10 … 32 V	
Operating current		
SSI	typ. 60 mA	
Parallel	typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x Us	
	Logic L = 0 V … 0.3 x Us	
Operation of zero-set [9]	≥ 100 ms	
Initialisation time after power on	40 ms	

1) For an encoder with connector outlet
2) Increasing when viewing the clockwise rotating shaft
3) If the shaft seal has been removed by the customer
4) Condensation not permitted
5) To DIN EN 61000-6-4 and DIN EN 61000-6-1
6) To DIN IEC 68 part 2-27
7) To DIN IEC 68 part 2-6
8) With mating connector fitted
9) Only with shaft stationary (note initialisation time)

Order information see pages 4/5

Order Information SSI Interface

Absolute Encoder Singleturn ARS 60 SSI, face mount flange, solid shaft 10 mm

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
A	**R**	**S**	**6**	**0**	**–**								

Point 7 → Electrical Interface; Point 8 → Mechanical Interface; Point 9 → Connection type; Points 10–14 → Resolution

Electrical Interface	
10…32 V, SSI, Gray	= **A**
10…32 V, SSI, Gray Excess	= **B**

Mechanical Interface	
Face mount flange, solid shaft 10 mm	= **4**

Connection type	
Connector M23, 12 pin, radial	= **A**
Connector M23, 12 pin, axial	= **B**
Cable 11 core, radial 1.5 m	= **K**
Cable 11 core, radial 3 m	= **L**
Cable 11 core, radial 5 m	= **M**
Cable 11 core, axial 1.5 m	= **R**
Cable 11 core, axial 3 m	= **S**
Cable 11 core, axial 5 m	= **T**

Resolution

Any number of steps from 00002 up to 32768 possible. Always 5 characters in clear text.

Order example: Absolute Encoder Singleturn ARS 60 SSI

10 … 32 V, SSI, Gray; face mount flange; connector M23, 12-pin, radial; number of steps: 8192

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
A	**R**	**S**	**6**	**0**	**–**	**A**	**4**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Order Information Parallel Interface

Absolute Encoder Singleturn ARS 60 Parallel, face mount flange, solid shaft 10 mm

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
A	**R**	**S**	**6**	**0**	**–**								

Point 7 → Electrical Interface; Point 8 → Mechanical Interface; Point 9 → Connection type; Points 10–14 → Resolution

Electrical Interface	
10…32 V, parallel, Gray	= **F**
10…32 V, parallel, Gray Exc.	= **G**
10…32 V, parallel, BIN	= **H**
10…32 V, parallel, BCD	= **J**

Mechanical Interface	
Face mount flange, solid shaft 10 mm	= **4**

Connection type	
Connector M23, 21 pin, radial	= **A**
Connector M23, 21 pin, axial	= **B**
Cable 22 core, radial 1.5 m	= **K**
Cable 22 core, radial 3 m	= **L**
Cable 22 core, radial 5 m	= **M**
Cable 22 core, axial 1.5 m	= **R**
Cable 22 core, axial 3 m	= **S**
Cable 22 core, axial 5 m	= **T**

Resolution

Any number of steps from 00002 up to 32.768 possible, with the following electrical interfaces:
10…32 V, parallel, Gray
10…32 V, parallel, Gray Excess
10…32 V, parallel, BIN

Number of steps from 00002 up to 08000 possible, with the electrical interface:
10…32 V, parallel, BCD
Always 5 characters in clear text.

Order example: Absolute Encoder Singleturn ARS 60 Parallel

10 … 32 V, Parallel, Gray; face mount flange; connector M23, 21-pin, radial; number of steps: 8192

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
A	**R**	**S**	**6**	**0**	**–**	**F**	**4**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

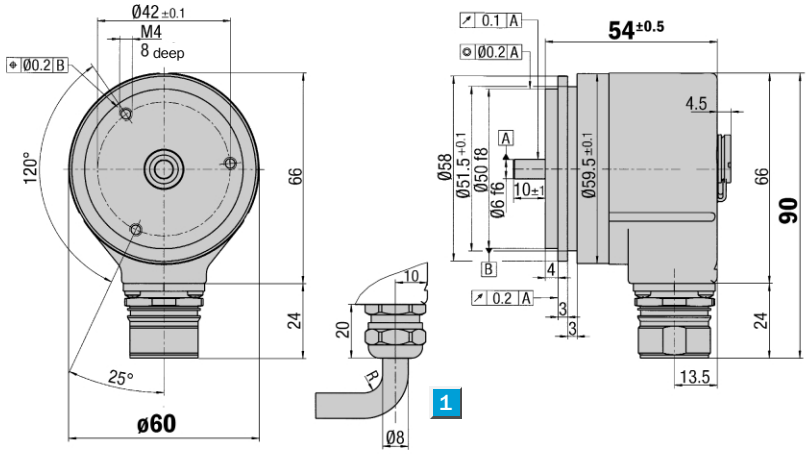
Number of steps
2 to 32.768

Absolute Encoder Singleturn

- Connector or cable outlet
- Protection class up to IP 66
- Electrical Interfaces SSI or Parallel
- Zero adjustment directly on the encoder or via a remote line

CE

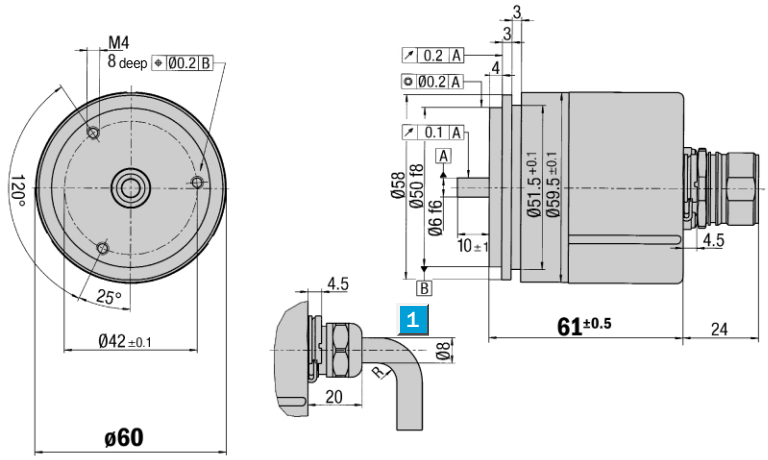
Dimensional drawing servo flange radial exit



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

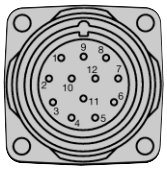
Dimensional drawing servo flange axial exit



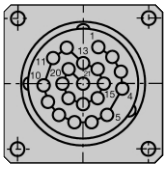
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation see page 18



View of the connector M 23 fitted to the encoder body SSI



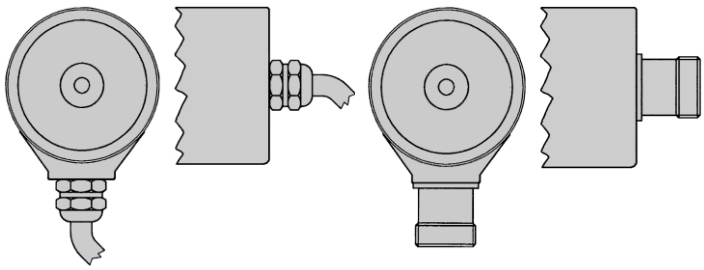
View of the connector M 23 fitted to the encoder body Single, Parallel

