Rotary and Linear Encoders

Rotary encoders

Incremental encoders

- Number of pulses from 1 to 10,000
- Zero-pulse Teach-in at the press of a button
- Opto-ASIC with chip-on-board technology
- Wide range of flanges and hollow shafts
- Various electrical interfaces

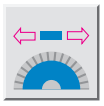
Singleturn absolute encoders

- Number of steps from 2 to 32,768
- Simple electronic zero-set at the push of a button or via a signal line
- Opto-ASIC with chip-on-board technology
- Wide range of flanges and hollow shafts
- Various interfaces

Multiturn absolute encoders

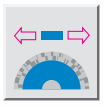
- Number of steps per revolution from 2 to 8,192. Maximum number of revolutions: 8,192.
- The multiturn function is achieved using a geared mechanism
- Simple electronic zero-set at the push of a button
- MR sensor system with chip-on-board technology
- Wide range of flanges and hollow shafts
- Various interfaces

Linear encoders



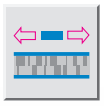
Incremental wire draw encoder

- Measuring lengths up to 50 m
- Resolution up to 0.025 mm
- Zero-Pulse-Teach via pressing a button
- Various electrical interfaces



Absolute wire draw encoder

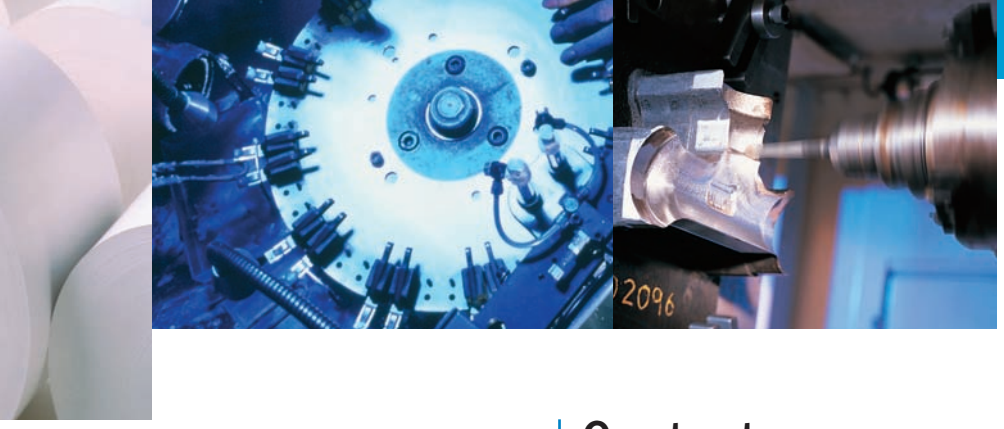
- Measuring lengths up to 50 m
- Resolution up to 0.025 mm
- Simple electronic adjustment at the press of a button
- Various interfaces



Absolute encoders

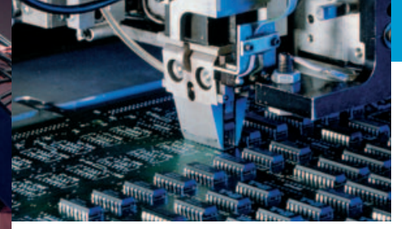
- Max. measuring length 1,700 m
- Resolution 0.1 mm
- Various interfaces
- Non-contact and wear-free

Rotary-



Contents

and Linear-Encoders →



High-precision displacement and angle measurement

Displacement, position, angle – in industrial automation where positions have to be precisely determined, you simply cannot beat an encoder. The same applies when determining speed and acceleration. Due to their working principle, the photoelectric scanning of optical code patterns, in linear displacement measurement these sensors have a resolution of micrometers and in angle measurement they have a resolution of a few thousandths of a degree. With less demanding tasks, of course, they cope easily.

Compared to incremental encoders, absolute encoders have one decisive advantage – they do not need an initialising reference-run.

Incremental encoders, rotary

Incremental encoders generate information relating to position and angle in the form of electrical impulses. The number of pulses per revolution determines the resolving capability. The individual position is determined by counting these pulses from a point of reference. When the power is first switched on an initialising reference run is needed to determine absolute position.

Wire draw encoder

Wire draw encoder consist of wire draw mechanism and encoder. The rotation of the drum is proportional to the length being measured. This movement is counted by an encoder and converted to a measuring signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult ambient conditions. Precise linear guidance, as required for other length measurement systems, is not necessary.

Absolute encoders, rotary

Absolute encoders generate information relating to position, angle or number of revolutions in the form of unique codes. A unique code is assigned to each angular step. The number of unique code patterns per revolution determines the resolving capability. Since an absolute position is assigned to each unique code pattern, an initialising reference run is not required. Singleturn and multiturn versions are available.

Absolute encoders, linear

Linear position measuring systems for material handling applications e.g. storage and conveying systems, have particularly high requirements. The current position is continually evaluated by the sensor unit and is directly transmitted as an encoded signal by the evaluation electronics housed in the sensor unit. Since the sensor unit and the reference scale are separate components, even extremely long distances can be measured.

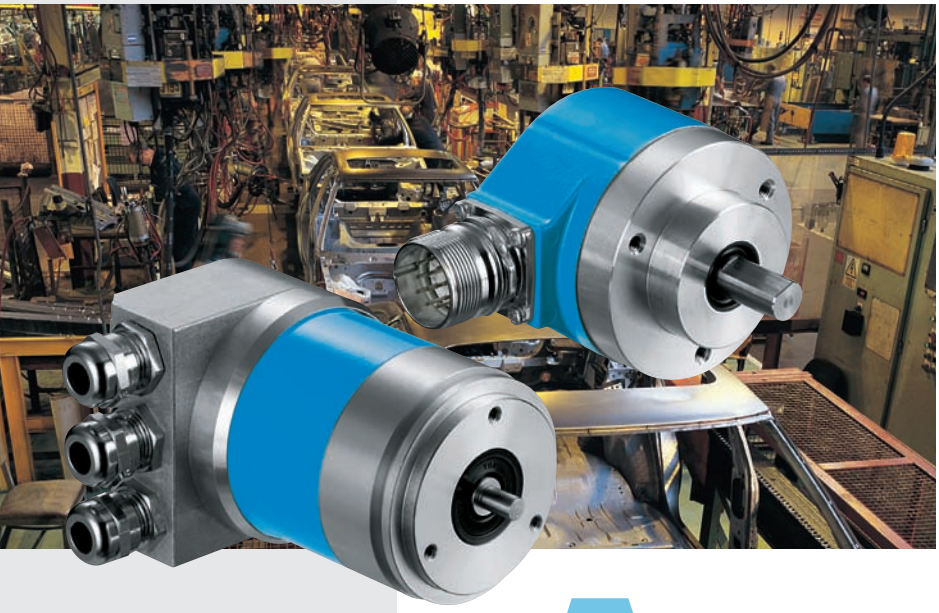
Resolution up to 26 bits

Absolute Encoder Multiturn

Number of steps 2 to 32.768

Absolut-Encoder Singleturn

Absolute Encoders Multiturn extremely robust and exceptionally reliable.



Absolute encoders from SICK-STEGMANN are provided in singleturn and multiturn.

All multiturn designs are implemented using mechanical gearboxes. These supply the revolution information very reliably and free from interference.

ARS60 absolute encoders singleturn are available with any desired number of steps between 2 and 32,768. The technology permits tailor-made solutions for every application, due to its modular design.

With SSI or RS 422 configuration interface, Profibus, CANopen or DeviceNet field bus technology, all current interfaces suitable for the high requirements in automation technology are also available.

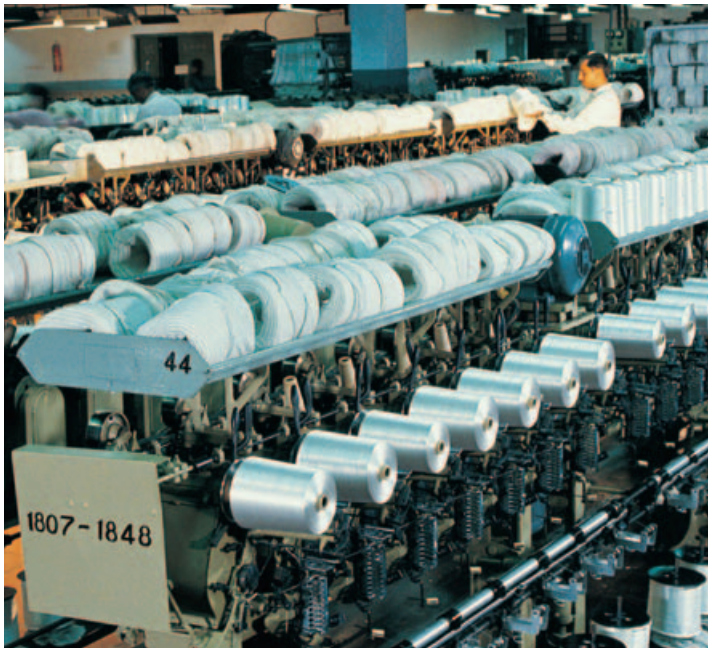
Whether with face mount flange, servo flange, blind or through hollow shaft with connector or cable outlet, the absolute encoders multiturn from SICK-STEGMANN will meet virtually any application profile.

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

- machine tools
- textile machines
- woodworking machines
- packaging machines
- wind turbines

◄ Speed and absolute precision are prerequisite for success in the printing industry. This is where Absolute Multiturn Encoders come into their own.

▲ Efficient and always under control, Multiturn Encoders are essential for generating energy from alternative sources.



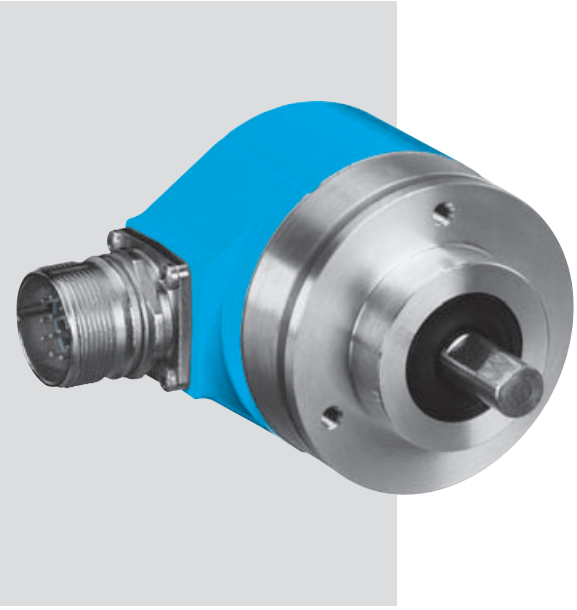
▲ It is no mean task to co-ordinate and monitor thousands of movements. Where every turn counts, Absolute Multiturn Encoders linked to essential bus systems are in their element.

► Chemical engineering is all about flow. Valves control the flow of materials, and Absolute Encoders constantly provide the control system with essential feedback of valve positions.

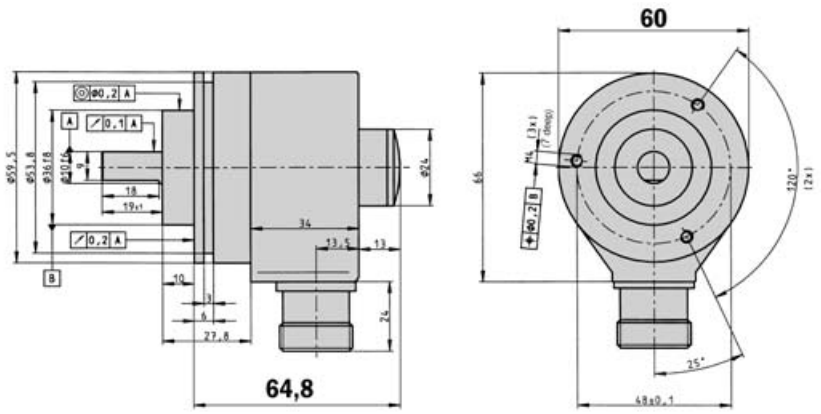
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- SSI and RS 422 configuration interface
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

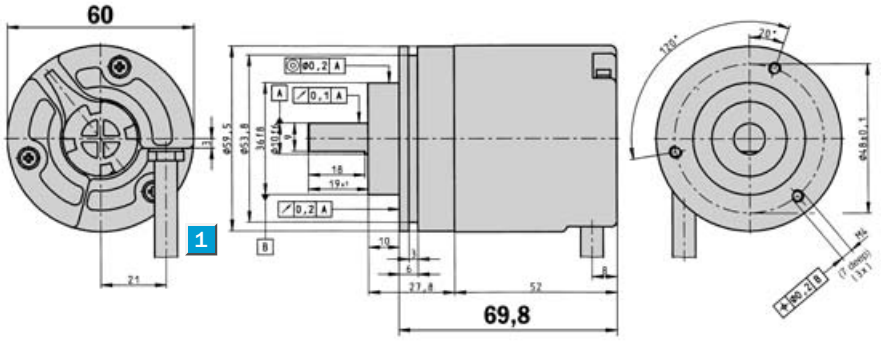


Dimensional drawing face mount flange, connector radial



General tolerances according DIN ISO 2768-mk

Dimensional drawing face mount flange, cable radial

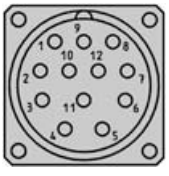


1 = bending radius min. 40 mm

General tolerances according DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Signal line
3	Clock +	yellow	Signal line
4	R x D +	grey	RS 422 programming line
5	R x D –	green	RS 422 programming line
6	T x D +	pink	RS 422 programming line
7	T x D –	black	RS 422 programming line
8	U_S	red	Supply voltage
9	SET	orange	Electronical adjustment
10	Data –	brown	Signal line
11	Clock –	lilac	Signal line
12	CW/$\overline{\text{CCW}}$	orange/black	Counting sequence when turning
	Screen		Housing potential



View of the connector M23 fitted to the encoder body

CW/$\overline{\text{CCW}}$ Foreward/reverse:
This input programs the counting direction ot 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_S for more than 100 ms, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 SSI	Flange type face m.
Solid shaft	10 mm	
Mass [1]	Approx. 0.5 kg	
Moment of inertia of the rotor	35 gcm^2	
Programmable code type	Gray/binary	
Programmable code direction	CW/CCW	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	6,000 min^{-1}	
Position forming time	0.15 ms	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque		
with shaft seal	1.8 Ncm	
without shaft seal [2]	0.3 Ncm	
Start up torque		
with shaft seal	2.5 Ncm	
without shaft seal [2]	0.5 Ncm	
Max. shaft loading		
radial	300 N	
axial	50 N	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 85 °C	
Storage temperature range	– 40 … + 100 °C	
Permissible relative humidity	98 %	
EMC [3]		
Resistance		
to shocks [4]	100/6 g/ms	
to vibration [5]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529		
with shaft seal	IP 67	
without shaft seal [6]	IP 43	
without shaft seal [7]	IP 65	
Operating voltage range (Us)	10 … 32 V	
Power consumption	0.8 W	
Initialisation time [8]	1050 ms	
Signals [9]		
Interface signals		
Clock +, Clock –, Data +, Data – [10]	SSI max. clock frequency 1 MHz i.e. min.	
	duration of low level (clock +): 500 ns	
T x D +, T x D –, R x D +, R x D –	RS 422	
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)	
CW/$\overline{\text{CCW}}$ (steps sequence in direction of rotation)	L-active (L ≙ 0 - 1.5 V; H ≙ 2.0 - U_s V)	

[1] For an encoder with connector outlet

[2] If the shaft seal has been removed by the customer

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] On encoder flange not sealed

[7] On encoder flange sealed

[8] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in

[9] Carried by 12 way connector, potential-free with respect to housing, or 12 core cable

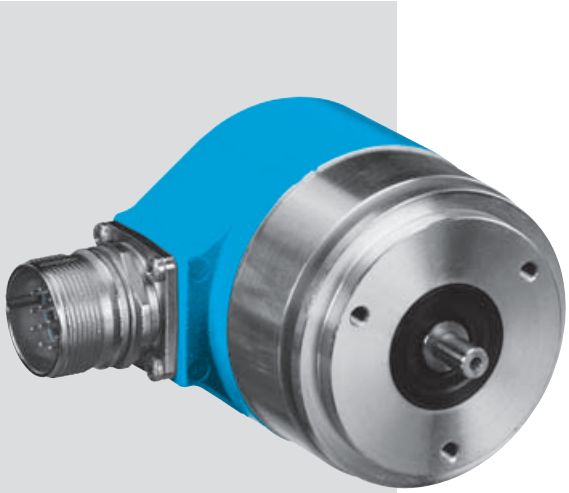
[10] For higher clock frequencies, choose synchronous SSI

Order information		
ATM 60 face mount flange solid shaft; U_s 10 … 32 V; SSI		
1 Configuration ex-works: 4,096 steps x 4,096 revolutions, Gray-Code, Set = 0		
Type	**Part no.**	**Explanation**
ATM60-A4A12X12	1 030 001	Connector M23, 12 pin
ATM60-A4K12X12	1 030 002	Cable 1.5 m
ATM60-A4L12X12	1 030 003	Cable 3 m
ATM60-A4M12X12	1 030 004	Cable 5 m
ATM60-A4N12X12	1 032 915	Cable 10 m
1 Other configurations on request		

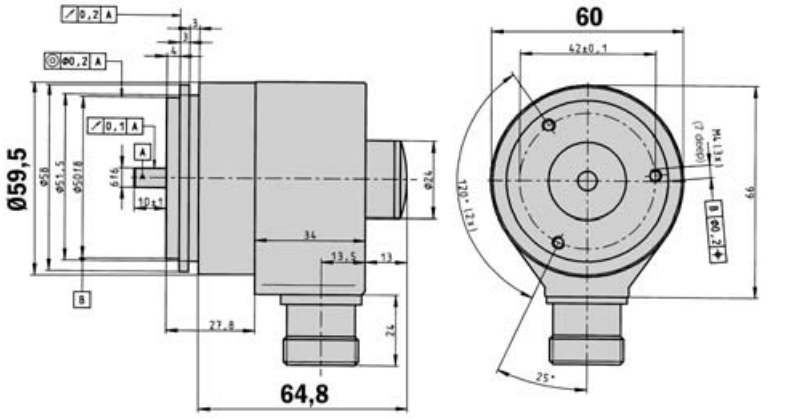
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- SSI and RS 422 configuration interface
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

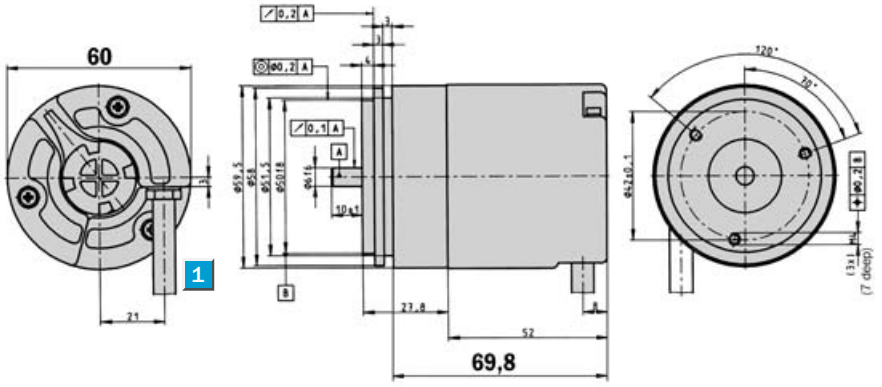


Dimensional drawing servo flange, connector radial



General tolerances according DIN ISO 2768-mk

Dimensional drawing servo flange, cable radial

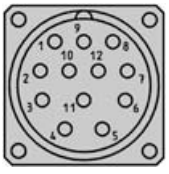


1 = bending radius min. 40 mm

General tolerances according DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Signal line
3	Clock +	yellow	Signal line
4	R x D +	grey	RS 422 programming line
5	R x D –	green	RS 422 programming line
6	T x D +	pink	RS 422 programming line
7	T x D –	black	RS 422 programming line
8	U_S	red	Supply voltage
9	SET	orange	Electronical adjustable
10	Data –	brown	Signal line
11	Clock –	lilac	Signal line
12	CW/$\overline{\text{CCW}}$	orange/black	Counting sequence when turning
	Screen		Housing potential



View of the connector M23 fitted to the encoder body

CW/$\overline{\text{CCW}}$ Foreward/reverse:
This input programs the counting direction ot 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_S for more than 100 ms, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 SSI	Flange type									
		servo									
Solid shaft	6 mm										
Mass [1]	Approx. 0.5 kg										
Moment of inertia of the rotor	35 gcm^2										
Programmable code type	Gray/binary										
Programmable code direction	CW/CCW										
Measuring step	0.043°										
Max. number of steps per revolution	8,192										
Max. number of revolutions	8,192										
Error limits	± 0.25°										
Repeatability	0.1°										
Operating speed	6,000 min^{-1}										
Position forming time	0.15 ms										
Max. angular acceleration	5 x 10^5 rad/s^2										
Operating torque											
with shaft seal	1.8 Ncm										
without shaft seal [2]	0.3 Ncm										
Start up torque											
with shaft seal	2.5 Ncm										
without shaft seal [2]	0.5 Ncm										
Max. shaft loading											
radial	300 N										
axial	50 N										
Bearing lifetime	3.6 x 10^9 revolutions										
Working temperature range	– 20 … + 85 °C										
Storage temperature range	– 40 … + 100 °C										
Permissible relative humidity	98 %										
EMC [3]											
Resistance											
to shocks [4]	100/6 g/ms										
to vibration [5]	20/10 … 2000 g/Hz										
Protection class acc. IEC 60529											
with shaft seal	IP 67										
without shaft seal [6]	IP 43										
without shaft seal [7]	IP 65										
Operating voltage range (Us)	10 … 32 V										
Power consumption	0.8 W										
Initialisation time [8]	1050 ms										
Signals [9]											
Interface signals											
Clock +, Clock –, Data +, Data – [10]	SSI max. clock frequency 1 MHz i.e. min.										
	duration of low level (clock +): 500 ns										
T x D +, T x D –, R x D +, R x D –	RS 422										
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)										
CW/$\overline{\text{CCW}}$ (steps sequence in	L-active (L ≙ 0 - 1.5 V; H ≙ 2.0 - U_s V)										
direction of rotation)											

[1] For an encoder with connector outlet

[2] If the shaft seal has been removed by the customer

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] On encoder flange not sealed

[7] On encoder flange sealed

[8] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in

[9] Carried by 12 way connector, potential-free with respect to housing, or 12 core cable

[10] For higher clock frequencies, choose synchronous SSI

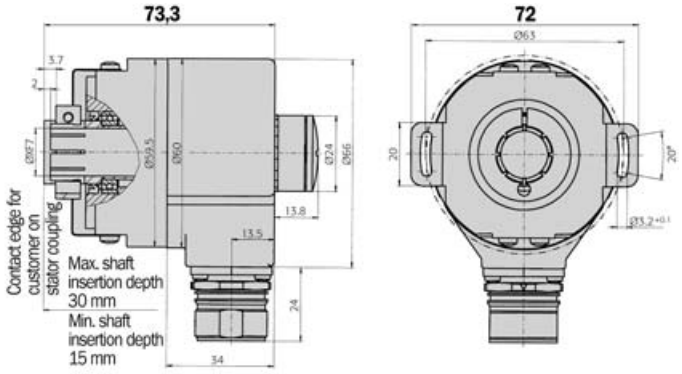
Order information		
ATM 60 servo flange solid shaft; U_s 10 … 32 V; SSI		
1 Configuration ex-works: 4,096 steps x 4,096 revolutions, Gray-Code, Set = 0		
Type	**Part no.**	**Explanation**
ATM60-A1A12X12	1 030 005	Connector M23, 12 pin
ATM60-A1K12X12	1 030 006	Cable 1.5 m
ATM60-A1L12X12	1 030 007	Cable 3 m
ATM60-A1M12X12	1 030 008	Cable 5 m
ATM60-A1N12X12	1 032 925	Cable 10 m
1 Other configurations on request		

Resolution up to 26 bits

Absolute Encoder Multiturn

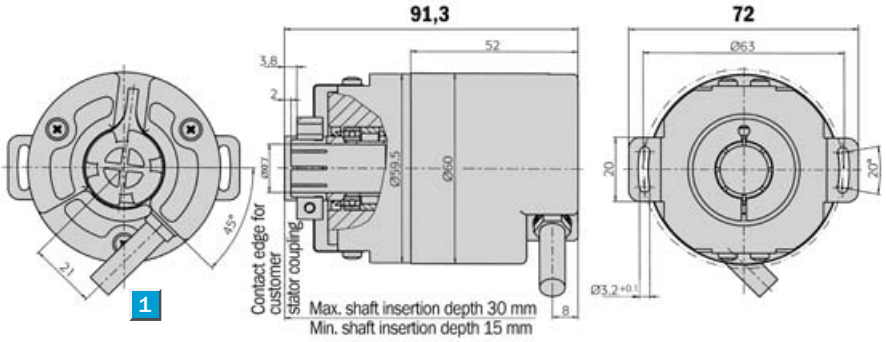
- Extremely robust
- SSI and RS 422 configuration interface
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

Dimensional drawing blind hollow shaft, connector radial



General tolerances according DIN ISO 2768-mk

Dimensional drawing blind hollow shaft, cable radial

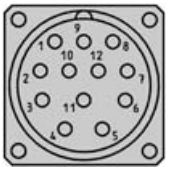


1 = bending radius min. 40 mm

General tolerances according DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Signal line
3	Clock +	yellow	Signal line
4	R x D +	grey	RS 422 programming line
5	R x D –	green	RS 422 programming line
6	T x D +	pink	RS 422 programming line
7	T x D –	black	RS 422 programming line
8	U_S	red	Supply voltage
9	SET	orange	Electronical adjustment
10	Data –	brown	Signal line
11	Clock –	lilac	Signal line
12	CW/$\overline{\text{CCW}}$	orange/black	Counting sequence when turning
	Screen		Housing potential



View of the connector M23 fitted to the encoder body

CW/$\overline{\text{CCW}}$ Foreward/reverse:
This input programs the counting direction ot 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_S for more than 100 ms, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 SSI	Flange type: blind
[1] **Hollow shaft diameter**	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Mass [1]	Approx. 0.4 kg	
Moment of inertia of the rotor	55 gcm²	
Programmable code type	Gray/binary	
Programmable code direction	CW/CCW	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	3,000 min⁻¹	
Position forming time	0.15 ms	
Max. angular acceleration	5 x 10⁵ rad/s²	
Operating torque	0.8 Ncm [2]	
Start up torque	1.2 Ncm [2]	
Permissible shaft movement		
of the drive element		
radial static/dynamic	± 0.3/± 0.1 mm	
axial static/dynamic	± 0.5/± 0.2 mm	
Bearing lifetime	3.6 x 10⁹ revolutions	
Working temperature range	– 20 … + 85 °C	
Storage temperature range	– 40 … + 100 °C	
Permissible relative humidity	98 %	
EMC [3]		
Resistance		
to shocks [4]	100/6 g/ms	
to vibration [5]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529 [2]	IP 67	
without shaft seal [6]	IP 43	
Operating voltage range (Us)	10 … 32 V	
Power consumption	0.8 W	
Initialisation time [7]	1050 ms	
Signals [8]		
Interface signals		
Clock +, Clock –, Data +, Data – [9]	SSI max. clock frequency 1 MHz i.e. min.	
	duration of low level (clock +): 500 ns	
T x D +, T x D –, R x D +, R x D –	RS 422	
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)	
CW/$\overline{\text{CCW}}$ [10]	L-active (L ≙ 0 - 1.5 V; H ≙ 2.0 - U_s V)	

[1] For an encoder with connector outlet

[2] With shaft seal

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] On encoder flange not sealed

[7] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

[8] Carried by 12 way connector, potential-free with respect to housing, or 12 core cable

[9] For higher clock frequencies, choose synchronous SSI

[10] Step sequence in direction of rotation

[2] **Other configurations on request**

Order information

ATM 60 blind hollow shaft; U_s 10 … 32 V; SSI

[2] **Configuration ex-works: 4,096 steps x 4,096 revolutions, Gray-Code, Set = 0**

Type	Part no.	Explanation
ATM60-AAA12X12	1 030 009	Connector M23, 12 pin
ATM60-AAK12X12	1 030 010	Cable 1.5 m
ATM60-AAL12X12	1 030 011	Cable 3 m
ATM60-AAM12X12	1 030 012	Cable 5 m
ATM60-AAN12X12	1 033 169	Cable 10 m

[1] **Attention: Please order the collet with required diameter separately**

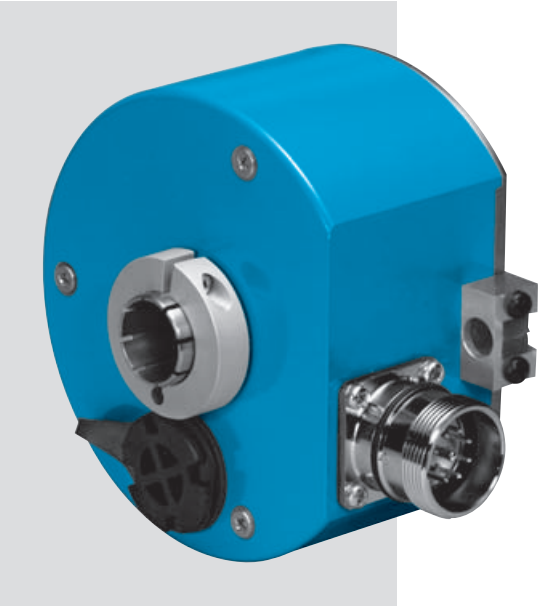
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

For 15 mm shaft diameter, collet is not needed

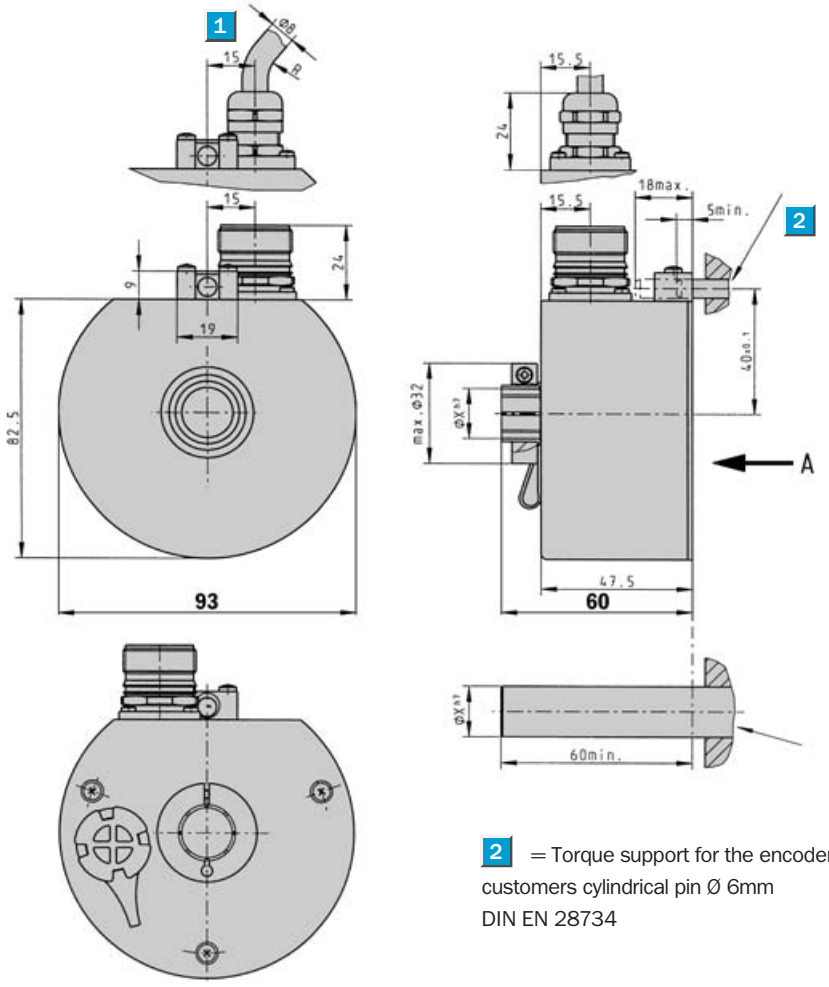
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- SSI and RS 422 configuration interface
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 65



Dimensional drawing through hollow shaft; connector radial, cable radial



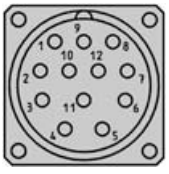
2 = Torque support for the encoder via customers cylindrical pin Ø 6mm DIN EN 28734

1 = bending radius min. 40 mm

General tolerances according DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Signal line
3	Clock +	yellow	Signal line
4	R x D +	grey	RS 422 programming line
5	R x D –	green	RS 422 programming line
6	T x D +	pink	RS 422 programming line
7	T x D –	black	RS 422 programming line
8	U_S	red	Supply voltage
9	SET	orange	Electronical adjustment
10	Data –	brown	Signal line
11	Clock –	lilac	Signal line
12	CW/$\overline{\text{CCW}}$	orange/black	Counting sequence when turning
	Screen		Housing potential



View of the connector M23 fitted to the encoder body

CW/$\overline{\text{CCW}}$ Foreward/reverse:
This input programs the counting direction ot 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_S for more than 100 ms, the current mechanical position is assigned the value 0 or the pre-programmed SET-value.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 90 SSI	Flange type
		through
Hollow shaft diameter	12, 16 mm, 1/2“	
Mass [1]	Approx. 0.8 kg	
Moment of inertia of the rotor	152.77 gcm^2	
Programmable code type	Gray/binary	
Programmable code direction	CW/CCW	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	2,000 min^{-1}	
Position forming time	0.15 ms	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	0.4 Ncm	
Start up torque	0.5 Ncm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 70 °C	
Storage temperature range	– 40 … + 100 °C	
Permissible relative humidity	98 %	
EMC [2]		
Resistance		
to shocks [3]	100/6 g/ms	
to vibration [4]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529		
with shaft seal	IP 65	
Operating voltage range (Us)	10 … 32 V	
Power consumption	0.8 W	
Initialisation time [5]	1050 ms	
Signals [6]		
Interface signals		
Clock +, Clock –, Data +, Data – [7]	SSI max. clock frequency 1 MHz i.e. min.	
	duration of low level (clock +): 500 ns	
T x D +, T x D –, R x D +, R x D –	RS 422	
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)	
CW/$\overline{\text{CCW}}$ [8]	L-active (L ≙ 0 - 0.9 V; H ≙ 1.9 - U_s V)	

1) For an encoder with connector outlet

2) To DIN EN 61000-6-2 and DIN EN 61000-6-3

3) To DIN EN 60068-2-27

4) To DIN EN 60068-2-6

5) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in

6) Carried by 12 way connector, potential-free with respect to housing, or 12 core cable

7) For higher clock frequencies, choose synchronous SSI

8) Step sequence in direction of rotation

Order information

ATM 90 through hollow shaft; U_s 10 … 32 V; SSI

1 Configuration ex-works: 4,096 steps x 4,096 revolutions, Gray-Code, Set = 0

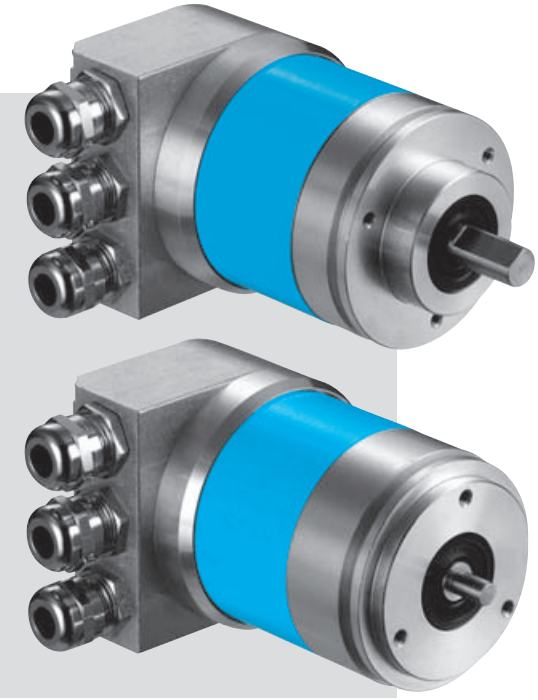
Type	Part no.	Explanation
ATM90-ATA12X12	1 030 030	Ø12 mm, connector M23, 12 pin
ATM90-ATK12X12	1 030 031	Ø12 mm, cable 1.5 m
ATM90-ATL12X12	1 030 032	Ø12 mm, cable 3 m
ATM90-ATM12X12	1 030 033	Ø12 mm, cable 5 m
ATM90-AUA12X12	1 030 034	Ø1/2“ , connector M23, 12 pin
ATM90-AUK12X12	1 030 035	Ø1/2“ , cable 1.5 m
ATM90-AUL12X12	1 030 036	Ø1/2“ , cable 3 m
ATM90-AUM12X12	1 030 037	Ø1/2“ , cable 5 m
ATM90-AXA12X12	1 030 038	Ø16 mm, connector M23, 12 pin
ATM90-AXK12X12	1 030 039	Ø16 mm, cable 1.5 m
ATM90-AXL12X12	1 030 040	Ø16 mm, cable 3 m
ATM90-AXM12X12	1 030 041	Ø16 mm, cable 5 m

1 Other configurations on request

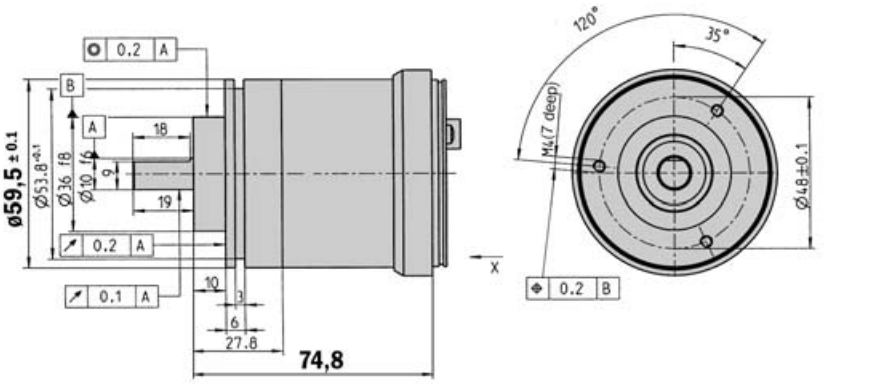
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, configuration adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

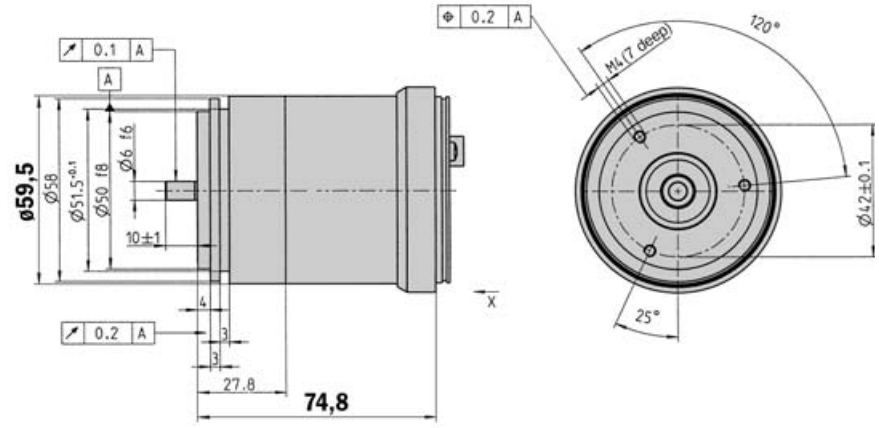


Dimensional drawing face mount flange



General tolerances according DIN ISO 2768-mk

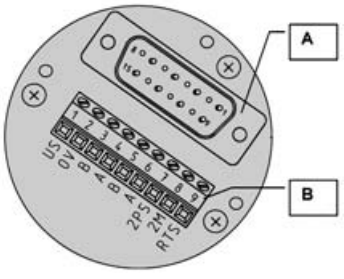
Dimensional drawing servo flange



General tolerances according DIN ISO 2768-mk

1 PIN and wire allocation for Profibus adaptor

Terminal strip	Connector 4 pin	Connector 5 pin	Conn. female 5 pin	Signal	Explanation
1	1	–	–	U_s (24 V)	Supply voltage 10 … 32 V
2	3	–	–	0 V (GND)	Ground (0 V)
3	–	–	4	B	Profibus DP B line (out)
4	–	–	2	A	Profibus DP A line (out)
5	–	4	–	B	Profibus DP B line (in)
6	–	2	–	A	Profibus DP A line (in)
7	–	–	1	2P5 [1]	+ 5 V (DC isolated)
8	–	–	3	2M [1]	0 V (DC isolated)
9	–	–	–	RTS [2]	Request To Send
–	2	1	–	N. C.	–
–	4	3	–	N. C.	–
–	–	5	5	Screen	Housing potential



A Internal plug connection to the encoder
B External connection to the bus

[1] Use for external bus termination or to supply the transmitter/receiver of an optical transmission link.

[2] Signal is optional, used to detect the direction of an optical connection.

1 Encoders with a Profibus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 Profibus	Flange type face m.	Flange type servo
Solid shaft	10 mm	■	
	6 mm		■
Mass	Approx. 0.59 kg	■	■
Moment of inertia of the rotor	35 gcm²	■	■
Measuring step	0.043°	■	■
Max. number of steps per revolution	8,192	■	■
Max. number of revolutions	8,192	■	■
Error limits	± 0.25°	■	■
Repeatability	0.1°	■	■
Operating speed	6,000 min⁻¹	■	■
Position forming time	0.15 ms	■	■
Max. angular acceleration	5 x 10⁵ rad/s²	■	■
Operating torque			
with shaft seal	1.8 Ncm	■	■
without shaft seal [1]	0.3 Ncm	■	■
Start up torque			
with shaft seal	2.5 Ncm	■	■
without shaft seal [2]	0.5 Ncm	■	■
Max. shaft loading			
radial	300 N	■	■
axial	50 N	■	■
Bearing lifetime	3.6 x 10⁹ revolutions	■	■
Working temperature range	– 20 … + 80 °C	■	■
Storage temperature range	– 40 … + 125 °C	■	■
Permissible relative humidity	98 %	■	■
EMC [2]		■	■
Resistance			
to shocks [3]	100/6 g/ms	■	■
to vibration [4]	20/10 … 2000 g/Hz	■	■
Protection class acc. IEC 60529			
with shaft seal	IP 67	■	■
without shaft seal [5]	IP 43	■	■
without shaft seal [6]	IP 66	■	■
Operating voltage range (Us)	10 … 32 V	■	■
Power consumption	2.0 W	■	■
Initialisation time [7]	1250 ms	■	■
Bus Interface Profibus DP			
Electrical interface [8]	RS 485	■	■
Protocol	Profile for Encoders (07_{hex}) – Class 2	■	■
Address setting (node number)	0 … 127 (DIP switches or protocol)	■	■
Data transmission rate (Baudrate)	9.6 kBaud – 12 MBaud [9]	■	■
Electronic adjustment (Number SET)	Via PRESET push button or protocol	■	■
Status information	Operation (LED green),	■	■
	bus aktivity (LED red)	■	■
Bus termination	Via DIP switches [10]	■	■
Electrical connection	Bus adaptor with srew fixing (x3)	■	■

[1] If the shaft seal has been removed by the customer

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

[3] To DIN EN 60068-2-27

[4] To DIN EN 60068-2-6

[5] On encoder flange not sealed

[6] On encoder flange sealed

[7] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in

[8] To EN 50 170-2 (DIN 19245 part 1-3) DC isolated via opto-couplers

[9] Automatic detection

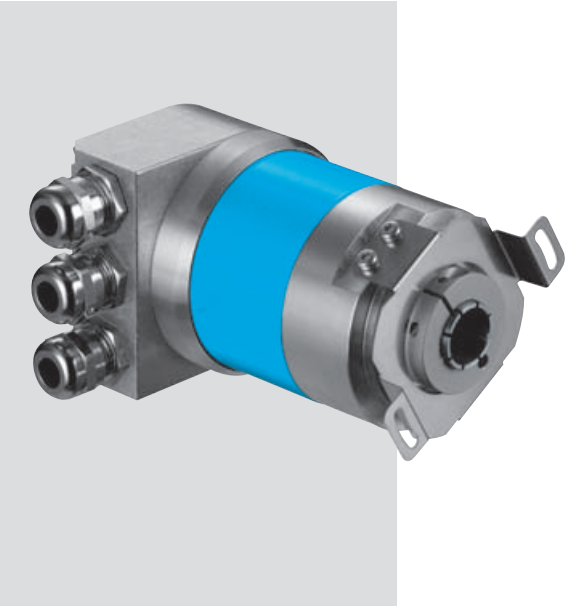
[10] Should only be connected in the final device

Order information		
ATM 60 Profibus face mount flange and servo flange solid shaft; U_s 10 … 32 V		
Type	**Part no.**	**Explanation**
ATM60-P4H13X13	1 030 013	Face mount fl., solid shaft Ø 10 mm
ATM60-P1H13X13	1 030 014	Servo flange, solid shaft Ø 6 mm
Attention: Please order the Profibus adaptor separately (see page 30)		

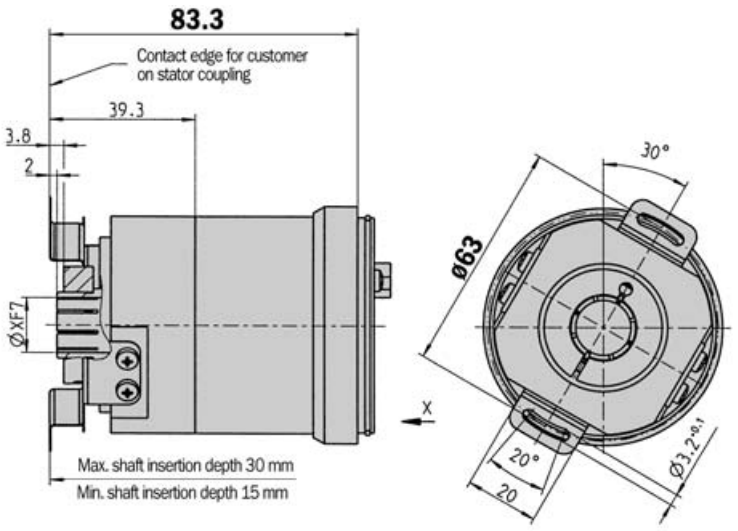
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67



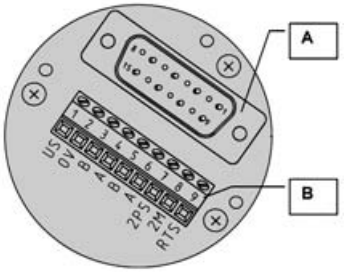
Dimensional drawing blind hollow shaft



General tolerances according DIN ISO 2768-mk

1 PIN and wire allocation for Profibus adaptor

Terminal strip	Connector 4 pin	Connector 5 pin	Conn. female 5 pin	Signal	Explanation
1	1	–	–	U_s (24 V)	Supply voltage 10 … 32 V
2	3	–	–	0 V (GND)	Ground (0 V)
3	–	–	4	B	Profibus DP B line (out)
4	–	–	2	A	Profibus DP A line (out)
5	–	4	–	B	Profibus DP B line (in)
6	–	2	–	A	Profibus DP A line (in)
7	–	–	1	2P5 [1]	+ 5 V (DC isolated)
8	–	–	3	2M [1]	0 V (DC isolated)
9	–	–	–	RTS [2]	Request To Send
–	2	1	–	N. C.	–
–	4	3	–	N. C.	–
–	–	5	5	Screen	Housing potential



A Internal plug connection to the encoder
B External connection to the bus

[1] Use for external bus termination or to supply the transmitter/receiver of an optical transmission link.

[2] Signal is optional, used to detect the direction of an optical connection.

1 Encoders with a Profibus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 Profibus	Flange type: blind
[1] **Hollow shaft diameter**	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Mass	Approx. 0.59 kg	
Moment of inertia of the rotor	55 gcm^2	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	3,000 min^{-1}	
Position forming time	0.25 ms	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	0.8 Ncm [1]	
Start up torque	1.2 Ncm [1]	
Permissible shaft movement		
of the drive element		
radial static/dynamic	± 0.3/± 0.1 mm	
axial static/dynamic	± 0.5/± 0.2 mm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 80 °C	
Storage temperature range	– 40 … + 125 °C	
Permissible relative humidity	98 %	
EMC [2]		
Resistance		
to shocks [3]	100/6 g/ms	
to vibration [4]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529 [1]	IP 67	
without shaft seal [5]	IP 43	
Operating voltage range (Us)	10 … 32 V	
Power consumption	2.0 W	
Initialisation time [6]	1250 ms	
Bus Interface Profibus DP		
Electrical Interface [7]	RS 485	
Protocol	Profile for Encoders (07$_{hex}$) – Class 2	
Address setting (node number)	0 … 127 (DIP switches or protocol)	
Data transmission rate (baud rate)	9.6 kBaud – 12 MBaud [8]	
Electronic adjustment (number SET)	Via PRESET push button or protocol	
Status information	Operation (green LED), bus activity (red LED)	
Bus termination	Via DIP switches [9]	
Electrical connection	Bus connector with srew fixing (x3)	

1) With shaft seal
2) To DIN EN 61000-6-2 and DIN EN 61000-6-3
3) To DIN EN 60068-2-27
4) To DIN EN 60068-2-6
5) On encoder flange not sealed
6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in
7) To EN 50 170-2 (DIN 19245 part 1-3) DC isolated via opto-couplers
8) Automatic detection
9) Should only be connected in the final device

Order information

ATM 60 Profibus blind hollow shaft; U_s 10 … 32 V

Type	Part no.	Explanation
ATM60-PAH13X13	1 030 015	Blind hollow shaft

Attention: Please order the Profibus adaptor separately (see page 30)

[1] **Attention: Please order the collet with required diameter separately**

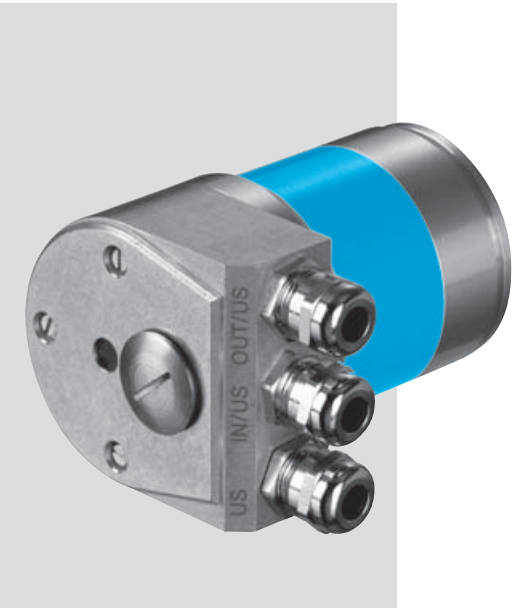
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

For 15 mm shaft diameter, collet is not needed

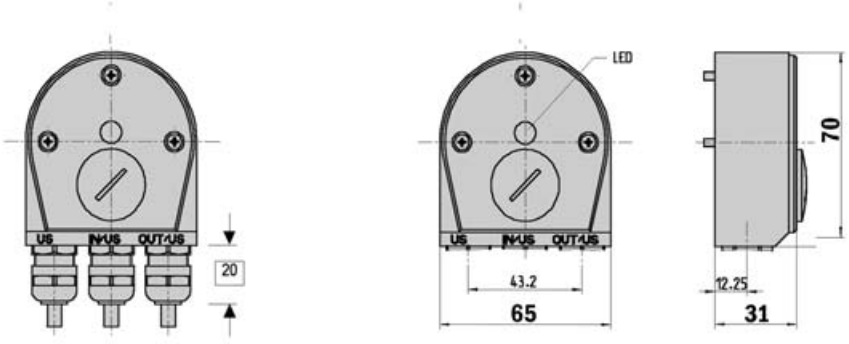
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

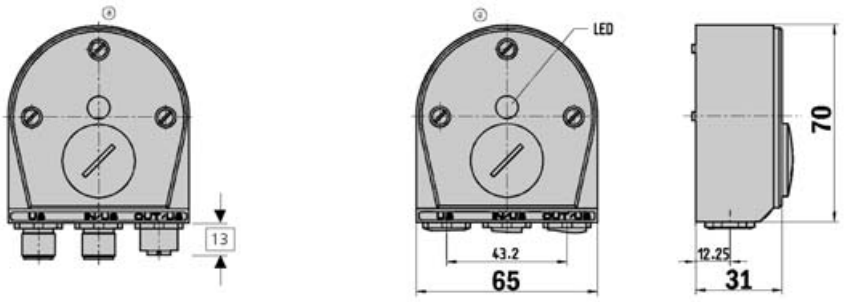


Dimensional drawing Profibus adaptor KA3



General tolerances according DIN ISO 2768-mk

Dimensional drawing Profibus adaptor SR3



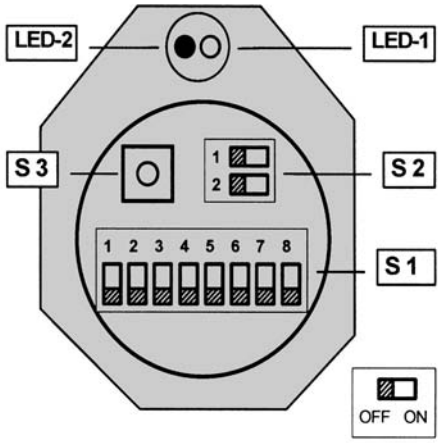
General tolerances according DIN ISO 2768-mk

Order information

ATM 60 Profibus adaptor

Type	Part no.	Explanation
AD-ATM60-KA3PR	2 029 225	Profibus adaptor KA3, 3 x PG
AD-ATM60-SR3PR	2 031 985	Profibus adaptor SR3, 1 x M12, 4 pin., 2 x M12, 5 pin.

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1 (1-7)	Address setting (0 … 127)
S 1 (8-8)	Counting direction (CW/CCW)
S 2	Bus termination
S 3	Preset push button (Number SET)

Status information via LEDs

LED-1	Operating voltage (green)
LED-2	Bus activity (red)

Implementation

DP Functionalities
in accordance with the Profibus DP basic functions.

DP services
- Data interchange (Write_Read_Data)
- Address allocation (Set_Slave_Address)
- Control commands (Global_Control)
- Read the inputs (Read_Inputs)
- Read the outputs (Read_Outputs)
- Read diagnostic data (Slave_Diagnosis)
- Send configuration data (Set_Param)
- Check configuration data (Chk_Config)

Communication
- Cyclic master – slave data traffic

Protective mechanisms
- Data transfer with HD = 4
- Time monitoring of the data traffic

Configuration
Settings in accordance with Encoder Profile
- Counting direction (CW, CCW)
- Class-2 functionality (ON, OFF)
- Scaling function (ON, OFF)
- Steps per turn (1 … 8192)
- Total resolution (GA) -- 1 … 67,108,864 steps, with GA = 2^n x SpU. -- (n=0 … 13)
- "Activation of SSA-service" [2)]
- Selection of the station address [2)]

Configuration
Setting the formats (IN/OUT)
for the cyclic data interchange via configuration byte (K-1)

2 words IN/OUT data (I-1/O-1) [1)]
4 words IN/OUT data (I-1, I-2, I-3/O-1) [2)]

Data interchange: - Input Data (IN)

I-1	Position value [1)]	4 bytes
I-2	Speed (rev/min) [2)]	2 bytes
I-3	Time stamp [2)]	2 bytes

Data interchange: - Output data (OUT)

O-1	PRESET Value [1)]	4 bytes

Diagnostic information
- Station-related diagnosis (63 bytes in acc. with Encoder Profile Class 2)

Setting: - PRESET value
The PRESET function is used for set into operation and to allocate a specific position value to the current physical angular position.
The following settings are possible:
- by hardware (PRESET push button: S3)
- by software: -- (see Output data)

Setting: - Counting direction
- by hardware via DIP switch S1-(8)
- by software via Telegram

Counting direction increasing:
Rotation of the shaft in the clockwise direction (CW) as viewed on the shaft

Setting: - Station address
- by hardware via DIP switch S1
- by software via Telegram

The setting by software is carried out only if the "SSA-service" has been previously activated.

Setting: - Bus termination
The 2-way DIP switch (S2) permits an internal bus termination to be switched in and out (ON/OFF).
If the bus is terminated externally, switch S2 must be in the OFF position.

Device-specific file (GS.)
For the purpose of automatic set into operation of the encoder, use is made of the GS file.
All the characteristic features of the device are defined in it.

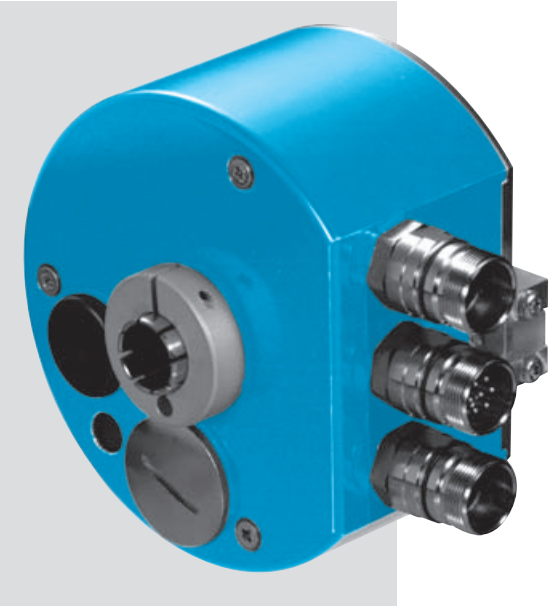
STEG 00FE.GSD	German
STEG 00FE.GSE	English
STEG 00FE.GSF	French

[1)] As per Encoder Profile
[2)] Manufacturer specific function

Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 65

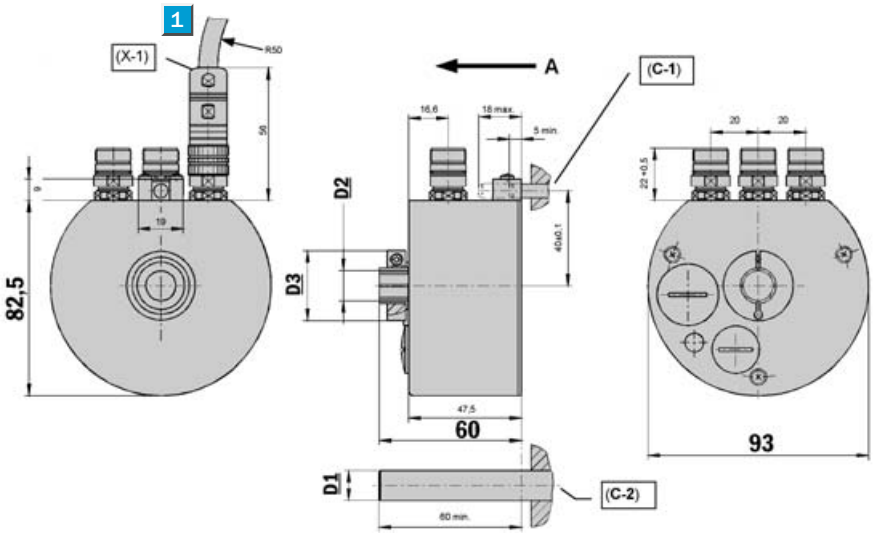


CE cULus

See chapter Accessories

Accessories for encoders

Dimensional drawing through hollow shaft, connector radial



1 = bending radius min. 40 mm

General tolerances according DIN ISO 2768-mk

Through hollow shaft	D1	D2	D3
12 mm	12.0_{h7}	12.0^{F7}	29.5
1/2"	12.7_{h7}	12.7^{F7}	29.5
16 mm	16.0_{h7}	16.0^{F7}	32.0

C - 1	Torque support via cylindrical pin (customer) Ø 6_{m6} to DIN EN ISO 8734
C - 2	Drive shaft (customer)
X - 1	7 pin plug connector MINITEC, (3x)
A	Direction of view on encoder (used to define the direction of rotation)

PIN and wire allocation Profibus DP (In/Out)

PIN	Signal	Explanation
1	RTS	Request To Send 2)
2	A	Profibus DP A line
3	N. C.	Not connected
4	B	Profibus DP B line
5	2M	0 V (potential free) 1)
6	2P5	+ 5 V (potential free) 1)
7	N. C.	Not connected

1) Use for external bus termination or to supply the transmitter/receiver of an optical fibre transmission link.

2) Signal is optional, is used to detect the direction of an optical fibre connection.

PIN and wire allocation U_s

PIN	Signal	Explanation
1	U_s (24 V)	Supply voltage
2	N. C.	Not connected
3	GND (0 V)	0 V (Gnd)
4	N. C.	Not connected
5	RTS	Request To Send 2)
6	N. C.	Not connected
7	N. C.	Not connected

2) Signal is optional, is used to detect the direction of an optical fibre connection.

N. C. = Not connected

Technical data acc. to DIN 32878	ATM 90 Profibus connector radial
Hollow shaft diameter	12, 16 mm, 1/2”
Mass	Approx. 0.6 kg
Moment of inertia of the rotor	153 gcm^2
Measuring step	0.043°
Max. number of steps per revolution	8,192
Max. number of revolutions	8,192
Error limits	± 0.25°
Repeatability	0.1°
Operating speed	3,000 min^{-1}
Position forming time	0.25 ms
Max. angular acceleration	0.6 x 10^5 rad/s^2
Operating torque	0.4 Ncm
Start up torque	0.5 Ncm
Bearing lifetime	3.6 x 10^9 revolutions
Working temperature range	– 20 … + 80 °C
Storage temperature range	– 40 … + 125 °C
Permissible relative humidity	98 %
EMC [1]	
Resistance	
to shocks [2]	100/6 g/ms
to vibration [3]	20/10 … 2000 g/Hz
Protection class acc. IEC 60529	
with shaft seal	IP 65
Operating voltage range (Us)	10 … 32 V
Power consumption	2.0 W
Initialisation time [4]	1250 ms

Bus Interface Profibus DP	
Electrical Interface [5]	RS 485
Protocol	Profile for Encoders (07$_{hex}$) – Class 2
Address setting (node number)	0 … 127 (DIP switches or protocol)
Data transmission rate (baud rate)	9.6 kBaud - 12 MBaud
	automatic detection
Electronic adjustment (number SET)	Via PRESET push button or protocol
Status information	Operation (green LED), bus activity (red LED)
Bus termination [6]	Via DIP switches
Electrical connection	M14 plug connector (7 pin)

Flange type	
through	

1) To DIN EN 61000-6-2 and DIN EN 61000-6-3
2) To DIN EN 60068-2-27
3) To DIN EN 60068-2-6
4) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in
5) To EN 50 170-2 (DIN 19245 part 1-3) DC isolated via opto-couplers
6) Should only be connected in the final device

Order information

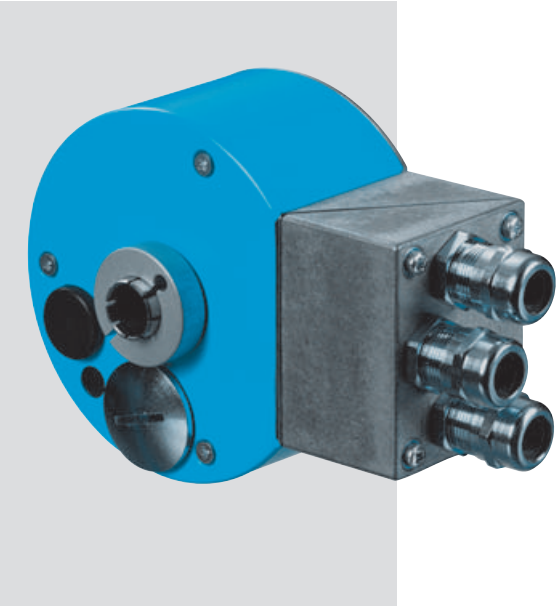
ATM 90 Profibus through hollow shaft; connector radial; U_s 10 … 32 V

Type	Part no.	Explanation
ATM90-PTF13X13	1 030 042	Through hollow Ø 12 mm, 3 x M14, 8.192 x 8.192
ATM90-PUF13X13	1 030 043	Through hollow Ø 1/2“, 3 x M14, 8.192 x 8.192
ATM90-PXF13X13	1 030 044	Through hollow Ø 16 mm, 3 x M14, 8.192 x 8.192
ATM90-PTF13X11	1 032 654	Through hollow Ø 12 mm, 3 x M14, 8.192 x 2.048
ATM90-PUF13X11	1 032 655	Through hollow Ø 1/2“, 3 x M14, 8.192 x 2.048
ATM90-PXF13X11	1 032 656	Through hollow Ø 16 mm, 3 x M14, 8.192 x 2.048
ATM90-PTF12X12	1 032 660	Through hollow Ø 12 mm, 3 x M14, 4.096 x 4.096
ATM90-PUF12X12	1 032 661	Through hollow Ø 1/2“, 3 x M14, 4.096 x 4.096
ATM90-PXF12X12	1 032 662	Through hollow Ø 16 mm, 3 x M14, 4.096 x 4.096
ATM90-PTF11X13	1 032 896	Through hollow Ø 12 mm, 3 x M14, 2.048 x 8.192
ATM90-PUF11X13	1 032 897	Through hollow Ø 1/2“, 3 x M14, 2.048 x 8.192
ATM90-PXF11X13	1 032 898	Through hollow Ø 16 mm, 3 x M14, 2.048 x 8.192

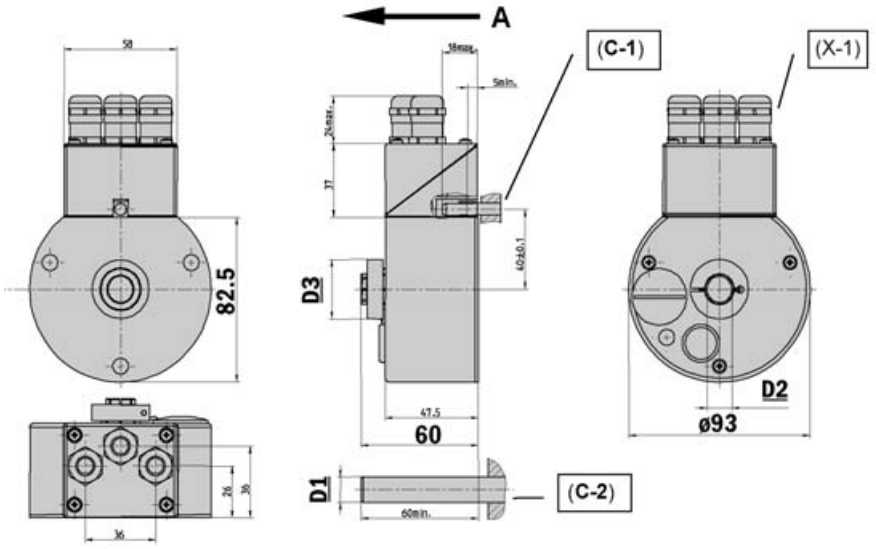
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 65



Dimensional drawing through hollow shaft cable radial



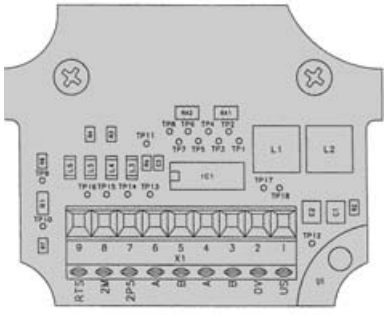
General tolerances according DIN ISO 2768-mk

Through hollow shaft	D1	D2	D3
12 mm	12.0_{h7}	12.0^{F7}	29.5
1/2"	12.7_{h7}	12.7^{F7}	29.5
16 mm	16.0_{h7}	16.0^{F7}	32.0

C - 1	Torque support via cylindrical pin (customer) Ø 6_{m6} to DIN EN ISO 8734
C - 2	Drive shaft (customer)
X - 1	3x screw fixings for cable connection, metric M16 x 1.5, 17
A	Direction of view on encoder (used to define the direction of rotation)

PIN and wire allocation for Profibus adaptor

PIN	Signal	Explanation
1	U_S (24 V)	Supply voltage
2	GND (0 V)	0 V (Gnd)
3	B	Profibus DP B line (out)
4	A	Profibus DP A line (out)
5	B	Profibus DP B line (in)
6	A	Profibus DP A line (in)
7	2P5	+ 5 V (potential free) 1)
8	2M	0 V (potential free) 1)
9	RTS	Request To Send 2)



1) Use for external bus termination or to supply the transmitter/receiver of an optical transmission link.

2) Signal is optional, used to detect the direction of an optical connection.

Technical data acc. to DIN 32878	ATM 90 ProfiBus with bus adaptor	Flange type through
Hollow shaft diameter	12, 16 mm, 1/2"	
Mass	Approx. 0.8 kg	
Moment of inertia of the rotor	153 gcm^2	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	3,000 min^{-1}	
Position forming time	0.25 ms	
Max. angular acceleration	0.6 x 10^5 rad/s^2	
Operating torque	0.4 Ncm	
Start up torque	0.5 Ncm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 80 °C	
Storage temperature range	– 40 … + 125 °C	
Permissible relative humidity	98 %	
EMC [1]		
Resistance		
to shocks [2]	100/6 g/ms	
to vibration [3]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529		
with shaft seal	IP 65	
Operating voltage range (Us)	10 … 32 V	
Power consumption	2.0 W	
Initialisation time [4]	1250 ms	
Bus Interface Profibus DP		
Electrical Interface [5]	RS 485	
Protocol	Profile for Encoders (07$_{hex}$) – Class 2	
Address setting (node number)	DIP switches or protocol	
Data transmission rate (baud rate)	9.6 kBaud - 12 MBaud	
	Automatic detection	
Electronic adjustment (number SET)	Via PRESET push button or protocol	
Status information	Operation (green LED), bus activity (red LED)	
Bus termination [6]	Via DIP switches	
Electrical connection	Screw fixing for cable (3x)	

[1] To DIN EN 61000-6-2 and DIN EN 61000-6-3

[2] To DIN EN 60068-2-27

[3] To DIN EN 60068-2-6

[4] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in

[5] To EN 50 170-2 (DIN 19245 part 1-3) DC isolated via opto-couplers

[6] Should only be connected in the final device

Order information

ATM 90 Profibus through hollow shaft; cable radial; U_s 10 … 32 V

Type	Part no.	Explanation
ATM90-PTG13X13	1 030 045	Through hollow Ø 12 mm, 3 x PG, 8.192 x 8.192
ATM90-PUG13X13	1 030 046	Through hollow Ø 1/2", 3 x PG, 8.192 x 8.192
ATM90-PXG13X13	1 030 047	Through hollow Ø 16 mm, 3 x PG, 8.192 x 8.192
ATM90-PTG13X11	1 032 657	Through hollow Ø 12 mm, 3 x PG, 8.192 x 2.048
ATM90-PUG13X11	1 032 658	Through hollow Ø 1/2", 3 x PG, 8.192 x 2.048
ATM90-PXG13X11	1 032 659	Through hollow Ø 16 mm, 3 x PG, 8.192 x 2.048
ATM90-PTG12X12	1 032 663	Through hollow Ø 12 mm, 3 x PG, 4.096 x 4.096
ATM90-PUG12X12	1 032 664	Through hollow Ø 1/2", 3 x PG, 4.096 x 4.096
ATM90-PXG12x12	1 032 665	Through hollow Ø 16 mm, 3 x PG, 4.096 x 4.096
ATM90-PTG11x13	1 032 899	Through hollow Ø 12 mm, 3 x PG, 2.048 x 8.192
ATM90-PUG11x13	1 032 900	Through hollow Ø 1/2", 3 x PG, 2.048 x 8.192
ATM90-PXG11x13	1 032 901	Through hollow Ø 16 mm, 3 x PG, 2.048 x 8.192

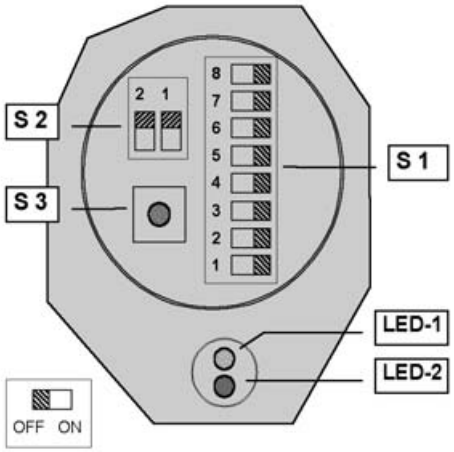
Attention: Bus adaptor included

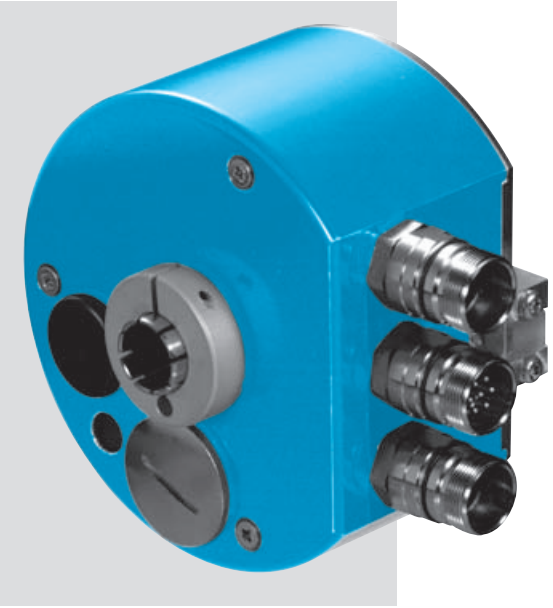
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- RS 485 bus coupling to Profibus DP Specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 65

Switch settings





Switch settings

Access to the DIP switches used for configuring the encoder can be gained by removing the screw on the back of the encoder.

S 1 (1-7)	Address setting (0 … 127)
S 1 (8-8)	Counting direction (CW/CCW)
S 2	Bus termination
S 3	Preset push button (Number SET)

In the version with a cable connection, the switches S1 and S2 are located inside the bus adaptor.

Status information via LEDs

LED-1	Operating voltage (green)
LED-2	Bus activity (red)

See chapter Accessories
Accessories for encoders

Implementation

DP Functionalities
in accordance with the Profibus DP basic functions.

DP services
- Data interchange (Write_Read_Data)
- Address allocation (Set_Slave_Address)
- Control commands (Global_Control)
- Read the inputs (Read_Inputs)
- Read the outputs (Read_Outputs)
- Read diagnostic data (Slave_Diagnosis)
- Send configuration data (Set_Param)
- Check configuration data (Chk_Config)

Communication
- Cyclic master – slave data traffic

Protective mechanisms
- Data transfer with HD = 4
- Time monitoring of the data traffic

Configuration
Settings in accordance with Encoder Profile
- Counting direction (CW, CCW)
- Class 2 functionality (ON, OFF)
- Scaling function (ON, OFF)
- Steps per turn (1 … 8,192)
- Total resolution (TR) -- 1…6,108,864 steps, with TR = 2^n x CPR -- (n=0 … 13)
- "Activation of SSA-service" 2)
- Selection of the station address 2)

Configuration
Setting the data format (Cx) for the cyclic data interchange (In/Out) via configuration byte (K-1).

C1 1) 2 Word (IO) (I-1/O-1)
C2 2) 4 Word (IO) (I-1, I-2, I-3/O-1)

Data interchange: - Input Data (IN)

I-1	Position value 1)	4 bytes
I-2	Speed (rev/min) 2)	2 bytes
I-3	Time stamp 2)	2 bytes

Data interchange: - Output data (OUT)

O-1	PRESET Value 1)	4 bytes

Diagnostic information
- Station-related diagnosis (63 bytes in acc. with Encoder Profile Class 2)

Setting: - PRESET value
The PRESET function is used for set into operation and to allocate a specific position value to the current physical angular position.
The following settings are possible:
- by hardware (PRESET push button: S3)
- by software: -- (see Output data)

Setting: - Counting direction
- by hardware via DIP switch S1-(8)
- by software via Telegram

Counting direction increasing:
Rotation of the shaft in the clockwise direction (CW) as viewed on the shaft.

Setting: - Station address
- by hardware via DIP switch S1
- by software via Telegram

The setting by software is carried out only if the "SSA-service" has been previously activated.

Setting: - Bus termination
The 2-way DIP switch (S2) permits an internal bus termination to be switched in and out (ON/OFF).
If the bus is terminated externally, switch S2 must be in the OFF position.

Device-specific file (GS.)
For the purpose of automatic set into operation of the encoder, use is made of the GS file.
All the characteristic features of the device are defined in it.

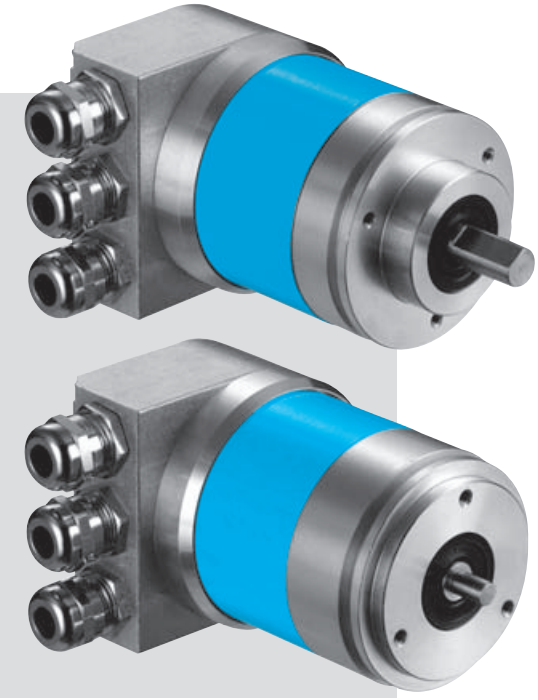
STEG 00FE.GSD	German
STEG 00FE.GSE	English
STEG 00FE.GSF	French

1) As per Encoder Profile
2) Manufacturer specific function

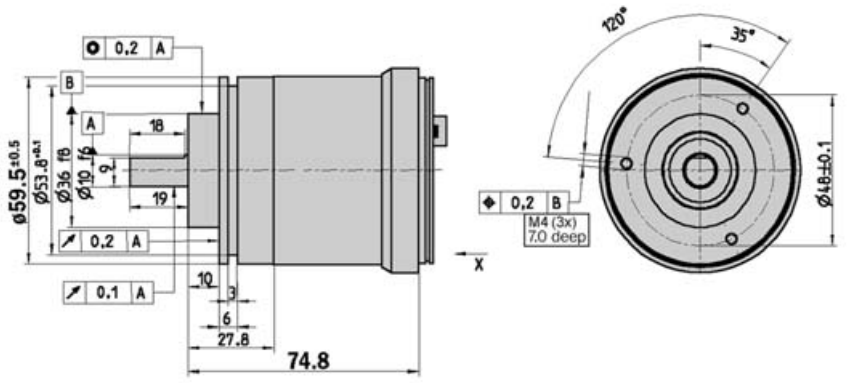
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

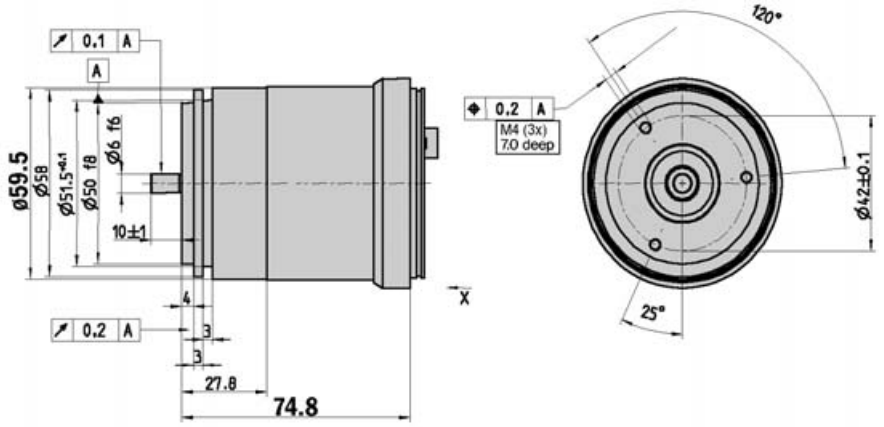


Dimensional drawing face mount flange



General tolerances according DIN ISO 2768-mk

Dimensional drawing servo flange



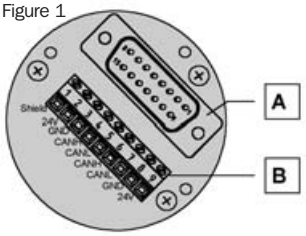
General tolerances according DIN ISO 2768-mk

1 PIN and wire allocation for bus adaptor

Terminal strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0V (Gnd)
4	4	CAN_H	CAN Bus Signal HIGH
5	5	CAN_L	CAN Bus Signal LOW
6		CAN_H	CAN Bus Signal HIGH
7		CAN_L	CAN Bus Signal LOW
8		GND (COM)	0V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V

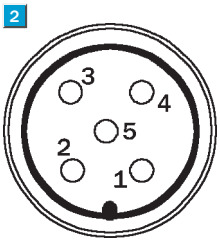
1 Encoders with a CANbus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure 1 shows the pin allocation within the bus connection.

Figure 1

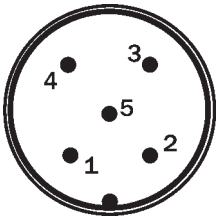


A Internal plug connection to the encoder
B External connection to the bus

2



OUT/U_S (female)



IN/U_S (male)

Connector M12 (Bus adaptor)

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 CANopen	Flange type	
		face m.	servo
Solid shaft	10 mm	■	
	6 mm		■
Mass	Approx. 0.59 kg	■	■
Moment of inertia of the rotor	35 gcm^2	■	■
Measuring step	0.043°	■	■
Max. number of steps per revolution	8,192	■	■
Max. number of revolutions	8,192	■	■
Error limits	± 0.25°	■	■
Repeatability	0.1°	■	■
Operating speed	6,000 min^{-1}	■	■
Position forming time	0.25 ms	■	■
Max. angular acceleration	5 x 10^5 rad/s^2	■	■
Operating torque			
with shaft seal	1.8 Ncm	■	■
without shaft seal [1]	0.3 Ncm	■	■
Start up torque			
with shaft seal	2.5 Ncm	■	■
without shaft seal [2]	0.5 Ncm	■	■
Max. shaft loading			
radial	300 N	■	■
axial	50 N	■	■
Bearing lifetime	3.6 x 10^9 revolutions	■	■
Working temperature range	– 20 … + 80 °C	■	■
Storage temperature range	– 40 … + 125 °C	■	■
Permissible relative humidity	98 %	■	■
EMC [2]		■	■
Resistance			
to shocks [3]	100/6 g/ms	■	■
to vibration [4]	20/10 … 2000 g/Hz	■	■
Protection class acc. IEC 60529			
with shaft seal	IP 67	■	■
without shaft seal [5]	IP 43	■	■
without shaft seal [6]	IP 66	■	■
Operating voltage range (Us)	10 … 32 V	■	■
Power consumption	2.0 W	■	■
Initialisation time [7]	1250 ms	■	■
Bus Interface CANopen			
Electrical interface [8]	ISO-DIS 11898	■	■
Protocol	Communication Profile DS 301 V4.0	■	■
	Device Profile DSP 406 V2.0	■	■
Address setting (NODE ID)	0 … 63 (DIP switches or protocol)	■	■
Data transmission rate (Baudrate)	{10, 20, 50, 125, 250, 500} kB, 1MB	■	■
	(DIP switches or protocol)	■	■
Electronic adjustment (number SET)	Via PRESET push button or protocol	■	■
Status Information	2-colour LED for CAN Controller status	■	■
Bus termination [9]	Via DIP switches	■	■
Electrical connection	Screw fixing with PG-9 for cable	■	■

1) In case that shaft seal has been removed by customer
2) To DIN EN 61000-6-2 and DIN EN 61000-6-3
3) To DIN EN 60068-2-27
4) To DIN EN 60068-2-6
5) Not sealed at encoder flange
6) Sealed at encoder flange
7) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in
8) (CAN High Speed) and CAN Specification 2.0 B, DC isolated
9) Should only be connected in the final device

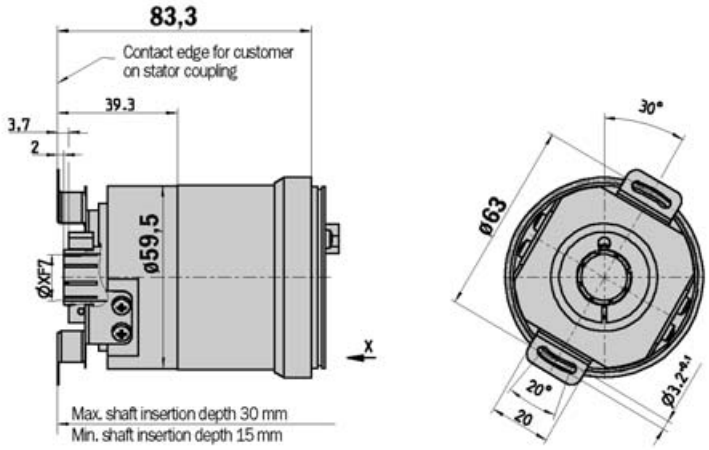
Order information		
ATM 60 CANopen face mount and servo flange; solid shaft; U_s 10 … 32 V		
Type	**Part no.**	**Explanation**
ATM60-C4H13X13	1 030 024	Face mount solid shaft Ø 10 mm
ATM60-C1H13X13	1 030 025	Servo flange solid shaft Ø 6 mm
Attention: Please order the CANbus adaptor separately (see page 42)		

Resolution up to 26 bits

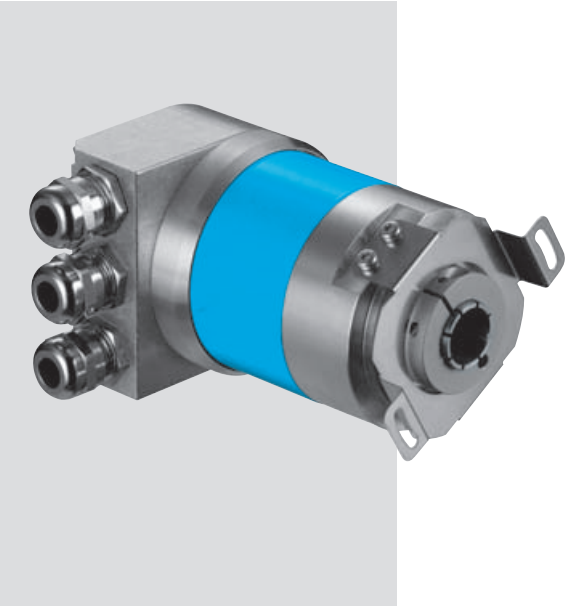
Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

Dimensional drawing blind hollow shaft



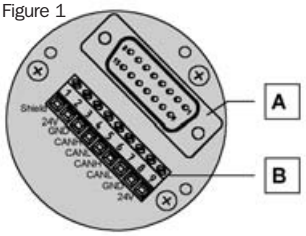
General tolerances according DIN ISO 2768-mk



1 PIN and wire allocation for bus adaptor

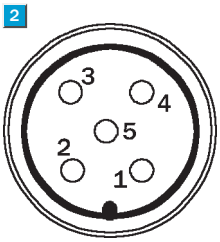
Terminal strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0V (Gnd)
4	4	CAN_H	CAN Bus Signal HIGH
5	5	CAN_L	CAN Bus Signal LOW
6		CAN_H	CAN Bus Signal HIGH
7		CAN_L	CAN Bus Signal LOW
8		GND (COM)	0V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V

Figure 1

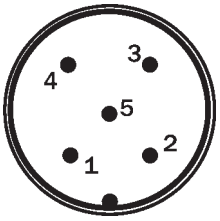


A Internal plug connection to the encoder
B External connection to the bus

2



OUT/U_S (female)



IN/U_S (male)

Connector M12 (Bus adaptor)

1 Encoders with a CANbus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure 1 shows the pin allocation within the bus connection.