Accessories

- Connection systems
- Mounting systems
- Adapter modules

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical data	ARS 60 servo flange	Flange type servo
Solid shaft	6 mm	
Number of steps per revolution	00002…32.768 see ordering information	
Electrical interfaces	SSI or Parallel	
Mass [1]	approx. 0.3 kg	
Moment of inertia of the rotor	48 gcm^2	
Code direction [2]	CW	
Measurement range	1 revolution	
Measuring step	360° / number of steps	
Repeatability	0.005°	
Error limits		
binary number of steps	0.035°	
non-binary number of steps	0.046°	
Measuring step deviation		
binary number of steps	0.005°	
non-binary number of steps	0.016°	
Measured value backlash	0.005°	
Response threshold	0.003°	
Max. angular acceleration	5 x 10^5 rad/s^2	
Max. operating speed		
with shaft seal	6.000 min^{-1}	
without shaft seal [3]	10.000 min^{-1}	
Operating torque	typ. 0.2 Ncm	
Start up torque	typ. 0.25 Ncm	
Permissible shaft loading		
radial	20 N	
axial	10 N	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	- 20° … + 85° C	
Storage temperature range	- 40° … + 100° C	
Permissible relative humidity [4]	90 %	
EMC [5]		
Resistance		
to shocks [6]	50 / 11 g/ms	
to vibration [7]	20 / 10 … 150 g/Hz	
Protection class acc. IEC 60529		
connector outlet [8]	IP 65	
calble outlet	IP 66	
Operating voltage range (Us)	10 … 32 V	
Operating current		
SSI	typ. 60 mA	
Parallel	typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x Us	
	Logic L = 0 V … 0.3 x Us	
Operation of zero-set [9]	≥ 100 ms	
Initialisation time after power on	40 ms	

1) For an encoder with connector outlet
2) Increasing when viewing the clockwise rotating shaft
3) If the shaft seal has been removed by the customer
4) Condensation not permitted
5) To DIN EN 61000-6-4 and DIN EN 61000-6-1
6) To DIN IEC 68 part 2-27
7) To DIN IEC 68 part 2-6
8) With mating connector fitted
9) Only with shaft stationary (note initialisation time)

Order information see pages 8/9

Order iuformation SSI Interface

Absolute Encoder Singleturn ARS 60 SSI, servo flange, solid shaft 6 mm

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
A	**R**	**S**	**6**	**0**	**–**								

Electrical Interface	
10…32 V, SSI, Gray	= **A**
10…32 V, SSI, Gray Excess	= **B**

Mechanical Interface	
Servo flange, solid shaft 6 mm	= **1**

Connection type	
Connector M23, 12 pin, radial	= **A**
Connector M23, 12 pin, axial	= **B**
Cable 11 core, radial 1.5 m	= **K**
Cable 11 core, radial 3 m	= **L**
Cable 11 core, radial 5 m	= **M**
Cable 11 core, axial 1.5 m	= **R**
Cable 11 core, axial 3 m	= **S**
Cable 11 core, axial 5 m	= **T**

Resolution
Any number of steps from 00002 up to 32768 possible. Always 5 characters in clear text.

Order example: Absolute Encoder Singleturn ARS 60 SSI

10 … 32 V, SSI, Gray; servo flange; connector M23, 12-pin, radial; number of steps 8192

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
A	**R**	**S**	**6**	**0**	**–**	**A**	**1**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Order information Parallel Interface

Absolute Encoder Singleturn ARS 60 Parallel, servo flange, solid shaft 6 mm

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
A	**R**	**S**	**6**	**0**	**–**								

Point 7 → Electrical Interface; Point 8 → Mechanical Interface; Point 9 → Connection type; Points 10–14 → Resolution

Electrical Interface	
10…32 V, parallel, Gray	= **F**
10…32 V, parallel, Gray Exc.	= **G**
10…32 V, parallel, BIN	= **H**
10…32 V, parallel, BCD	= **J**

Mechanical Interface	
Servo flange, solid shaft 6 mm	= **1**

Connection type	
Connector M23, 21 pin, radial	= **A**
Connector M23, 21 pin, axial	= **B**
Cable 22 core, radial 1.5 m	= **K**
Cable 22 core, radial 3 m	= **L**
Cable 22 core, radial 5 m	= **M**
Cable 22 core, axial 1.5 m	= **R**
Cable 22 core, axial 3 m	= **S**
Cable 22 core, axial 5 m	= **T**

Resolution

Any number of steps from 00002 up to 32768 possible, with the following electrical interfaces:
10…32 V, parallel, Gray
10…32 V, parallel, Gray Excess
10…32 V, parallel, BIN

Number of steps from 00002 up to 08000 possible, with the electrical interface:
10…32 V, parallel, BCD
Always 5 characters, in clear text.

Order example: Absolute Encoder Singleturn ARS 60 Parallel

10 … 32 V, Parallel, Gray; servo flange; connector M23, 21-pin, radial; number of steps: 8192

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
A	**R**	**S**	**6**	**0**	**–**	**F**	**1**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

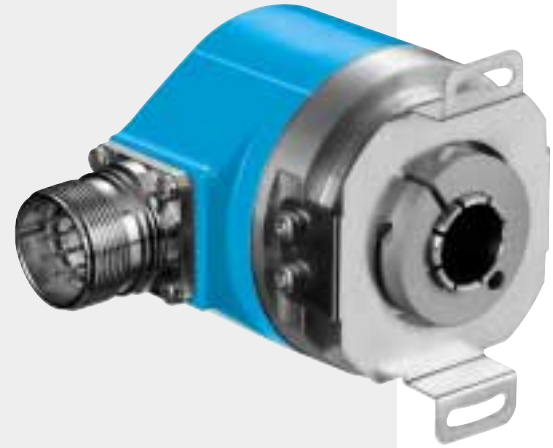
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Number of steps
2 to 32.768

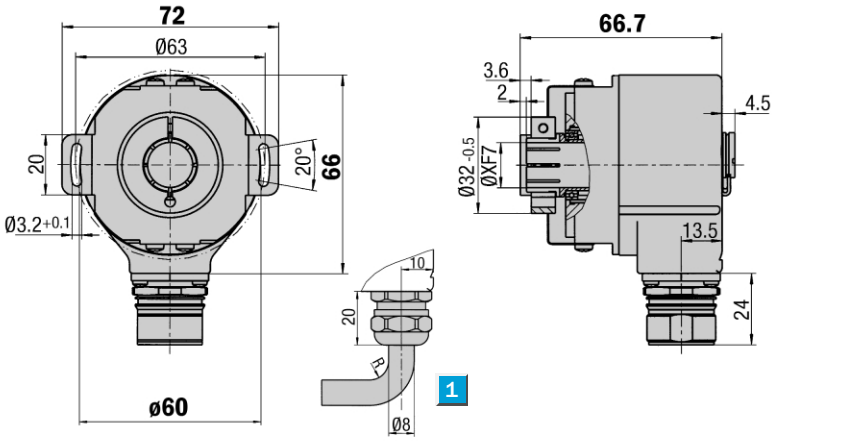
Absolute Encoder Singleturn

- Connector or cable outlet
- Protection class up to IP 66
- Electrical Interfaces
  SSI or Parallel
- Zero adjustment directly on
  the encoder or via a remote line