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 CANopen	Flange type
		blind
[1] **Hollow shaft diameter**	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Mass	Approx. 0.59 kg	
Moment of inertia of the rotor	55 gcm^2	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0.25°	
Repeatability	0.1°	
Operating speed	3,000 min^{-1}	
Position forming time	0.25 ms	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	0.8 Ncm [1]	
Start up torque	1.2 Ncm [1]	
Permissible shaft movement		
of the drive element		
radial static/dynamic	± 0.3/± 0.1 mm	
axial static/dynamic	± 0.5/± 0.2 mm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 80 °C	
Storage temperature range	– 40 … + 125 °C	
Permissible relative humidity	98 %	
EMC [2]		
Resistance		
to shocks [3]	100/6 g/ms	
to vibration [4]	20/10 … 2000 g/Hz	
Protection class acc. IEC 60529 [1]	IP 67	
without shaft seal [5]	IP 43	
Operating voltage range (Us)	10 … 32 V	
Power consumption	2.0 W	
Initialisation time [6]	1250 ms	
Bus Interface CANopen		
Electrical interface [7]	ISO-DIS 11898	
Protocol	Communication Profile DS 301 V4.0	
	Device Profile DSP 406 V2.0	
Address setting (NODE ID)	0 … 63 (DIP switches or protocol)	
Data transmission rate (Baudrate)	{10, 20, 50, 125, 250, 500} kB, 1MB	
	(DIP switches or protocol)	
Electronic adjustment (number SET)	Via PRESET push button or protocol	
Status Information	2-colour LED for CAN Controller status	
Bus termination [8]	Via DIP switches	
Electrical connection	Screw fixing with PG-9 for cable	

1) With shaft seal
2) To DIN EN 61000-6-2 and DIN EN 61000-6-3
3) To DIN EN 60068-2-27
4) To DIN EN 60068-2-6
5) Not sealed at encoder flange
6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.
7) (CAN High Speed) and CAN Specification 2.0 B, DC isolated
8) Should only be connected in the final device

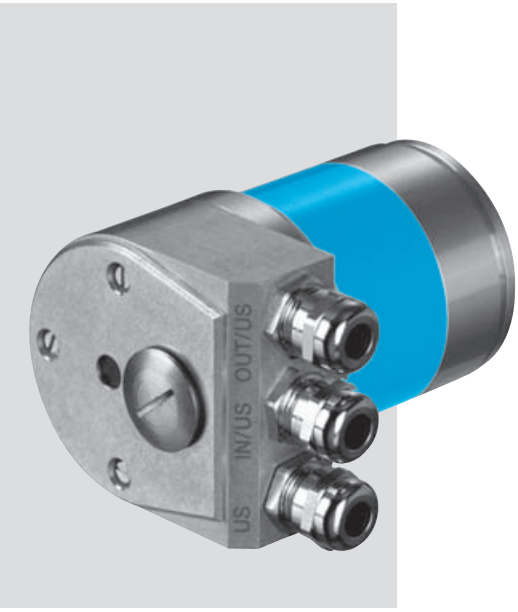
Order information		
ATM 60 CANopen blind hollow shaft; U_s 10 … 32 V		
Type	**Part no.**	**Explanation**
ATM60-CAH13X13	1 030 026	Blind hollow shaft
Attention: Please order the CANbus adaptor separately (see page 42)		

[1] **Attention: Please order the collet with required diameter separately**		
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"
For 15 mm shaft diameter, collet is not needed		

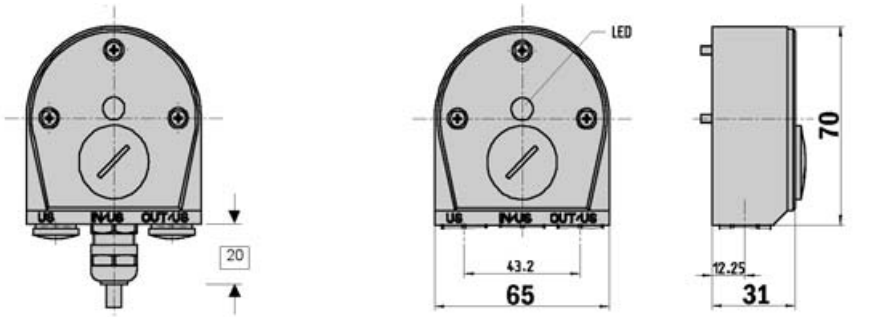
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

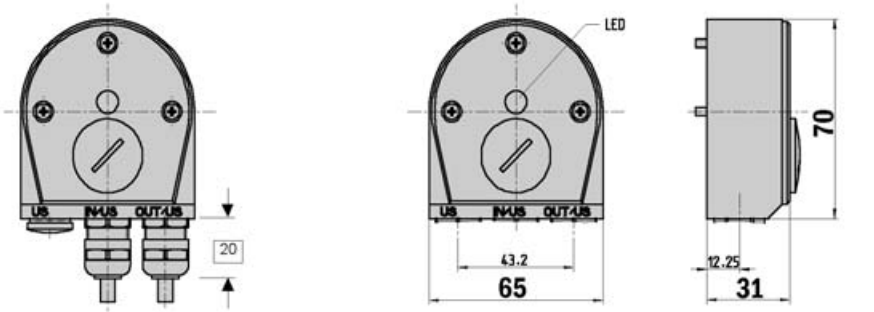


Dimensional drawing CANopen adaptor KR1



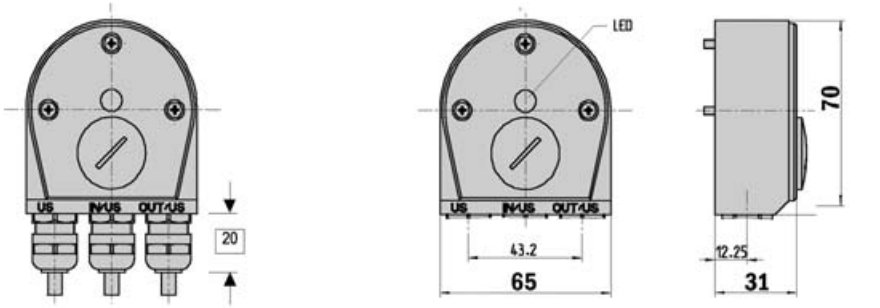
General tolerances according DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR2



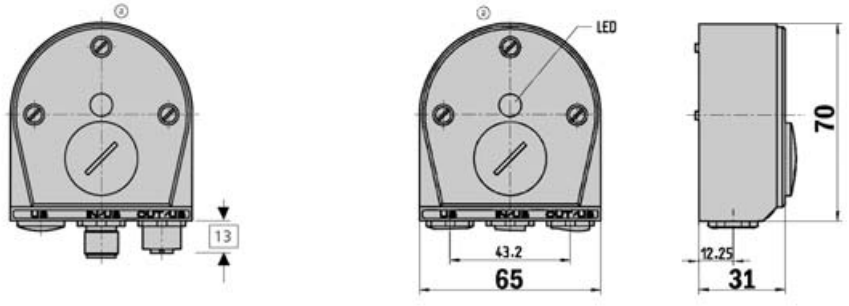
General tolerances according DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR3



General tolerances according DIN ISO 2768-mk

Dimensional drawing CANopen adaptor SR2



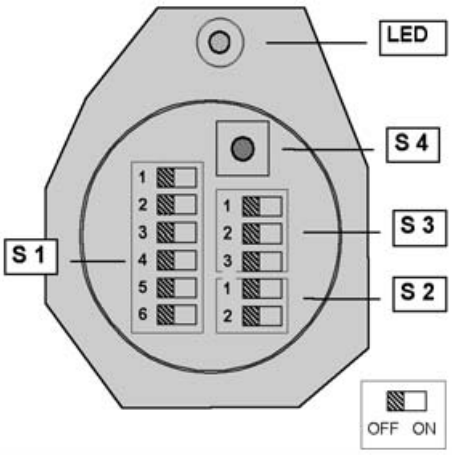
General tolerances according DIN ISO 2768-mk

Order information

ATM 60 CANopen adaptor

Type	Part no.	Explanation
AD-ATM60-KR1CO	2 029 230	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2CO	2 029 231	Bus adaptor KR2, 2 x PG
AD-ATM60-KR3CO	2 029 232	Bus adaptor KR3, 3 x PG
AD-ATM60-SR2CO	2 020 935	Bus adaptor SR2, 2 x M12, 5 pin.

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1	Address setting (Node ID)
S 2	Bus termination
S 3	Baud rate setting (Data Rate)
S 4	Preset push button (Number zero SET)

Status information via LED

LED	2-colour red/green
	CAN Controller status

Implementation

CANopen Functionality

Predefined Connection Set
- Sync Object
- Emergency Object
- NMT Network Object (Error Control services, Boot-Up service)
- One Service Data Object (SDO)
- Two Process Data Object (PDO)

I/O-Operating Modes
- Synchronic: -- Depends on Sync Object
- Asynchronous. -- No reference to Sync Object. Triggered by "Timer" (Cyclic) or by event (COS)
- Remote Transmission (RTR)

Encoder Parameters

according the Device Profile for Encoders:
- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Steps per revolution (CPR) - 1 … 8,192
- Total resolution (TR) -- 1 … 67,108,864 steps, with TR = 2^n x CPR -- (n=0 … 13)
- Limits for the working range
- Cycle Timer for asynchronous PDOs
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific Profile:
- Node commissioning. -- Location and values for Node-ID and Baud rate
- Hysteresis to position change required for Async PDOs with COS mode
- Limits and display format for the speed and acceleration values

PDO Data Mapping

Mapping of up to four data objects to each of the two Transmit PDOs. The resulting data length within one PDO is limited to 8 Byte.

(1)	Object 1/Pos Val[1)]	I-1
(n)	Object 2 … Object 4	I-1 to I-7

Input Data Objects

I-1	Position value [Pos Val]	4 Byte
I-2	Status of cam	1 Byte
I-3	Status of working range	1 Byte
I-4	Alarms	1 Byte
I-5	Warnings	1 Byte
I-6	Speed value	4 Byte
I-7	Acceleration value	4 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch) or EEPROM

Setting: - Baud rate

10kb, 20kb, 50kb, 125kb, 250kb, 500kb, 1 MB by Hardware (DIP Switch) or EEPROM

Setting: - Bus Termination

The DIP-Switch (S2) is used to switch on/off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]

The adjustment is carried out in 2 ways:
- by Hardware (PRESET push button)
- by Software (CANopen Protocol)

Equipment Configuration

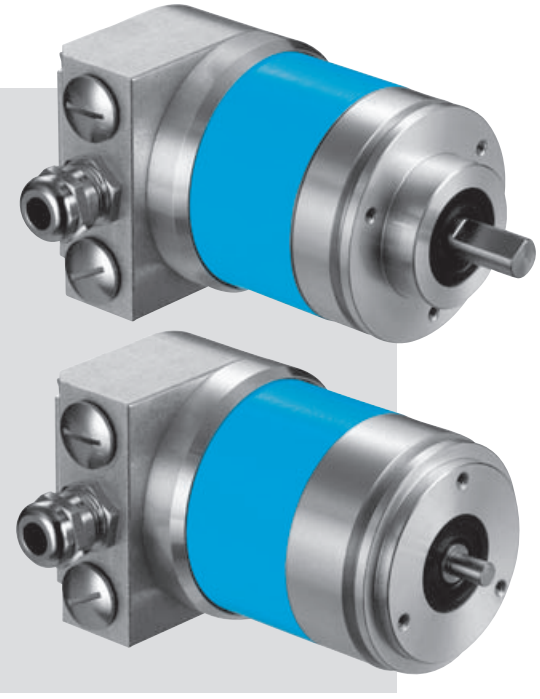
Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

1) Default Setting

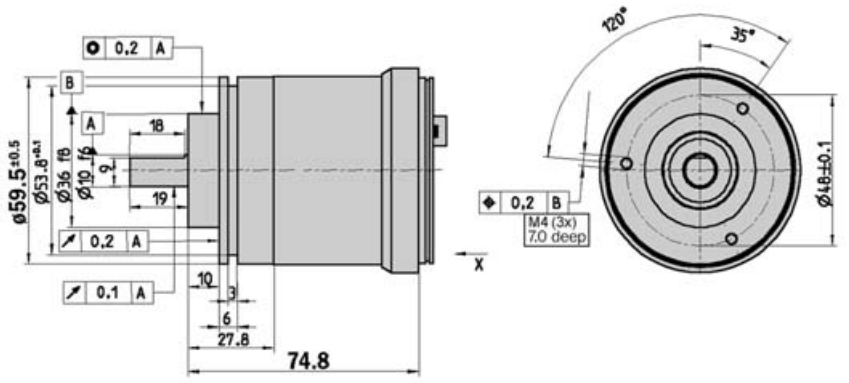
Resolution up to 26 bits

Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

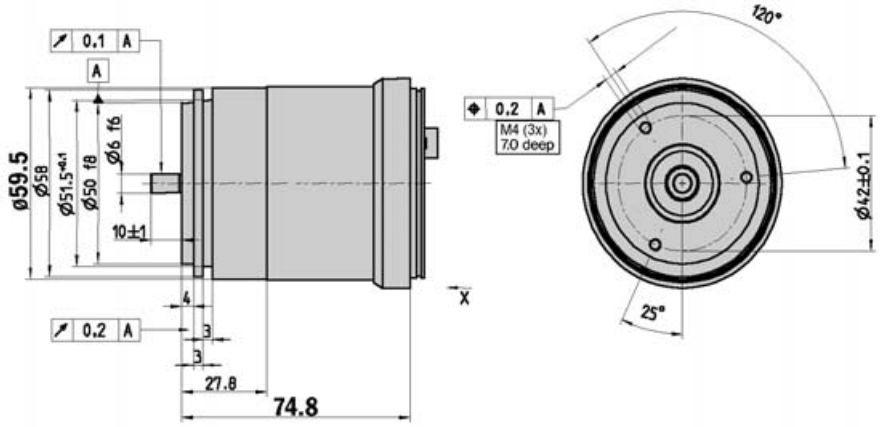


Dimensional drawing face mount flange



General tolerances according DIN ISO 2768-mk

Dimensional drawing servo flange



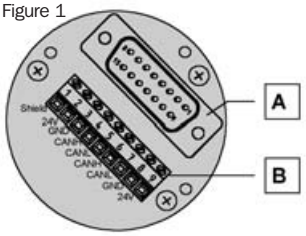
General tolerances according DIN ISO 2768-mk

1 PIN and wire allocation for bus adaptor

Terminal strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0V (Gnd)
4	4	CAN_H	CAN Bus Signal HIGH
5	5	CAN_L	CAN Bus Signal LOW
6		CAN_H	CAN Bus Signal HIGH
7		CAN_L	CAN Bus Signal LOW
8		GND (COM)	0V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V

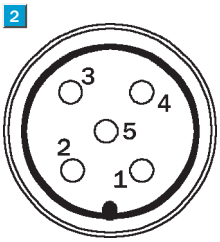
1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure 1 shows the pin allocation within the bus connection.

Figure 1

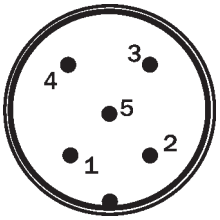


A Internal plug connection to the encoder
B External connection to the bus

2



OUT/U_S (female)



IN/U_S (male)

Connector M12 (Bus adaptor)

See chapter Accessories
Accessories for encoders

Technical data according to DIN 32878	ATM 60 DeviceNet	Flange type	
		face m.	servo
Solid shaft	10 mm	■	
	6 mm		■
Mass	Approx. 0.59 kg	■	■
Moment of inertia of the rotor	35 gcm^2	■	■
Measuring step	0.043°	■	■
Max. number of steps per revolution	8,192	■	■
Max. number of revolutions	8,192	■	■
Error limits	± 0.25°	■	■
Repeatability	0.1°	■	■
Operating speed	6,000 min^{-1}	■	■
Position forming time	0.25 ms	■	■
Max. angular acceleration	5 x 10^5 rad/s^2	■	■
Operating torque	1.8 Ncm [1]	■	■
without shaft seal [1]	0.3 Ncm	■	■
Start up torque	2.5 Ncm [1]	■	■
without shaft seal [2]	0.5 Ncm	■	■
Max. shaft loading			
radial	300 N	■	■
axial	50 N	■	■
Bearing lifetime	3.6 x 10^9 revolutions	■	■
Working temperature range	– 20 … + 80 °C	■	■
Storage temperature range	– 40 … + 125 °C	■	■
Permissible relative humidity	98 %	■	■
EMC [3]		■	■
Resistance			
to shocks [4]	100/6 g/ms	■	■
to vibration [5]	20/10 … 2000 g/Hz	■	■
Protection class acc. IEC 60529		■	■
with shaft seal	IP 67	■	■
without shaft seal [6]	IP 43	■	■
without shaft seal [7]	IP 66	■	■
Operating voltage range (Us)	10 … 32 V	■	■
Power consumption	2.0 W	■	■
Initialisation time [8]	1250 ms	■	■
Bus Interface DeviceNet			
Electrical interface [9]	ISO-DIS 11898	■	■
Protocol	DeviceNet Specification, Release 2.0	■	■
Address setting (NODE ID)	0 … 63 (DIP switches or protocol)	■	■
Data transmission rate (Data Rate)	{125, 250, 500} kB	■	■
	(DIP switches or protocol)	■	■
Electronic adjustment (Number SET)	Via PRESET push button or protocol	■	■
Status Information	Network Status LED (NS), 2-colours	■	■
Bus Termination [10]	Via DIP switches	■	■
Electrical Connection	Bus adaptor [11]	■	■

1) With shaft seal

2) In case that shaft seal has been removed by customer

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN IEN 60068-2-6

6) Not sealed at encoder flange

7) Sealed at encoder flange

8) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

9) (CAN High Speed) and CAN Specification 2.0 B, DC isolated

10) Should only be connected in the final device

11) For cable with PG 9 or connector (see bus adaptor)

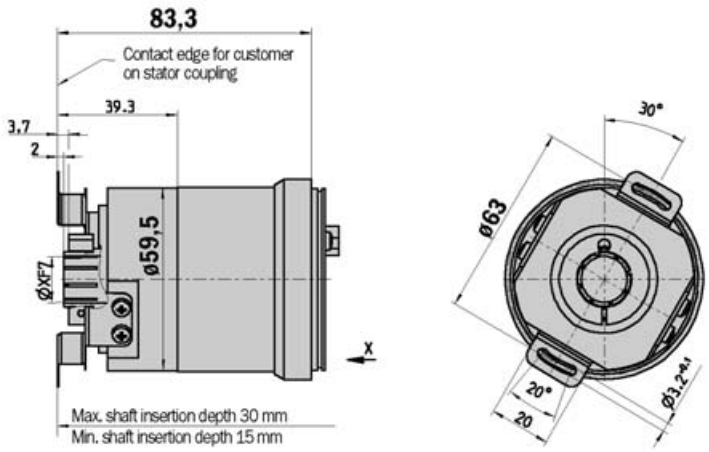
Order information		
ATM 60 DeviceNet face mount and servo flange solid shaft; U_s 10 … 32 V		
Type	**Part no.**	**Explanation**
ATM60-D4H13X13	1 030 017	Face mount solid shaft Ø 10 mm
ATM60-D1H13X13	1 030 018	Servo flange solid shaft Ø 6 mm
Attention: Please order the DeviceNet adaptor separately (see page 48)		

Resolution up to 26 bits

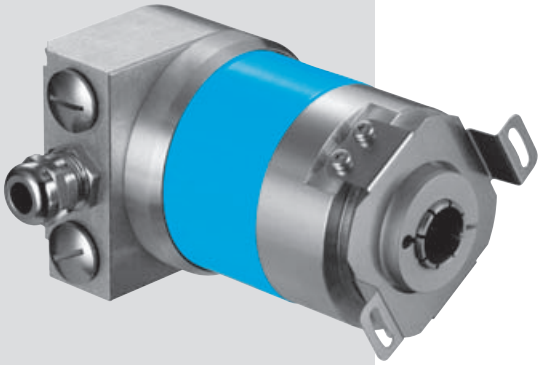
Absolute Encoder Multiturn

- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67

Dimensional drawing blind hollow shaft



General tolerances according DIN ISO 2768-mk



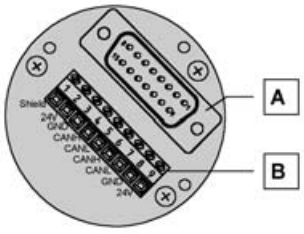
CE

See chapter Accessories

Accessories for encoders

1 PIN and wire allocation for bus adaptor

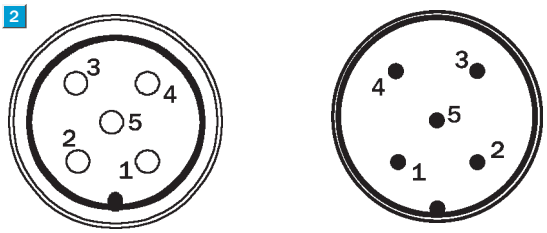
Terminal strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0V (Gnd)
4	4	CAN_H	CAN Bus Signal HIGH
5	5	CAN_L	CAN Bus Signal LOW
6		CAN_H	CAN Bus Signal HIGH
7		CAN_L	CAN Bus Signal LOW
8		GND (COM)	0V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V



A Internal plug connection to the encoder
B External connection to the bus

1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

2



OUT/U_S (female) IN/U_S (male)

Connector M12 (Bus adaptor)

Technical data according to DIN 32878	ATM 60 DeviceNet	Flange type
		blind
[1] **Hollow shaft diameter**	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Mass	Approx. 0.59 kg	
Moment of inertia of the rotor	55 gcm^2	
Measuring step	0.043°	
Max. number of steps per revolution	8,192	
Max. number of revolutions	8,192	
Error limits	± 0,25°	
Repeatability	0.1°	
Operating speed	3,000 min^{-1}	
Position forming time	0.25 ms	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	0.8 Ncm [1]	
Start up torque	1.2 Ncm [1]	
Permissible shaft movement		
of the drive element		
radial static/dynamic	± 0.3/± 0.1 mm	
axial static/dynamic	± 0.5/± 0.2 mm	
Bearing lifetime	3.6 x 10^9 revolutions	
Working temperature range	– 20 … + 80 °C	
Storage temperature range	– 40 … + 125 °C	
Permissible relative humidity	98 %	
EMC [2]		
Resistance		
to shocks [3]	100/6 g/ms	
to vibration [4]	20 /10 … 2000 g/Hz	
Protection class acc. IEC 60529 [1]	IP 67	
without shaft seal [5]	IP 43	
Operating voltage range (Us)	10 … 32 V	
Power consumption	2.0 W	
Initialisation time [6]	1250 ms	
Bus Interface DeviceNet		
Electrical interface [7]	ISO-DIS 11898	
Protocol	DeviceNet Specification, Release 2.0	
Address setting (NODE ID)	0 … 63 (DIP switches or protocol)	
Data transmission rate (Data Rate)	{125, 250, 500} kB	
	(DIP switches or protocol)	
Electronic adjustment (Number SET)	Via PRESET push button or protocol	
Status Information	Network Status LED (NS), 2-colours	
Bus Termination [8]	Via DIP switches	
Electrical Connection	Bus adaptor [9]	

1) With shaft seal
2) To DIN EN 61000-6-2 and DIN EN 61000-6-3
3) To DIN EN 60068-2-27
4) To DIN EN 60068-2-6
5) Not sealed at encoder flange
6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in
7) (CAN High Speed) and CAN Specification 2.0 B, DC isolated
8) Should only be connected in the final device
9) For cable with PG 9 or connector (see bus adaptor)

Order information

ATM 60 DeviceNet blind hollow shaft; U_s 10 … 32 V

Type	Part no.	Explanation
ATM60-DAH13X13	1 030 019	Blind hollow shaft

Attention: Please order the DeviceNet adaptor separately (see page 48)

[1] Attention: Please order the collet with required diameter separately

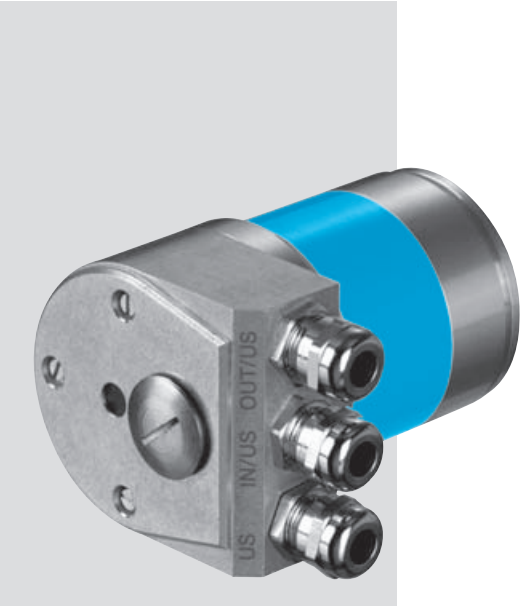
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

For 15 mm shaft diameter, collet is not needed

Resolution up to 26 bits

Absolute Encoder Multiturn

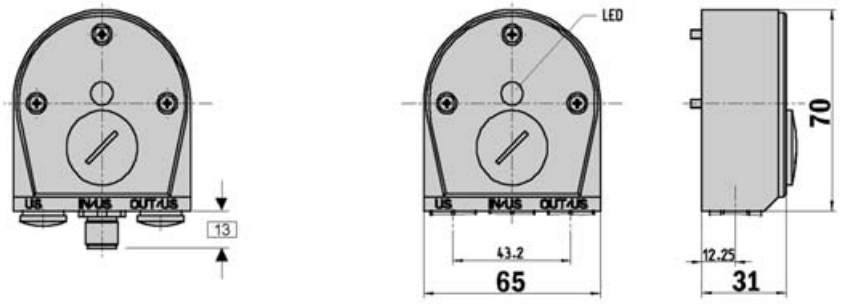
- Extremely robust
- Bus coupling to CAN-High speed specification
- Electronically adjustable, resolution adjustable
- Highly shock- and vibration-proof
- High degree of protection IP 67



See chapter Accessories

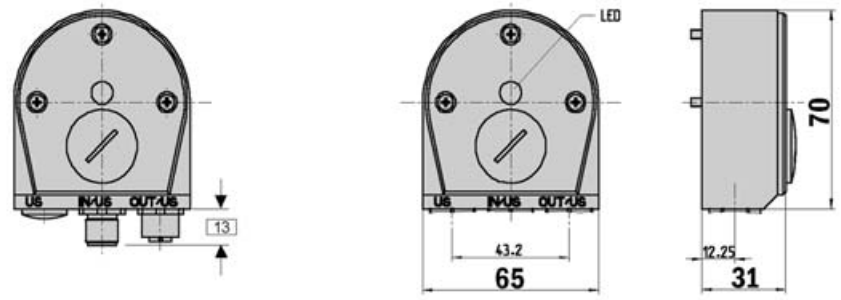
Accessories for encoders

Dimensional drawing DeviceNet adaptor SR1



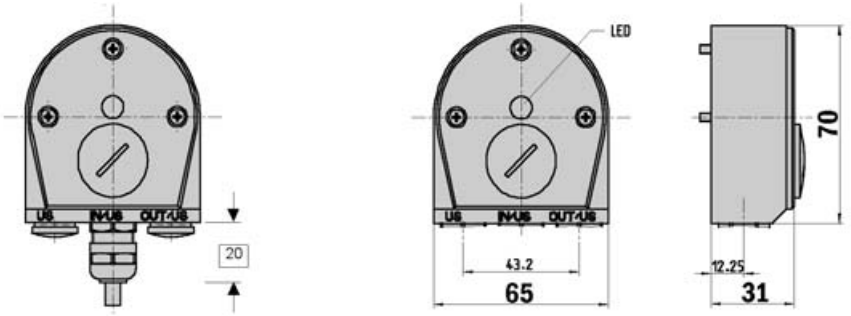
General tolerances according DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor SR2



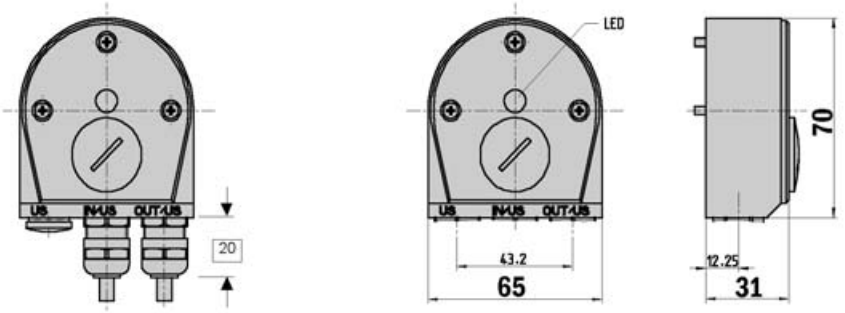
General tolerances according DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR1



General tolerances according DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR2



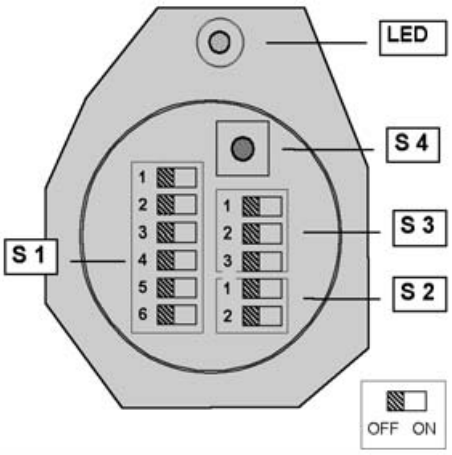
General tolerances according DIN ISO 2768-mk

Order information

ATM 60 DeviceNet adaptor

Type	Part no.	Explanation
AD-ATM60-SR1DN	2 029 226	Bus adaptor SR1, 1 x M12, 5 pin
AD-ATM60-SR2DN	2 029 227	Bus adaptor SR2, 2 x M12, 5 pin
AD-ATM60-KR1DN	2 029 228	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2DN	2 029 229	Bus adaptor KR2, 2 x PG

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1	Address setting (Node ID)
S 2	Bus termination
S 3	Baud rate setting (Data Rate)
S 4	Preset push button (Number zero SET)

Status information (NS) via LED

LED	2-colour red/green
	Network communication status

Implementation

DN Functionality

Object model
- Identity Object
- Message Router Object
- DeviceNet Object
- Assembly Object
- Connection Object
- Acknowledge Handler Object
- Encoder Object

I/O-Operating Modes
- Polling
- Change of State/Cyclic
- Bits Strobe

Encoder Parameters

according the Device Profile for Encoders:
- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Hysteresis to position change of required for COS communication
- Steps per revolution (CPR) - 1 … 8,192
- Total resolution (TR) -- 1 … 67,108,864 steps, with TR = 2^n x CPR -- (n=0 … 13)
- Limits for the working range (software limit switches)
- Limits and display format for the speed and acceleration values
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific parameters:
- Assignment of the I/O Data Assembly to the different I/O operating modes
- Diagnostic data indicating the current maximum results of the encoder
- Device-specific data

I/O Data Assembly

1)	Pos Val (Position Value) [1]	I-1
2)	Pos Val + Flag	I-1, I-2
3)	Pos Val + Speed	I-1, I-3
4)	Pos Val + Status of Cam	I-1, I-4

Input Data Objects

I-1	Position value [Pos Val]	4 Byte
I-2	Flag (Alarm, Warning)	1 Byte
I-3	Speed	4 Byte
I-4	Status of cam	1 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch)

Setting: - Baud rate

125kb, 250kb, 500kb by Hardware (DIP Switch)

Setting: - Bus Termination

The DIP Switch (S2) is used to switch on/off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]

The adjustment is carried out in 2 ways:
- by Hardware (PRESET push button)
- by Software (DeviceNet Protocol)

Equipment Configuration

Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

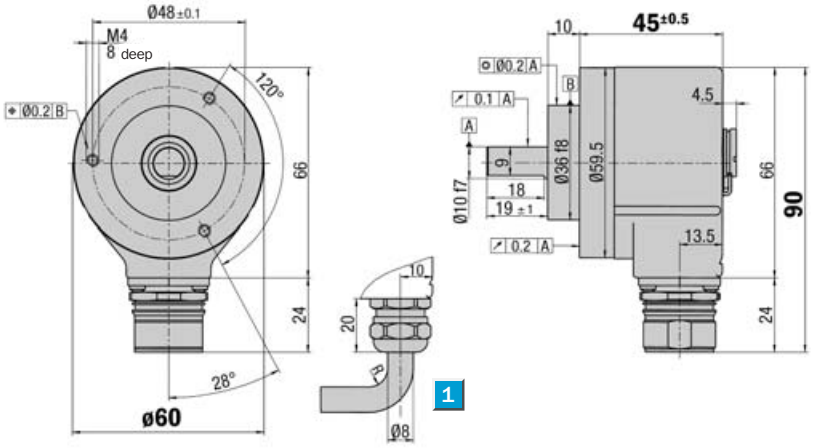
[1] Default Setting

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

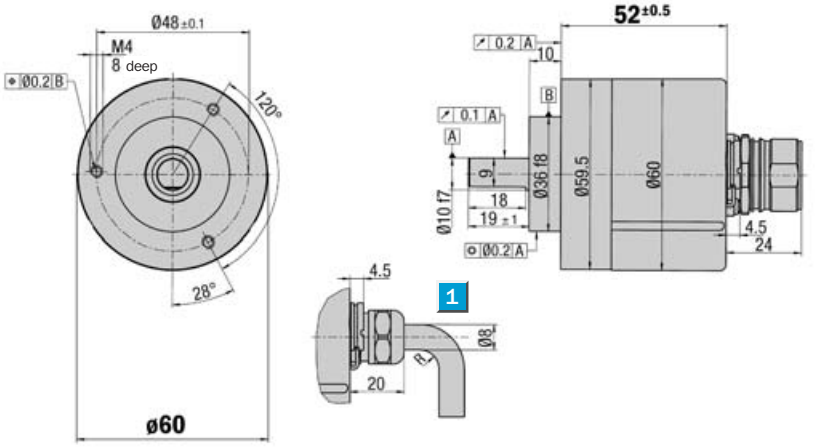
Dimensional drawing face mount flange radial exit



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

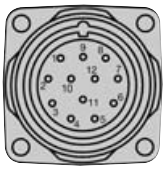
Dimensional drawing face mount flange axial exit



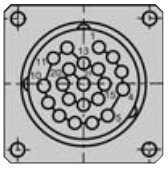
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation see page 66



View of the connector M23 fitted to the encoder body SSI

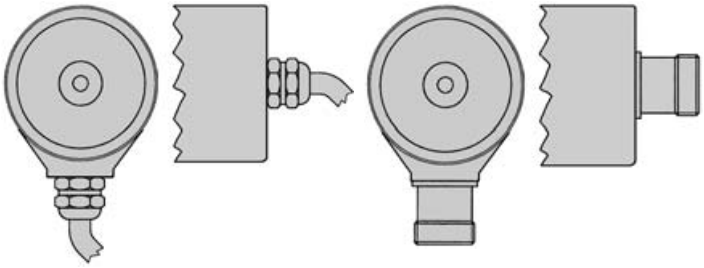


View of the connector M23 fitted to the encoder body Single, Parallel

See chapter Accessories
Accessories for encoders

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical Data acc. to DIN 32878	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 … 2000 g/Hz	
Protection class acc. IEC 60529		
connector outlet [8]	IP 65	
cable outlet	IP 66	
Operating voltage range (U_s)	10 … 32 V	
Operating current		
SSI	Typ. 60 mA	
Parallel	Typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x U_s	
	Logic L = 0 V … 0.3 x U_s	
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 61000-6-2 and DIN EN 61000-6-3
6) To DIN EN 60068-2-27
7) To DIN EN 60068-2-6
8) With mating connector fitted
9) Only with shaft stationary (note initialisation time)

Order information see pages 52/53

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**	**–**								

Electrical interface (Point 7)	
10 … 32 V, SSI, Gray	= **A**
10 … 32 V, SSI, Gray Excess	= **B**

Mechanical interface (Point 8)	
Face mount flange, solid shaft 10 mm	= **4**

Connection type (Point 9)	
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 (Points 10–14)
Any number of steps from 00002 up to 32,768 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: 8,192

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 07999 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: 8,192

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**	**–**								

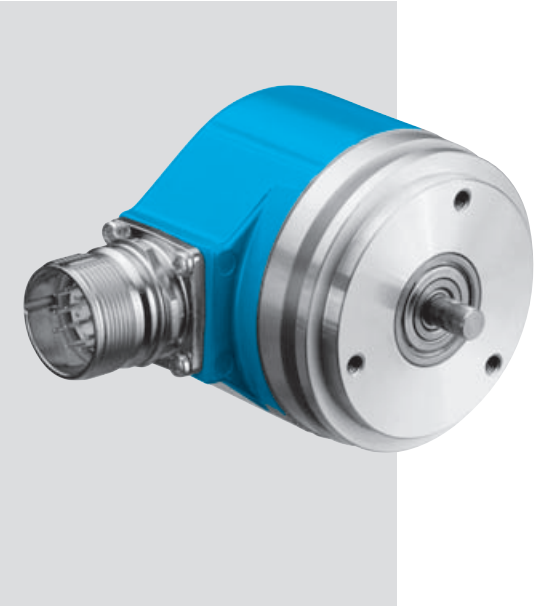
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
A	**R**	**S**	**6**	**0**	**–**								

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

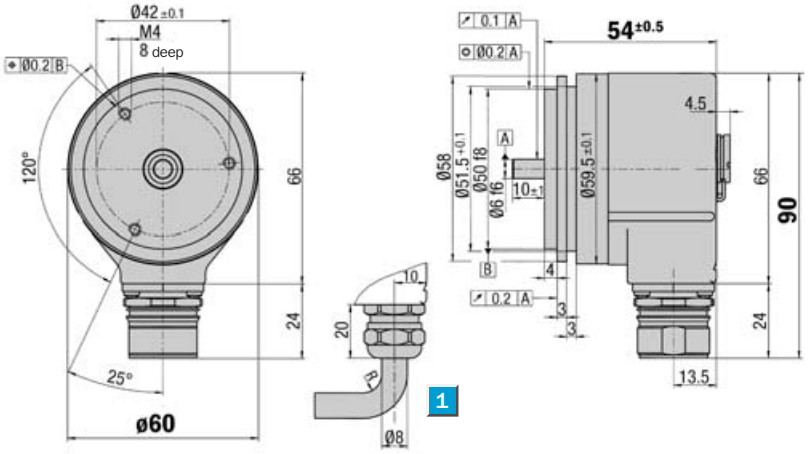
- Connector or cable outlet
- Protection class up to IP 66
- Electrical Interfaces SSI or Parallel
- Zero adjustment directly on the encoder or via a remote line



CE cULus

See chapter Accessories
Accessories for encoders

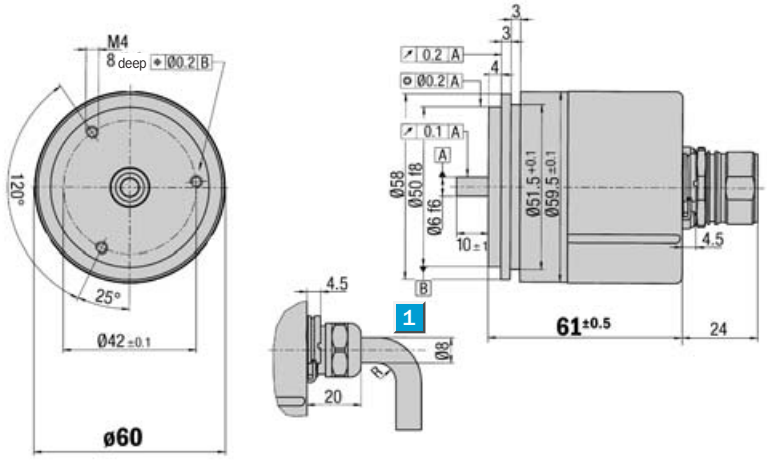
Dimensional drawing servo flange radial exit



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

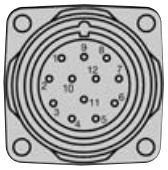
Dimensional drawing servo flange axial exit



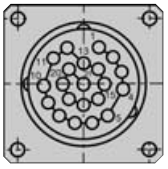
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation see page 66



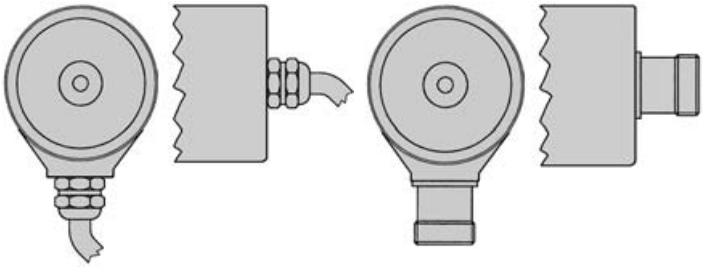
View of the connector M23 fitted to the encoder body SSI



View of the connector M23 fitted to the encoder body Single, Parallel

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical Data acc. to DIN 32878	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 … 2000 g/Hz	
Protection class acc. IEC 60529		
connector outlet [8]	IP 65	
cable outlet	IP 66	
Operating voltage range (U_s)	10 … 32 V	
Operating current		
SSI	Typ. 60 mA	
Parallel	Typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x U_s	
	Logic L = 0 V … 0.3 x U_s	
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 61000-6-2 and DIN EN 61000-6-3
6) To DIN EN 60068-2-27
7) To DIN EN 60068-2-6
8) With mating connector fitted
9) Only with shaft stationary (note initialisation time)

Order information see pages 56/57

Order information 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**	**–**								

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	
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 32,768 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: 8,192

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 to 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 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 07999 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: 8,192

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**	**–**								

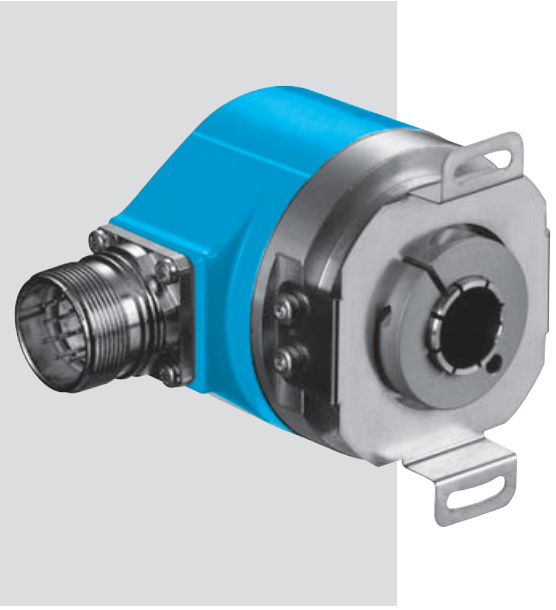
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
A	**R**	**S**	**6**	**0**	**–**								

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

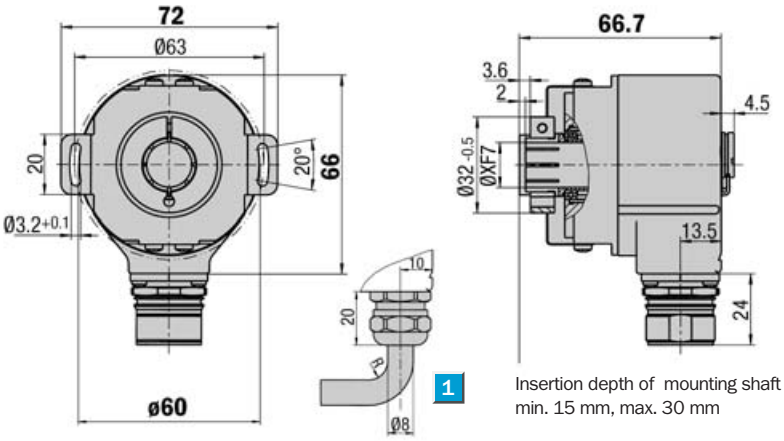
- Connector or cable outlet
- Protection class up to IP 66
- Electrical Interfaces SSI or Parallel
- Zero adjustment directly on the encoder or via a remote line



CE cULus

See chapter Accessories
Accessories for encoders

Dimensional drawing blind hollow shaft radial exit

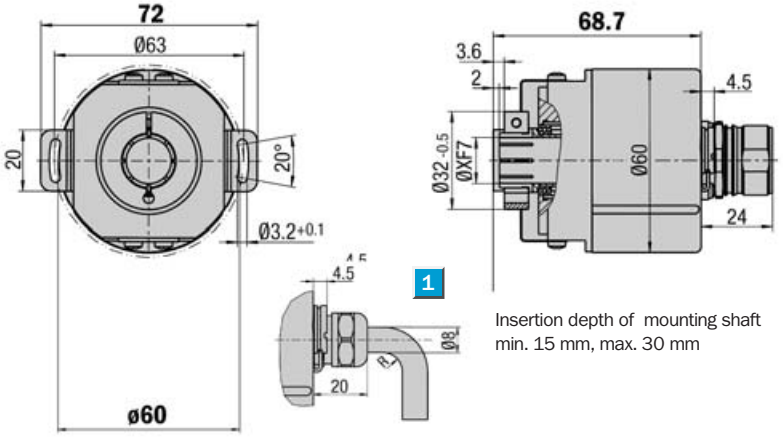


Insertion depth of mounting shaft min. 15 mm, max. 30 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing blind hollow shaft axial exit

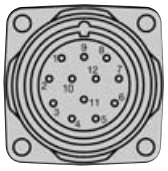


Insertion depth of mounting shaft min. 15 mm, max. 30 mm

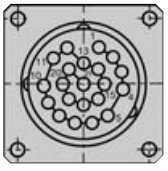
1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation see page 66



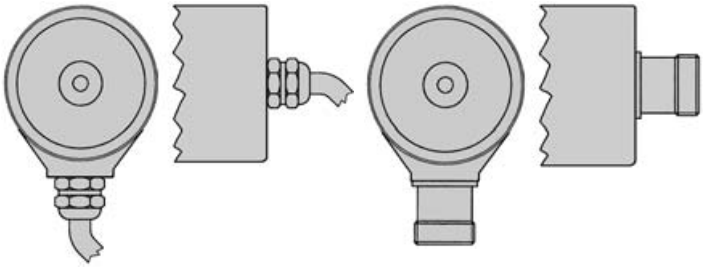
View of the connector M23 fitted to the encoder body SSI



View of the connector M23 fitted to the encoder body Single, Parallel

Connection type

Radial cable | Axial cable | Radial connector | Axial connector



Technical Data acc. to DIN 32878	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 … 2000 g/Hz	
Protection class acc. IEC 60529		
connector outlet [7]	IP 65	
cable 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 U_s	
	Logic L = 0 V … 0.3 x U_s	
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 61000-6-2 and DIN EN 61000-6-3
5) To DIN EN 60068-2-27
6) To DIN EN 60068-2-6
7) With mating connector fitted
8) Only with shaft stationary (note initialisation time)

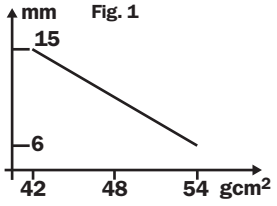


Fig. 1

Order information see pages 60/61

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 32,768 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 8,192

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**	**–**								

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	
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 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 07999 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 8,192

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

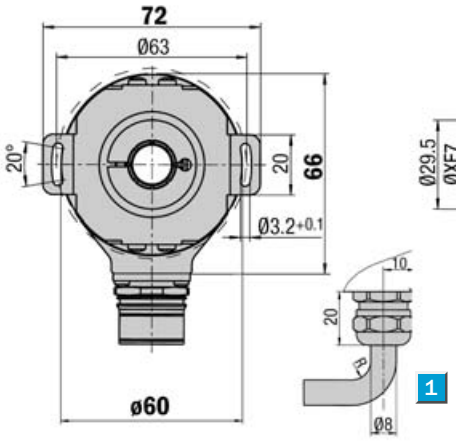
Type	Part no.	Shaft diameter
SPZ-006-AD-A	2 029 174	6 mm
SPZ-1E4-AD-A	2 029 175	1/4"
SPZ-008-AD-A	2 029 176	8 mm
SPZ-3E8-AD-A	2 029 177	3/8"
SPZ-010-AD-A	2 029 178	10 mm
SPZ-012-AD-A	2 029 179	12 mm
SPZ-1E2-AD-A	2 029 180	1/2"

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

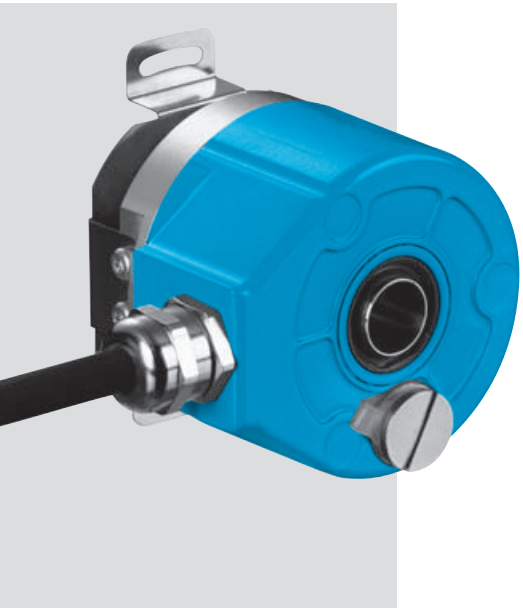
Dimensional drawing through hollow shaft, radial exit



1 Insertion depth of mounting shaft min. 15 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk



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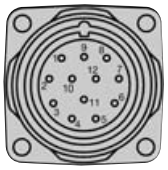
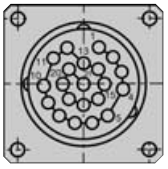
PIN and wire allocation see page 66



View of the connector M23 fitted to the encoder body SSI



View of the connector M23 fitted to the encoder body Single, Parallel

See chapter Accessories
Accessories for encoders

Connection type

Radial cable | Radial connector

Technical Data acc. to DIN 32878	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 … 2000 g/Hz	
Protection class acc. IEC 60529		
connector outlet [7]	IP 64	
cable outlet	IP 64	
Operating voltage range (U_s)	10 … 32 V	
Operating current		
SSI	Typ. 60 mA	
Parallel	Typ. 90 mA	
Switching level of the control inputs		
	Logic H = 0.7 x U_s	
	Logic L = 0 V … 0.3 x U_s	
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 61000-6-2 and DIN EN 61000-6-3
5) To DIN EN 60068-2-27
6) To DIN EN 60068-2-6
7) With mating connector fitted
8) Only with shaft stationary (note initialisation time)

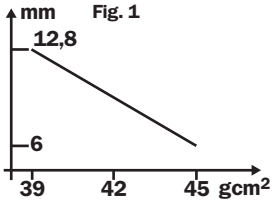


Fig. 1

Order information see pages 64/65

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 32,768 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 8,192

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**	**–**								

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	
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 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 07999 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 8,192

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**	**–**								

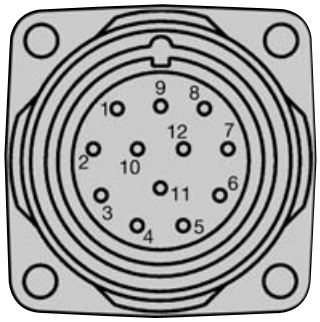
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
A	**R**	**S**	**6**	**0**	**–**								

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

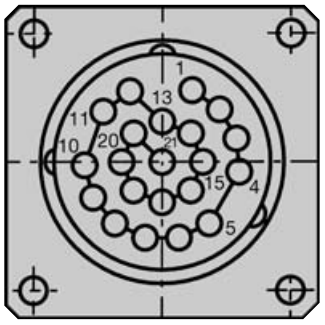
Allocation for encoder with 12 pin connector; SSI Interface



View of the connector M23 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/$\overline{CCW}$	5	pink
N. C.	6	–
N. C.	7	–
U_s	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 M23 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	U_s	U_s	U_s	
Housing		Screen	Screen	Screen	

* Set line only possible with a cable outlet

U_s	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 U_s.
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 U_s for more than 100 ms, the mechanical position corresponds to the value 0.