CE

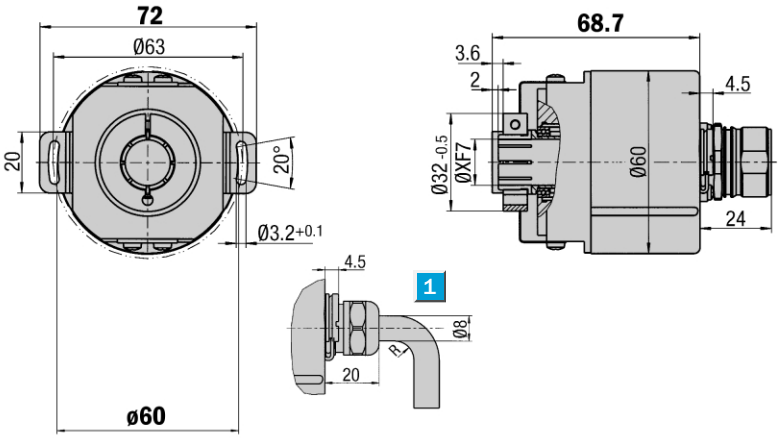
Dimensional drawing blind hollow shaft radial exit



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

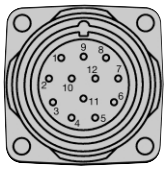
Dimensional drawing blind hollow shaft axial exit



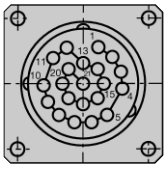
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation see page 18



View of the connector M 23 fitted to the encoder body SSI



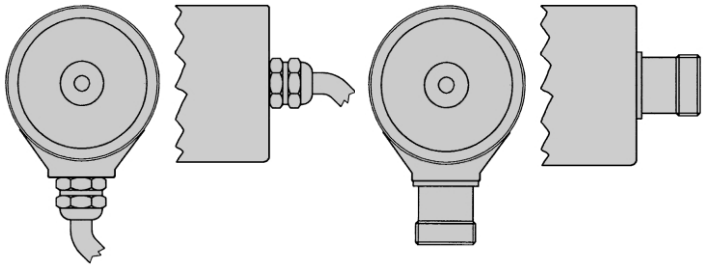
View of the connector M 23 fitted to the encoder body Single, Parallel

Accessories

- Connection systems
- Mounting systems
- Collets
- Adapter modules

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical data	ARS 60 blind hollow shaft	Flange type: blind
Hollow shaft diameter	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Number of steps per revolution	00002…32.768 see ordering information	
Electrical interfaces	SSI or Parallel	
Mass [1]	approx. 0.3 kg	
Moment of inertia of the rotor	see Fig. 1	
Code direction [2]	CW	
Measurement range	1 revolution	
Measuring step	360° / number of steps	
Repeatability	0.005°	
Error limits		
binary number of steps	0.035°	
non-binary number of steps	0.046°	
Measuring step deviation		
binary number of steps	0.005°	
non-binary number of steps	0.016°	
Measured value backlash	0.005°	
Response threshold	0.003°	
Max. angular acceleration	5 x 10^5 rad/s^2	
Max. operating speed	3.000 min^{-1}	
Operating torque	typ. 0.4 Ncm	
Start up torque	typ. 0.6 Ncm	
Permissible movement		
of the drive element		
Radial movement static / dynamic	± 0.3 / ± 0.1 mm	
Axial movement static / dynamic	± 0.5 / ± 0.2 mm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	- 20° … + 85° C	
Storage temperature range	- 40° … + 100° C	
Permissible relative humidity [3]	90 %	
EMC [4]		
Resistance		
to shocks [5]	50 / 11 g/ms	
to vibration [6]	20 / 10 … 150 g/Hz	
Protection class acc. IEC 60529		
connector outlet [7]	IP 65	
calble outlet	IP 66	
Operating voltage range (Us)	10 … 32 V	
Operating current		
SSI	typ. 60 mA	
Parallel	typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x Us	
	Logic L = 0 V … 0.3 x Us	
Operation of zero-set [8]	≥ 100 ms	
Initialisation time after power on	40 ms	

[1] For an encoder with connector outlet

[2] Increasing when viewing the clockwise rotating shaft

[3] Condensation not permitted

[4] To DIN EN 61000-6-4 and DIN EN 61000-6-1

[5] To DIN IEC 68 part 2-27

[6] To DIN IEC 68 part 2-6

[7] With mating connector fitted

[8] Only with shaft stationary (note initialisation time)

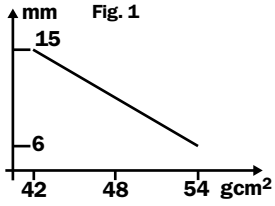


Fig. 1

Order information see pages 12/13

Order information SSI Interface

Absolute Encoder Singleturn ARS 60 SSI, 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
A	**R**	**S**	**6**	**0**	**–**								

Point 7: Electrical Interface; Point 8: Mechanical Interface; Point 9: Connection type; Points 10–14: Resolution

Electrical Interface	
10…32 V, SSI, Gray	= **A**
10…32 V, SSI, Gray Excess	= **B**

Mechanical Interface	
Blind hollow shaft [1)]	= **A**

[1)] **Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below). For 15 mm shaft diameter collet is not needed.**

Connection type	
Connector M23, 12 pin, radial	= **A**
Connector M23, 12 pin, axial	= **B**
Cable 11 core, radial 1.5 m	= **K**
Cable 11 core, radial 3 m	= **L**
Cable 11 core, radial 5 m	= **M**
Cable 11 core, axial 1.5 m	= **R**
Cable 11 core, axial 3 m	= **S**
Cable 11 core, axial 5 m	= **T**

Resolution

Any number of steps from 00002 up to 32768 possible. Always 5 characters in clear text.

Order example: Absolute Encoder Singleturn ARS 60 SSI

10 … 32 V, SSI, Gray; blind hollow shaft; connector M23, 12-pin, radial; number of steps 8192

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
A	**R**	**S**	**6**	**0**	**–**	**A**	**A**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Collets for blind hollow shaft encoder

Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

Order information Parallel Interface

Absolute Encoder Singleturn ARS 60 Parallel, 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
A	**R**	**S**	**6**	**0**	**–**								

Electrical Interface	
10…32 V, parallel, Gray	= **F**
10…32 V, parallel, Gray Exc.	= **G**
10…32 V, parallel, BIN	= **H**
10…32 V, parallel, BCD	= **J**

Mechanical Interface	
Blind hollow shaft [1]	= **A**

[1] Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below). For 15 mm shaft diameter collet is not needed.

Connection type	
Connector M23, 21 pin, radial	= **A**
Connector M23, 21 pin, axial	= **B**
Cable 22 core, radial 1.5 m	= **K**
Cable 22 core, radial 3 m	= **L**
Cable 22 core, radial 5 m	= **M**
Cable 22 core, axial 1.5 m	= **R**
Cable 22 core, axial 3 m	= **S**
Cable 22 core, axial 5 m	= **T**

Resolution
Any number of steps from 00002 up to 32768 possible, with the following electrical interfaces: 10…32 V, parallel, Gray 10…32 V, parallel, Gray Excess 10…32 V, parallel, BIN
Number of steps from 00002 up to 08000 possible, with the electrical interface: 10…32 V, parallel, BCD Always 5 characters, in clear text.

Order example: Absolute Encoder Singleturn ARS 60 Parallel

10 … 32 V, Parallel, Gray; blind hollow shaft; connector M23, 21-pin, radial; number of steps 8192

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
A	**R**	**S**	**6**	**0**	**–**	**F**	**A**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Collets for blind hollow shaft encoder

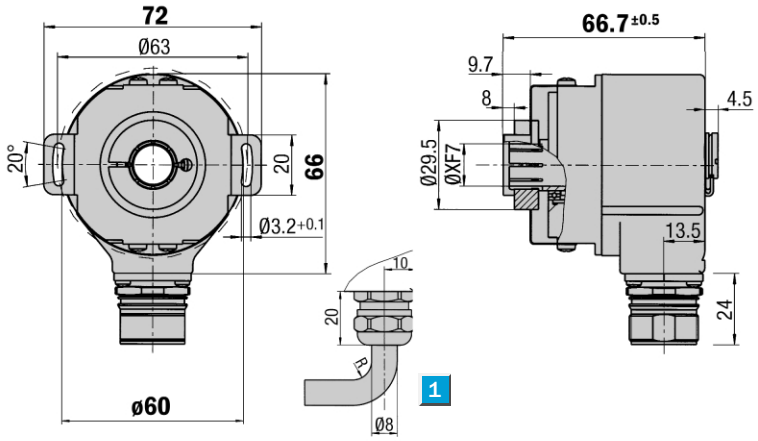
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

Number of steps
2 to 32.768

Absolute Encoder Singleturn

- Connector or cable outlet
- Protection class up to IP 64
- Electrical Interfaces SSI or Parallel
- Zero adjustment directly on the encoder or via a remote line

Dimensional drawing through hollow shaft, radial exit

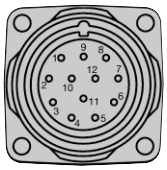


1 R = bending radius min. 40 mm

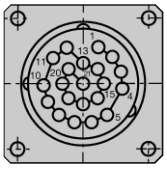
General tolerances according to DIN ISO 2768-mk

CE

PIN and wire allocation see page 18



View of the connector M 23 fitted to the encoder body SSI



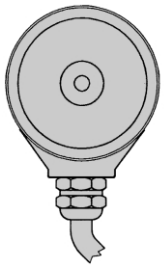
View of the connector M 23 fitted to the encoder body Single, Parallel

Accessories

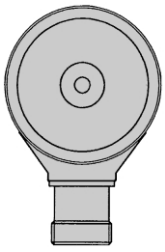
- Connection systems
- Mounting systems
- Collets
- Adapter modules

Connection type

Radial cable



Radial connector



Technical data	ARS 60 through hollow shaft	Flange type through
Hollow shaft diameter	6, 8, 10, 12 mm, 1/4", 3/8", 1/2"	
Number of steps per revolution	00002…32.768 see ordering information	
Electrical interfaces	SSI or Parallel	
Mass [1]	approx. 0.3 kg	
Moment of inertia of the rotor	see Fig. 1	
Code direction [2]	CW	
Measurement range	1 revolution	
Measuring step	360° / number of steps	
Repeatability	0.005°	
Error limits		
binary number of steps	0.035°	
non-binary number of steps	0.046°	
Measuring step deviation		
binary number of steps	0.005°	
non-binary number of steps	0.016°	
Measured value backlash	0.005°	
Response threshold	0.003°	
Max. angular acceleration	5 x 10^5 rad/s^2	
Max. operating speed	3.000 min^{-1}	
Operating torque	typ. 1.6 Ncm	
Start up torque	typ. 2.2 Ncm	
Permissible movement		
of the drive element		
Radial movement static / dynamic	± 0.3 / ± 0.1 mm	
Axial movement static / dynamic	± 0.5 / ± 0.2 mm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	- 20° … + 85° C	
Storage temperature range	- 40° … + 100° C	
Permissible relative humidity [3]	90 %	
EMC [4]		
Resistance		
to shocks [5]	50 / 11 g/ms	
to vibration [6]	20 / 10 … 150 g/Hz	
Protection class acc. IEC 60529		
connector outlet [7]	IP 64	
calble outlet	IP 64	
Operating voltage range (Us)	10 … 32 V	
Operating current		
SSI	typ. 60 mA	
Parallel	typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x Us	
	Logic L = 0 V … 0.3 x Us	
Operation of zero-set [8]	≥ 100 ms	
Initialisation time after power on	40 ms	

[1] For an encoder with connector outlet

[2] Increasing when viewing the clockwise rotating shaft

[3] Condensation not permitted

[4] To DIN EN 61000-6-4 and DIN EN 61000-6-1

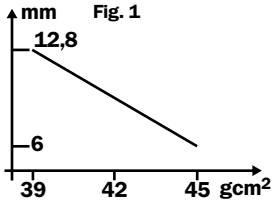
[5] To DIN IEC 68 part 2-27

[6] To DIN IEC 68 part 2-6

[7] With mating connector fitted

[8] Only with shaft stationary (note initialisation time)

Fig. 1



Order information see pages 16/17

Order information SSI Interface

Absolute Encoder Singleturn ARS 60 SSI, 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
A	**R**	**S**	**6**	**0**	**–**								

Point 7: Electrical Interface; Point 8: Mechanical Interface; Point 9: Connection type; Points 10–14: Resolution

Electrical Interface	
10…32 V, SSI, Gray	= **A**
10…32 V, SSI, Gray Excess	= **B**

Mechanical Interface	
Through hollow shaft [1]	= **D**

[1] Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below).

Connection type	
Connector M23, 12 pin, radial	= **A**
Cable 11 core, radial 1.5 m	= **K**
Cable 11 core, radial 3 m	= **L**
Cable 11 core, radial 5 m	= **M**

Resolution

Any number of steps from 00002 up to 32768 possible. Always 5 characters in clear text.

Order example: Absolute Encoder Singleturn ARS 60 SSI

10 … 32 V, SSI, Gray; through hollow shaft; connector M23, 12-pin, radial; number of steps 8192

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
A	**R**	**S**	**6**	**0**	**–**	**A**	**D**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

Collets for blind hollow shaft encoder

Type	Part no.	Shaft diameter
SPZ-006-AD-D	2 029 192	6 mm
SPZ-1E4-AD-D	2 029 193	1/4"
SPZ-008-AD-D	2 029 194	8 mm
SPZ-3E8-AD-D	2 029 195	3/8"
SPZ-010-AD-D	2 029 196	10 mm
SPZ-012-AD-D	2 029 197	12 mm
SPZ-1E2-AD-D	2 029 198	1/2"

Order information Parallel Interface

Absolute Encoder Singleturn ARS 60 Parallel, 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
A	**R**	**S**	**6**	**0**	**–**								

Electrical Interface	
10…32 V, parallel, Gray	= **F**
10…32 V, parallel, Gray Exc.	= **G**
10…32 V, parallel, BIN	= **H**
10…32 V, parallel, BCD	= **J**

Mechanical Interface	
Through hollow shaft [1]	= **D**

[1] Collets for 6, 8, 10, 12 mm and 1/4", 3/8" and 1/2" as accessories, separate order item (see below).