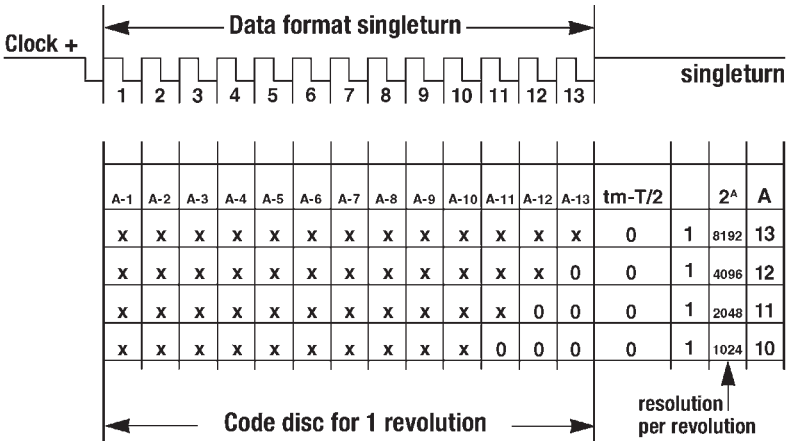
Signal outputs

Data format for resolutions ≤ 8,192 (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.



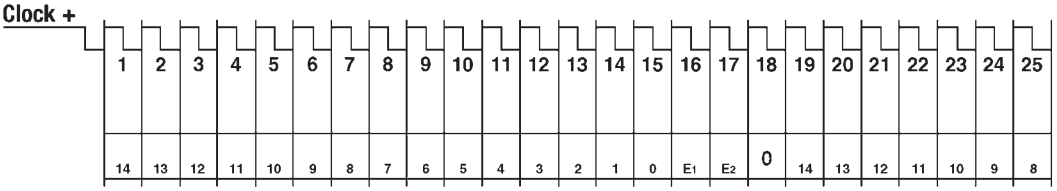
A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	tm-T/2		2^A	A
x	x	x	x	x	x	x	x	x	x	x	x	x	0	1	8192	13
x	x	x	x	x	x	x	x	x	x	x	x	0	0	1	4096	12
x	x	x	x	x	x	x	x	x	x	x	0	0	0	1	2048	11
x	x	x	x	x	x	x	x	x	x	0	0	0	0	1	1024	10

Data format for resolutions > 8,192 (14 and 15 bits)

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

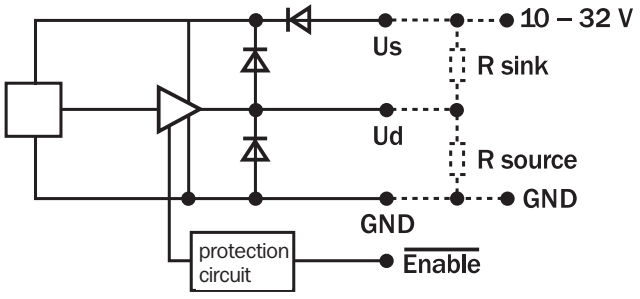
Error 1 (E_1) = Position error
During the determination of the position, an error has occurred since the last SSI transmission. This error bit will be deleted during the next SSI transmission.

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



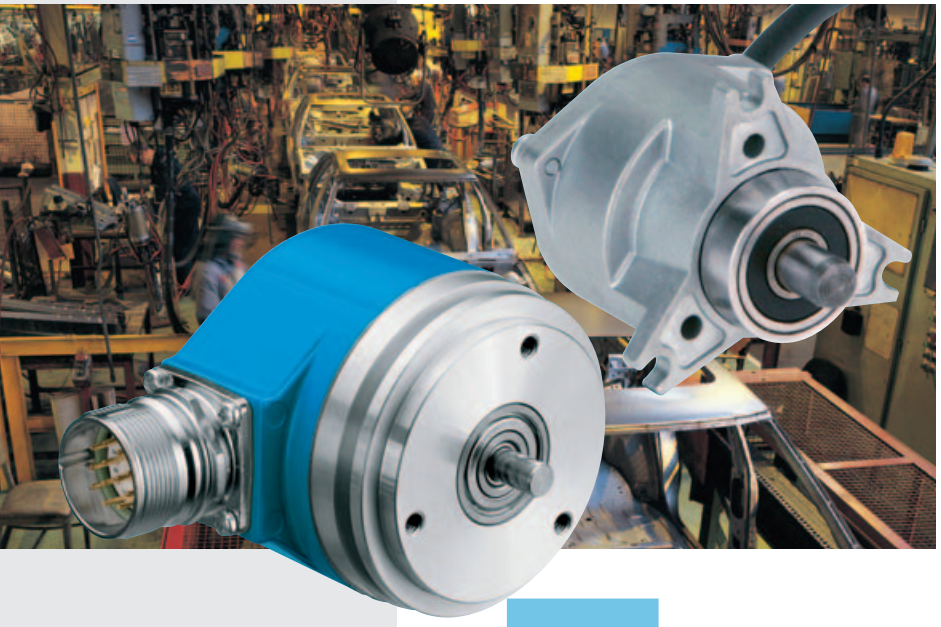
Technical Data: Parallel interface

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)	to Id_H	10 mA	2.8 V
U_S-Ud_H		30 mA	3.0 V
Output saturation voltage (L-level)	to 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

Number of lines 1 up to 8,192

Incremental Encoder

Incremental Encoder – robust and reliable



Whether with face mount flange, servo flange, blind or through hollow shaft with connector or cable outlet, TTL or HTL interface, the incremental 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,
· packing machines.

The incremental encoder series from SICK-STEGMANN offers the user many technical options.

DRS61: The number of lines from 1 up to 8,192 and the width of the zero pulse can be freely programmed **by the customer**

DRS60: Incremental encoders are available with any desired number of lines between 1 and 8,192

DKS40: Extremely robust per Mini-Disc technology, resolutions up to 2,048

DGS60, DGS65, DGS66: Under toughest environmental conditions, resolutions up to 10,000 lines

◄ Metering, filling, closing – every step is precisely monitored and controlled. Incremental Encoders are used in packaging technology, at points where it really matters.

▼ In harsh environments, we rely not only on technical capabilities but also on a robust housing. With protection of up to IP 67, the DGS Encoder series is extremely reliable, even in harsh operating conditions.

▲ Each sequence of movements starts at the same point, taking the same path at a precisely calculated speed. Incremental Encoders not only safeguard the production process, but also the quality of the manufactured products.

▲ Speed and absolute precision are prerequisite for success in the printing industry. In amny of these areas, Incremental Encoders are prerequisite for controlled production sequences.

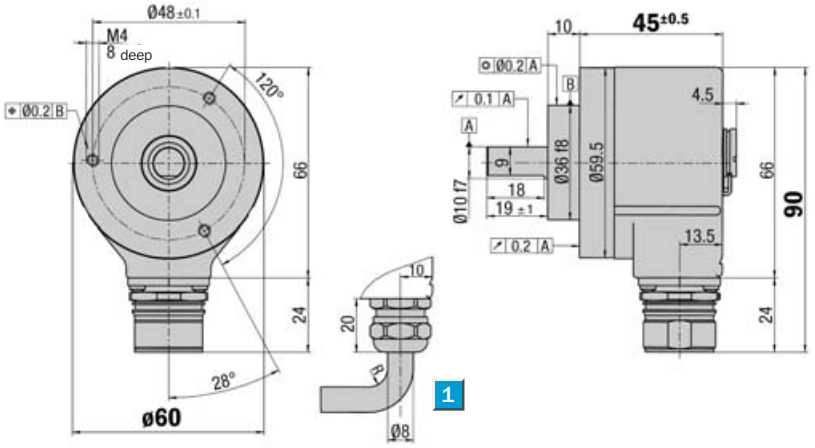
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**

See chapter Accessories
Accessories for encoders

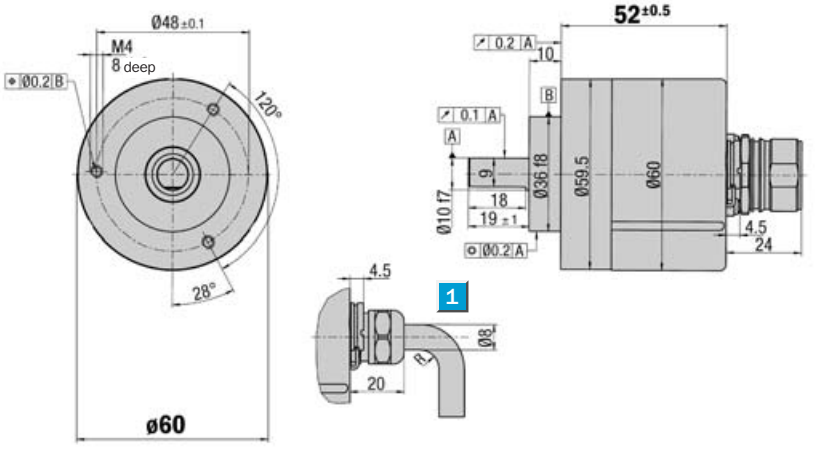
Dimensional drawing face mount flange radial



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing face mount flange axial

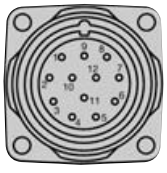


1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	$\overline{B}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	A	white	Signal line
6	$\overline{A}$	brown	Signal line
7	N. C.	orange	Not connected
8	B	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]



View of the connector M23 fitted to the encoder body

[1] Potential free to housing

N. C. = Not connected

Technical Data acc. to DIN 32878	DRS 60/DRS 61 face mount flange	Flange type face m.									
Solid shaft	10 mm										
Number of lines per revolution	00001 up to 08192, see order info										
Electrical Interface	TTL/RS 422, 6-channel										
	HTL/push-pull, 6-channel										
Mass [1]	Approx. 0.3 kg										
Moment of inertia of the rotor	54 gcm^2										
Measuring step	90°/number of lines										
Reference signal											
Number	1										
Position [2]	90° or 180°										
Error limits											
binary number of lines	0.035°										
non-binary number of lines	0.046°										
Measuring step deviation											
binary number of lines	0.005°										
non-binary number of lines	0.016°										
Max. output frequency											
TTL	820 kHz										
HTL	200 kHz										
Operating torque max.											
with shaft seal	6,000 min^{-1}										
without shaft seal [3]	10,000 min^{-1}										
Max. angular acceleration	5 x 10^5 rad/s^2										
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 … 2000 g/Hz										
Protection class IEC 60529											
Connector outlet [8]	IP 65										
Cable outlet	IP 66										
Operating voltage range											
Load current TTL/RS 422, 4.5 … 5.5 V	Max. 20 mA										
TTL/RS 422, 10 … 32 V	Max. 20 mA										
HTL/push-pull, 10 … 32 V	Max. 60 mA										
No-load operating current											
at 10 … 32 V	Typ. 100 mA										
at 5 V	Typ. 120 mA										
Operation of zero-set [9]	≥ 100 ms										
Initialisation time after power on	40 ms										

[1] Concerning encoder with connector
[2] Electrical, logically linked to A and B
[3] In case, that shaft seal has been removed by customer
[4] Condensation of the optical scanning not permitted
[5] To DIN EN 61000-6-2 and DIN EN 61000-6-3
[6] To DIN EN 60068-2-27
[7] To DIN EN 60068-2-6
[8] With mating connector fitted
[9] Only with shaft stationary

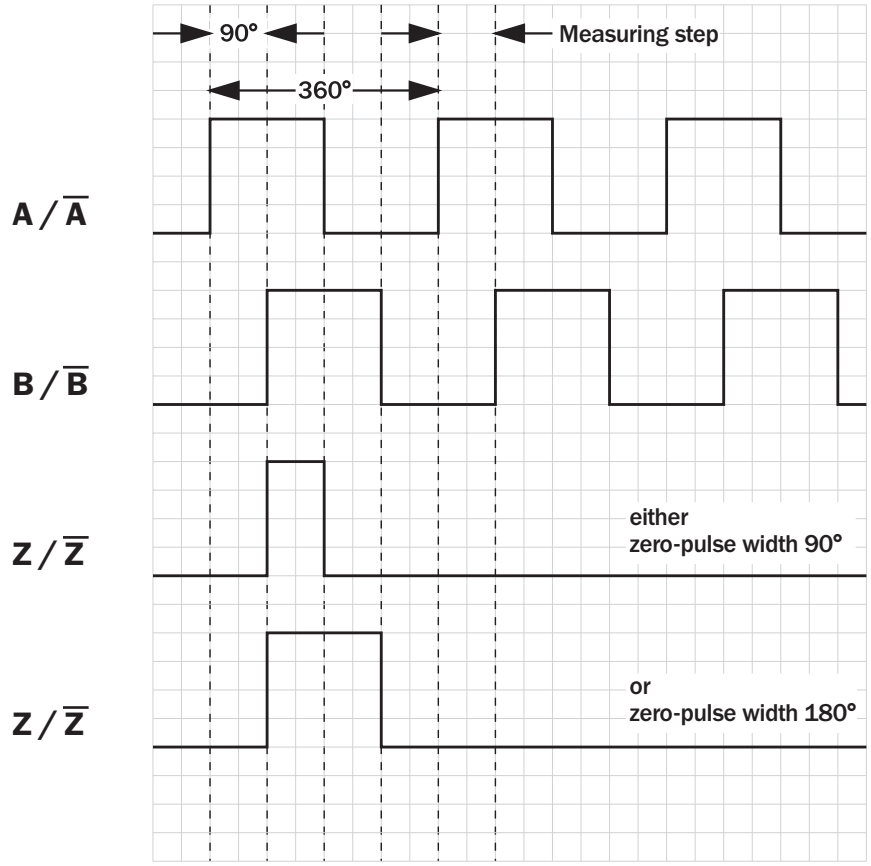
Order information see page 73

Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**

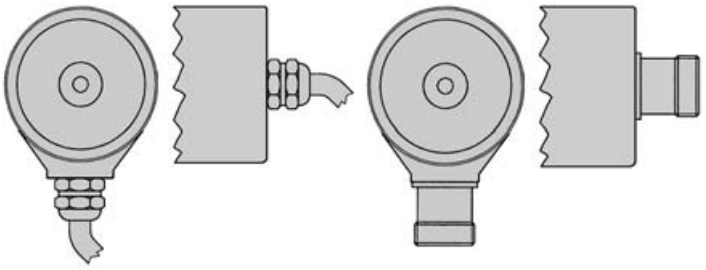
Incremental pulse diagram



Electrical interface			
Supply voltage	4.5 … 5.5 V	10 … 32 V	10 … 32 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type

Cable radial	Cable axial	Connector radial	Connector axial



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DRS 60, face mount flange, solid 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
D	R	S	6	0	–		4						

Electrical interface

4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 90°	= A
4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 180°	= B
10 … 32 V, TTL/RS 422 Zero-pulse width 90°	= C
10 … 32 V, TTL/RS 422 Zero-pulse width 180°	= D
10 … 32 V, HTL/push-pull Zero-pulse width 90°	= E
10 … 32 V, HTL/push-pull Zero-pulse width 180°	= F

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, radial 10 m	= N
Cable 11 core, axial 1.5 m	= R
Cable 11 core, axial 3 m	= S
Cable 11 core, axial 5 m	= T
Cable 11 core, axial 10 m	= U

Number of lines

Each number of lines from 00001 up to 08192 possible.
Always 5 characters in clear text.

Order example Incremental Encoder DRS 60

4.5 … 5.5 V, TTL/RS 422 zero-pulse width 90°; face mount flange; connector M23, 12 pin, radial; number of lines: 360

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
D	R	S	6	0	–	A	4	A	0	0	3	6	0

NEW

Incremental-Encoder DRS 61 face mount flange, solid shaft (number of lines and zero pulse width can be freely programmed by the customer) [1]

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
D	R	S	6	1	–		4		0	8	1	9	2

Electrical interface

4.5 … 5.5 V, TTL/RS 422	= A
10 … 32 V, TTL/RS 422	= C
10 … 32 V, HTL/push-pull	= E

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, axial 1.5 m	= R

Number of lines

Factory-programmed to 8,192.

Order example Incremental Encoder DRS 61

4.5 … 5.5 Volt, TTL/RS 422; face mount flange; connector M23, 12 pin, radial; number of lines: 8,192 (factory-programmed)

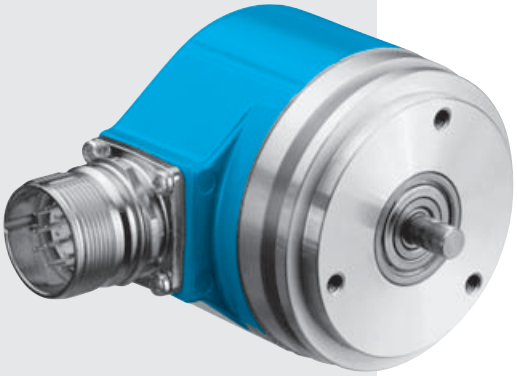
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	1	–	A	4	A	0	8	1	9	2

[1] Please order programming tool seperately (see chapter Accessories)

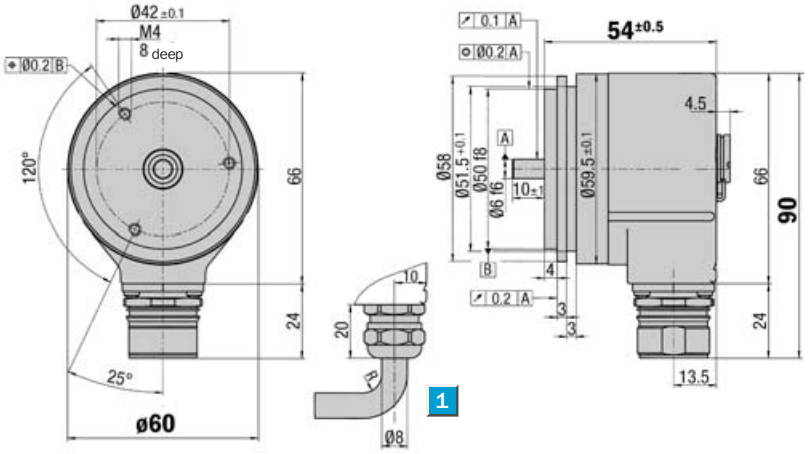
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



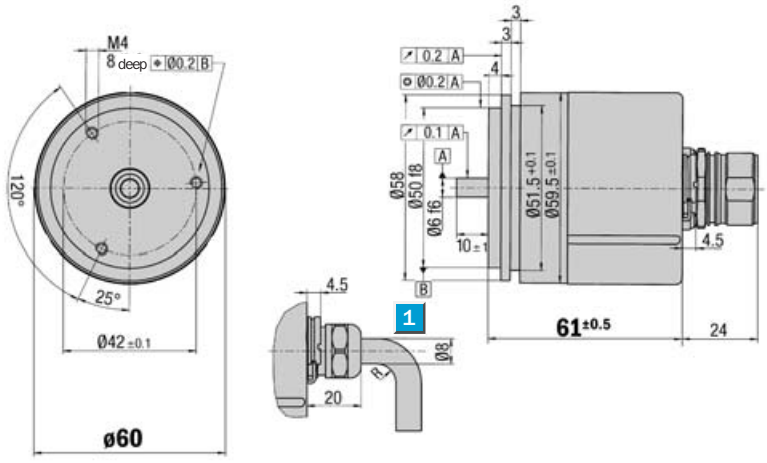
Dimensional drawing servo flange radial



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing servo flange axial

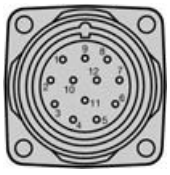


1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	$\overline{B}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	A	white	Signal line
6	$\overline{A}$	brown	Signal line
7	N. C.	orange	Not connected
8	B	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]



View of the connector M23 fitted to the encoder body

[1] Potential free to housing

N. C. = Not connected

See chapter Accessories
Accessories for encoders

Technical Data acc. to DIN 32878	DRS 60/DRS 61 servo flange	Flange type: servo
Solid shaft	6 mm	
Number of lines per revolution	00001 up to 08192, see order info	
Electrical Interface	TTL/RS 422, 6-channel	
	HTL/push-pull, 6-channel	
Mass [1]	Approx. 0.3 kg	
Moment of inertia of the rotor	48 gcm^2	
Measuring step	90°/number of lines	
Reference signal		
Number	1	
Position [2]	90° or 180°	
Error limits		
binary number of lines	0.035°	
non-binary number of lines	0.046°	
Measuring step deviation		
binary number of lines	0.005°	
non-binary number of lines	0.016°	
Max. output frequency		
TTL	820 kHz	
HTL	200 kHz	
Operating torque max.		
with shaft seal	6,000 min^{-1}	
without shaft seal [3]	10,000 min^{-1}	
Max. angular acceleration	5 x 10^5 rad/s^2	
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 … 2000 g/Hz	
Protection class IEC 60529		
Connector outlet [8]	IP 65	
Cable outlet	IP 66	
Operating voltage range		
Load current TTL/RS 422, 4.5 … 5.5 V	Max. 20 mA	
TTL/RS 422, 10 … 32 V	Max. 20 mA	
HTL/push-pull, 10 … 32 V	Max. 60 mA	
No-load operating current		
at 10 … 32 V	Typ. 100 mA	
at 5 V	Typ. 120 mA	
Operation of zero-set [9]	≥ 100 ms	
Initialisation time after power on	40 ms	

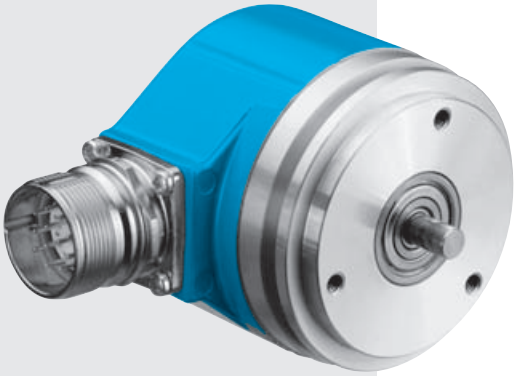
1) Concerning encoder with connector
2) Electrical, logically linked to A and B
3) In case, that shaft seal has been removed by customer
4) Condensation of the optical scanning not permitted
5) To DIN EN 61000-6-2 and DIN EN 61000-6-3
6) To DIN EN 60068-2-27
7) To DIN EN 60068-2-6
8) With mating connector fitted
9) Only with shaft stationary

Order information see page 77

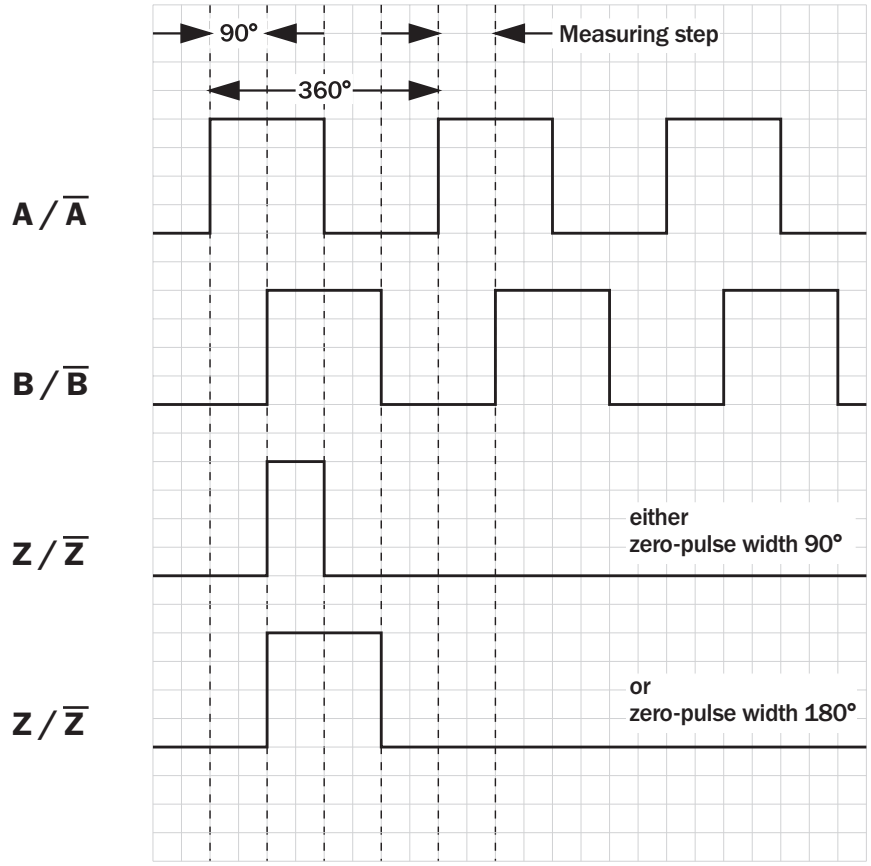
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



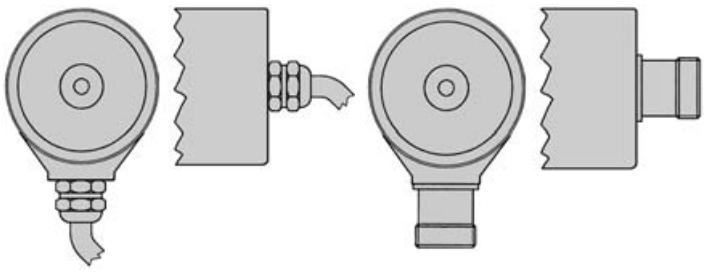
Incremental pulse diagram



Electrical interface			
Supply voltage	4.5 … 5.5 V	10 … 32 V	10 … 32 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type

Cable radial	Cable axial	Connector radial	Connector axial



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DRS 60, servo flange, solid 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
D	R	S	6	0	–		1						

Electrical interface

4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 90°	= **A**
4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 180°	= **B**
10 … 32 V, TTL/RS 422 Zero-pulse width 90°	= **C**
10 … 32 V, TTL/RS 422 Zero-pulse width 180°	= **D**
10 … 32 V, HTL/push-pull Zero-pulse width 90°	= **E**
10 … 32 V, HTL/push-pull Zero-pulse width 180°	= **F**

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, radial 10 m	= **N**
Cable 11 core, axial 1.5 m	= **R**
Cable 11 core, axial 3 m	= **S**
Cable 11 core, axial 5 m	= **T**
Cable 11 core, axial 10 m	= **U**

Number of lines

Each number of lines from 00001 up to 08192 possible.
Always 5 characters in clear text.

Order example Incremental Encoder DRS 60

4.5 … 5.5 V, TTL/RS 422 zero-pulse width 90°; servo flange; connector M23, 12 pin, radial; number of lines: 360

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
D	R	S	6	0	–	A	1	A	0	0	3	6	0

NEW

Incremental-Encoder DRS 61, servo flange, solid shaft (number of lines and zero pulse width can be freely programmed by the customer) [1]

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
D	R	S	6	1	–		1		0	8	1	9	2

Electrical interface

4.5 … 5.5 V, TTL/RS 422	= **A**
10 … 32 V, TTL/RS 422	= **C**
10 … 32 V, HTL/push-pull	= **E**

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, axial 1.5 m	= **R**

Number of lines

Factory-programmed to 8,192.

Order example Incremental Encoder DRS 61

4.5 … 5.5 Volt, TTL/RS 422; servo flange; connector M23, 12 pin, radial; number of lines: 8,192 (factory-programmed)

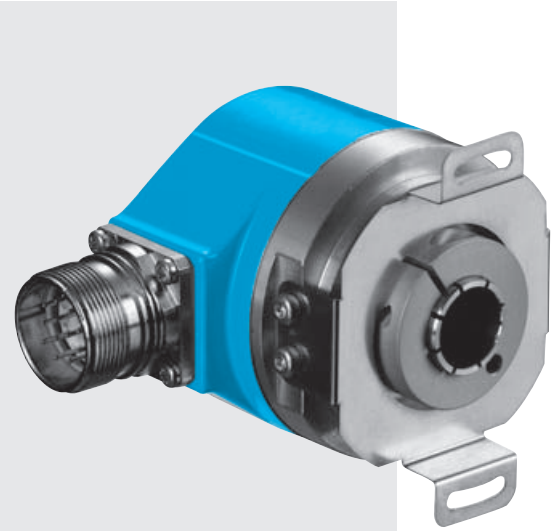
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	1	–	A	1	A	0	8	1	9	2

[1] Please order programming tool seperately (see chapter Accessories)

Number of lines
1 up to 8,192

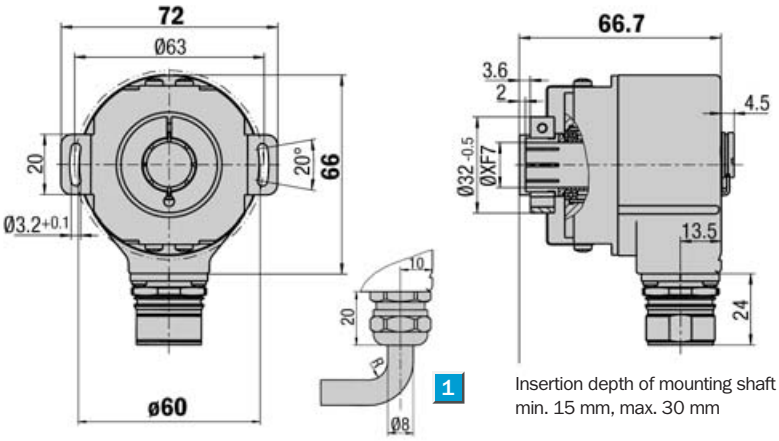
Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



See chapter Accessories
Accessories for encoders

Dimensional drawing blind hollow shaft radial

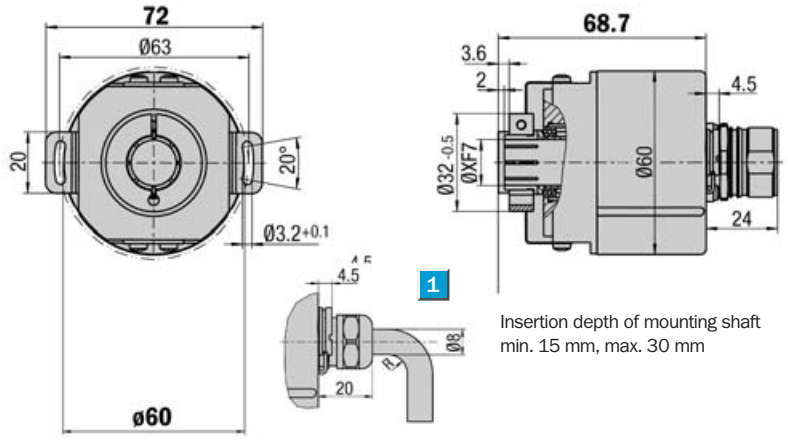


Insertion depth of mounting shaft min. 15 mm, max. 30 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing blind hollow shaft axial



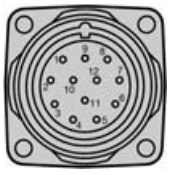
Insertion depth of mounting shaft min. 15 mm, max. 30 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	$\overline{B}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	A	white	Signal line
6	$\overline{A}$	brown	Signal line
7	N. C.	orange	Not connected
8	B	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]



View of the connector M23 fitted to the encoder body

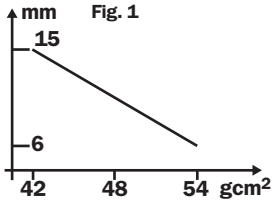
[1] Potential free to housing

N. C. = Not connected

Technical Data acc. to DIN 32878	DRS 60/DRS 61 blind hollow shaft	Flange type: blind
Hollow shaft diameter	6, 8, 10, 12, 15 mm, 1/4", 3/8", 1/2"	
Number of lines per revolution	00001 up to 08192, see order info	
Electrical Interface	TTL/RS 422, 6-channel	
	HTL/push-pull, 6-channel	
Mass [1]	Approx. 0.3 kg	
Moment of inertia of the rotor	See Fig. 1	
Measuring step	90°/number of lines	
Reference signal		
Number	1	
Position [2]	90° or 180°	
Error limits		
binary number of lines	0.035°	
non-binary number of lines	0.046°	
Measuring step deviation		
binary number of lines	0.005°	
non-binary number of lines	0.016°	
Max. output frequency		
TTL	820 kHz	
HTL	200 kHz	
Operating torque max.	3,000 min^{-1}	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	Typ. 0.4 Ncm	
Start up torque	Typ. 0.6 Ncm	
Permissible movement of the drive element		
radial static/dynamic movement	± 0.3/± 0.1 mm	
axial static/dynamic movement	± 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 [6]	50/11 g/ms	
to vibration [6]	20/10 … 2000 g/Hz	
Protection class IEC 60529		
Connector outlet [7]	IP 65	
Cable outlet	IP 66	
Operating voltage range		
Load current TTL/RS 422, 4.5 … 5.5 V	Max. 20 mA	
TTL/RS 422, 10 … 32 V	Max. 20 mA	
HTL/push-pull, 10 … 32 V	Max. 60 mA	
No-load operating current		
at 10 … 32 V	Typ. 100 mA	
at 5 V	Typ. 120 mA	
Operation of zero-set [8]	≥ 100 ms	
Initialisation time after power on	40 ms	

1) Concerning encoder with connector
2) Electrical, logically linked to A and B
3) Condensation of the optical scanning not permitted
4) To DIN EN 61000-6-2 and DIN EN 61000-6-3
5) To DIN EN 60068-2-27
6) To DIN EN 60068-2-6
7) With mating connector fitted
8) Only with shaft stationary

Fig. 1

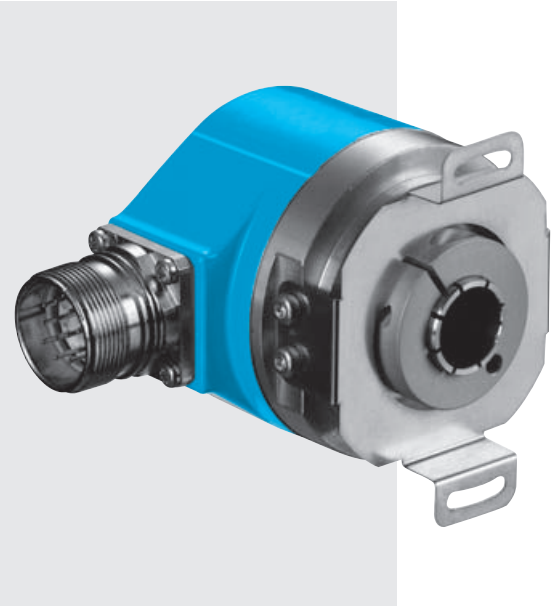


Order information see page 81

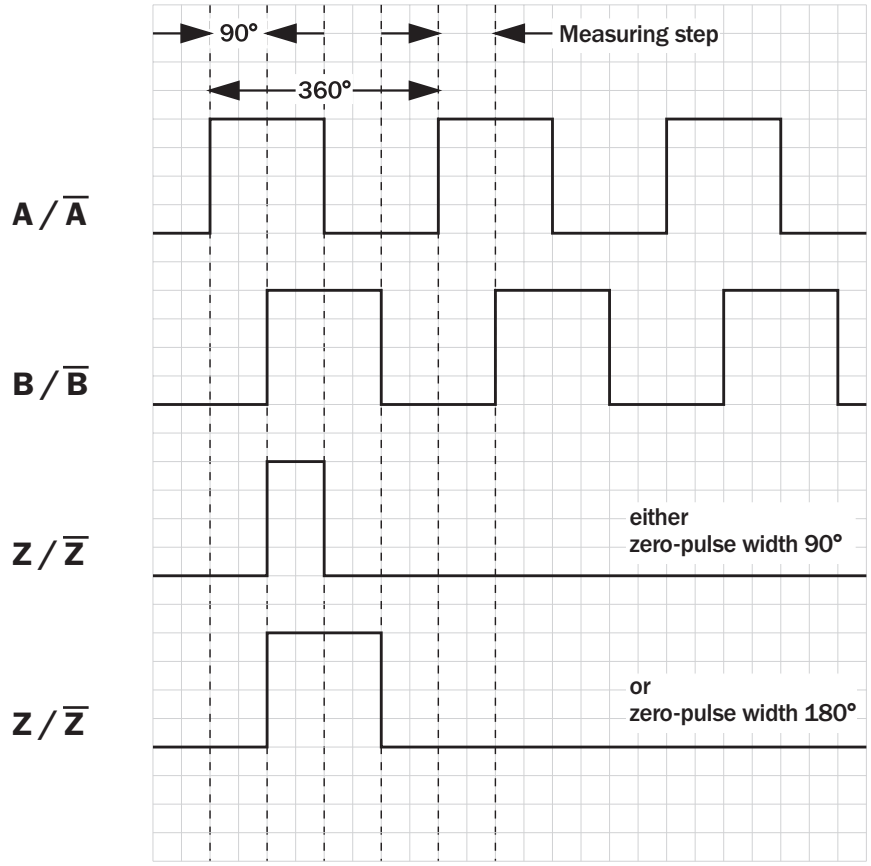
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



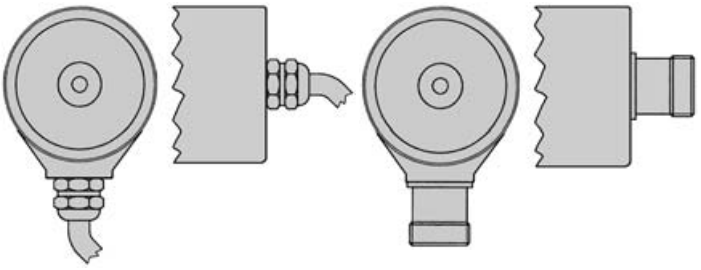
Incremental pulse diagram



Electrical interface			
Supply voltage	4.5 … 5.5 V	10 … 32 V	10 … 32 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type

Cable radial	Cable axial	Connector radial	Connector axial



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DRS 60, 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
D	R	S	6	0	–		A						

Electrical interface

4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 90°	= A
4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 180°	= B
10 … 32 V, TTL/RS 422 Zero-pulse width 90°	= C
10 … 32 V, TTL/RS 422 Zero-pulse width 180°	= D
10 … 32 V, HTL/push-pull Zero-pulse width 90°	= E
10 … 32 V, HTL/push-pull Zero-pulse width 180°	= F

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, radial 10 m	= N
Cable 11 core, axial 1.5 m	= R
Cable 11 core, axial 3 m	= S
Cable 11 core, axial 5 m	= T
Cable 11 core, axial 10 m	= U

Number of lines

Each number of lines from 00001 up to 08192 possible.
Always 5 characters in clear text.