Connection type	
Connector M23, 21 pin, radial	= **A**
Cable 22 core, radial 1.5 m	= **K**
Cable 22 core, radial 3 m	= **L**
Cable 22 core, radial 5 m	= **M**

Resolution
Any number of steps from 00002 up to 32768 possible, with the following electrical interfaces: 10…32 V, parallel, Gray 10…32 V, parallel, Gray Excess 10…32 V, parallel, BIN
Number of steps from 00002 up to 08000 possible, with the electrical interface: 10…32 V, parallel, BCD Always 5 characters, in clear text.

Order example: Absolute Encoder Singleturn ARS 60 Parallel

10 … 32 V, Parallel, Gray; through hollow shaft; connector M23, 21-pin, radial; number of steps 8192

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
A	**R**	**S**	**6**	**0**	**–**	**F**	**D**	**A**	**0**	**8**	**1**	**9**	**2**

Please enter your individual encoder here.

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
A	**R**	**S**	**6**	**0**	**–**								

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
A	**R**	**S**	**6**	**0**	**–**								

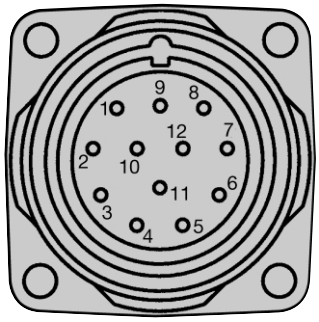
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
A	**R**	**S**	**6**	**0**	**–**								

Collets for blind hollow shaft encoder

Type	Part no.	Shaft diameter
SPZ-006-AD-D	2 029 192	6 mm
SPZ-1E4-AD-D	2 029 193	1/4"
SPZ-008-AD-D	2 029 194	8 mm
SPZ-3E8-AD-D	2 029 195	3/8"
SPZ-010-AD-D	2 029 196	10 mm
SPZ-012-AD-D	2 029 197	12 mm
SPZ-1E2-AD-D	2 029 198	1/2"

PIN and wire allocation

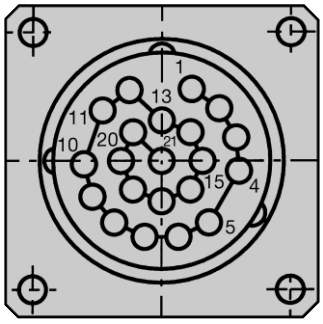
Allocation for encoder with 12-pin connector; SSI Interface



View of the connector M 23 fitted to the encoder body SSI

Signal	12-pin connector	11-core cable outlet
GND	1	blue
Data (+)	2	white
Clock (+)	3	yellow
N. C.	4	–
CW/$\overline{\text{CCW}}$	5	pink
N. C.	6	–
N. C.	7	–
Us	8	red
SET	9	orange
Data (-)	10	brown
Clock (-)	11	violet
N. C.	12	–

Allocation for encoder with 21-pin connector Single; Parallel Interface



View of the connector M 23 fitted to the encoder body Single, Parallel

PIN	Wire colour by cable outlet	Binary	Gray	BCD	Explanation
1	violet	2^0	G_0	2^0 v.10^0	
2	white/brown	2^1	G_1	2^1 v.10^0	
3	white/green	2^2	G_2	2^2 v.10^0	
4	white/yellow	2^3	G_3	2^3 v.10^0	
5	white/grey	2^4	G_4	2^0 v.10^1	
6	white/pink	2^5	G_5	2^1 v.10^1	
7	white/blue	2^6	G_6	2^2 v.10^1	
8	white/red	2^7	G_7	2^3 v.10^1	
9	white/black	2^8	G_8	2^0 v.10^2	
10	brown/green	2^9	G_9	2^1 v.10^2	
11	brown/yellow	2^{10}	G_{10}	2^2 v.10^2	Data lines, outputs
12	brown/grey	2^{11}	G_{11}	2^3 v.10^2	
13	brown/pink	2^{12}	G_{12}	2^0 v.10^3	
14	brown/blue	2^{13}	G_{13}	2^1 v.10^3	
15	brown/red	2^{14}	G_{14}	2^2 v.10^3	
16	green	Parity	Parity	Parity	
17	pink	Store_	Store_	Store_	
18	yellow	Enable_	Enable_	Enable_	
19	brown	CW/CCW_	CW/CCW_	CW/CCW_	
*)	grey	SET	SET	SET	
20	blue	GND	GND	GND	
21	red	Us	Us	Us	
Housing		Screen	Screen	Screen	

* Set line only possible with a cable outlet

Us	Supply voltage to the encoder (before commissioning, note must be taken of the type label of the encoder).
GND	Zero volt connection to the encoder: electrically isolated from the housing. The voltage referred to GND is Us.
CW/CCW_	Foreward/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).
Enable_	This input activates the data output driver when a »low« level is applied. If not connected, this input is »low«. In the case of a »high« level, the outputs are in the tristate mode.
Store_	This input stores the encoder data in Gray code when a »low« level is applied. This avoids a read error if the output data ist requested in binary code. If this input is »low«, the data at the encoder output is stable, irrespective of whether the input shaft rotates. If not switched, this input is »high«.
Parity	This output supplies a »high« level when the binary checksum of the data bits is even.
SET	This input serves to set the zero electronically. If the SET line is connected to Us for more than 100 ms, the mechanical position corresponds to the value 0.

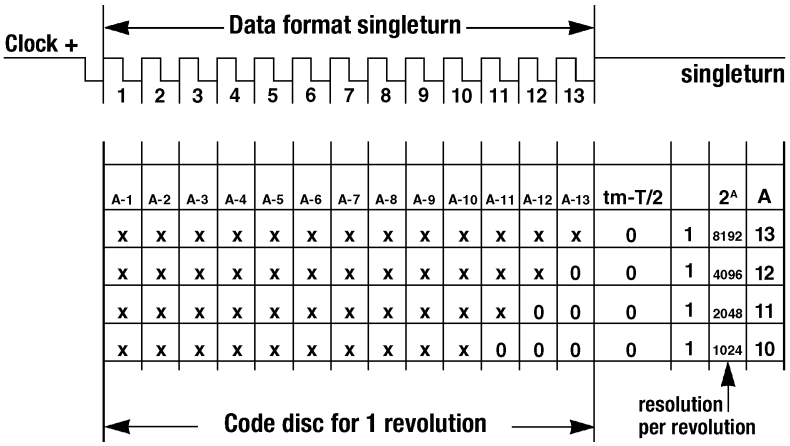
Signal outputs

Data format for resolutions ≤ 8192 (1-13 bits)

In order to be compatible with the data formats on the market, a distinction is made in the ARS 60 between two data formats.

The first data format applies to the encoder designs with resolutions up to 13 bits.

This is the standard data format for the singleturn absolute encoder.



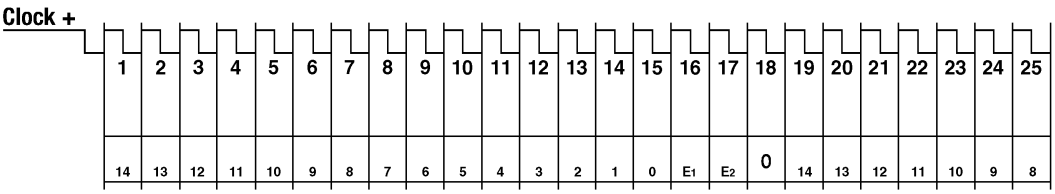
A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	tm-T/2		2^A	A
x	x	x	x	x	x	x	x	x	x	x	x	x	0	1	8192	13
x	x	x	x	x	x	x	x	x	x	x	x	0	0	1	4096	12
x	x	x	x	x	x	x	x	x	x	x	0	0	0	1	2048	11
x	x	x	x	x	x	x	x	x	x	0	0	0	0	1	1024	10

Data format for resolutions > 8192 (14 and 15 bits)

The data transmitted is left-justified. The 15 data bits are followed by two error bits.

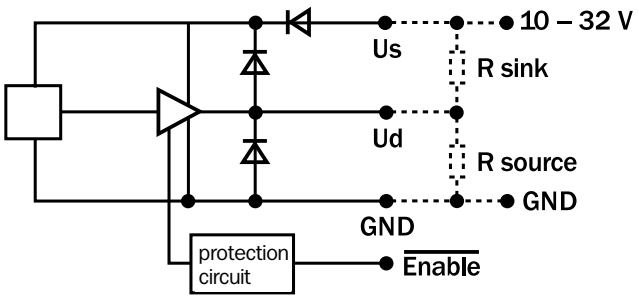
Error 1 (E_1) = Position error
During the determination of the position, an error has occurred since the last SSI transmission. This error bit will be deleted during the next SSI transmission.

Error 2 (E_2) = light source monitoring



Parallel Interface (Output driver 7272 push-pull)

- Tristate capability
- Short-circuit protected
- Protected against reverse polarity
- Integrated transient protection diodes



Technical Data: Parallel Interface

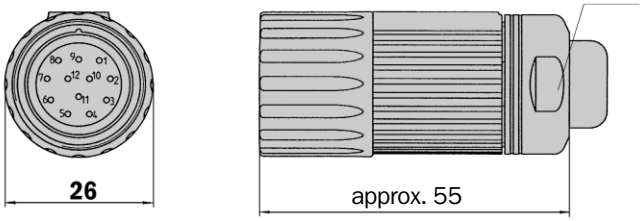
Id_H max. at +85° C 8 nF 6000 min^{-1}		30 mA	
Id_L max. at +85° C 8 nF 6000 min^{-1}		30 mA	
Output saturation voltage (H-level)	Id_H	10 mA	2.8 V
	$Us\text{-}Ud_H$	30 mA	3.0 V
Output saturation voltage (L-level)	Id_L	10 mA	0.4 V
	Ud_L	30 mA	2.0 V
Position refresh time (dependent upon the encoder resolution and output code)	Parallel Gray-Code		60 µs
	Parallel BIN-Code		60 µs
	Parallel BCD-Code		200 µs

Dimensional drawings and order information

Screw-in system M 23, 12-pin

Female connector M 23, 12-pin, straight

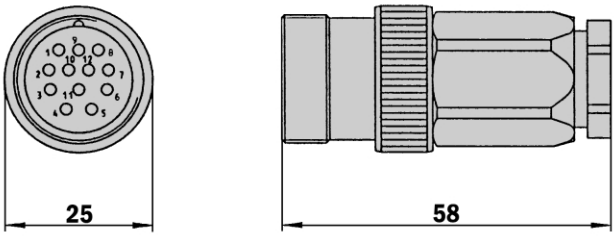
Type	Part no.	Contacts
DOS-2312-G	6 027 538	12



General tolerances according to DIN ISO 2768-mk

Male connector M 23, 12-pin, straight

Type	Part no.	Contacts
STE-2312-G	6 027 537	12



General tolerances according to DIN ISO 2768-mk

Female connector M 23, 12-pin, straight, cable 12-pin, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screening, capable of being dragged, cable diameter 7.8 mm

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2 029 212	12	1.5 m
DOL-2312-G03MMA3	2 029 213	12	3.0 m
DOL-2312-G05MMA3	2 029 214	12	5.0 m
DOL-2312-G10MMA3	2 029 215	12	10.0 m
DOL-2312-G20MMA3	2 029 216	12	20.0 m
DOL-2312-G30MMA3	2 029 217	12	30.0 m

Cables

Cable 8-core, per meter, 4 x 2 x 0.15 mm² with screening, cable diameter 5.6 mm

Type	Part no.	Wires
LTG-2308-MW	6 027 529	8

Cable 11-core, per meter, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screening, cable diameter 7.5 mm

Type	Part no.	Wires
LTG-2411-MW	6 027 530	11

Cable 12-core, per meter, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screening, capable of being dragged, cable diameter 7.8 mm

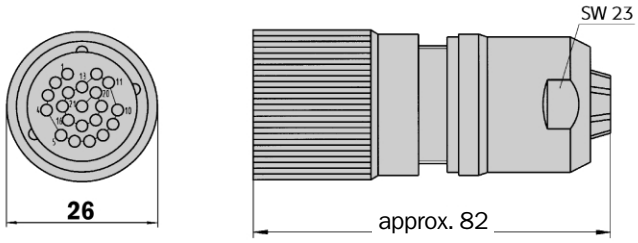
Type	Part no.	Wires
LTG-2512-MW	6 027 531	12

Dimensional drawings and order information

Screw-in system M 23, 21-pin

Female connector M 23, 21-pin, straight, screened, capable of being dragged

Type	Part no.	Contacts
DOS-2312-G	6 027 539	21



General tolerances according to DIN ISO 2768-mk

Female connector M 23, 21-pin, cable 22-core, 20 x 0.14 + 2 x 0.5 mm² with screening, capable of being dragged, cable diameter 7.8 mm

Type	Part no.	Contacts	Cable length
DOL-2321-G1M5PA4	2 029 218	21	1.5 m
DOL-2321-G03MPA4	2 029 219	21	3.0 m
DOL-2321-G05MPA4	2 029 220	21	5.0 m
DOL-2321-G10MPA4	2 029 221	21	10.0 m
DOL-2321-G20MPA4	2 029 222	21	20.0 m

Cables

Cable 22-core, per meter, 20 x 0.14 + 2 x 0.5 mm² with screening, cable diameter 7.8 mm

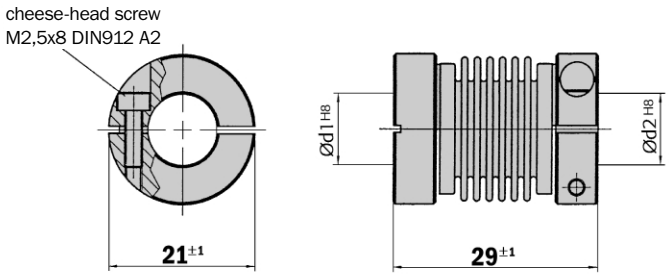
Type	Part no.	Wires
LTG-2622-MW	6 027 532	22