Order example Incremental Encoder DRS 60

4.5 … 5.5 V, TTL/RS 422 zero-pulse width 90°; blind hollow shaft; connector M23, 12 pin, radial; number of lines: 360

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
D	R	S	6	0	–	A	A	A	0	0	3	6	0

NEW

Incremental-Encoder DRS 61 blind hollow shaft (number of lines and zero pulse width can be freely programmed by the customer) 1

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
D	R	S	6	1	–		A		0	8	1	9	2

Electrical interface

4.5 … 5.5 V, TTL/RS 422	= A
10 … 32 V, TTL/RS 422	= C
10 … 32 V, HTL/push-pull	= E

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, axial 1.5 m	= R

Number of lines

Factory-programmed to 8,192.

Order example Incremental Encoder DRS 61

4.5 … 5.5 Volt, TTL/RS 422; blind hollow shaft; connector M23, 12 pin, radial; number of lines: 8,192 (factory-programmed)

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
D	R	S	6	1	–	A	A	A	0	8	1	9	2

1 Please order programming tool seperately (see chapter Accessories)

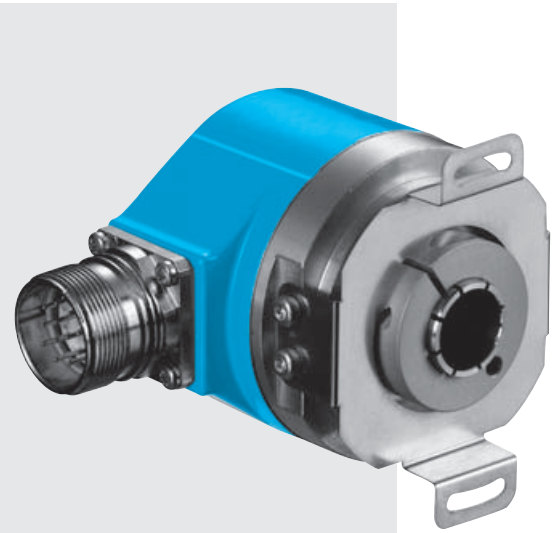
Blind hollow shaft collets

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"

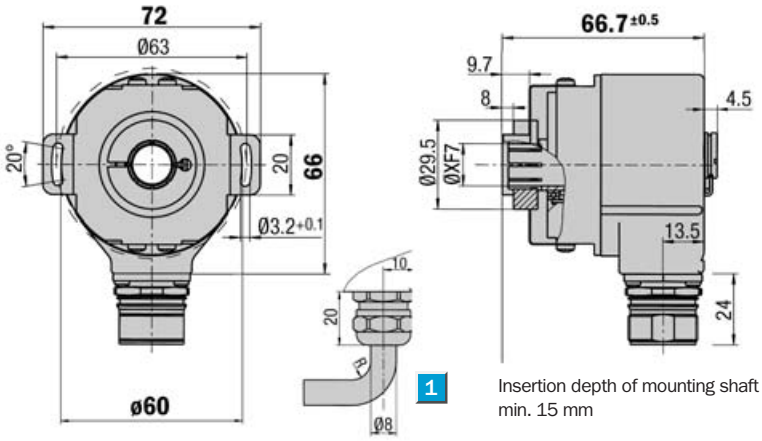
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



Dimensional drawing through hollow shaft radial



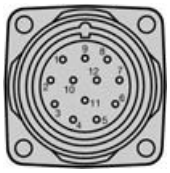
1 Insertion depth of mounting shaft min. 15 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	$\overline{B}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	A	white	Signal line
6	$\overline{A}$	brown	Signal line
7	N. C.	orange	Not connected
8	B	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Zero volt connected to the encoder
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]



View of the connector M23 fitted to the encoder body

[1] Potential free to housing

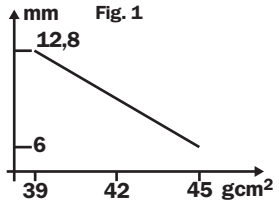
N. C. = Not connected

See chapter Accessories
Accessories for encoders

Technical Data acc. to DIN 32878	DRS 60/DRS 61 through hollow shaft	Flange type through
Hollow shaft diameter	6, 8, 10, 12 mm and 1/4", 3/8", 1/2"	
Number of lines per revolution	00001 up to 08192, see order info	
Electrical Interface	TTL/RS 422, 6-channel	
	HTL/push-pull, 6-channel	
Mass [1]	Approx. 0.3 kg	
Moment of inertia of the rotor	See Fig. 1	
Measuring step	90°/number of lines	
Reference signal		
Number	1	
Position [2]	90° or 180°	
Error limits		
binary number of lines	0.035°	
non-binary number of lines	0.046°	
Measuring step deviation		
binary number of lines	0.005°	
non-binary number of lines	0.016°	
Max. output frequency		
TTL	820 kHz	
HTL	200 kHz	
Operating torque max.	3,000 min^{-1}	
Max. angular acceleration	5 x 10^5 rad/s^2	
Operating torque	Typ. 1.6 Ncm	
Start up torque	Typ. 2.2 Ncm	
Permissible movement of the drive element		
radial static/dynamic movement	± 0.3/± 0.1 mm	
axial static/dynamic movement	± 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 … 2000 g/Hz	
Protection class IEC 60529		
Connector outlet [7]	IP 64	
Cable outlet	IP 64	
Operating voltage range		
Load current TTL/RS 422, 4.5 … 5.5 V	Max. 20 mA	
TTL/RS 422, 10 … 32 V	Max. 20 mA	
HTL/push-pull, 10 … 32 V	Max. 60 mA	
No-load operating current		
at 10 … 32 V	Typ. 100 mA	
at 5 V	Typ. 120 mA	
Operation of zero-set [8]	≥ 100 ms	
Initialisation time after power on	40 ms	

1) Concerning encoder with connector
2) Electrical, logically linked to A and B
3) Condensation of the optical scanning not permitted
4) To DIN EN 61000-6-2 and DIN EN 61000-6-2
5) To DIN EN 60068-2-27
6) To DIN EN 60068-2-6
7) With mating connector fitted
8) Only with shaft stationary

Fig. 1

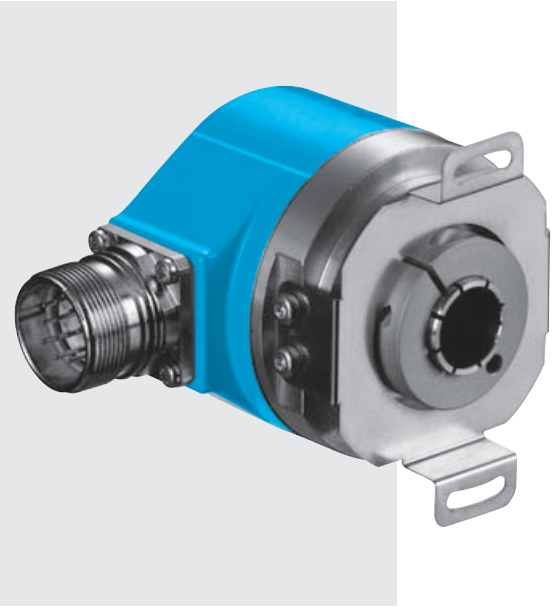


Order information see page 81

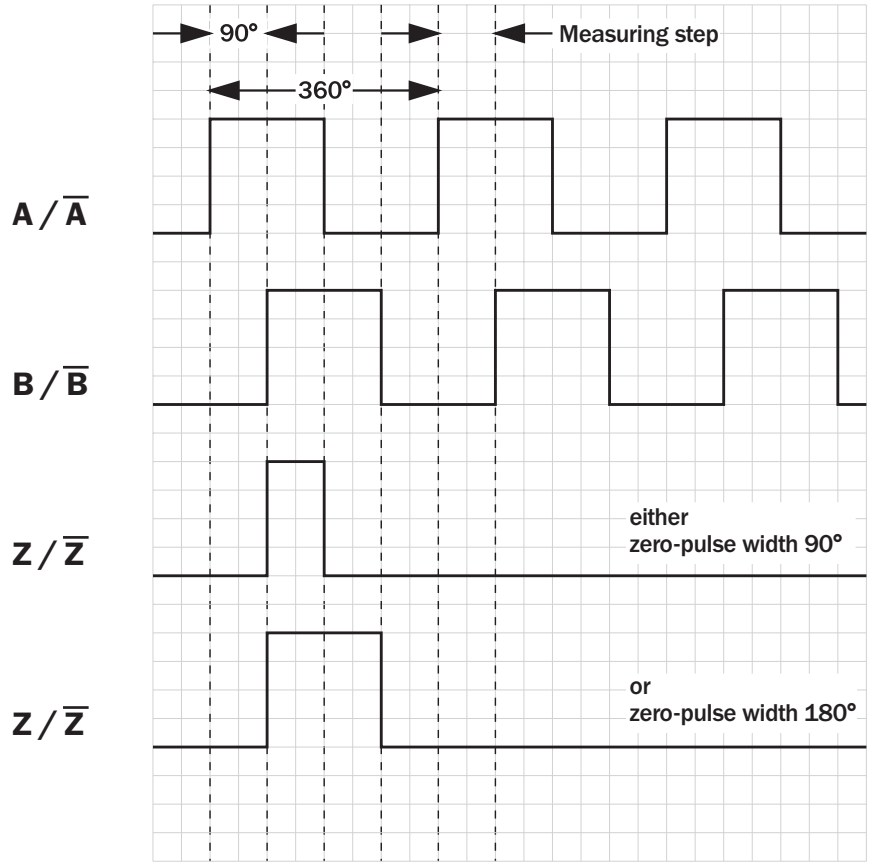
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS 61: number of lines and zero pulse width can be freely programmed **by the customer**



Incremental pulse diagram



Electrical interface			
Supply voltage	4.5 … 5.5 V	10 … 32 V	10 … 32 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type

Cable radial	Connector radial

See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DRS 60, 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
D	R	S	6	0	–		D						

Electrical interface

4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 90°	= A
4.5 … 5.5 V, TTL/RS 422 Zero-pulse width 180°	= B
10 … 32 V, TTL/RS 422 Zero-pulse width 90°	= C
10 … 32 V, TTL/RS 422 Zero-pulse width 180°	= D
10 … 32 V, HTL/push-pull Zero-pulse width 90°	= E
10 … 32 V, HTL/push-pull Zero-pulse width 180°	= F

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
Cable 11 core, radial 10 m	= N

Number of lines

Each number of lines from 00001 up to 08192 possible.
Always 5 characters in clear text.

Order example Incremental Encoder DRS 60

4.5 … 5.5 V, TTL/RS 422 zero-pulse width 90°; through hollow shaft; connector M23, 12 pin, radial; number of lines: 360

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
D	R	S	6	0	–	A	D	A	0	0	3	6	0

NEW

Incremental-Encoder DRS 61 through hollow shaft (number of lines and zero pulse width can be freely programmed by the customer) [1]

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
D	R	S	6	1	–		D		0	8	1	9	2

Electrical interface

4.5 … 5.5 V, TTL/RS 422	= A
10 … 32 V, TTL/RS 422	= C
10 … 32 V, HTL/push-pull	= E

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

Number of lines

Factory-programmed to 8,192.

Order example Incremental Encoder DRS 61

4.5 … 5.5 Volt, TTL/RS 422; through hollow shaft; connector M23, 12 pin, radial; number of lines: 8,192 (factory-programmed)

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
D	R	S	6	1	–	A	D	A	0	8	1	9	2

[1] Please order programming tool seperately (see chapter Accessories)

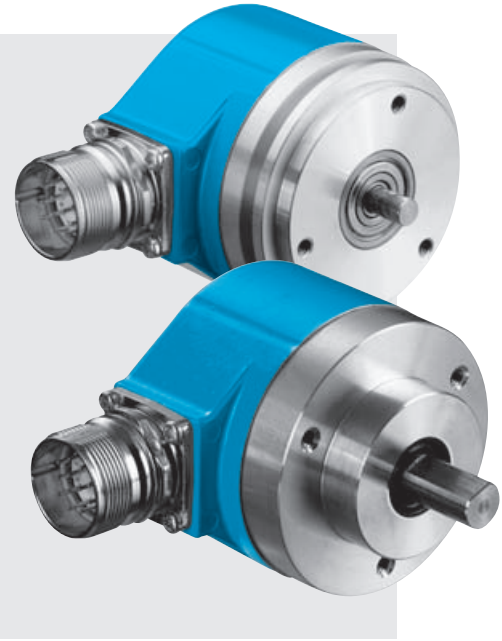
Through hollow shaft collets

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"

Number of lines
100 to 10,000

Incremental Encoder

- Servo or face mount flange
- Connector or cable outlet
- Protection class up to IP 67
- Electrical Interfaces
  TTL and HTL



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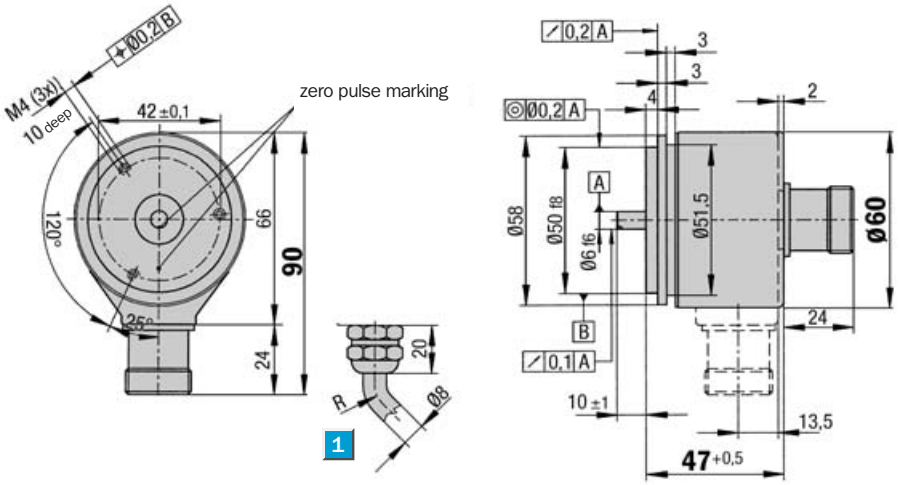
See chapter Accessories
Accessories for encoders

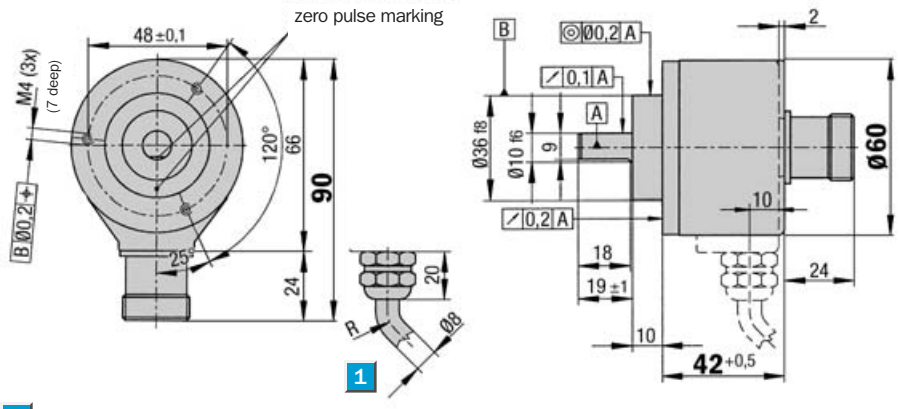
Dimensional drawing servo flange



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing face mount flange

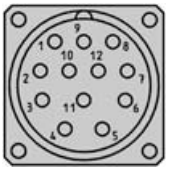


1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal HTL	Signal TTL	Core colour (cable outlet)	Explanation
1	N. C.	$\overline{B}$	black	Signal line
2	N. C.	Sense +	grey	Connected internally to U_s
3	Z	Z	lilac	Signal line
4	N. C.	$\overline{Z}$	yellow	Signal line
5	A	A	white	Signal line
6	N. C.	$\overline{A}$	brown	Signal line
7	N. C.	N. C.	orange	N. C.
8	B	B	pink	Signal line
9	Screen	Screen		Housing potential
10	GND	GND	blue	Ground connection
11	N. C.	Sense –	green	Connected internally to ground
12	U_s	U_s	red	Power supply[1)]



View of the connector M23 fitted to the encoder body

[1)] Potential free to housing

N. C. = Not Connected

Technical Data to DIN 32878	DGS60	Flange type: servo	face m.
Solid shaft	10 mm		■
	6 mm	■	
Number of lines (Z) per revolution	00100 to 10,000, see order info	■	■
Attention: number of lines > 5000	Only with TTL 4 … 6V	■	■
Electrical Interface	TTL/RS 422, 6-channel	■	■
	HTL/push-pull, 3-channel (A, B, Z)	■	■
Mass [1]	Approx. 0.3 kg	■	■
Moment of inertia of the rotor			
Servo flange	13 gcm^2	■	
Face mount flange	25 gcm^2		■
Measuring step	90°/number of lines	■	■
Reference signal			
Number	1	■	■
Position	90° electr. & logically interlocked with A+B	■	■
Error limits			
100 ≤ Z < 1250	45/Z + 0.054°	■	■
1250 < Z ≤ 10000	45/Z + 0.039°	■	■
Measuring step deviation	45/Z °	■	■
Max. output frequency			
TTL	300 kHz (600 at > 5000 lines)	■	■
HTL	200 kHz	■	■
Max. operating speed [2]			
with shaft seal	6,000 min^{-1}	■	■
without shaft seal	10,000 min^{-1}	■	■
Max. angular acceleration	5 x 10^5 rad/s^2	■	■
Operating torque			
with shaft seal	1 Ncm	■	■
without shaft seal	0.1 Ncm	■	■
Start up torque			
with shaft seal	1.5 Ncm	■	■
without shaft seal	0.2 Ncm	■	■
Permissible shaft loading			
Servo flange radial/axial	20 N/10 N	■	
Face mount flange radial/axial	40 N/20 N		■
Bearing lifetime	3.6 x 10^{10} revolutions	■	■
Working temperature range	– 20 … + 85 °C	■	■
Storage temperature range	– 30 … + 85 °C	■	■
Permissible relative humidity [3]	90 %	■	■
EMC [4]		■	■
Resistance			
to shocks [5]	30/11 g/ms	■	■
to vibration [6]	20/10 … 2000 g/Hz	■	■
Protection class acc. IEC 60529 [7]			
Housing side	IP 67	■	■
Flange side	IP 65	■	■
Operating voltage range			
Load current TTL/RS 422, 4 … 6 V	Max. 20 mA	■	■
TTL/RS 422, 10 … 30 V	Max. 20 mA	■	■
HTL/push-pull, 10 … 30 V	Max. 60 mA	■	■
Operating current range at no load			
at 24 V	100 mA	■	■
at 5 V	120 mA	■	■

1) For an encoder with connector outlet

2) At speeds > 6000 rpm the shaft seal must be removed

3) Condensation not permitted

4) To DIN EN 61000-6-2 and DIN EN 61000-6-3

5) To DIN EN 60068-2-27

6) To DIN EN 60068-2-6

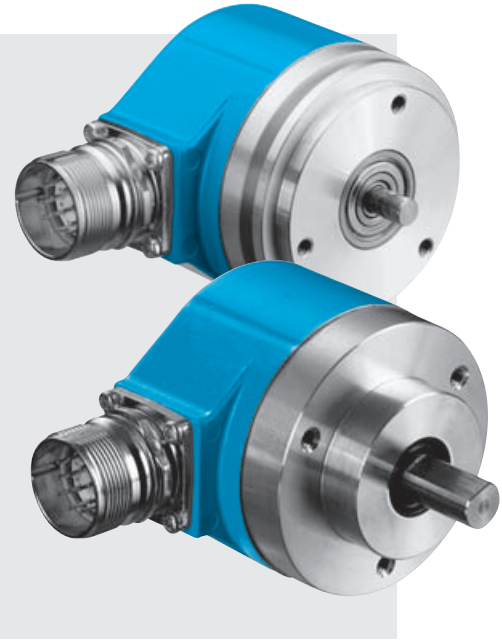
7) With mating connector fitted

Order information see page 89

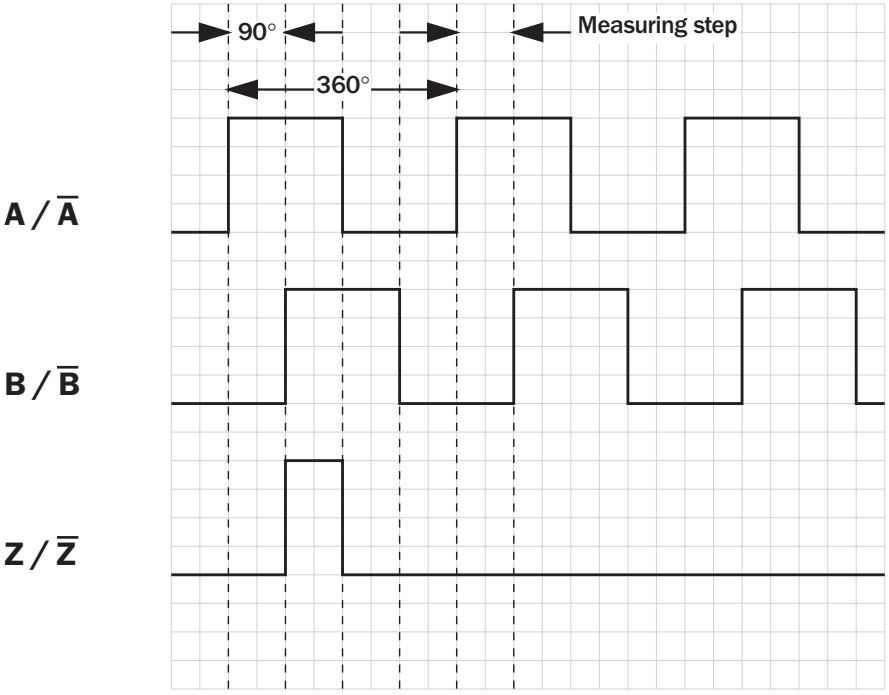
Number of lines
100 to 10,000

Incremental Encoder

- Servo or face mount flange
- Connector or cable outlet
- Protection class up to IP 67
- Electrical Interfaces
  TTL and HTL

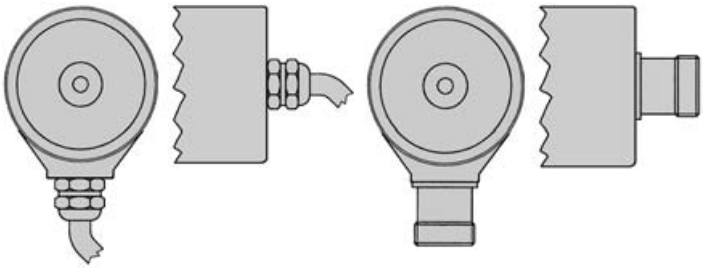


Incremental pulse diagram



Electrical interfaces			
Supply voltage	4 … 6 V	10 … 30 V	10 … 30 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type			
Cable radial	Cable axial	Connector radial	Connector axial



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DGS60, solid 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
D	**G**	**S**	**6**	**0**	**–**								

Point 7: Electrical interface; Point 8: Mechanical interface; Point 9: Connection type; Points 10–14: Number of lines

Electrical interface	
4 … 6 V, TTL (RS 422)	= **A**
10 … 30 V, TTL (RS 422)	= **C**
10 … 30 V, HTL (push-pull)	= **G**

Mechanical interface	
Servo flange, shaft 6 mm	= **1**
Face mount flange, 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**

Number of lines
Always 5 characters in clear text [1]

[1] Number of lines (Z) per revolution

00100	00250	00500	00720	01024	02000	04000	07200
00125	00256	00512	00750	01200	02048	04096	08000
00150	00300	00570	00800	01250	02500	04500	08192
00160	00314	00600	00900	01500	03000	05000	09000
00180	00360	00625	01000	01800	03600	06000	10000
00200	00400	00700					

Order example: Incremental Encoder DGS60

4 … 6 V, TTL; servo flange; connector M23, 12 pin, radial; number of lines: 360

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
D	**G**	**S**	**6**	**0**	**–**	**A**	**1**	**A**	**0**	**0**	**3**	**6**	**0**

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
D	**G**	**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
D	**G**	**S**	**6**	**0**	**–**								

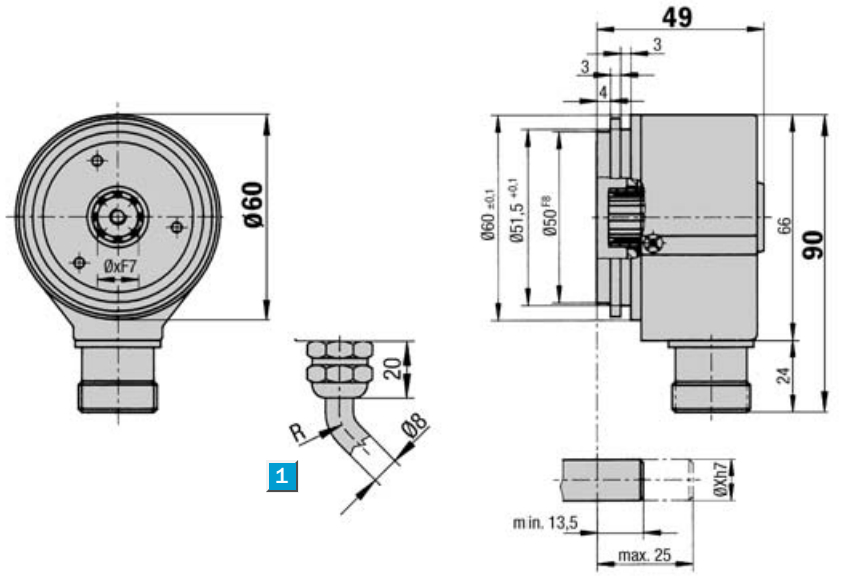
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	**G**	**S**	**6**	**0**	**–**								

Number of lines
100 to 10,000

Incremental Encoder

- Collets for shaft diameter 6, 8, 10, 11, 12 mm and 3/8"
- Connector or cable outlet
- Electrical Interfaces TTL and HTL

Dimensional drawing blind hollow shaft

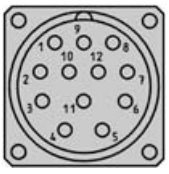


1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 11 core

PIN	Signal HTL	Signal TTL	Core colour (cable outlet)	Explanation
1	N. C.	$\overline{B}$	black	Signal line
2	N. C.	Sense +	grey	Connected internally to U_s
3	Z	Z	lilac	Signal line
4	N. C.	$\overline{Z}$	yellow	Signal line
5	A	A	white	Signal line
6	N. C.	$\overline{A}$	brown	Signal line
7	N. C.	N. C.	orange	N. C.
8	B	B	pink	Signal line
9	Screen	Screen		Housing potential
10	GND	GND	blue	Ground connection
11	N. C.	Sense –	green	Connected internally to ground
12	U_s	U_s	red	Power supply[1)]



View of the connector M23 fitted to the encoder body

1) Potential free to housing

N. C. = Not Connected

See chapter Accessories
Accessories for encoders

Technical Data to DIN 32878		DGS65	Flange type: blind									
Hollow shaft diameter		6, 8, 10, 11, 12 mm and 3/8"										
Number of lines (Z) per revolution		00100 to 10,000, see order info										
Attention: number of lines > 5000		Only with TTL 4…6 V										
Electrical Interface		TTL/RS 422, 6-channel										
		HTL/push-pull, 3-channel (A, B, Z)										
Mass [1]		Approx. 0.4 kg										
Moment of inertia of the rotor		25 gcm^2										
Measuring step		90°/number of lines										
Reference signal												
Number		1										
Position		90° electr. & logically interlocked with A+B										
Error limits												
100 ≤ Z < 1250		45/Z + 0.054°										
1250 < Z ≤ 10000		45/Z + 0.039°										
Measuring step deviation		45/Z °										
Max. output frequency												
TTL		300 kHz (600 at > 5000 lines)										
HTL		200 kHz										
Max. operating speed		6,000 min^{-1}										
Max. angular acceleration		5 x 10^5 rad/s^2										
Operating torque		0.1 Ncm										
Start up torque		0.3 Ncm										
Permissible shaft movement												
static	radial/axial	± 0.5 mm/± 0.5 mm										
dynamic	radial/axial	± 0.1 mm/± 0.2 mm										
Angular movement at right angles to the axis												
static		34 x 10^{-3} mm										
dynamic		17 x 10^{-3} mm										
Bearing lifetime		3.6 x 10^{10} revolutions										
Working temperature range		– 20 … + 85 °C										
Storage temperature range		– 30 … + 85 °C										
Permissible relative humidity [2]		90 %										
EMC [3]												
Resistance												
to shocks [4]		30/11 g/ms										
to vibration [5]		20/10 … 2000 g/Hz										
Protection class acc. IEC 60529 [6]												
Housing side		IP 65										
Flange side		IP 66										
Operating voltage range												
Load current	TTL/RS 422, 4 … 6 V	Max. 20 mA										
	TTL/RS 422, 10 … 30 V	Max. 20 mA										
	HTL/push-pull, 10 … 30 V	Max. 60 mA										
Operating current range at no load												
at 24 V		100 mA										
at 5 V		120 mA										

[1] For an encoder with connector outlet

[2] Condensation not permitted

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] With mating connector fitted

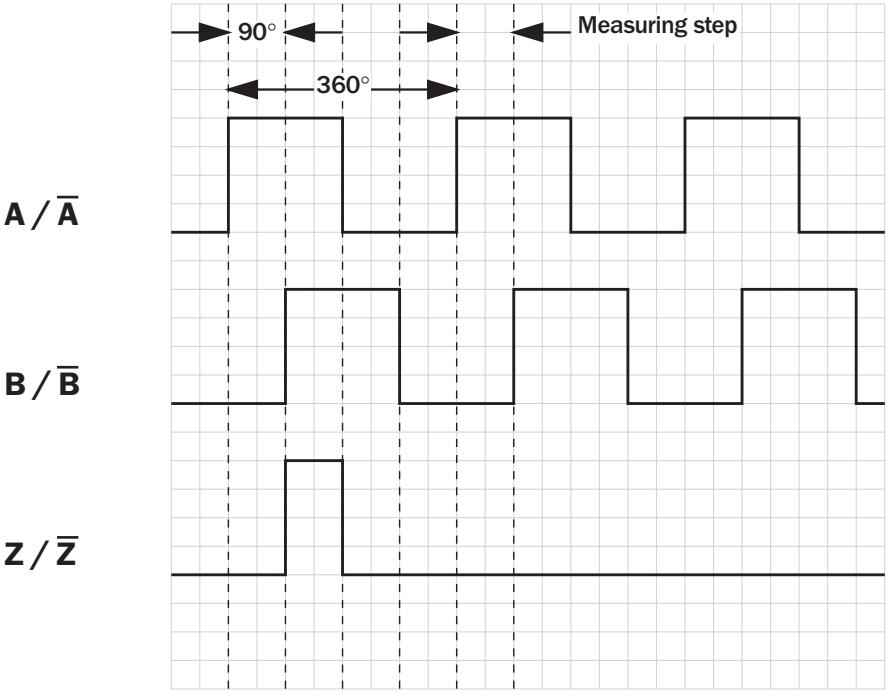
Order information see page 93

Number of lines
100 to 10,000

Incremental Encoder

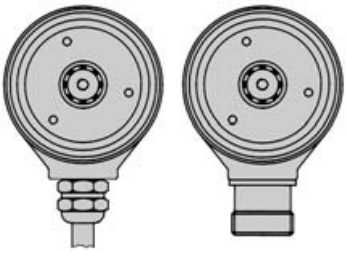
- Collets for shaft diameter 6, 8, 10, 11, 12 mm and 3/8"
- Connector or cable outlet
- Electrical Interfaces TTL and HTL

Incremental pulse diagram



Electrical interfaces			
Supply voltage	4 … 6 V	10 … 30 V	10 … 30 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type	
Cable radial	Connector radial



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DGS65, 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
D	**G**	**S**	**6**	**5**	**–**								

Electrical interface (Point 7)

4 … 6 V, TTL (RS 422)	= **A**
10 … 30 V, TTL (RS 422)	= **C**
10 … 30 V, HTL (push-pull)	= **G**

Mechanical interface (Point 8)

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

[1] Collets for 6, 8, 10, 11, 12 mm and 3/8" as accessories, separate order item (see below).

Connection type (Point 9)

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**

Number of lines (Points 10–14)

Always 5 characters in clear text [1]

[1] Number of lines (Z) per revolution

00100	00244	00336	00600	00785	01024	02000	04096
00125	00250	00360	00625	00800	01200	02048	05000
00150	00256	00400	00700	00900	01250	02500	07200[2]
00160	00300	00500	00720	00938	01375	03000	08192[2]
00180	00308	00512	00750	01000	01500	03600	10000[2]
00200	00314	00570	00768	01005	01800	04000	

[2] Only possible with interface 4 … 6 V, TTL (RS 422) = A

Order example: Incremental Encoder DGS65

4 … 6 V, TTL; blind hollow shaft; connector M23, 12 pin, radial; number of lines: 360

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
D	**G**	**S**	**6**	**5**	**–**	**A**	**A**	**A**	**0**	**0**	**3**	**6**	**0**

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
D	**G**	**S**	**6**	**5**	**–**								

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
D	**G**	**S**	**6**	**5**	**–**								

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
D	**G**	**S**	**6**	**5**	**–**								

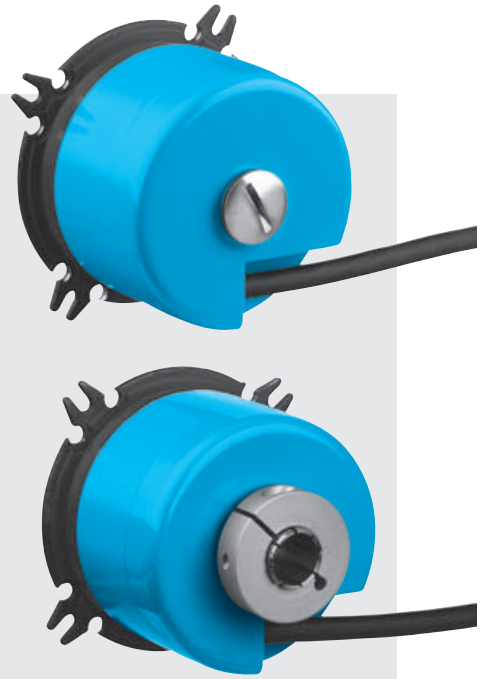
Collets for DGS65 Encoder with blind hollow shaft

Type	Part no.	Shaft diameter
SPZ-006-DD65-A	2029181	6 mm
SPZ-008-DD65-A	2029182	8 mm
SPZ-010-DD65-A	2029183	10 mm
SPZ-011-DD65-A	2019043	11 mm
SPZ-012-DD65-A	2029184	12 mm
SPZ-3E8-DD65-A	2039227	3/8 "

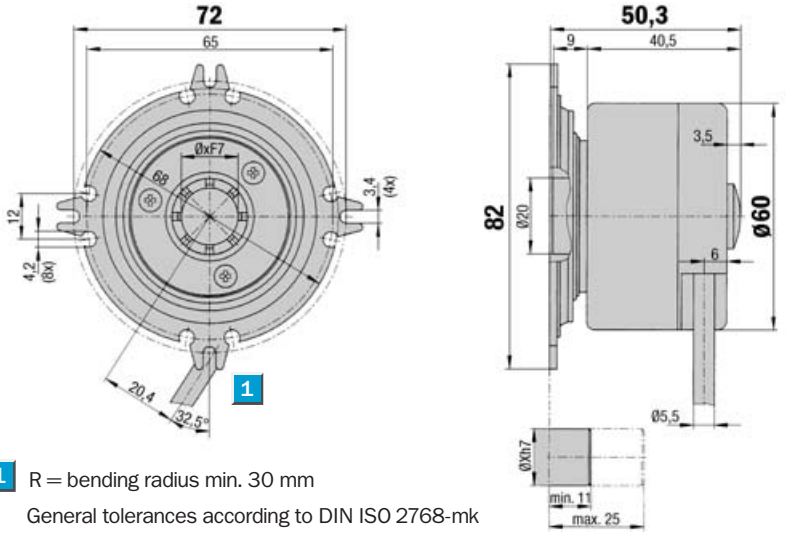
Number of lines
100 to 10,000

Incremental Encoder

- 100 to 10,000 number of lines per revolution
- Electrical Interfaces TTL and HTL



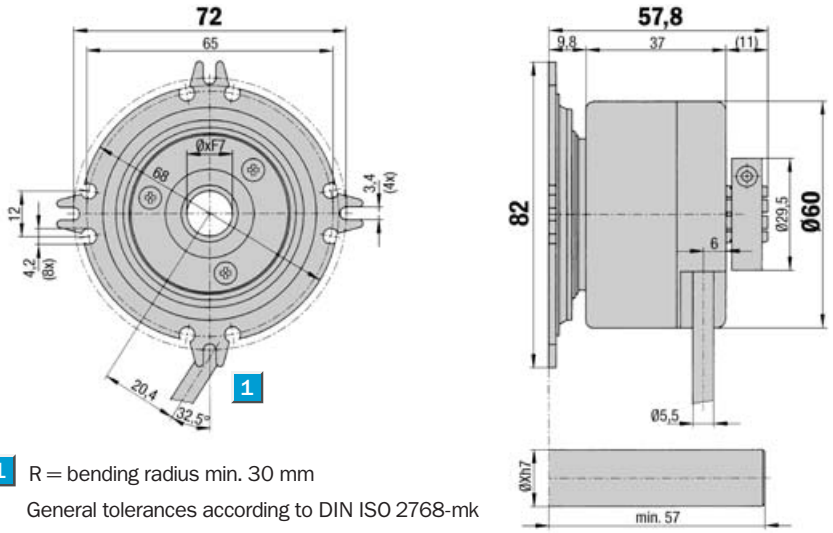
Dimensional drawing blind hollow shaft



1 R = bending radius min. 30 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing through hollow shaft



1 R = bending radius min. 30 mm

General tolerances according to DIN ISO 2768-mk

PIN and wire allocation/cable 8 core

Core colour HTL	Explanation	Core colour TTL	Explanation
black	N. C.	black	$\overline{B}$
lilac	Z	lilac	Z
yellow	N. C.	yellow	$\overline{Z}$
white	A	white	A
brown	N. C.	brown	$\overline{A}$
pink	B	pink	B
Screen	Screen	Screen	Screen
blue	Ground connection	blue	Ground connection
red	Power supply [1]	red	Power supply [1]

[1] Potential free to housing

N. C. = Not Connected

See chapter Accessories
Accessories for encoders

Technical Data to DIN 32878		DGS66	Flange type: blind	Flange type: through
Hollow shaft diameter		6, 8, 10, 12, 14 and 15 mm, 1/2"	■	
		6, 8, 10, 12, 14 mm, 3/8" and 1/2"		■
Number of lines (Z) per revolution		00100 to 10,000, see order info	■	■
Attention: number of lines > 5000		Only with TTL 4…6 V	■	■
Electrical Interface		TTL/RS 422, 6-channel	■	■
		HTL/push-pull, 3-channel (A, B, Z)	■	■
Mass [1]		Approx. 0.3 kg	■	■
Moment of inertia of the rotor		45 gcm^2	■	■
Measuring step		90°/number of lines	■	■
Reference signal				
Number		1	■	■
Position		90° electr. & logically interlocked with A+B	■	■
Error limits				
100 ≤ Z < 1250		45/Z + 0.054°	■	■
1250 < Z ≤ 10000		45/Z + 0.039°	■	■
Measuring step deviation		45/Z °	■	■
Max. output frequency				
TTL		300 kHz (600 at > 5000 lines)	■	■
HTL		200 kHz	■	■
Max. operating speed		6,000 min^{-1}	■	■
Max. angular acceleration		5 x 10^5 rad/s^2	■	■
Operating torque		0.2 Ncm	■	■
Start up torque		0.4 Ncm	■	■
Permissible shaft movement				
static	radial/axial	± 0.1 mm/± 2.0 mm	■	■
dynamic	radial/axial	± 0.05 mm/± 0.2 mm	■	■
Angular movement at right angles to the axis				
static		34 x 10^{-3} mm	■	■
dynamic		17 x 10^{-3} mm	■	■
Bearing lifetime		3.6 x 10^{10} revolutions	■	■
Working temperature range		– 20 … + 85 °C	■	■
Storage temperature range		– 30 … + 85 °C	■	■
Permissible relative humidity [1]		90 %	■	■
EMC [2]			■	■
Resistance				
to shocks [3]		30/11 g/ms	■	■
to vibration [4]		20/10 … 2000 g/Hz	■	■
Protection class acc. IEC 60529				
Cable outlet		IP 65	■	■
Operating voltage range				
Load current	TTL/RS 422, 4 … 6 V	Max. 20 mA	■	■
	TTL/RS 422, 10 … 30 V	Max. 20 mA	■	■
	HTL/push-pull, 10 … 30 V	Max. 60 mA	■	■
Operating current range at no load				
at 24 V		100 mA	■	■
at 5 V		120 mA	■	■

1) Condensation not permitted

2) To DIN EN 61000-6-2 and DIN EN 61000-6-3

3) To DIN EN 60068-2-27

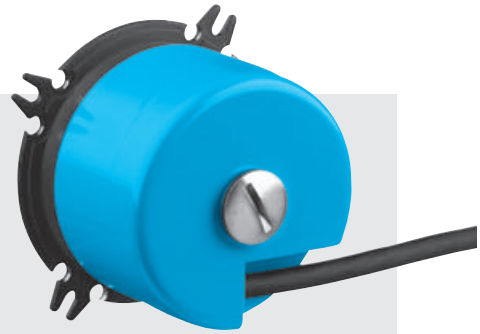
4) To DIN EN 60068-2-6

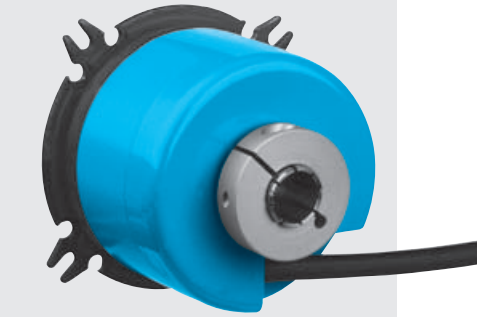
Order information see page 97

Number of lines
100 to 10,000

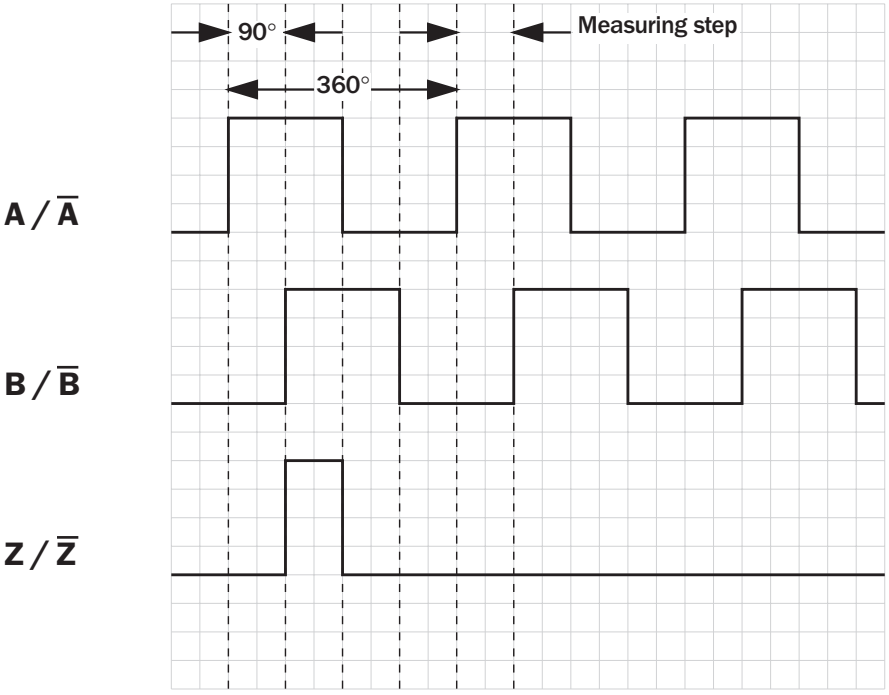
Incremental Encoder

- 100 to 10,000 number of lines per revolution
- Electrical Interfaces TTL and HTL





Incremental pulse diagram



Electrical interfaces			
Supply voltage	4 … 6 V	10 … 30 V	10 … 30 V
Interfaces/drivers	TTL (RS 422)	TTL (RS 422)	HTL (push-pull)

Connection type

Cable radial

See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DGS66, blind/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
D	**G**	**S**	**6**	**6**	**–**								

Point 7: Electrical interface; Point 8: Mechanical interface; Point 9: Connection type; Points 10–14: Number of lines

Electrical interface	
4 … 6 V, TTL (RS 422)	= **A**
10 … 30 V, TTL (RS 422)	= **C**
10 … 30 V, HTL (push-pull)	= **G**

Mechanical interface	
Blind hollow shaft[1]	= **A**
Through hollow shaft 6 mm	= **M**
Through hollow shaft 8 mm	= **P**
Through hollow shaft 3/8"	= **R**
Through hollow shaft 10 mm	= **S**
Through hollow shaft 12 mm	= **T**
Through hollow shaft 1/2"	= **U**
Through hollow shaft 14 mm	= **V**

[1] Collets for 6, 8, 10, 12, 14, 15 mm and 1/2" as accessories, separate order item (see below).