Dimensional drawings and order information

Couplings

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

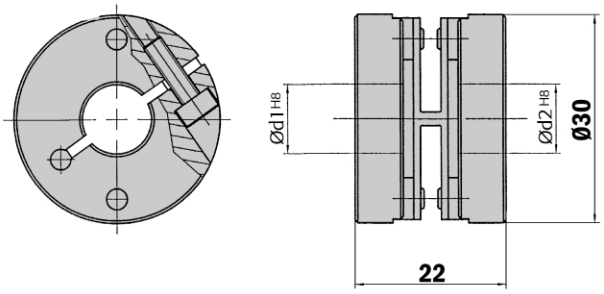
Type	Part no.	Shaft diameter
KUP-0606-B	5 312 981	6 mm - 6 mm
KUP-0610-B	5 312 982	6 mm - 10 mm
KUP-1010-B	5 312 983	10 mm - 10 mm
KUP-1012-B	5 312 984	10 mm - 12 mm



General tolerances according to DIN ISO 2768-mk

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

Type	Part no.	Shaft diameter
KUP-0610-F	5 312 985	6 mm - 10 mm
KUP-1010-F	5 312 986	10 mm - 10 mm



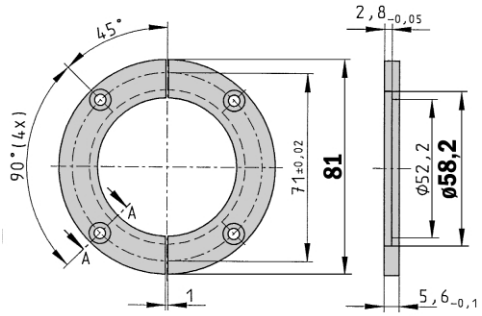
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Servo clamps

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

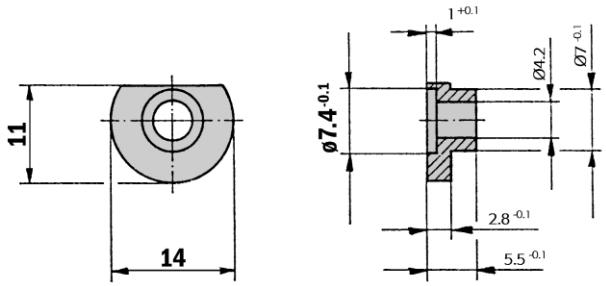
Type	Part no.
BEF-WG-SF050	2 029 165



General tolerances according to DIN ISO 2768-mk

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

Type	Part no.
BEF-WK-SF	2 029 166

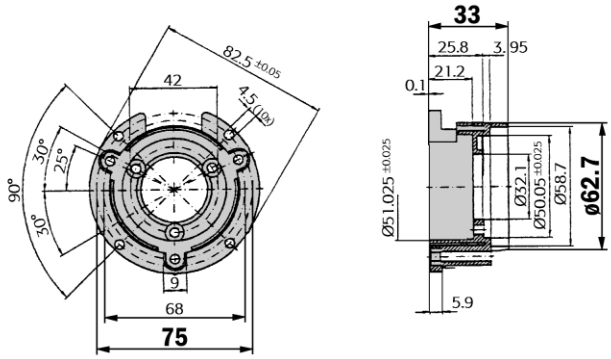


General tolerances according to DIN ISO 2768-mk

Mechanical Adaptors

Mounting bell incl. fixing set for encoder with servo flange

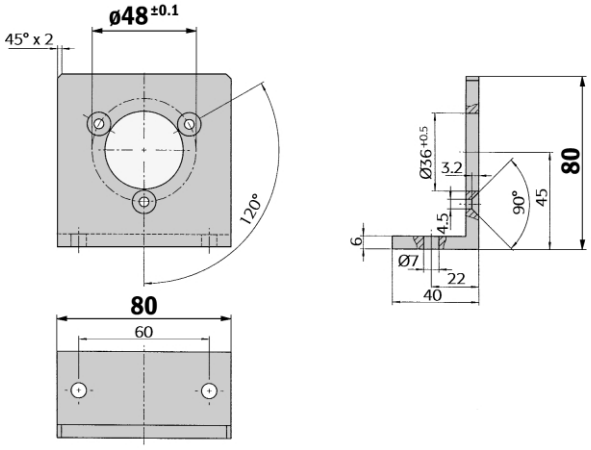
Type	Part no.	Flange spigot
BEF-MG-50	5 312 987	Diameter 50 mm



General tolerances according to DIN ISO 2768-mk

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

Type	Part no.	Flange spigot
BEF-WF-36	2 029 164	Diameter 36 mm



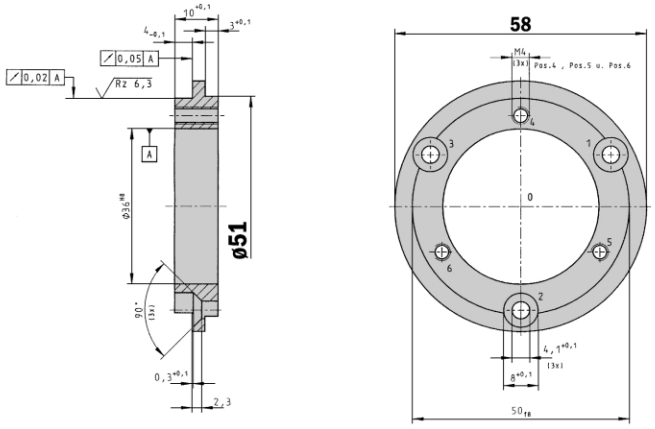
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Mechanical Adaptors

Adaptor flange of aluminium for face mount flange, spigot 36 mm

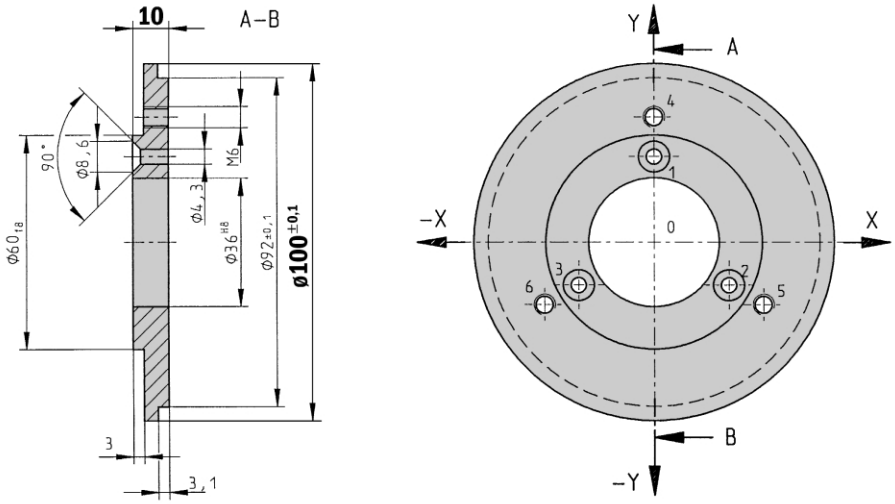
Type	Part no.	Adaption
BEF-FA-036-050	2 029 160	To 50 mm Servo flange