Connection type	
Cable 8 core, radial 1.5 m	= **K**
Cable 8 core, radial 3 m	= **L**
Cable 8 core, radial 5 m	= **M**

Number of lines
Always 5 characters in clear text 1

1 Number of lines (Z) per revolution with electrical interface 4 … 6 V, TTL (RS 422) = A

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

1 Number of lines (Z) per revolution with the electrical interfaces 10 … 30 V, TTL (RS 422) = C and 10 … 30 V, HTL (push-pull) = G

00100	00360	00515	01024	02000	02500	04096	
00250	00500	01000	01250	02048	03600	05000	

Order example Incremental Encoder DGS66

4 … 6 V, TTL; blind hollow shaft; cable 8 core 1.5 m, radial; number of lines: 360

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
D	**G**	**S**	**6**	**6**	**–**	**A**	**A**	**K**	**0**	**0**	**3**	**6**	**0**

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
D	**G**	**S**	**6**	**6**	**–**								

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
D	**G**	**S**	**6**	**6**	**–**								

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
D	**G**	**S**	**6**	**6**	**–**								

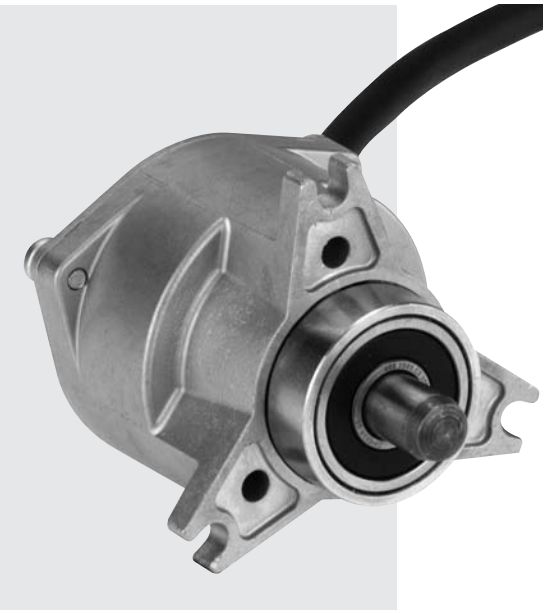
Collets for DGS66 Encoder with blind hollow shaft

Type	Part no.	Shaft diameter
SPZ-006-DD66-A	2029185	6 mm
SPZ-008-DD66-A	2029186	8 mm
SPZ-010-DD66-A	2029187	10 mm
SPZ-012-DD66-A	2029188	12 mm
SPZ-1E2-DD66-A	2029189	1/2 "
SPZ-014-DD66-A	2029190	14 mm
SPZ-015-DD66-A	2029191	15 mm

Number of lines
1 up to 2,048

Incremental-Encoder

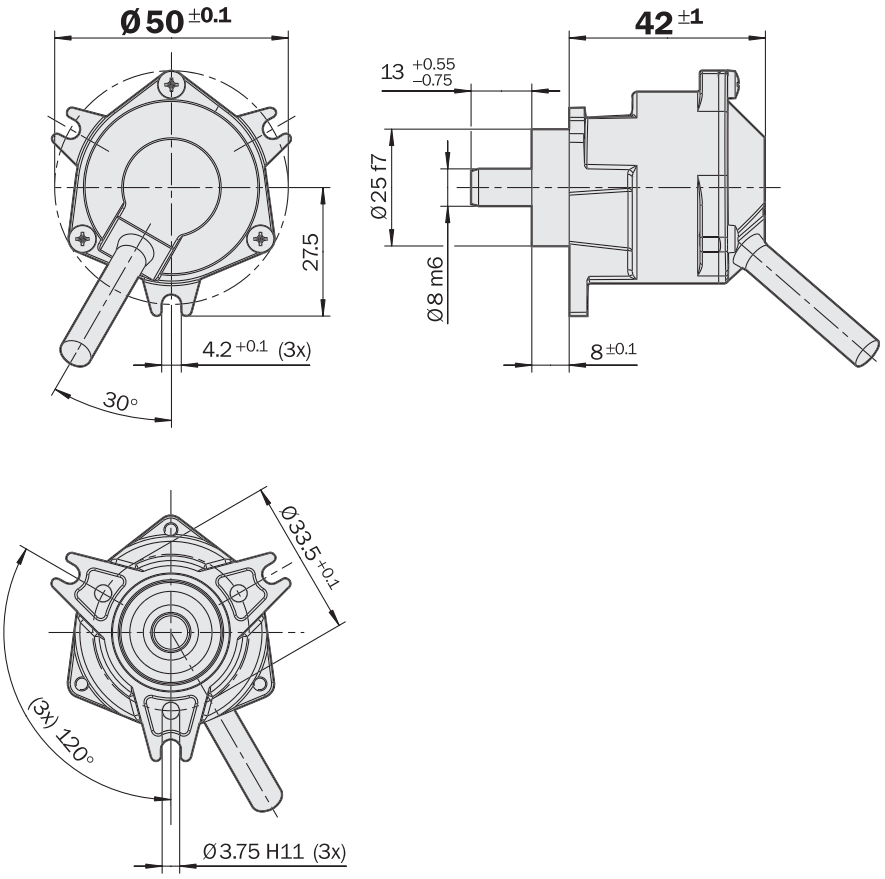
- Cable outlet
- Enclosure rating IP 64
- Electrical Interfaces Open Collector NPN, TTL, HTL



See chapter Accessories

Accessories for encoders

Dimensional drawing face mount flange



General tolerances according to DIN ISO 2768-mk

Wire allocation/cable 8 core

Colour of wires	Signal for OC	Signal for TTL and HTL	Explanation
Red	$+U_S$	$+U_S$	Supply voltage [1]
Blue	GND	GND	Zero volt connection for the encoder
White	A	A	Signal line
Pink	B	B	Signal line
Lilac	Z	Z	Signal line
Brown	N. C.	$\overline{A}$	Signal line
Black	N. C.	$\overline{B}$	Signal line
Yellow	N. C.	$\overline{Z}$	Signal line
Screen	Screen	Screen	Screen

[1] Potential free to housing

N. C. = Not Connected

Technical data according to 32878		DKS 40	DKS									
Number of lines (Z) per revolution		1 to 2,048										
Electrical Interfacees		4.5 … 5.5 V, Open Coll. NPN, 3-channel										
		10 … 30 V, Open Coll. NPN, 3-channel										
		4.5 … 5.5 V, TTL/RS422, 6-channel										
		10 … 30 V, HTL, 6-channel										
Mass		0.18 Kg										
Moment of inertia of the rotor		6 gcm^2										
Measuring step		90°/number of lines										
Reference signal	Number	1										
	Position	90° electr., logic. interlocked with A+B										
Error limits												
"binary" number of lines [1]		± 0.09 degree										
"non-binary" number of lines [2]		± 0.13 degree										
Measuring step deviation												
binary number of lines		± 0.03 degree										
non-binary number of lines		± 0.07 degree										
Max. output frequency	Open Collector	50 KHz										
	TTL/RS422	200 KHz										
	HTL/push-pull	200 KHz										
Operating speed		6,000 min^{-1}										
Angular acceleration		3.6 x 10^9 rad/s^2										
Operating torque		0.15 Ncm										
Start up torque		0.2 Ncm										
Permissible shaft loading												
radial		40 N										
axial		20 N										
Bearing lifetime		2 x 10^9 revolutions										
Working temperature range		0 … + 60 °C										
Storage temperature range		– 40 … + 70 °C										
Permissible relative humidity [3]		90 %										
EMC [4]												
Resistance												
to shocks [5]		50/7 g/ms										
to vibration [6]		20/10 … 2000 g/Hz										
Protection class acc. IEC 60529		IP 64										
Load current		30 mA										
Operating current range at no load		40 mA										
Initialisation time after power on		40 ms										

[1] „Binary" number of lines 2^n, n is a whole number

[2] „Non binary" number of lines 2^n, n is not a whole number

[3] Condensation of optical scanning system not permitted

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

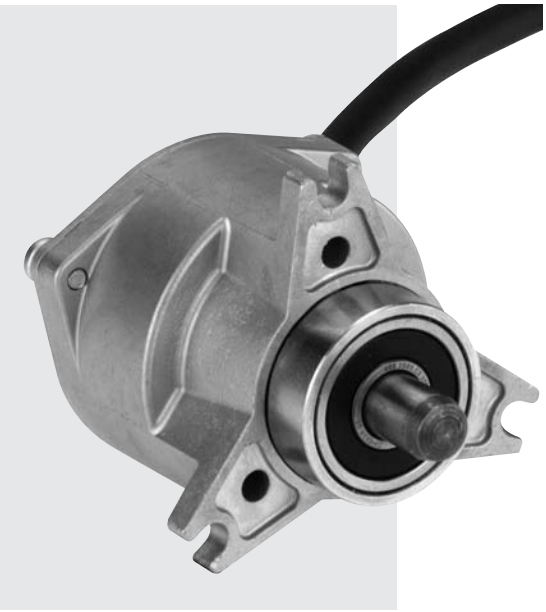
[5] To DIN EN 60068-2-27

[6] To DIN EN 60068-2-6

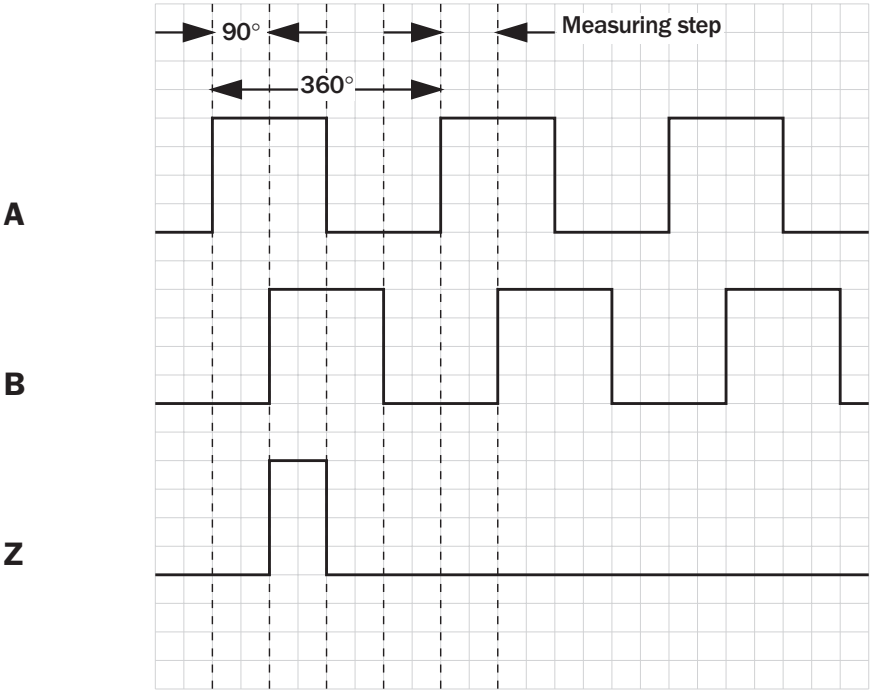
Number of lines
1 up to 2,048

Incremental-Encoder

- Cable outlet
- Enclosure rating IP 64
- Electrical Interfaces
  Open Collector NPN,
  TTL, HTL



Incremental pulse diagram



CW rotation when looking at the encoder shaft

$\overline{A}$, $\overline{B}$, $\overline{Z}$ inverted signals to A, B, Z

Electrical interfaces				
Supply voltage	4.5 … 5.5 V	10 … 30 V	4.5 … 5.5 V	10 … 30 V
Interfaces/drivers	Open Coll. NPN	Open Coll. NPN	TTL/RS422	HTL/push-pull

See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DKS 40, solid 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
D	**K**	**S**	**4**	**0**	**–**		**5**	**J**					

Point 7 = Electrical interface; Point 8 = Mechanical interface; Point 9 = Connection type; Points 10–14 = Number of lines

Electrical interface

4.5 … 5.5 V, Open Collector NPN, 3-channel	= **P**
10 … 30 V, Open Collector NPN, 3-channel	= **R**
4.5 … 5.5 V, TTL/RS422, 6-channel	= **A**
10 … 30 V, HTL/push-pull, 6-channel	= **E**

Mechanical interface

Face mount flange, Solid shaft Ø 8 x 13 mm = **5**

Connection type

Cable 8 core, universal 0,5 m [1)] = **J**

Number of lines

Always 5 characters in clear text [1] with leading zeros

[1)] **The universal cable output is positioned so that a kink-free cable run is possible in radial or axial direction.**

Number of lines (Z) per revolution							
00010	00050	00200	00256	00500	00720	01024	02048
00020	00100	00250	00360	00512	01000	02000	**others on request**

Order example: Incremental Encoder DKS 40

4.5 … 5.5 Volt, TTL; face mount flange, cable 8 core, number of lines: 360

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
D	**K**	**S**	**4**	**0**	**–**	**A**	**5**	**J**	**0**	**0**	**3**	**6**	**0**

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
D	**K**	**S**	**4**	**0**	**–**		**5**	**J**					

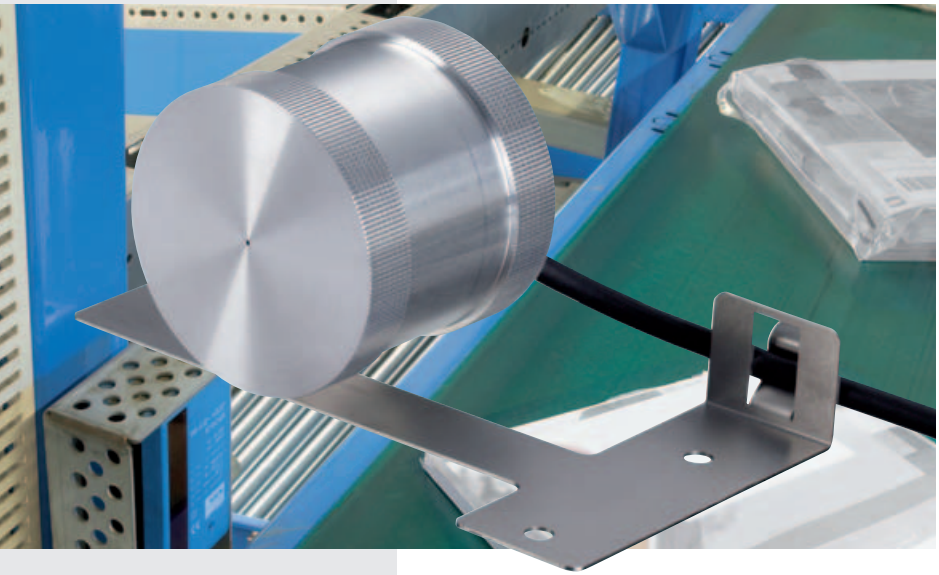
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	**K**	**S**	**4**	**0**	**–**		**5**	**J**					

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
D	**K**	**S**	**4**	**0**	**–**		**5**	**J**					

Number of lines
1 up to 2,048

Incremental Encoder

DKV 60: Incremental measuring wheel encoder



The basis of the product is the DKS40 incremental encoder. The DKS40 and therefore the DKV60 utilise Mini-Disc technology, making the DKV60, extremely robust and resistant to shock and vibration. The DKV60 also features a high protection rating (IP 65).

Specify your own individual measuring wheel encoder!

Possible product variations:

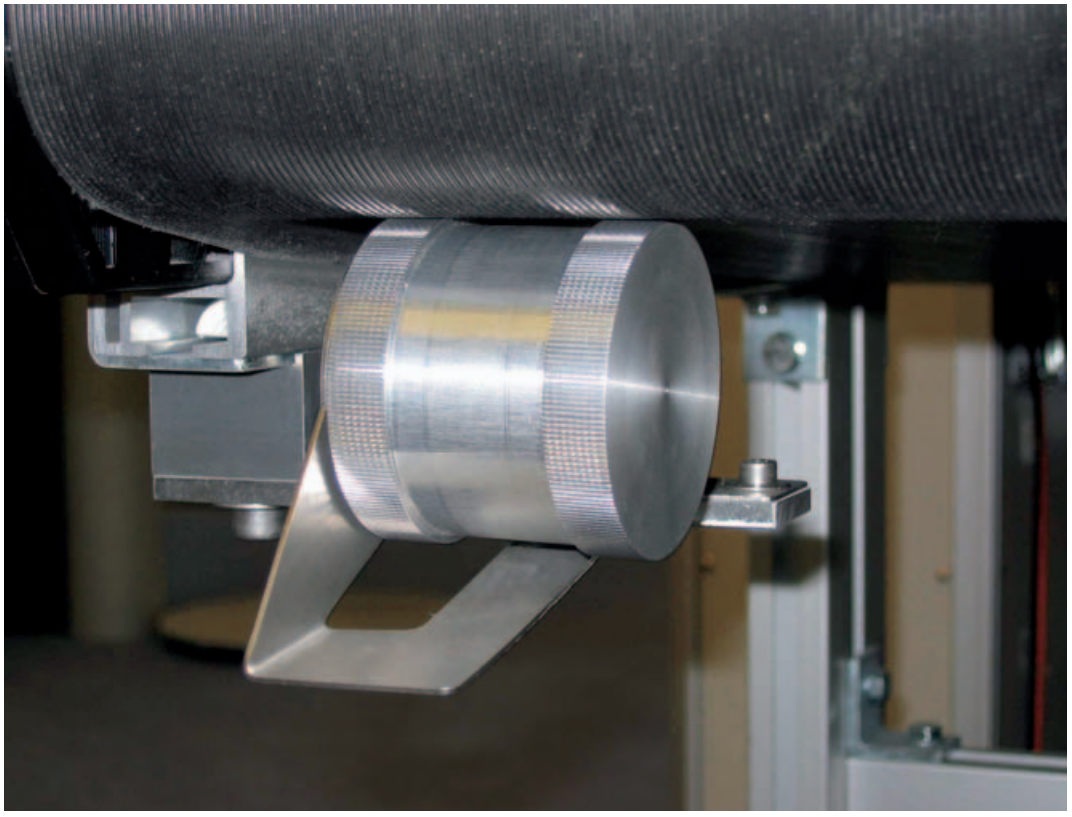
- Interface
  TTL/RS422, HTL/push-pull
- Measuring drum
  Knurled surface,
  'O' ring surface
- Cable outlet 1.5 m

The DKV60 incremental measuring wheel encoder is a cost-effective and extremely compact solution for the direct determination of position and speed of a conveyor belt.

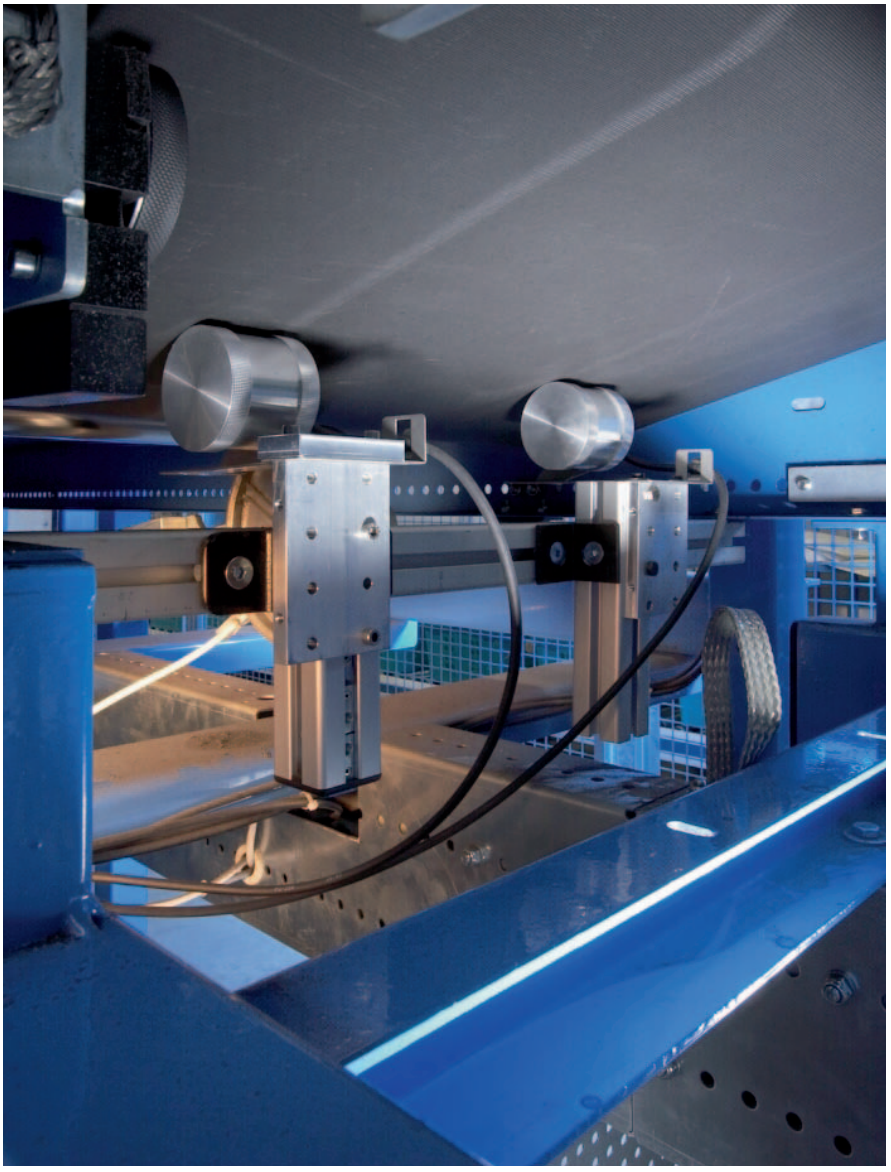
The DKV60 incremental measuring wheel encoder can be fitted directly to the conveyor belt, without the need of any mechanical accessories.

The product versatility enables many uses, e. g. in:

- Woodworking machinery
- Steel and sheet processing machinery
- Storage and conveying technology
- Sorting systems
- Conveyor belts
- Textile machinery
- Printing and paper



◄ 4 in one: encoder, measuring wheel, sprung mounting arm and bracket in a compact metal housing. This saves mounting space and simplifies assembly.

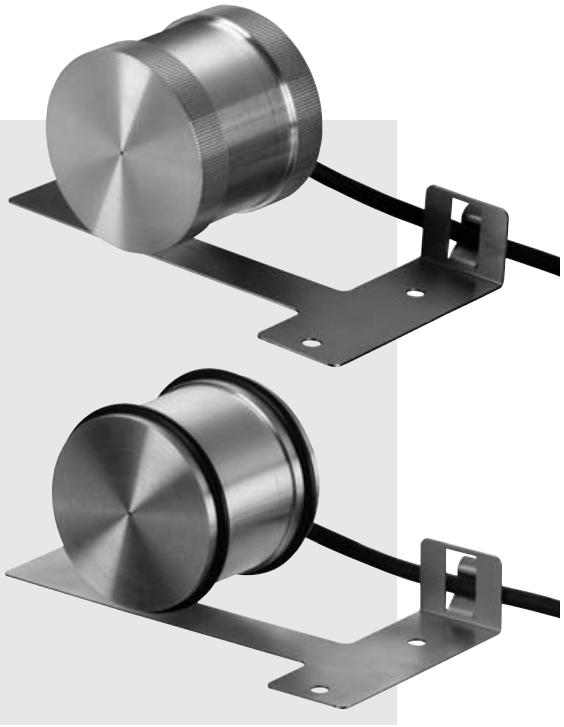


► The knurled version is suitable for rough surfaces, such as conveyor belts, and the 'O' ring version is suitable for hard, smooth and sensitive surfaces such as glass or plastic sheets.

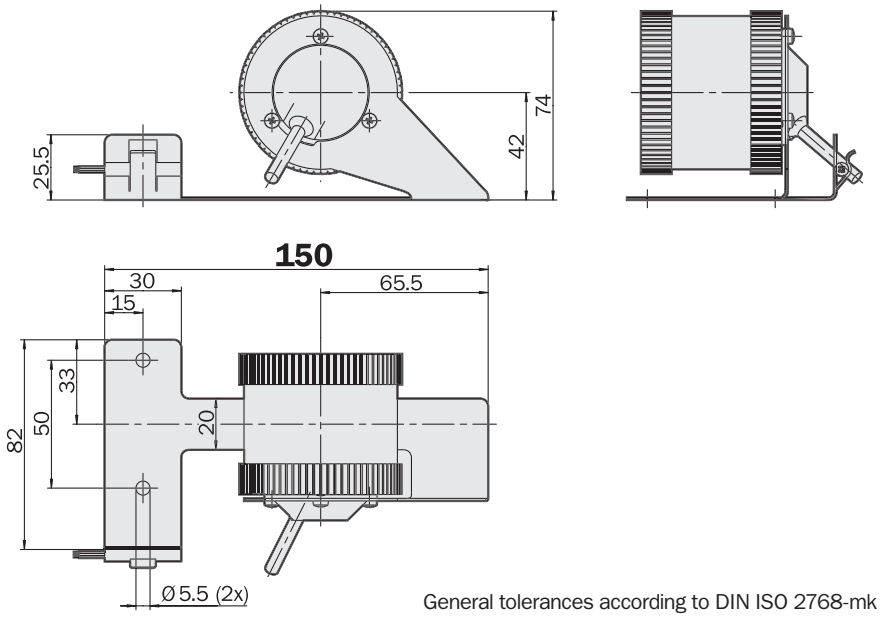
Number of lines
1 up to 2,048

Incremental Encoder

- Cable outlet
- Protection rating up to IP 65
- Electrical interfaces
  TTL and HTL

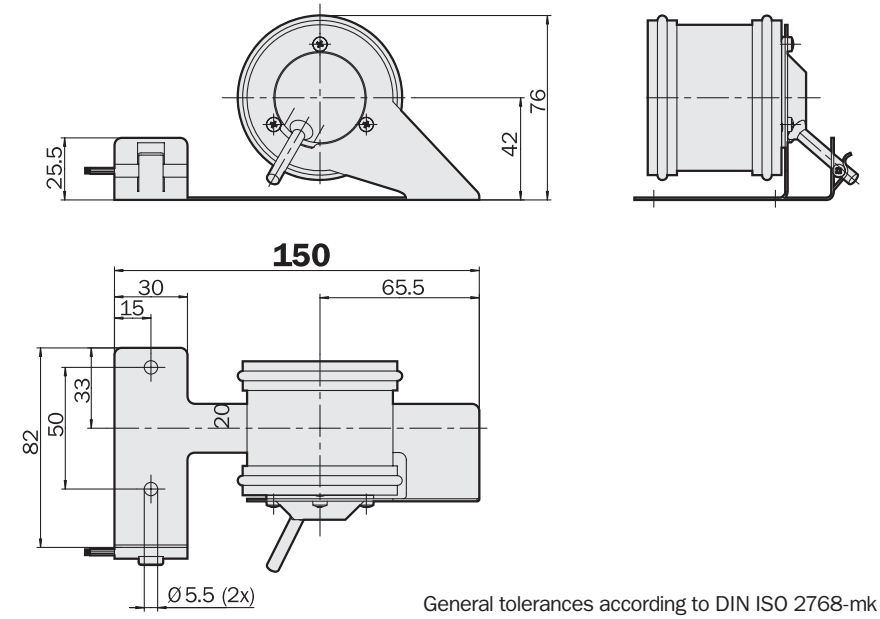


Dimensional drawing DKV 60 knurled surface



General tolerances according to DIN ISO 2768-mk

Dimensional drawing DKV 60 'O' ring surface



General tolerances according to DIN ISO 2768-mk

Core assignment/8-core cable

Core colours	Signal for TTL and HTL	Explanation
Red	+ U_s	supply voltage [1]
Blue	GND	encoder ground connection
White	A	signal line
Pink	B	signal line
Lilac	Z	signal line
Brown	$\overline{A}$	signal line
Black	$\overline{B}$	signal line
Yellow	$\overline{Z}$	signal line
Screen	Screen	Screen

[1] Potential free to housing

See chapter Accessories
Accessories for encoders

Technical Data to DIN 32878	DKV 60	DKV									
Pulses per 200 mm	1 to 2,048										
Electrical interface	4.5 … 5.5 V, TTL/RS 422, 6-channel										
	10 … 30 V, HTL, 6-channel										
Mass	0.42 kg										
Reference signal											
Number	1										
Position	90° electr., logically linked with A and B										
Error limits											
Knurled surface	± 0.5 mm/m										
'O' ring surface	± 4 mm/m										
Max. operating speed	1,500 min^{-1}										
Bearing lifetime	2 x 10^9 revolutions										
Working temperature range	– 10 … + 60 °C										
Storage temperature range	– 40 … + 70 °C										
Permissible relative humidity [1]	90 %										
EMC [2]											
Resistance											
to shocks [3]	50/7 g/ms										
to vibration [4]	20/10 … 2000 g/Hz										
Protection class IEC 60529	IP 65										
Load current											
4.5 … 5.5 V, TTL/RS 422	Max. 30 mA										
10 … 30 V, HTL/push-pull	Max. 30 mA										
No-load operating current											
4.5 … 5.5 V, TTL/RS 422	40 mA										
10 … 30 V, HTL/push-pull	40 mA										
Initialisation time after power on	40 ms										

[1] Condensation of the optical scanning is not permitted

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

[3] To DIN EN 60068-2-27

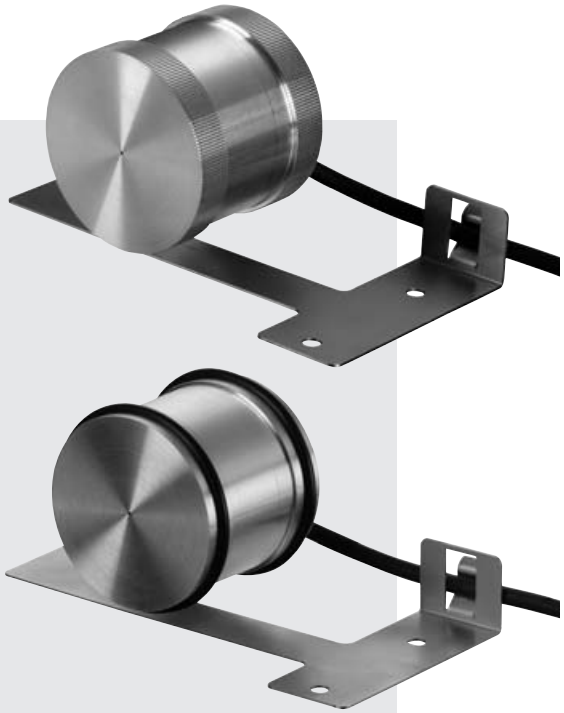
[4] To DIN EN 60068-2-6

Order information see page 107

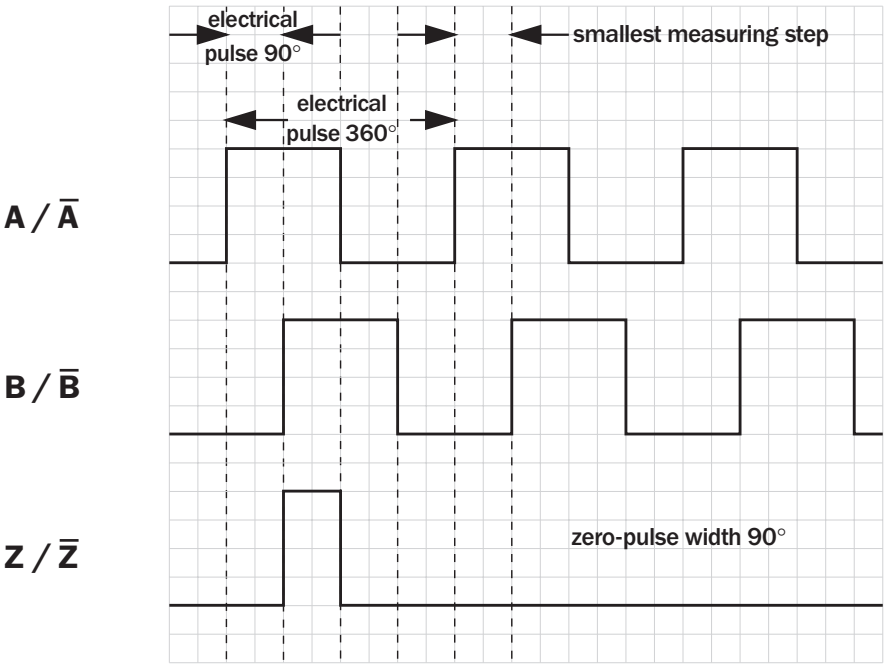
Number of lines
1 up to 2,048

Incremental Encoder

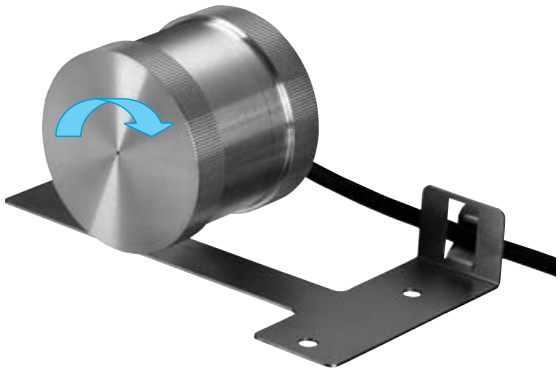
- Cable outlet
- Protection rating up to IP 65
- Electrical interfaces
  TTL and HTL



Signal outputs



Cw looking at the measuring drum



See chapter Accessories
Accessories for encoders

Order information

Incremental Encoder DKV 60

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
D	**K**	**V**	**6**	**0**	**–**			**K**					

Electrical interface	Mechanical version	Connection type	Pulses per 200 mm
4.5 … 5.5 V, TTL/RS 422 6-channel = **A**	Measuring drum, knurled surface DIN82-RAA 1 = **1**	Cable 8-core, 1.5 m = **K**	Always 5 characters in clear text.
10 … 30 V, HTL/push-pull 6-channel = **E**	Measuring drum, 'O' ring surface EPDM, Highly abrasion-resistant = **2**		

Order example

DKV 60; 4.5 … 5.5 V, TTL/RS 422; 6-channel; Measuring drum knurled surface

Type	Part no.	Pulses/200 mm	Resolution	Smallest measuring step
DKV60-A1K00020	1 035 039	20	1 pulse = 10 mm	2.5 mm
DKV60-A1K00200	1 035 040	200	1 pulse = 1 mm	0.25 mm
DKV60-A1K01000	1 035 041	1000	1 pulse = 0.2 mm	0.05 mm
DKV60-A1K02000	1 035 042	2000	1 pulse = 0.1 mm	0.025 mm

DKV 60; 4.5 … 5.5 V, TTL/RS 422; 6-channel; Measuring drum 'O' ring surface; EPDM, Highly abrasion-resistant

Type	Part no.	Pulses/200 mm	Resolution	Smallest measuring step
DKV60-A2K00020	1 035 043	20	1 pulse = 10 mm	2.5 mm
DKV60-A2K00200	1 035 044	200	1 pulse = 1 mm	0.25 mm
DKV60-A2K01000	1 035 045	1000	1 pulse = 0.2 mm	0.05 mm
DKV60-A2K02000	1 035 046	2000	1 pulse = 0.1 mm	0.025 mm

DKV 60; 10 … 30 V, HTL/push-pull; 6-channel; Measuring drum knurled surface

Type	Part no.	Pulses/200 mm	Resolution	Smallest measuring step
DKV60-E1K00020	1 035 047	20	1 pulse = 10 mm	2.5 mm
DKV60-E1K00200	1 035 048	200	1 pulse = 1 mm	0.25 mm
DKV60-E1K01000	1 035 049	1000	1 pulse = 0.2 mm	0.05 mm
DKV60-E1K02000	1 035 050	2000	1 pulse = 0.1 mm	0.025 mm

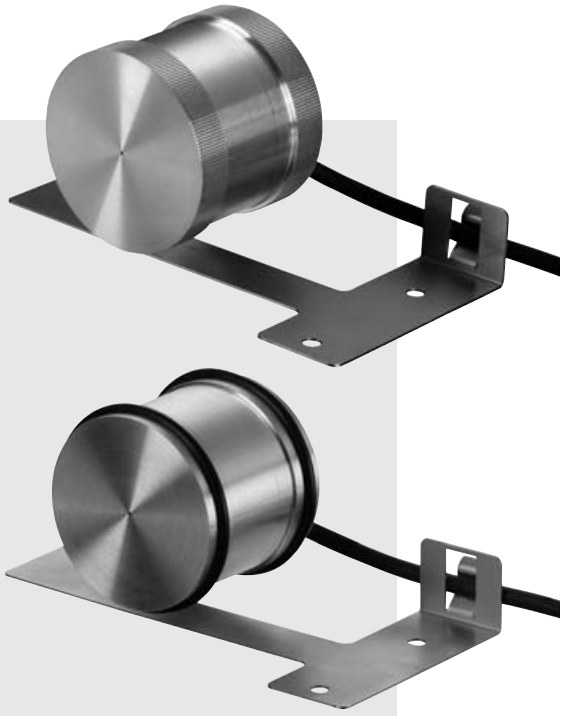
DKV 60; 10 … 30 V, HTL/push-pull; 6-channel; Measuring drum 'O' ring surface; EPDM, Highly abrasion-resistant

Type	Part no.	Pulses/200 mm	Resolution	Smallest measuring step
DKV60-E2K00020	1 035 051	20	1 pulse = 10 mm	2.5 mm
DKV60-E2K00200	1 035 052	200	1 pulse = 1 mm	0.25 mm
DKV60-E2K01000	1 035 053	1000	1 pulse = 0.2 mm	0.05 mm
DKV60-E2K02000	1 035 054	2000	1 pulse = 0.1 mm	0.025 mm

Number of lines
1 up to 2,048

Incremental Encoder

- Cable outlet
- Protection rating up to IP 65
- Electrical interfaces
  TTL and HTL

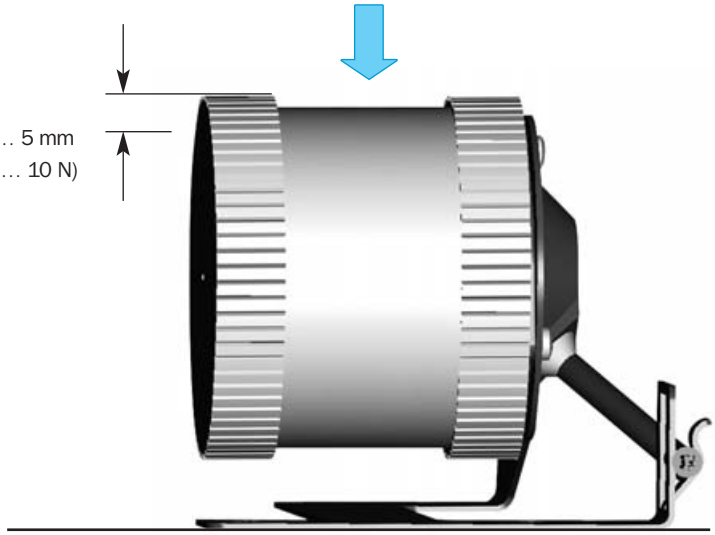


CE cULus

See chapter Accessories
Accessories for encoders

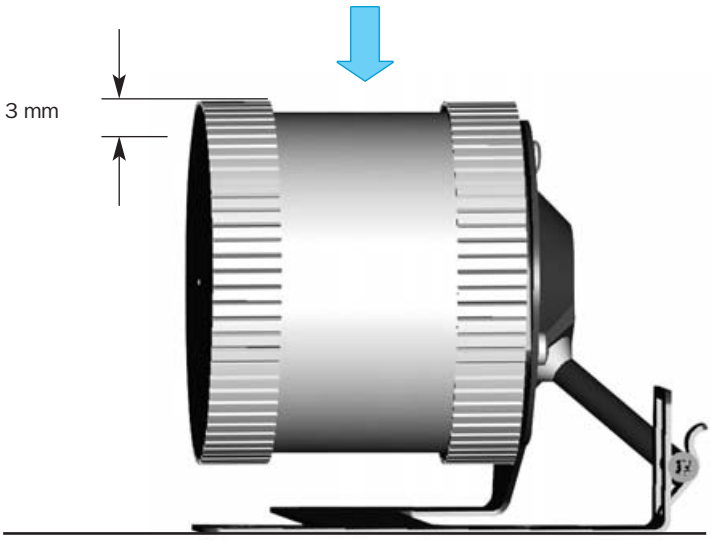
Working position/force

Working position/
force = 2 … 5 mm
(5 … 10 N)

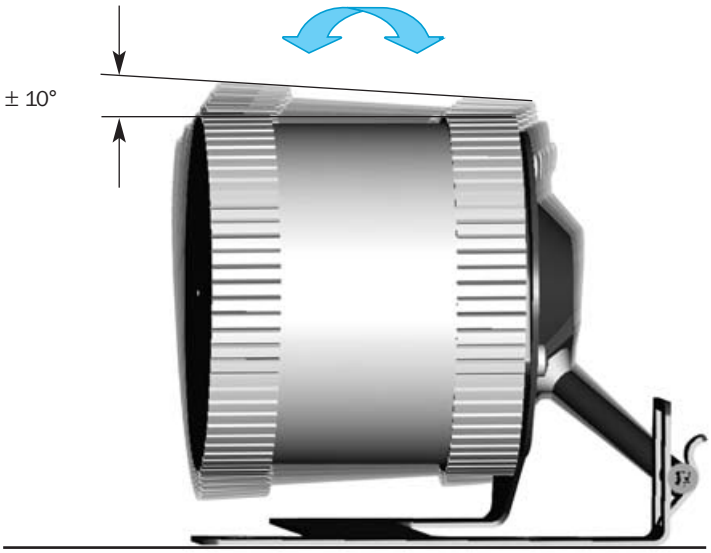


Max. deflection

Max. deflection Y = 3 mm



Max. deflection X = ± 10°



Resolution
0.1 mm

Linear Encoder

POMUX®

KH 53: Absolute Linear Encoders. Wear-free for rough environmental conditions

The POMUX KH 53 absolute linear encoder functions on the transmitter/receiver principle. Because of the absolute position detection, an initialising reference run is not necessary.

The measuring method: A read head determines without contact, the absolute position of a series of scale sections, which are mounted along the measurement section.
The read head consists of a series of magnetoresistive sensors, which can always detect the position of at least 3 permanent magnets to determine the absolute position.

The scale sections are manufactured from aluminium and are referred to as measuring elements: These are mounted in a row at fixed intervals with the aid of a mounting gauge until the desired measuring length is reached. Fitted within each measuring element are permanent magnets, whose spacing from one another represents the unique encoding of a portion of the measurement section. The read head moves parallel to these measuring elements. The separation of read head and measuring element is 25 mm.

With a measuring length of up to 1.700 m, the KH 53 is particularly suitable for use in cranes, in storage and conveyor engineering and on rail-bound vehicles. As a result of the non-contact principle of operation, this system operates without wear even under the harshest environmental conditions.

◄ In a high-bay warehouse, the co-ordinates MUST be correct in order to ensure smooth operation. With KH 53 Linear Encoders, they are correct to a tenth of a millimetre.

▼ Pinpoint positioning, even over long distances: in fully and partially automated loading stations, Linear Encoders – quite literally – are the measure of all things.

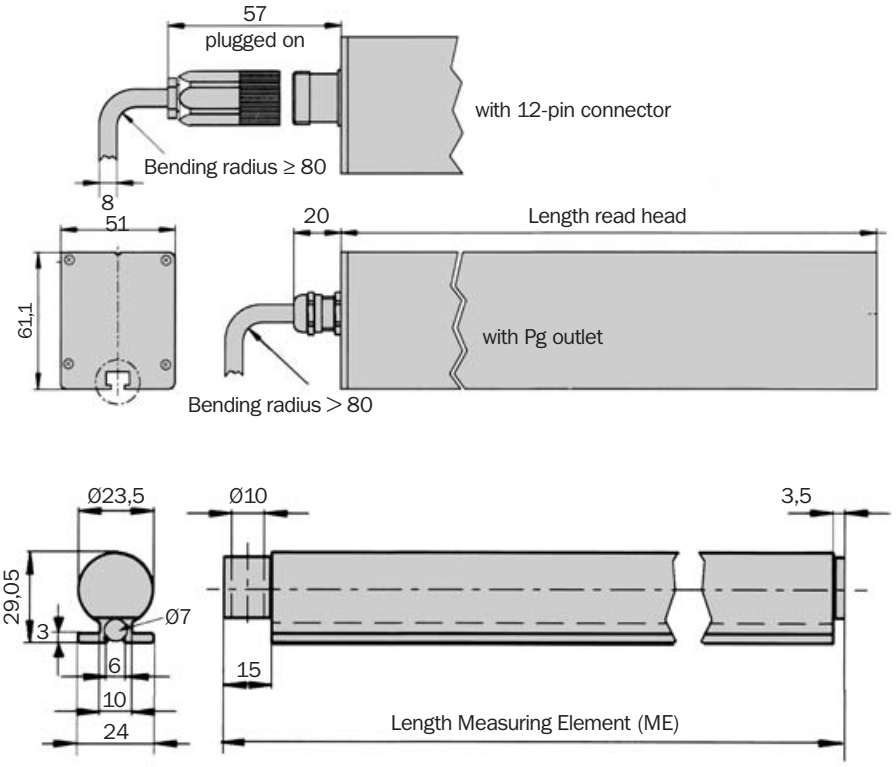
Resolution 0.1 mm

Linear Encoder

- Measuring length up to 1.7 km
- Non-contact length measuring system, wear free
- Absolute position measurement no initialising reference run
- Choice of electrical interfaces
- Position sampling time independent of length
- Degree of protection up to IP 66

CE

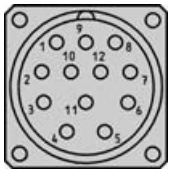
Dimensional drawing Linear Encoder KH 53 SSI



PIN and wire allocation SSI Interface [1)]

PIN	Signal	Colour of wires (cable outlet)	Explanation
1	GND	blue	Earth (ground) connection
2	data +	white	Interface signal
3	clock +	yellow	Interface signal
4	R x D +	grey	RS 422 Programming lines
5	R x D –	green	RS 422 Programming lines
6	T x D +	pink	RS 422 Programming lines
7	T x D –	black	RS 422 Programming lines
8	+ U_S	red	Supply voltage
9	N. C.	orange	Not connected
10	data –	brown	Interface signal
11	clock –	violet	Interface signal
12	N. C.	–	Not connected

See chapter Accessories
Accessories for encoders



View of the connector M23 fitted to the encoder body SSI

[1)] **Other Interfaces on request**

Technical data		KH 53 SSI
System resolution		0.1 mm
Reproducibility		0.3 mm
Measurement accuracy [1]		± 1000 + ME (Tu-25° C) Tk µm
Coefficient of thermal expansion Tk		28 µm/°C/m
Mass		
Read head	38	2.4 kg
	107	2.7 kg
	354	3.6 kg
	1700	5.2 kg
Measuring element		0.5 kg/m
Material		
Read head		AlMgSiPbF28
Measuring element		AlMgSi0,5F22
Resistance to shocks [2]		
Read head		30/10 g/ms
Measuring element		50/10 g/ms
Resistance to vibration [3]		
Read head		10/20 … 250 g/Hz
Measuring element		30/20 … 250 g/Hz
Working temperature range		– 20° … + 60 °C
Storage temperature range		
Read head		– 40° … + 85 °C
Protection class acc. IEC 60529		
Read head with srew-in system		IP 65
Read head with cable		IP 66
Max. movement speed [4]		6.6 m/s
Initialisation time		2 s
Position forming time		0.8 ms
Supply voltage		10 … 32 V
Operating current SSI		120 mA
Interface for parameterising		
Four wire transmission, asynchrony, full duplex		
Data format: 1 start bit, 8 data bits, 1 stop bit, no parity		
Data protocol: ASCII, Baud rate 9600		RS 422
Interface digital, serial		SSI 24 bits format
Standart (Default setting SSI standard)		RS 422 off

[1] If the read head and measuring element are mounted within ± 1 mm of the nominal mounting distance in the N and Y directions.
The figures quoted related to the accuracy within a measuring element with reference to the start of that measuring element.
ME = length (x)
Tu = Ambient temperature °C

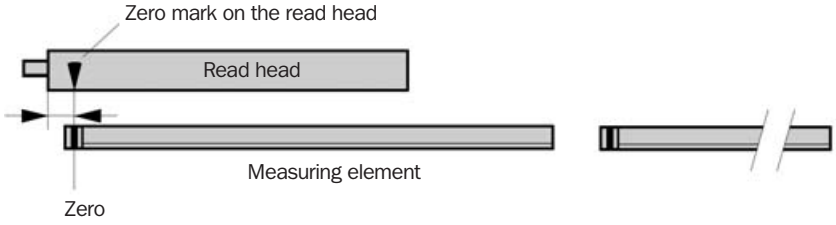
[2] According DIN EN 61000-2-27 the shock resistance can be considerably increased in special variants.

[3] According DIN EN 61000-2-6 the vibration resistance can be considerably increased in special variants.

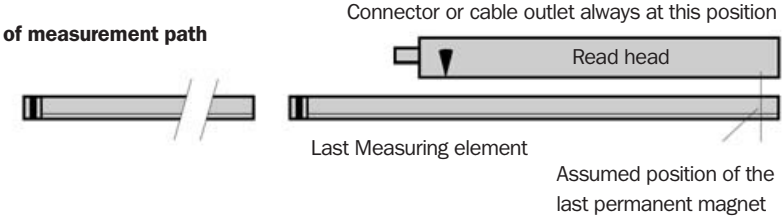
[4] If the max. movement speed is exceeded or the read head cannot detect a measuring element the error message FF FF FE Hex is produced.

Position tolerances

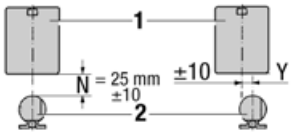
Start of measuring path



End of measurement path



1 Read head
2 Measuring element



The reliability and accuracy of the measuring system are dependent upon maintaining the mounting tolerances! Any magnetic material should be at least of 80 mm from the measuring elements.

Order information see page 115

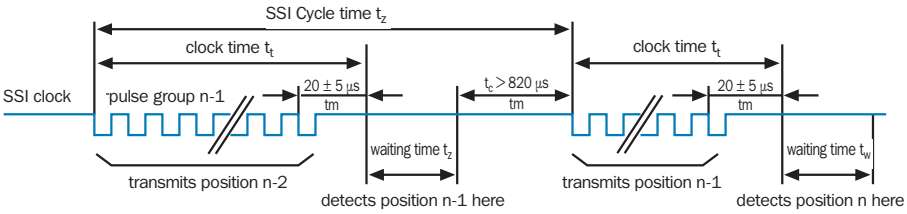
Resolution 0.1 mm

Linear Encoder

- Measuring length up to 1.7 km
- Non-contact length measuring system, wear free
- Absolute position measurement no initialising reference run
- Choice of electrical interfaces
- Position sampling time independent of length
- Degree of protection up to IP 66

CE

Interface description



tm = Monoflop time
tc = Read head scanning interval with deactivated asynchronous interface (Default).

A number of special features must be observed for use of this interface in POMUX KH 53 :

Standard operation

The digital angle information cannot be read directly from a coding disc but is formed by complex computation algorithm from a number of analog voltages, it is not possible to detect the position value associated with this time when first trailing edge of the clock signal occurs.

During standard operation, the KH 53 forms a position value cyclically every 800 µs irrespective of the SSI read cycle, and places this value in the output register provided for this purpuse, for recovery by the interface. Since the SSI read cycle and the position forming cycle can never be the same, this results in a continuous shift in the time position assignment.

In other words:
The time assignment of the position value fluctuates from 5 µs to 800 µs in this operating mode.

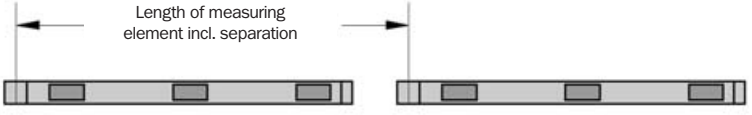
Synchronous SSI-Operation

The synchronous SSI operating mode can be connected via the parametrising interface in order to avoid the fluctuation of the time position assignment, which can lead to highly unpredictable behaviour of the control loop.
In this operating mode, position detection is started on the first trailing edge of the SSI pulse, and the position is detected using the last pulse group.
In order to keep the delay time of between position measurement and position transmission as short as possible, the position measurement can be delayed by parameterising a waiting time. This ensures that the current position is measured as shortly as possible before the SSI clock group.

The waiting time t_w must be less than the SSi cycle time t_z minus the clock time t_t minus 820 µs.

Waiting time condition
$t_w < t_z - t_t - t_c$
$t_c = 820$ µs

Order information



See chapter Accessories
Accessories for encoders

Dimension and calculation table

Measuring length	Read head length	Length of measuring element incl. separation	Mounting equipment per measuring element (proposed)
up to 38 m	0.87 m	2.30 m Ident. A1 … AN	4 Spacer supports or 8 Fastening clamps
up to 107 m	1.05 m	1.87 m Ident. B1 … BN	3 Spacer supports or 6 Fastening clamps
up to 354 m	1.38 m	2.50 m Ident. C1 … CN	4 Spacer supports or 8 Fastening clamps
up to 1700 m	2.03 m	1.90 m Ident. D1 … DN	3 Spacer supports or 6 Fastening clamps

Order information

Calculation example for a measuring length of 100 m

Choose the system with a max. measuring length of 107 m

Number of measuring elements required = $\frac{\text{Desired measuring length}}{\text{Length of measuring element (see table above)}}$

Number of measuring element = 100 m/1.87 m = **53.48**

Ordering quantity is therefore **54** pcs **measuring elements** and **54 * 3 = 162 spacer supports**

If **two separate measuring lengths** are required, then please order as **2 x 54** measuring elements (**not 108** measuring elements)

Length measuring systems

Length measuring system KH 53 - absolute, linear; measuring length up to 38 Meter

Type	Part no.	Measuring element length
KHK53-AXR00038	1 030 048	Read head 38, SSI, cable 1.5 m
KHK53-AXS00038	1 030 049	Read head 38, SSI, cable 3.0 m
KHK53-AXT00038	1 030 050	Read head 38, SSI, cable 5.0 m
KHK53-AXU00038	1 030 051	Read head 38, SSI, cable 10.0 m
KHK53-AXB00038	1 030 052	Read head 38, SSI, connector M23, 12 pin
KHT53-XXX00038	1 030 055	Measuring element up to 38 m, coded
KHU53-XXX00038	1 030 056	Measuring element up to 38 m, universal, configurable [1]
KHM53-XXX00038	1 030 057	Mounting gauge 38

Length measuring system KH 53 - absolute, linear; measuring length up to 107 Meter

Type	Part no.	Measuring element length
KHK53-AXR00107	1 030 058	Read head 107, SSI, cable 1.5 m
KHK53-AXS00107	1 030 059	Read head 107, SSI, cable 3.0 m
KHK53-AXT00107	1 030 060	Read head 107, SSI, cable 5.0 m
KHK53-AXU00107	1 030 061	Read head 107, SSI, cable 10.0 m
KHK53-AXB00107	1 030 062	Read head 107, SSI, connector M23, 12 pin
KHT53-XXX00107	1 030 065	Measuring element up to 107 m, coded
KHU53-XXX00107	1 030 066	Measuring element up to 107 m, universal, configurable [1]
KHM53-XXX00107	1 030 067	Mounting gauge 107

Length measuring system KH 53 - absolute, linear; measuring length up to 354 Meter

Type	Part no.	Measuring element length
KHK53-AXR00354	1 030 068	Read head 354, SSI, cable 1.5 m
KHK53-AXS00354	1 030 069	Read head 354, SSI, cable 3.0 m
KHK53-AXT00354	1 030 070	Read head 354, SSI, cable 5.0 m
KHK53-AXU00354	1 030 071	Read head 354, SSI, cable 10.0 m
KHK53-AXB00354	1 030 072	Read head 354, SSI, connector M23, 12 pin
KHT53-XXX00354	1 030 075	Measuring element up to 354 m, coded
KHU53-XXX00354	1 030 076	Measuring element up to 354 m, universal, configurable [1]
KHM53-XXX00354	1 030 077	Mounting gauge 354

Length measuring system KH 53 - absolute, linear; measuring length up to 1700 Meter

Type	Part no.	Measuring element length
KHK53-AXR01700	1 030 078	Read head 1700, SSI, cable 1.5 m
KHK53-AXS01700	1 030 079	Read head 1700, SSI, cable 3.0 m
KHK53-AXT01700	1 030 080	Read head 1700, SSI, cable 5.0 m
KHK53-AXU01700	1 030 081	Read head 1700, SSI, cable 10.0 m
KHK53-AXB01700	1 030 082	Read head 1700, SSI, connector M23, 12 pin
KHT53-XXX01700	1 030 085	Measuring element up to 1700 m, coded
KHU53-XXX01700	1 030 086	Measuring element up to 1700 m, universal, configurable [1]
KHM53-XXX01700	1 030 087	Mounting gauge 1700

[1] For temporary replacement of damaged measuring elements

Resolution 0.1 mm

Linear Encoder

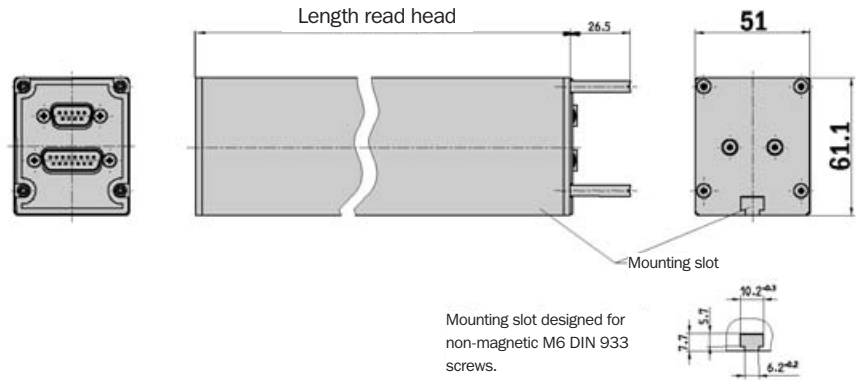
- Measuring length up to 1.7 km
- Non-contact length measuring system, wear free
- Absolute position measurement no initialising reference run
- Choice of electrical interfaces
- Position sampling time independent of length
- Degree of protection up to IP 66

CE

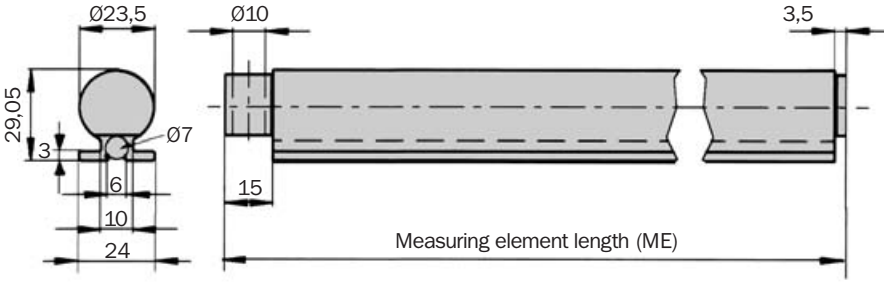
See chapter Accessories

Accessories for encoders

Dimensional drawing read head



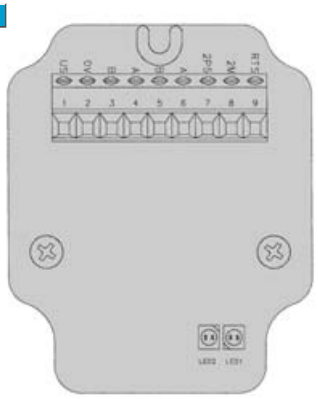
Dimensional drawing measuring element



1 Profibus Adaptor PIN and wire allocation

Terminal strip	Signal	Explanation
1	U_S (24 V)	Supply voltage 10 … 32 V
2	0 V (GND)	Ground (0 V)
3	B	B-cable Profibus DP (out)
4	A	A-cable Profibus DP (out)
5	B	B-cable Profibus DP (in)
6	A	A-cable Profibus DP (in)
7	2P5 [1]	+ 5 V (potential free)
8	2M [1]	0 V (potential free)
9	RTS [2]	Request to Send

1



[1] For the connection of external bus termination or to supply the transmitter/receiver of a fibre optic data transfer system.

[2] This signal is optional for the direction acknowledgement for a fibre optic connection.

1 To connect the wires the connection adapter can be completely removed from the rest of the unit. The diagram alongside shows the terminal allocation.

Technical Data		KH 53 ProfiBus
System resolution		0.1 mm
Reproducibility		± 0.3 mm
Measurement accuracy [1]		± 1000 + ME (Tu-25° C) Tk µm
Coefficient of thermal expansion Tk		28 µm/°C/m
Mass		
Read head	38	2.4 kg
	107	2.7 kg
	354	3.6 kg
	1700	5.2 kg
Measuring element		0.5 kg/m
Material		
Read head		AlMgSiPbF28
Measuring element		AlMgSi0,5F22
Resistance to shocks [2]		
Read head		30/10 g/ms
Measuring element		50/10 g/ms
Resistance to vibration [3]		
Read head		10/20 … 250 g/Hz
Measuring element		30/20 … 250 g/Hz
Working temperature range		– 20° … + 60 °C
Storage temperature range		– 40° … + 85 °C
Protection class acc. IEC 60529		IP 66
Max. movement speed [4]		6.6 m/s
Initialisation time		2 s
Position forming time		1.1 ms
Supply voltage		10 … 32 V
Operating current		2.0 W
Bus Interface Profibus DP		
Electrical Interface [5]		RS 485
Protocol		Profibus DP basic functions
		Profile for encoders (07hex) – Class 2
Address setting (node number)		0 … 127 (DIP switches or protocol)
Data transmission rate (baud rate)		9.6 kBaud – 12 MBaud
		automatic detection
Electronic adjustment (number SET)		Via Protocol
Status information		Operation (green LED), bus activity(red LED)
Bus termination [6]		Via DIP switches
Electrical connection		Bus connector with screw fixing (x3)

[1] If the read head and measuring element are mounted within ± 1 mm of the nominal mounting distance in the N and Y directions.
The figures quoted related to the accuracy within a measuring element with reference to the start of that measuring element.
ME = length (x)
Tu = Ambient temperature °C

[2] According DIN EN 61000-2-27 the shock resistance can be considerably increased in special variants.

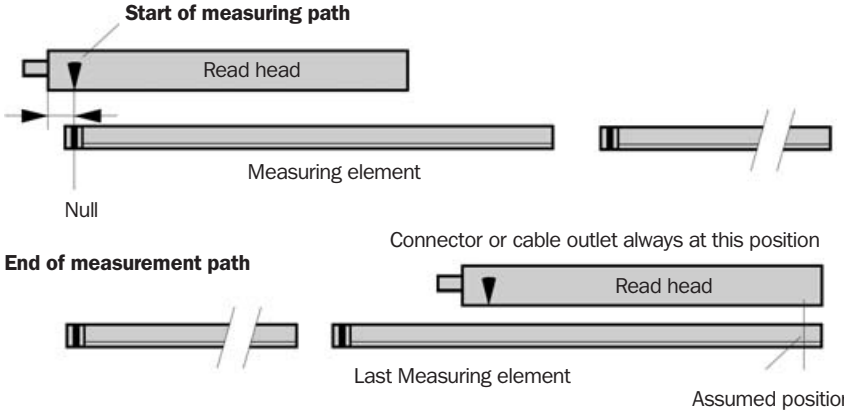
[3] According DIN EN 61000-2-6 the vibration resistance can be considerably increased in special variants.

[4] If the max. movement speed is exceeded or the read head cannot detect a measuring element an error message is produced.

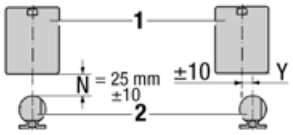
[5] Acc. EN 50 170-2 (DIN 19245 part 1-3) DC isolated via opto-couplers

[6] Should only be connected in the final device.

Position tolerances



1 Read head
2 Measuring element



The reliability and accuracy of the measuring system are dependent upon maintaining the mounting tolerances! Any magnetic material should be at least of 80 mm from the measuring elements.

Order information see page 119

Implementation

DP Functionalities
In acc. with the Profibus DP basic functions.

DP services
- Data interchange (Write_Read_Data)
- Address allocation (Set_Slave_Address)
- Control commands (Global_Control)
- Read the inputs (Read_Inputs)
- Read the outputs (Read_Outputs)
- Read diagnostic data (Slave_Diagnosis)
- Send configuration data (Set_Param)
- Check configuration data (Chk_Config)

Communication
- Cyclic Master-Slave Data transfer

Protective mechanisms
- Data transfer with HD = 4
- Time monitoring of the data traffic

Configuration
Settings in accordance with encoder profile
- Counting direction (CW, CCW)
- Class-2 functionality (ON, OFF)
- Scaling function (ON, OFF)

- „Activation of SSA-service“ 2)
- Selection of the station address 2)

Configuration
Setting the formats (IN/OUT) for the cyclic-data interchange via one configuration byte (K-1).

2 words IN/OUT data (I-1/O-1) 1)
4 words IN/OUT data (I-1, I-2, I-3/O-1) 2)

Data interchange: - Input Data (IN)
I-1 Position value 1) 4 bytes
I-2 Speed (0,1m/min) 2) 2 bytes
I-3 Time stamp 2) 2 bytes

Data interchange: - Output data (OUT)
O-1 PRESET Value 1) 4 bytes

Diagnostic information
Station-related diagnosis (63 bytes in accordance with Encoder Profil Class-2)

Setting: - PRESET value
The PRESET function is used for commissioning, and to allocate a specific position value to the current physical position.
The following settings are possible:
- by software: -- (see Output data)

Setting: - Counting direction
- by hardware via DIP switches S1
- by software via telegram

Counting direction increasing:
When the encoder travels in the direction of measuring element n to measuring element n+1.

Setting: - Station Address
- by hardware via DIP switch S1
- by software via telegram

The setting by software is carried out only if the „SSA-service“ has been previously activated.

Setting: - Bus termination
The 2-way DIP switch (S2) permits an internal bus termination to be switched in and out (ON/OFF).
If the bus is terminated externally, switch S2 must be in the OFF position.

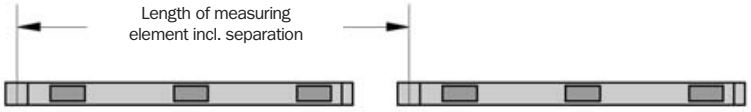
Device specific file (*.GS_)
For the purpose of automatic commissioning of the encoder, use is made of the *.GS_-file. All the characteristic features of the device are defined in it.

STEG05F6.GSD	German
STEG05F6.GSE	English

1) As per Encoder Profile
2) Manufacturer-specific function

Order information see page 117

Dimensional drawing and order information



Dimension and calculation table			
Measuring length	**Read head length**	**Length of measuring element [1)]**	**Mounting equipment per measuring element (proposed)**
up to 38 m	0.87 m	2.30 m (Ident. A1 … AN)	4 Spacer supports or 8 Fastening clamps
up to 107 m	1.05 m	1.87 m (Ident. B1 … BN)	3 Spacer supports or 6 Fastening clamps
up to 354 m	1.38 m	2.50 m (Ident. C1 … CN)	4 Spacer supports or 8 Fastening clamps
up to 1700 m	2.03 m	1.90 m (Ident. D1 … DN)	3 Spacer supports or 6 Fastening clamps

[1)] Including separation

Calculation example for a measuring length of 100 m

Choose the system with a max. measuring length of 107 m

$$\textbf{Number of measuring elements required} = \frac{\textbf{Desired measuring length}}{\textbf{Length of measuring element (see table above)}}$$

Number of measuring element = 100 m/1.87 m = **53.48**

Ordering quantity is therefore **54** pcs **measuring elements** and **54 * 3 = 162 spacer supports**

If **two separate measuring lengths** are required, then please order as **2 x 54** measuring elements (**not 108** measuring elements)

Length measuring systems

Length measuring system KH 53 – absolute, linear; measuring length up to 38 Meter		
Type	**Part no.**	**Measuring element length**
KHK53-PXH00038	1 030 053	Read head 38, Profibus DP, Interface for Profibus Link Adaptor
		Profibus Link Adaptor please order separately (see page 120)
KHT53-XXX00038	1 030 055	Measuring element up to 38 m, coded
KHU53-XXX00038	1 030 056	Measuring element up to 38 m, universal, configurable [2)]
KHM53-XXX00038	1 030 057	Mounting gauge 38

Length measuring system KH 53 – absolute, linear; measuring length up to 107 Meter		
Type	**Part no.**	**Measuring element length**
KHK53-PXH00107	1 030 063	Read head 107, Profibus DP, Interface for Profibus Link Adaptor
		Profibus Link Adaptor please order separately (see page 120)
KHT53-XXX00107	1 030 065	Measuring element up to 107 m, coded
KHU53-XXX00107	1 030 066	Measuring element up to 107 m, universal, configurable [2)]
KHM53-XXX00107	1 030 067	Mounting gauge 107

Length measuring system KH 53 – absolute, linear; measuring length up to 354 Meter		
Type	**Part no.**	**Measuring element length**
KHK53-PXH00354	1 030 073	Read head 354, Profibus DP, Interface for Profibus Link Adaptor
		Profibus Link Adaptor please order separately (see page 120)
KHT53-XXX00354	1 030 075	Measuring element up to 354 m, coded
KHU53-XXX00354	1 030 076	Measuring element up to 354 m, universal, configurable [2)]
KHM53-XXX00354	1 030 077	Mounting gauge 354

Length measuring system KH 53 – absolute, linear; measuring length up to 1700 Meter		
Type	**Part no.**	**Measuring element length**
KHK53-AXR01700	1 030 083	Read head 1700, Profibus DP, Interface for Profibus Link Adaptor
		Profibus Link Adaptor please order separately (see page 120)
KHT53-XXX01700	1 030 085	Measuring element up to 1700 m, coded
KHU53-XXX01700	1 030 086	Measuring element up to 1700 m, universal, configurable [2)]
KHM53-XXX01700	1 030 087	Mounting gauge 1700

[1)] For temporary replacement of damaged measuring elements

Resolution 0.1 mm

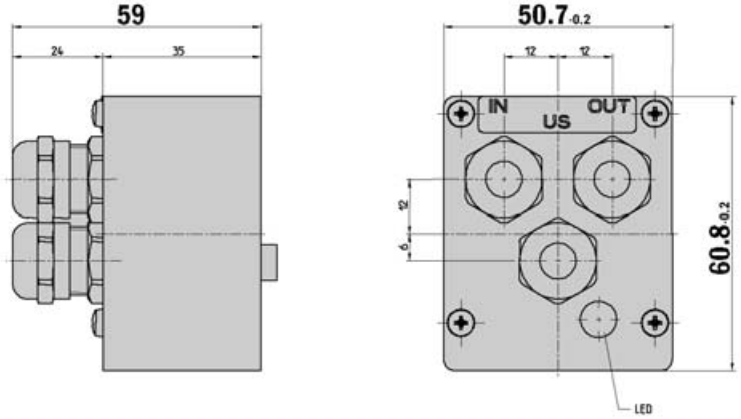
Linear Encoder

- Measuring length up to 1.7 km
- Non-contact length measuring system, wear free
- Absolute position measurement no initialising reference run
- Choice of electrical interfaces
- Position sampling time independent of length
- Degree of protection up to IP 66

CE

See chapter Accessories
Accessories for encoders

Dimensional drawing Profibus Link Adaptor KA3



General tolerances according to DIN ISO 2768-mk

KH 53 Profibus Link Adaptor KA3

Type	Part no.	Explanation
AD-KHK53-KA3PR	2 029 157	KH 53 Profibus Link Adaptor KA3

Switch settings

In the Profibus Link Adaptor it is possible to change the following settings via DIP switches or push buttons.

S 1 (1-7) Address setting (0 … 127)

S 1 (8-8) Counting direction (CW/CCW)

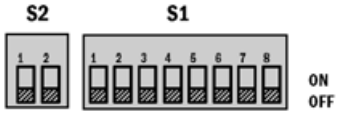
S 2 Bus termination

Access is provided via a removable screw cap (metrical/PG) on the rear of the Profibus Link Adaptor.

Status Information via LEDs

LED-1 Bus activity (red)

LED-2 Operating voltage (green)



General

The KH 53 Profibus is an absolute length measuring system with a resolution of 100 µm. The Bus coupling is realised within the encoder and is a Profibus DP slave in accordance with EN 50170 Vol. 2. The realisation of the Profibus interface is performed by the Profibus ASIC SPC3 from Siemens.

The KH 53 Profibus encompasses all Class 2 functions in accordance with Encoder Profile (1.1)

The encoder is implemented as a DP slave with general DP functions.

The conformance of the encoder with Profibus DP was verified by the PNO certified test centre.

The physical connection of the encoder is realised using a connection adaptor. The following options are available:

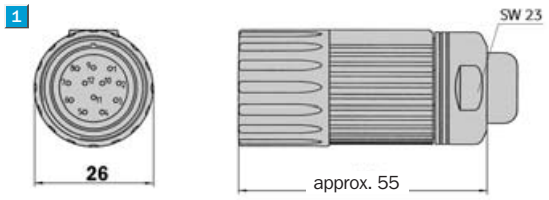
- Cable exit with 3 cable glands

Dimensional drawings and order information

Screw-in system M23, 12 pin for SSI-Interface

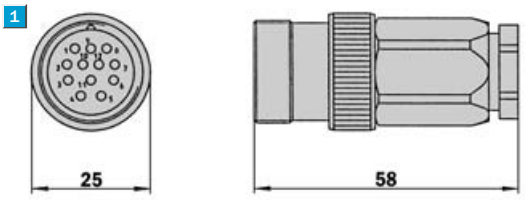
Connector M23 female, 12 pin

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



Connector M23 male, 12 pin

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



Cable connector M23, 12 pin, straight, cable 12 core, SSI and programming, screened, flexible

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2 029 200	12	1.5 m
DOL-2312-G03MMA1	2 029 201	12	3.0 m
DOL-2312-G05MMA1	2 029 202	12	5.0 m
DOL-2312-G10MMA1	2 029 203	12	10.0 m
DOL-2312-G20MMA1	2 029 204	12	20.0 m
DOL-2312-G30MMA1	2 029 205	12	30.0 m

Cable 12 core, per meter, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screening, flexible, cable diameter 7.8 mm

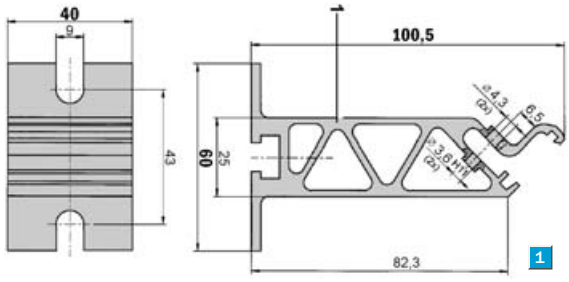
Type	Part no.	Cores	Explanation
LTG-2512-MW	6 027 531	12	
LTG-2612-MW	6 028 516	12	UV and salt water resistant

Mounting systems

Spacer support, height 100 mm, for KH 53, bored with srews *

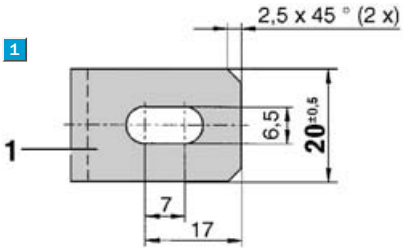
Type	Part no.
BEF-KHK-KHT53	2 029 158

* To fit measuring element



Fastening clamp for KH 53, screws not included

Type	Part no.
BEF-WK-KHT53	2 029 159



1 General tolerances according to DIN ISO 2768-mk

Adaptor modules for SSI Interface

Serial Parallel Adaptor

Type	Part no.	Explanation
AD-SSIG-PA	1 030 106	SSI Parallel Adaptor module, with 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, with plastic housing 2
AD-SSIPF-PA	1 030 109	SSI Parallel Adaptor module, programmable, without plastic housing, with front plate 2
AD-SSIP-PA	1 030 110	SSI Parallel Adaptor module, programmable, without plastic housing, without front plate 2

Connection system Sub-D for Adaptor modules

Cable connector Sub-D male, 15 pin, straight, screened

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

Cable connector Sub-D female, 37 pin, straight, screened

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

Programming Tools

Programming Tool for KH 53 (with SSI Interface)

Type	Part no.
PGT-01-S	1 030 111

Programming Tool for SSI Adaptor modules 2

Type	Part no.
PGT-02-S	1 030 112

BTF/PRF:

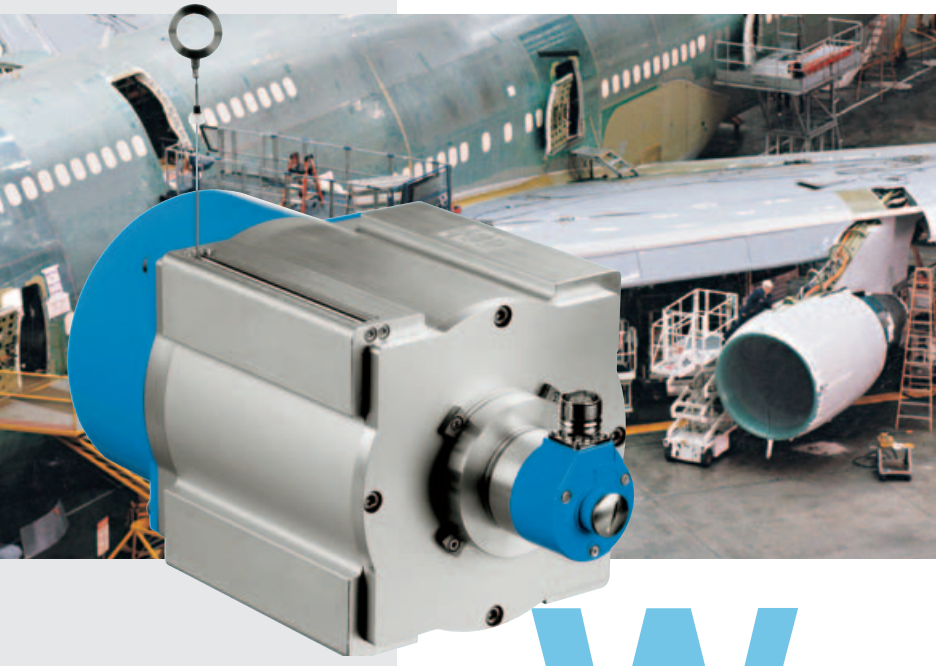
Resolution up to 0,025 mm

Absolut Wire Draw Encoders

Resolution up to 0,025 mm

Incremental Wire Draw Encoders

Absolute and incremental wire draw encoders for measuring lengths up to 50 m



BKS/PKS:

Resolution up to 0,05 mm

Absolut Wire Draw Encoders

Resolution up to 0,05 mm

Incremental Wire Draw Encoders

Wire draw encoders consist of wire draw mechanism and an encoder.

The rotation of the drum is proportional to the lenght being measured. This movement is counted by an encoder and converted to a measuring signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult ambient conditions.
Precise linear guidance, as required for other length measurement systems, is not necessary.

The combination of the wire draw mechanism and absolute or incremental encoders manufactured by SICK-STEGMANN enables made-to-measure solutions for almost any application profile.

To comply with the exacting demands of automation technology, these wire draw encoders offer the correct interface for every application:

- SSI, Profibus, CANopen or Device-Net field bus technology for absolute encoders
- HTL or TTL interfaces for incremental encoders.

For example, this product can be utilised in many applications including:

- Crane, drilling and excavator systems
- Presses, punching and injection machines
- Weir systems and locks
- High-bay shelving and theatre stages
- Woodworking and stone processing machines
- Machinery construction, medical technology and many other industries.

◄ Wire Draw Encoders assist construction cranes in positioning heavy loads safely.

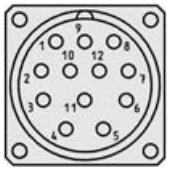
▼ In fully and partially automated loading stations, Wire Draw Encoders precisely measure travel routes.

Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

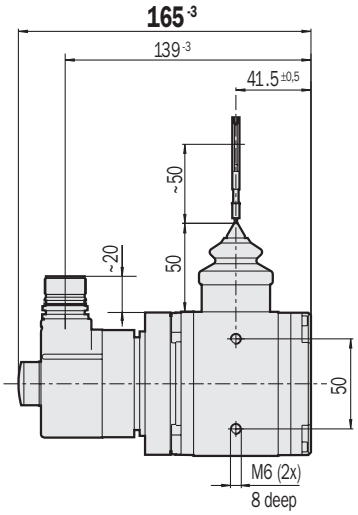
CE

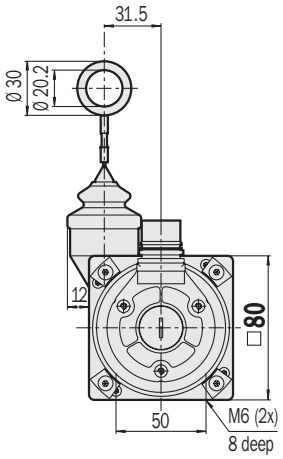


View of the connector M23 fitted to the encoder body

See chapter Accessories
Accessories for encoders

Dimensional drawing wire draw encoder BTF08 SSI, measuring length 2 m

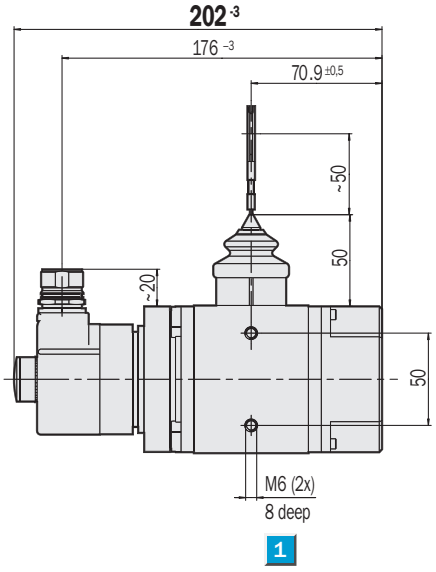


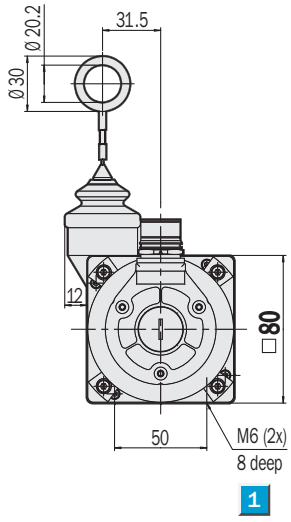


1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder BTF08 SSI, measuring length 3 m





1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D –	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D –	black	RS422 programming line
8	U_s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data –	brown	Interface signals
11	Clock –	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.

Technical data	BTF08	SSI 2 m	SSI 3 m								
Drum housing	Anodised Aluminium	■	■								
Spring housing	Die-cast zinc	■	■								
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■								
Measuring length	2 m max.	■									
	3 m max.		■								
Mass	1.8 kg approx.	■									
	2.0 kg approx.		■								
Code type	25 bit/Gray	■	■								
Code sequence	Increasing in direction of measurement	■	■								
Measuring step	0.025 mm	■	■								
Linearity	0.05 % typ.	■	■								
Repeatability	± 1 measuring step	■	■								
Operating speed	4 m/sec.	■	■								
Position forming time	0.15 ms	■	■								
Spring return force (typ.)											
start/finish [1]	6 N/14 N	■	■								
Working temperature range	– 20 … + 70 °C	■	■								
Storage temperature range	– 40 … + 100 °C	■	■								
Life of wire draw mechanism [2]	1 million cycles	■	■								
EMC [3]		■	■								
Resistance											
to shocks [4]	100/6 g/ms	■	■								
to vibration [5]	20/10 … 2,000 g/Hz	■	■								
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■								
	IP 67 (encoder)	■	■								
Operating voltage range (U_s)	10 … 32 V	■	■								
Power consumption max.	0.8 W	■	■								
Initialisation time [6]	1,050 ms	■	■								
Interface signals											
Clock +, Clock –, Data +, Data – [7]	SSI max. clock freqency 1 MHz i.e. min.	■	■								
	duration LOW level (Clock +): 500 ns	■	■								
T x D +, T x D –, R x D +, R x D –	RS422	■	■								
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)	■	■								

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

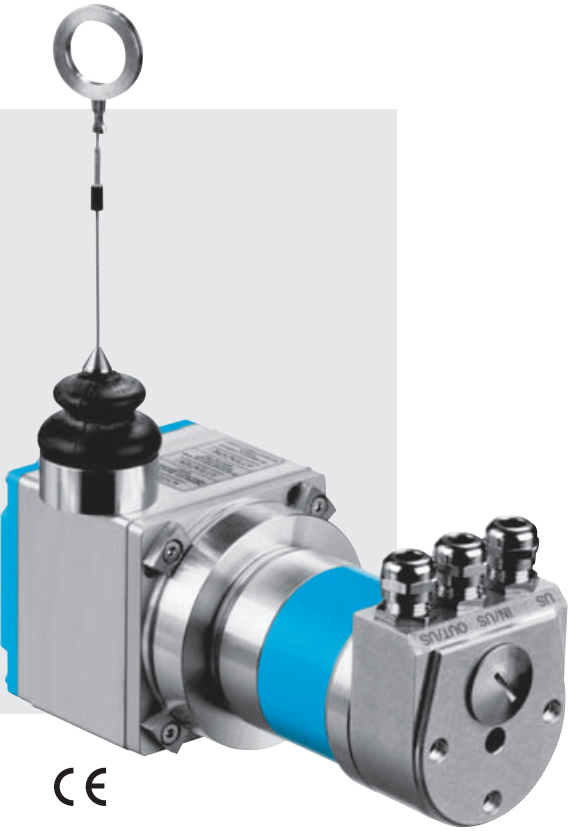
7) For higher clock frequencies, choose synchronous SSI.