General tolerances according to DIN ISO 2768-mk

Adaptor flange of aluminium for face mount flange, spigot 36 mm

Type	Part no.	Adaption
BEF-FA-036-100	2 029 161	To 100 mm servo flange



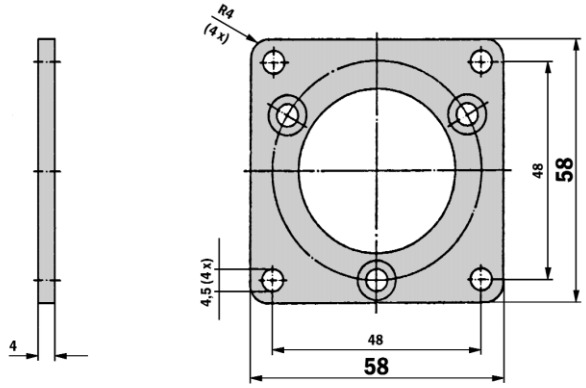
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Mechanical Adaptors

Adaptor flange of aluminium for face mount flange spigot 36 mm

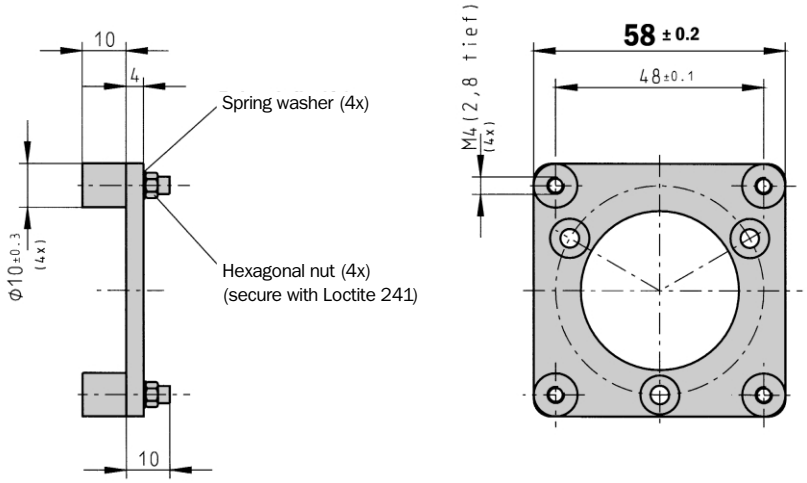
Type	Part no.	Adaption
BEF-FA-036-060REC	2 029 162	To 60 mm square mounting plate



General tolerances according to DIN ISO 2768-mk

Adaptor flange of aluminium for face mount flange, spigot 36 mm

Type	Part no.	Adaption
BEF-FA-036-060RSA	2 029 163	To 60 mm square mounting plate with shock absorbers



General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Collets

Collets for blind hollow shaft

Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

Collets for through hollow shaft

Type	Part no.	Shaft diameter
SPZ-006-AD-D	2 029 192	6 mm
SPZ-1E4-AD-D	2 029 193	1/4"
SPZ-008-AD-D	2 029 194	8 mm
SPZ-3E8-AD-D	2 029 195	3/8"
SPZ-010-AD-D	2 029 196	10 mm
SPZ-012-AD-D	2 029 197	12 mm
SPZ-1E2-AD-D	2 029 198	1/2"

Adaptor modules for SSI Interface

Serial-Parallel Adaptor modules

Type	Part no.	Description
AD-SSIG-PA	1 030 106	SSI-Parallel Adaptor module in plastic housing
AD-SSI-PA	1 030 107	SSI-Parallel Adaptor module without plastic housing
AD-SSIPG-PA	1 030 108	SSI-Parallel Adaptor module, programmable, in plastic housing
AD-SSIPF-PA	1 030 109	SSI-Parallel Adaptor module programmable, without plastic housing, with front plate
AD-SSIP-PA	1 030 110	SSI-Parallel Adaptor module programmable, without plastic housing, without front plate

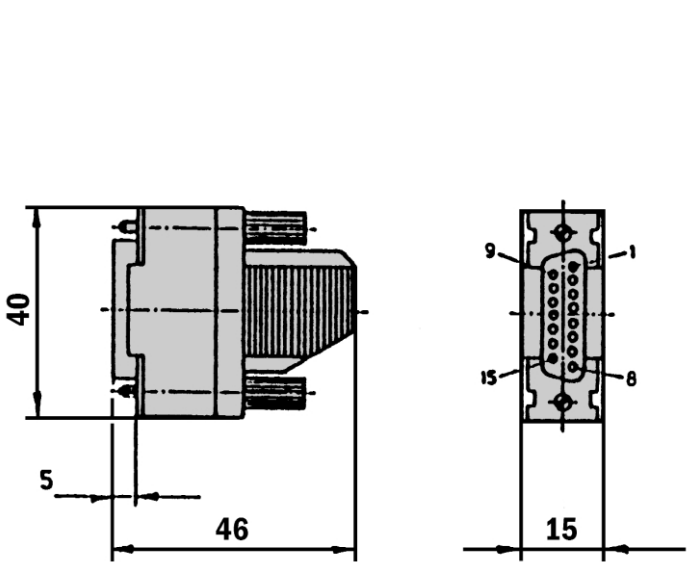
Screw-in systems SUB-D for Adaptor modules

Male connector SUB-D, 15-pin, straight, screened

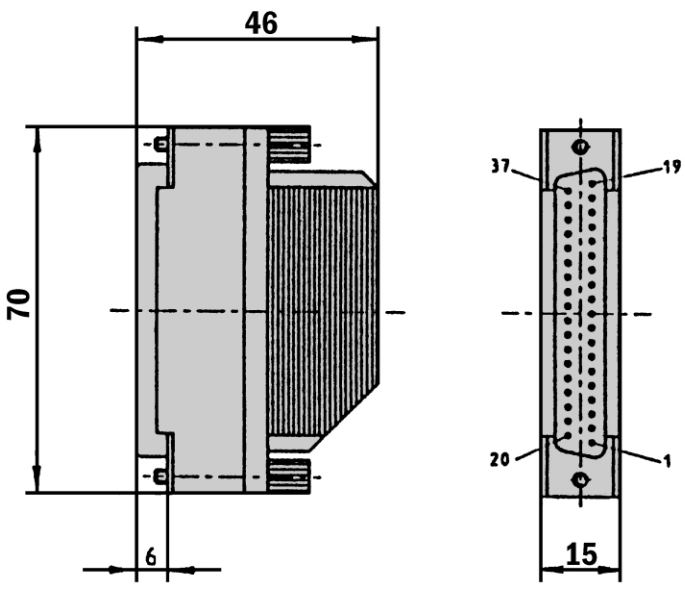
Type	Part no.	Contacts
STE-0D15-G	2 029 223	15

Female connector SUB-D, 37-pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2 029 224	37



General tolerances according to DIN ISO 2768-mk



General tolerances according to DIN ISO 2768-mk

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