Order information		
BTF08; U_s 10 … 32 V; connector M23, 12 pin		
25 bit SSI, Gray-Code, Set = 1,000		
Type	**Part no.**	**Description**
BTF08-A1AM0240	1034299	SSI, measuring length 2 m
BTF08-A1AM0340	1034892	SSI, measuring length 3 m

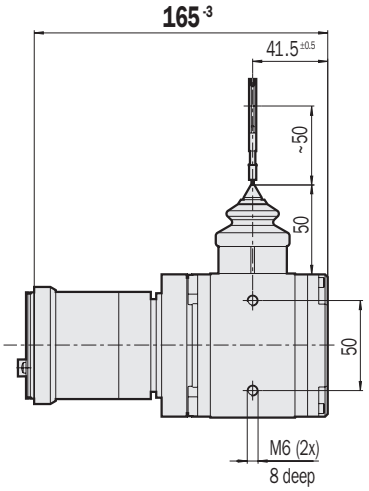
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

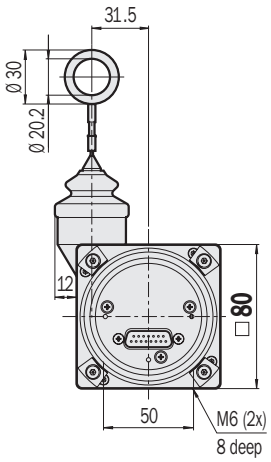


Dimensional drawing wire draw encoder BTF08 Profibus, CANopen, DeviceNet, measuring length 2 m



1

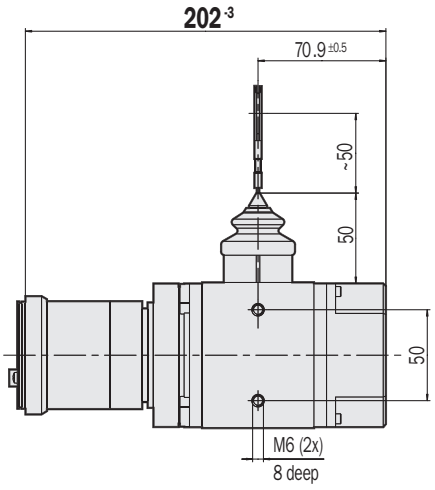
1 Threaded blind hole for mounting



1

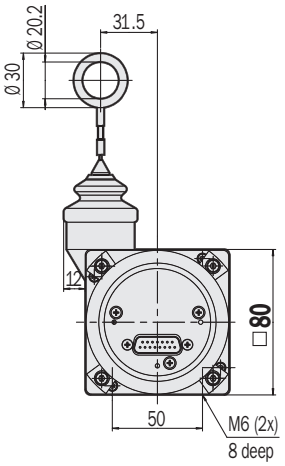
General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder BTF08 Profibus, CANopen, DeviceNet, measuring length 3 m



1

1 Threaded blind hole for mounting



1

General tolerances to DIN ISO 2768-mk

See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141
CANopen adaptor with PIN and wire allocation see pages 142 / 143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data	BTF08	PB 2m	CO 2m	DN 2m	PB 3m	CO 3m	DN 3m
Drum housing	Anodised Aluminium	■	■	■	■	■	■
Spring housing	Die-cast zinc	■	■	■	■	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■	■	■	■	■
Measuring length	2 m max.	■	■	■			
	3 m max.				■	■	■
Mass	1.9 kg approx.	■	■	■			
	2.1 kg approx.				■	■	■
Measuring step (recommended)	0.025 mm [1]	■	■	■	■	■	■
Linearity	0.05 % typ.	■	■	■	■	■	■
Repeatability	± 1 measuring step	■	■	■	■	■	■
Operating speed	4 m/sec.	■	■	■	■	■	■
Position forming time	0.25 ms	■	■	■	■	■	■
Spring return force (typ.)							
start/finish [1]	6 N/14 N	■	■	■	■	■	■
Working temperature range	– 20 … + 70 °C	■	■	■	■	■	■
Storage temperature range	– 40 … + 100 °C	■	■	■	■	■	■
Life of wire draw mechanism [2]	1 million cycles	■	■	■	■	■	■
EMC [3]		■	■	■	■	■	■
Resistance							
to shocks [4]	100/6 g/ms	■	■	■	■	■	■
to Vibration [5]	20/10 … 2,000 g/Hz	■	■	■	■	■	■
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■	■	■	■	■
	IP 67 (encoder)	■	■	■	■	■	■
Operating voltage range (U_s)	10 … 32 V	■	■	■	■	■	■
Power consumption max.	2.0 W	■	■	■	■	■	■
Initialisation time [6]	1,250 ms	■	■	■	■	■	■
Bus interface							
Electronic adjustment (Number SET)	Via PRESET switch or protocol	■	■	■	■	■	■
Bus termination [7]	Via DIP switch	■	■	■	■	■	■
Electrical connection	Connection adaptor	■	■	■	■	■	■
Electrical interface [8]	RS485	■			■		
Electrical interface [9]	ISO-DIS 11898		■	■		■	■
Protocol	Profile for encoders (07_{hex}) – Class 2	■			■		
	Communication Profile DS 301 V4.0		■			■	
	Device Profile DSP 406 V2.0		■			■	
	DeviceNet Specification, Release 2.0			■			■
Address setting (node no.)	0 … 127 (DIP switch or protocol)	■			■		
Address setting (Node ID)	0 … 63 (DIP switch or protocol)		■	■		■	■
Data transmission rate (Baud rate) [10]	9.6 kBaud … 12 MBaud	■			■		
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB		■			■	
(DIP switch or protocol)	(125, 250, 500) kB			■			■
Status information	Running (LED green), bus activity (LED red)	■			■		
	2-coloured LED for CAN Controller Status		■			■	
	Network status LED (NS), 2-coloured			■			■

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

7) Connection for terminal device only

8) To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

9) (CAN High Speed) and CAN specification 2.0 B, galvanically separated

10) Automatic detection

[1] When the customer configures the encoder to 8,000 steps x 16 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

Order information

BTF08; U_s 10 … 32 V; field buses

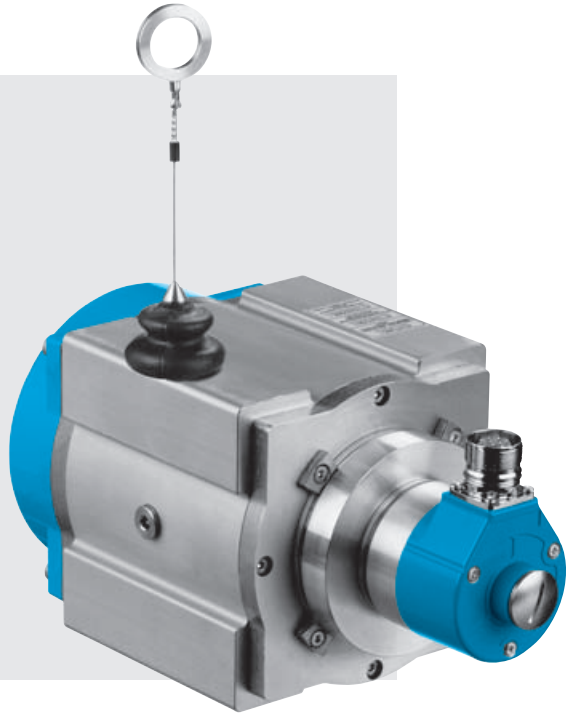
Type	Part no.	Description
BTF08-P1HM0241	1034305	Profibus, measuring length 2 m
BTF08-D1HM0241	1034311	DeviceNet, measuring length 2 m
BTF08-C1HM0241	1034317	CANopen, measuring length 2 m
BTF08-P1HM0341	1034893	Profibus, measuring length 3 m
BTF08-D1HM0341	1034894	DeviceNet, measuring length 3 m
BTF08-C1HM0341	1034895	CANopen, measuring length 3 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



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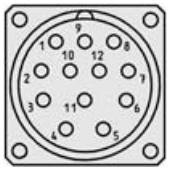
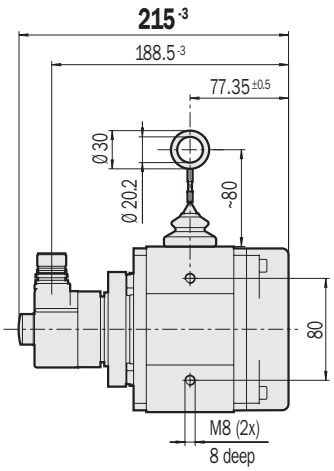


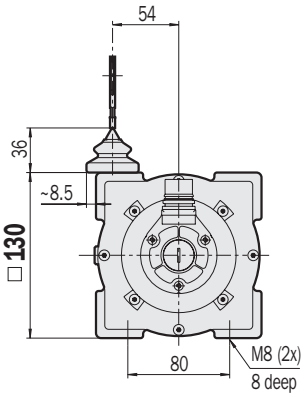
View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Dimensional drawing wire draw encoder BTF13 SSI, measuring length 5 m





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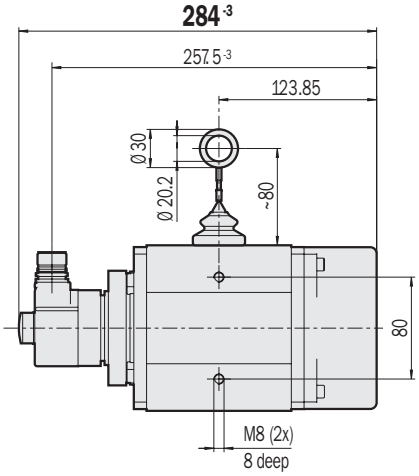
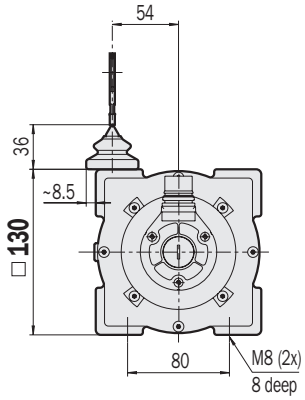
Dimensional drawing wire draw encoder BTF13 SSI, measuring length 10 m





1

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D –	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D –	black	RS422 programming line
8	U_s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data –	brown	Interface signals
11	Clock –	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.

Technical data	BTF13	SSI 5 m	SSI 10 m
Drum housing	Anodised Aluminium	■	■
Spring housing	Plastic	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■
Measuring length	5 m max.	■	
	10 m max.		■
Mass	3.3 kg approx.	■	
	4.0 kg approx.		■
Code type	25 bit/Gray	■	■
Code sequence	Increasing in direction of measurement	■	■
Measuring step	0.05 mm	■	■
Linearity	0.05 % typ.	■	■
Repeatability	± 1 measuring step	■	■
Operating speed	4 m/sec.	■	■
Position forming time	0.15 ms	■	■
Spring return force (typ.)			
start/finish [1]	15 N/20 N	■	
start/finish [1]	10 N/20 N		■
Working temperature range	– 20 … + 70 °C	■	■
Storage temperature range	– 40 … + 100 °C	■	■
Life of wire draw mechanism [2]	1 million cycles	■	■
EMC [3]		■	■
Resistance			
to shocks [4]	100/6 g/ms	■	■
to vibration [5]	20/10 … 2,000 g/Hz	■	■
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■
	IP 67 (encoder)	■	■
Operating voltage range (U_s)	10 … 32 V	■	■
Power consumption max.	0.8 W	■	■
Initialisation time [6]	1,050 ms	■	■
Interface signals			
Clock +, Clock –, Data +, Data – [7]	SSI max. clock freqency 1 MHz i.e. min.	■	■
	duration LOW level (Clock +): 500 ns	■	■
T x D +, T x D –, R x D +, R x D –	RS422	■	■
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)	■	■

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

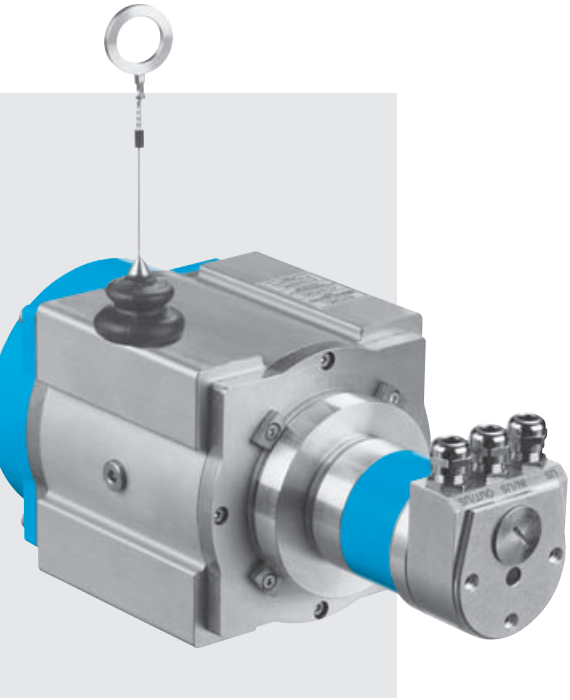
[7] For higher clock frequencies, choose synchronous SSI.

Order information		
BTF13; U_s 10 … 32 V; connector M23, 12 pin		
25 bit SSI; Gray-Code, Set = 1,000		
Type	**Part no.**	**Description**
BTF13-A1AM0520	1034300	SSI, measuring length 5 m
BTF13-A1AM1020	1034301	SSI, measuring length 10 m

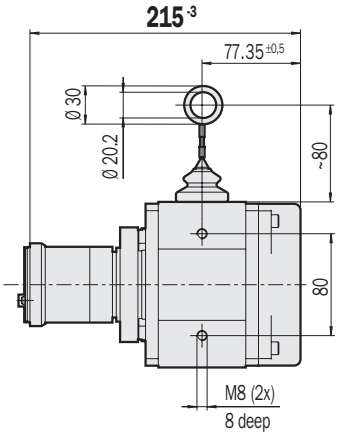
Resolution up to 0.025 mm

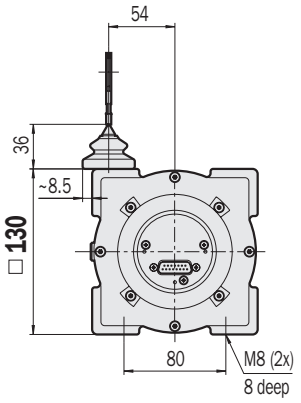
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 5 m





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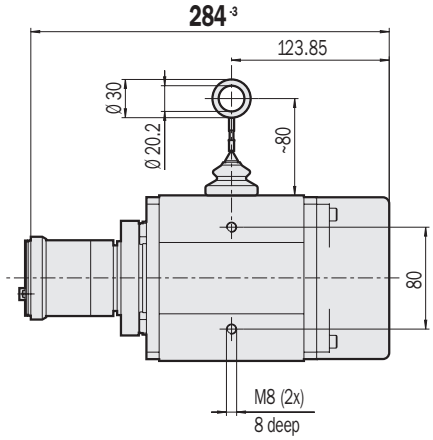
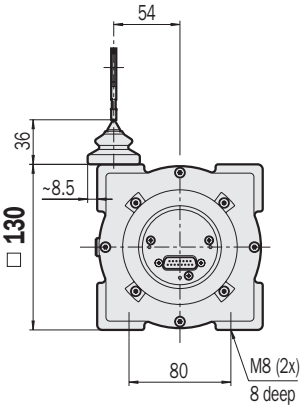
Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 10 m





1

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141
CANopen adaptor with PIN and wire allocation see pages 142 / 143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data	BTF13	PB 5m	CO 5m	DN 5m	PB 10m	CO 10m	DN 10m				
Drum housing	Anodised Aluminium	■	■	■	■	■	■				
Spring housing	Plastic	■	■	■	■	■	■				
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■	■	■	■	■				
Measuring length	5 m max.	■	■	■							
	10 m max.				■	■	■				
Mass	3.4 kg approx.	■	■	■							
	4.1 kg approx.				■	■	■				
Measuring step (recommended)	0.05 mm 1	■	■	■	■	■	■				
Linearity	0.05 % typ.	■	■	■	■	■	■				
Repeatability	± 1 measuring step	■	■	■	■	■	■				
Operating speed	4 m/sec.	■	■	■	■	■	■				
Position forming time	0.25 ms	■	■	■	■	■	■				
Spring return force (typ.)											
start/finish [1]	15 N/20 N	■	■	■							
start/finish [1]	10 N/20 N				■	■	■				
Working temperature range	– 20 … + 70 °C	■	■	■	■	■	■				
Storage temperature range	– 40 … + 100 °C	■	■	■	■	■	■				
Life of wire draw mechanism [2]	1 million cycles	■	■	■	■	■	■				
EMC [3]		■	■	■	■	■	■				
Resistance											
to shocks [4]	100/6 g/ms	■	■	■	■	■	■				
to vibration [5]	20/10 … 2,000 g/Hz	■	■	■	■	■	■				
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■	■	■	■	■				
	IP 67 (encoder)	■	■	■	■	■	■				
Operating voltage range (U_s)	10 … 32 V	■	■	■	■	■	■				
Power consumption max.	2.0 W	■	■	■	■	■	■				
Initialisation time [6]	1,250 ms	■	■	■	■	■	■				
Bus interface											
Electronic adjustment (Number SET)	Via PRESET switch or protocol	■	■	■	■	■	■				
Bus termination [7]	Via DIP switch	■	■	■	■	■	■				
Electrical connection	Connection adaptor	■	■	■	■	■	■				
Electrical interface [8]	RS485	■			■						
Electrical interface [9]	ISO-DIS 11898		■	■		■	■				
Protocol	Profile for encoders (07_{hex}) – Class 2	■			■						
	Communication Profile DS 301 V4.0		■			■					
	Device Profile DSP 406 V2.0		■			■					
	DeviceNet Specification, Release 2.0			■			■				
Address setting (node no.)	0 … 127 (DIP switch or protocol)	■			■						
Address setting (Node ID)	0 … 63 (DIP switch or protocol)		■	■		■	■				
Data transmission rate (Baud rate) [10]	9.6 kBaud … 12 MBaud	■			■						
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB		■			■					
(DIP switch or protocol)	(125, 250, 500) kB			■			■				
Status information	Running (LED green), bus activity (LED red)	■			■						
	2-coloured LED for CAN Controller Status		■			■					
	Network status LED (NS), 2-coloured			■			■				

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

[7] Connection for terminal device only

[8] To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

[9] (CAN High Speed) and CAN specification 2.0 B, galvanically separated

[10] Automatic detection

1 When the customer configures the encoder to 6,680 steps x 32 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

Order information

BTF13; U_s 10 … 32 V; field buses

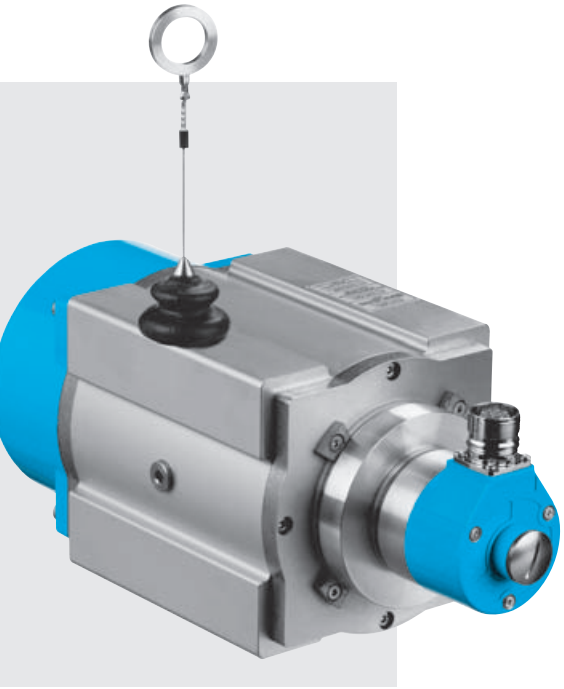
Type	Part no.	Description
BTF13-P1HM0525	1 034 306	Profibus, measuring length 5 m
BTF13-D1HM0525	1 034 312	DeviceNet, measuring length 5 m
BTF13-C1HM0525	1 034 318	CANopen, measuring length 5 m
BTF13-P1HM1025	1 034 307	Profibus, measuring length 10 m
BTF13-D1HM1025	1 034 313	DeviceNet, measuring length 10 m
BTF13-C1HM1025	1 034 319	CANopen, measuring length 10 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



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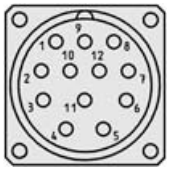
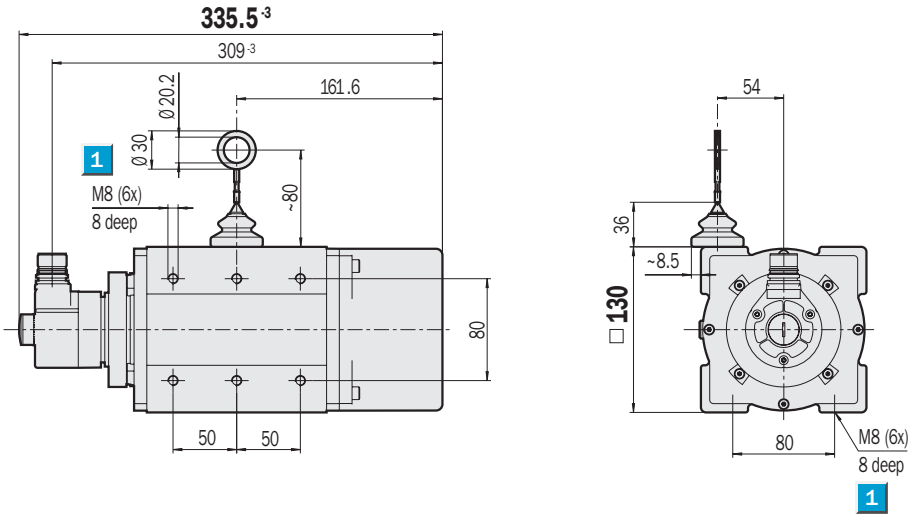


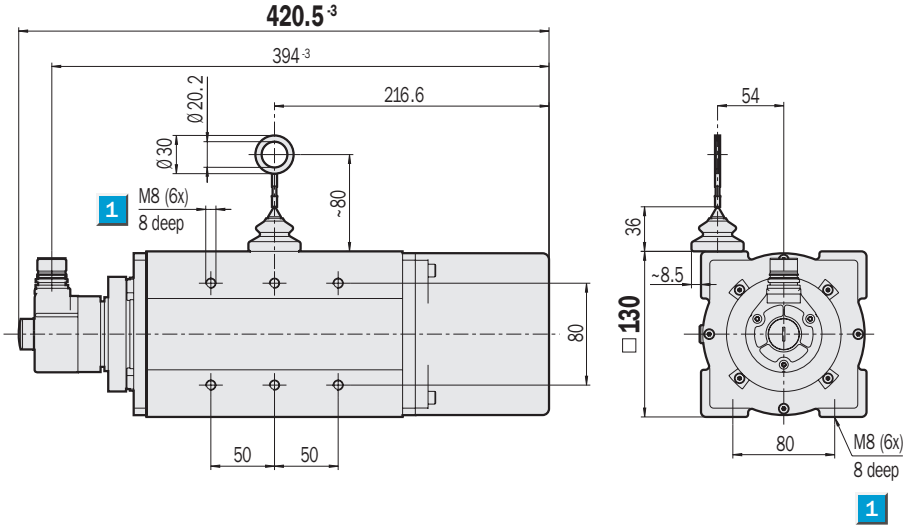
View of the connector M23 fitted to the encoder body

See chapter Accessories
Accessories for encoders

Dimensional drawing wire draw encoder BTF13 SSI, measuring length 20 m



Dimensional drawing wire draw encoder BTF13 SSI, measuring length 30 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D –	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D –	black	RS422 programming line
8	U_s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data –	brown	Interface signals
11	Clock –	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.

Technical data	BTF13	SSI 20 m	SSI 30 m
Drum housing	Anodised Aluminium		
Spring housing	Plastic		
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm		
Measuring length	20 m max.		
	30 m max.		
Mass	5.3 kg approx.		
	6.5 kg approx.		
Code type	25 bit/Gray		
Code sequence	Increasing in direction of measurement		
Measuring step	0.05 mm		
Linearity	0.05 % typ.		
Repeatability	± 1 measuring step		
Operating speed	4 m/sec.		
Position forming time	0.15 ms		
Spring return force (typ.)			
start/finish [1]	10 N/20 N		
Working temperature range	– 20 … + 70 °C		
Storage temperature range	– 40 … + 100 °C		
Life of wire draw mechanism [2]	1 million cycles		
EMC [3]			
Resistance			
to shocks [4]	100/6 g/ms		
to vibration [5]	20/10 … 2,000 g/Hz		
Protection to IEC 60529	IP 64 (wire draw mechanism)		
	IP 67 (encoder)		
Operating voltage range (U_s)	10 … 32 V		
Power consumption max.	0.8 W		
Initialisation time [6]	1,050 ms		
Interface signals			
Clock +, Clock –, Data +, Data – [7]	SSI max. clock freqency 1 MHz i.e. min.		
	duration LOW level (Clock +): 500 ns		
T x D +, T x D –, R x D +, R x D –	RS422		
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)		

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

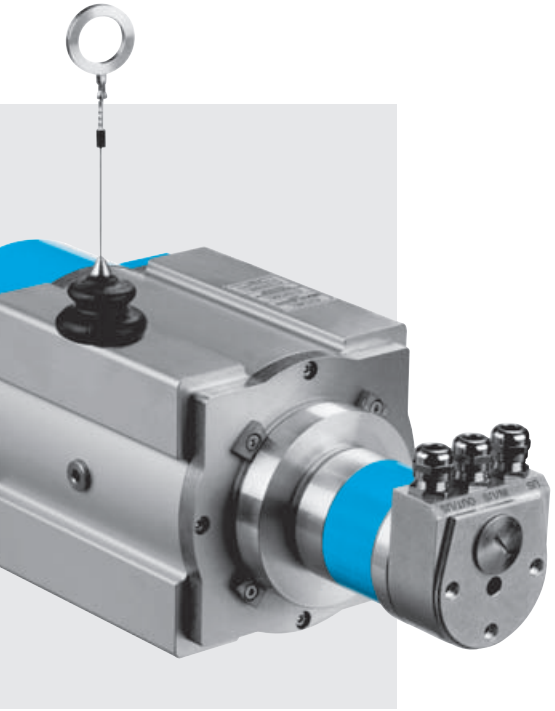
7) For higher clock frequencies, choose synchronous SSI.

Order information		
BTF13; U_s 10 … 32 V; connector M23, 12 pin		
25 bit SSI; Gray-Code, Set = 1,000		
Type	**Part no.**	**Description**
BTF13-A1AM2020	1034302	SSI, measuring length 20 m
BTF13-A1AM3020	1034303	SSI, measuring length 30 m

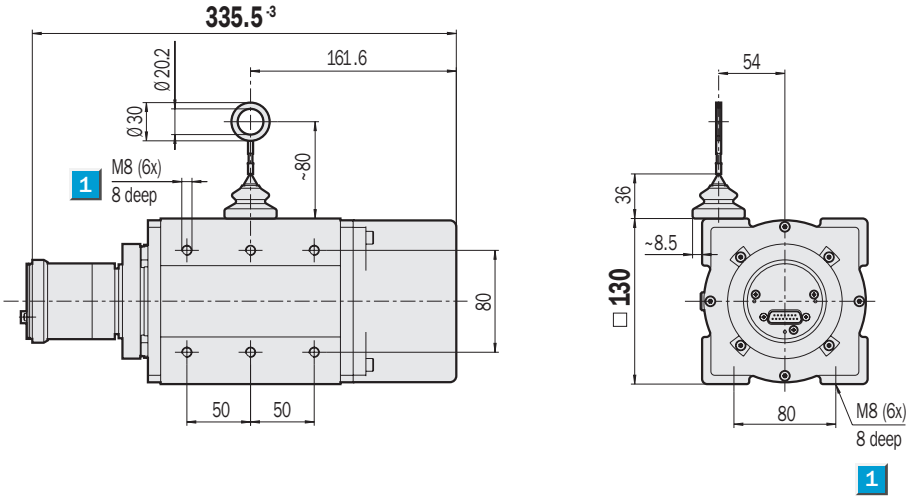
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

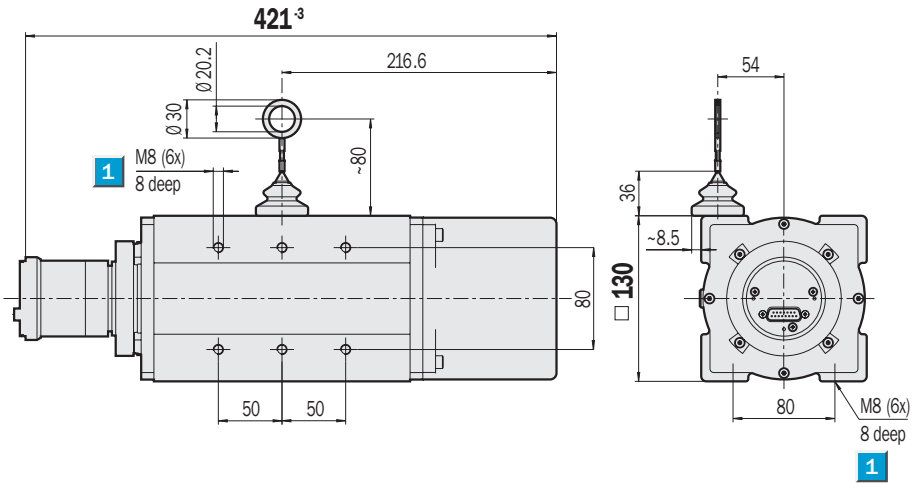
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 20 m



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 30 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141
CANopen adaptor with PIN and wire allocation see pages 142 / 143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data	BTF13	PB 20 m	CO 20 m	DN 20 m	PB 30 m	CO 30 m	DN 30 m
Drum housing	Anodised Aluminium	■	■	■	■	■	■
Spring housing	Plastic	■	■	■	■	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm	■	■	■	■	■	■
Measuring length	20 m max.	■	■	■			
	30 m max.				■	■	■
Mass	5.4 kg approx.	■	■	■			
	6.6 kg approx.				■	■	■
Measuring step (recommended)	0.05 mm 1	■	■	■	■	■	■
Linearity	0.05 % typ.	■	■	■	■	■	■
Repeatability	± 1 measuring step	■	■	■	■	■	■
Operating speed	4 m/sec.	■	■	■	■	■	■
Position forming time	0.25 ms	■	■	■	■	■	■
Spring return force (typ.)							
start/finish [1]	10 N/20 N	■	■	■	■	■	■
Working temperature range	– 20 … + 70 °C	■	■	■	■	■	■
Storage temperature range	– 40 … + 100 °C	■	■	■	■	■	■
Life of wire draw mechanism [2]	1 million cycles	■	■	■	■	■	■
EMC [3]		■	■	■	■	■	■
Resistance							
to shocks [4]	100/6 g/ms	■	■	■	■	■	■
to vibration [5]	20/10 … 2,000 g/Hz	■	■	■	■	■	■
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■	■	■	■	■
	IP 67 (encoder)	■	■	■	■	■	■
Operating voltage range (U_s)	10 … 32 V	■	■	■	■	■	■
Power consumption max.	2.0 W	■	■	■	■	■	■
Initialisation time [6]	1,250 ms	■	■	■	■	■	■
Bus interface							
Electronic adjustment (Number SET)	Via PRESET switch or protocol	■	■	■	■	■	■
Bus termination [7]	Via DIP switch	■	■	■	■	■	■
Electrical connection	Connection adaptor	■	■	■	■	■	■
Electrical interface [8]	RS485	■			■		
Electrical interface [9]	ISO-DIS 11898		■	■		■	■
Protocol	Profile for encoders (07_{hex}) – Class 2	■			■		
	Communication Profile DS 301 V4.0		■			■	
	Device Profile DSP 406 V2.0		■			■	
	DeviceNet Specification, Release 2.0			■			■
Address setting (node no.)	0 … 127 (DIP switch or protocol)	■			■		
Address setting (Node ID)	0 … 63 (DIP switch or protocol)		■	■		■	■
Data transmission rate (Baud rate) [10]	9.6 kBaud … 12 MBaud	■			■		
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB		■			■	
(DIP switch or protocol)	(125, 250, 500) kB			■			■
Status information	Running (LED green), bus activity (LED red)	■			■		
	2-coloured LED for CAN Controller Status		■			■	
	Network status LED (NS), 2-coloured			■			■

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

[7] Connection for terminal device only

[8] To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

[9] (CAN High Speed) and CAN specification 2.0 B, galvanically separated

[10] Automatic detection

1 When the customer configures the encoder to 6,646 steps x 128 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

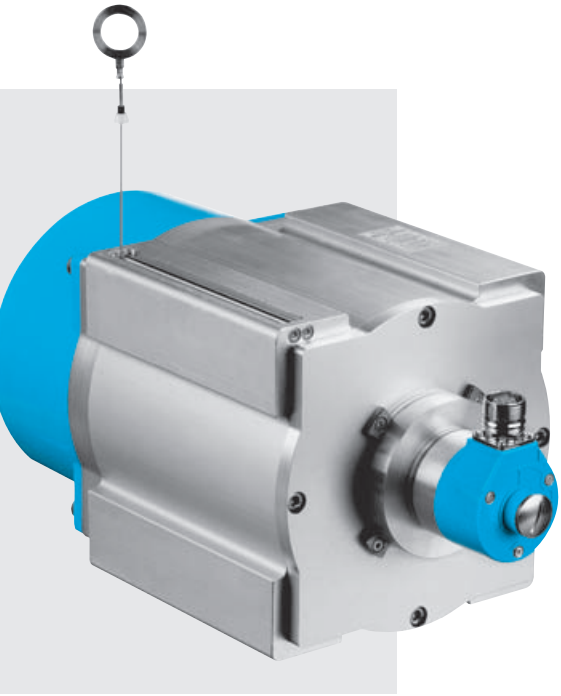
Order information		
BTF13; U_s 10 … 32 V; field buses		
Type	**Part no.**	**Description**
BTF13-P1HM2025	1034308	Profibus, measuring length 20 m
BTF13-D1HM2025	1034314	DeviceNet, measuring length 20 m
BTF13-C1HM2025	1034320	CANopen, measuring length 20 m
BTF13-P1HM3025	1034309	Profibus, measuring length 30 m
BTF13-D1HM3025	1034315	DeviceNet, measuring length 30 m
BTF13-C1HM3025	1034321	CANopen, measuring length 30 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

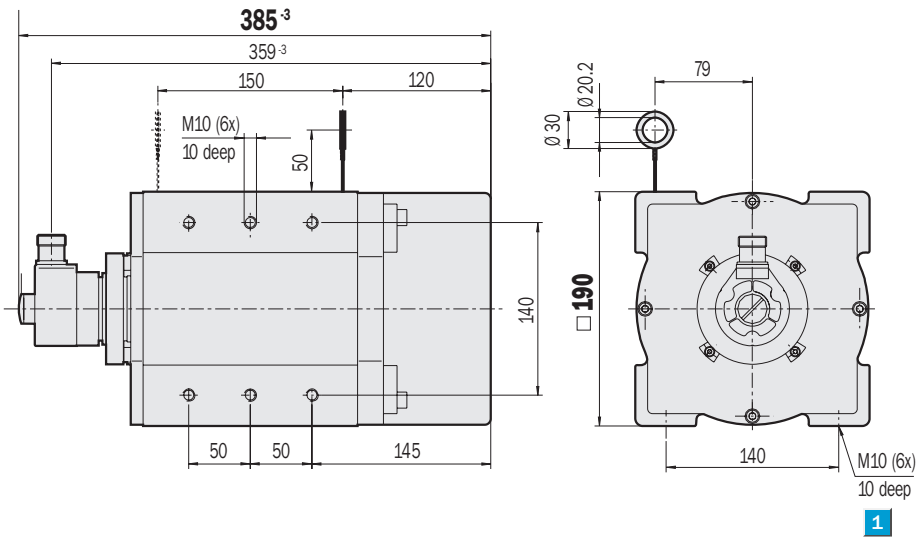
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire

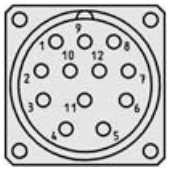


Dimensional drawing wire draw encoder BTF19 SSI, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D –	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D –	black	RS422 programming line
8	U_s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data –	brown	Interface signals
11	Clock –	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.

Technical data	BTF19	SSI 50 m									
Drum housing	Anodised Aluminium										
Spring housing	Die-cast zinc										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm										
Measuring length	50 m max.										
Mass	16.8 kg approx.										
Code type	25 bit/Gray										
Code sequence	Increasing in direction of measurement										
Measuring step	0.1 mm										
Linearity	0.05 % typ.										
Repeatability	± 1 measuring step										
Operating speed	4 m/sec.										
Position forming time	0.15 ms										
Spring return force (typ.)											
start/finish [1]	18 N/37 N										
Working temperature range	– 20 … + 70 °C										
Storage temperature range	– 40 … + 100 °C										
Life of wire draw mechanism [2]	1 million cycles										
EMC [3]											
Resistance											
to shocks [4]	100/6 g/ms										
to vibration [5]	20/10 … 2,000 g/Hz										
Protection to IEC 60529	IP 31 (wire draw mechanism)										
	IP 67 (encoder)										
Operating voltage range (U_s)	10 … 32 V										
Power consumption max.	0.8 W										
Initialisation time [6]	1,050 ms										
Interface signals											
Clock +, Clock –, Data +, Data – [7]	SSI max. clock freqency 1 MHz i.e. min.										
	duration LOW level (Clock +): 500 ns										
T x D +, T x D –, R x D +, R x D –	RS422										
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U_s V)										

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

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

[4] To DIN EN 60068-2-27

[5] To DIN EN 60068-2-6

[6] From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

[7] For higher clock frequencies, choose synchronous SSI.

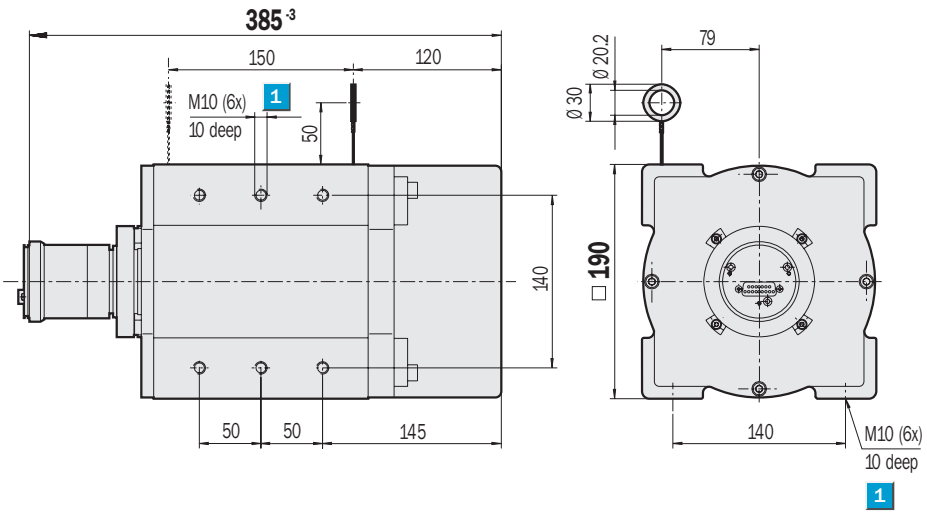
Order information		
BTF19; U_s 10 … 32 V; connector M23, 12 pin		
25 bit SSI, Gray-Code, Set = 1,000		
Type	**Part no.**	**Description**
BTF19-A1AM5010	1034304	SSI, measuring length 50 m

Resolution up to 0.025 mm

Absolute Wire Draw Encoders

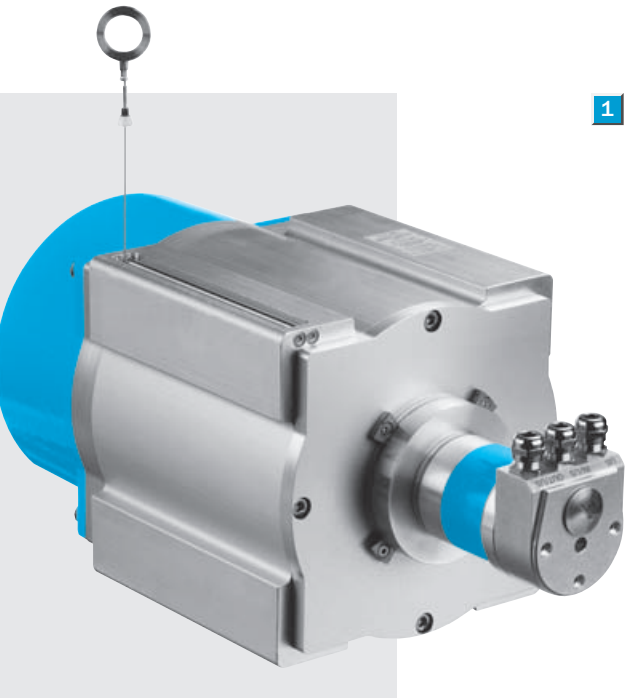
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire

Dimensional drawing wire draw encoder BTF19 Profibus, CANopen, DeviceNet, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



CE

See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140/141
CANopen adaptor with PIN and wire allocation see pages 142/143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data	BTF19	PB 50 m	CO 50 m	DN 50 m
Drum housing	Anodised Aluminium			
Spring housing	Die-cast zinc			
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm			
Measuring length	50 m max.			
Mass	16.9 kg approx.			
Measuring step (recommended)	0.1 mm 1			
Linearity	0.05 % typ.			
Repeatability	± 1 measuring step			
Operating speed	4 m/sec.			
Position forming time	0.25 ms			
Spring return force (typ.)				
start/finish 1)	18 N/37 N			
Working temperature range	– 20 … + 70 °C			
Storage temperature range	– 40 … + 100 °C			
Life of wire draw mechanism 2)	1 million cycles			
EMC 3)				
Resistance				
to shocks 4)	100/6 g/ms			
to vibration 5)	20/10 … 2,000 g/Hz			
Protection to IEC 60529	IP 31 (wire draw mechanism)			
	IP 67 (encoder)			
Operating voltage range (U_s)	10 … 32 V			
Power consumption max.	2.0 W			
Initialisation time 6)	1,250 ms			
Bus interface				
Electronic adjustment (Number SET)	Via PRESET switch or protocol			
Bus termination 7)	Via DIP switch			
Electrical connection	Connection adaptor			
Electrical interface 8)	RS485			
Electrical interface 9)	ISO-DIS 11898			
Protocol	Profile for encoders (07_{hex}) – Class 2			
	Communication Profile DS 301 V4.0			
	Device Profile DSP 406 V2.0			
	DeviceNet Specification, Release 2.0			
Address setting (node no.)	0 … 127 (DIP switch or protocol)			
Address setting (Node ID)	0 … 63 (DIP switch or protocol)			
Data transmission rate (Baud rate) 10)	9.6 kBaud … 12 MBaud			
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB			
(DIP switch or protocol)	(125, 250, 500) kB			
Status information	Running (LED green), bus activity (LED red)			
	2-coloured LED for CAN Controller Status			
	Network status LED (NS), 2-coloured			

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

7) Connection for terminal device only

8) To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

9) (CAN High Speed) and CAN specification 2.0 B, galvanically separated

10) Automatic detection

1 When the customer configures the encoder to 4,900 steps x 128 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

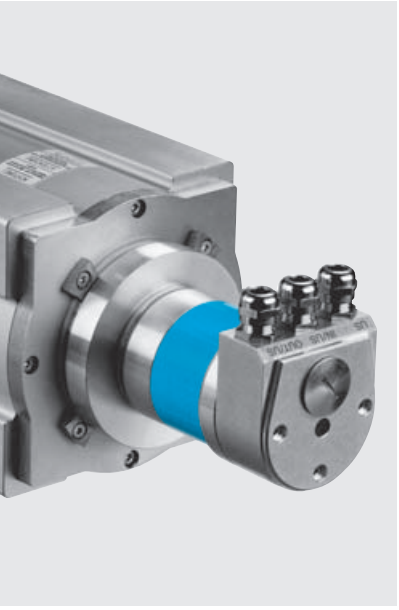
Order information		
BTF19; U_s 10 … 32 V; field buses		
Type	**Part no.**	**Description**
BTF19-P1HM5017	1034310	Profibus, measuring length 50 m
BTF19-D1HM5017	1034316	DeviceNet, measuring length 50 m
BTF19-C1HM5017	1034322	CANopen, measuring length 50 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

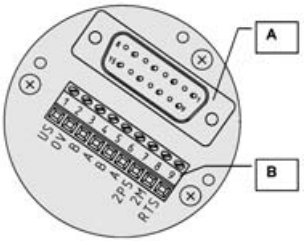
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



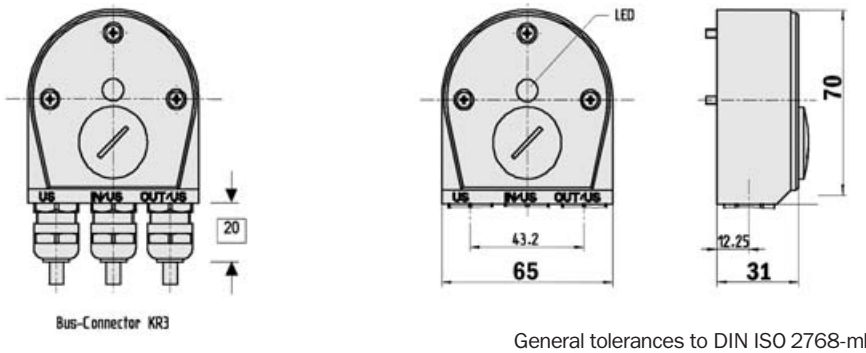
CE



A Internal plug connection to the encoder
B External connection to the bus

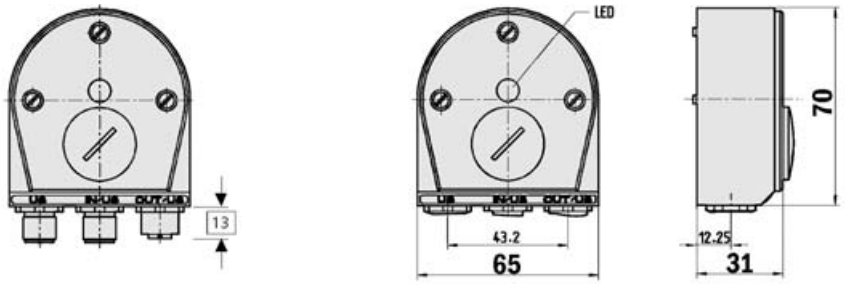
1 Encoders with a Profibus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

Dimensional drawing Profibus adaptor KA3



General tolerances to DIN ISO 2768-mk

Dimensional drawing Profibus adaptor SR3



General tolerances to DIN ISO 2768-mk

Order information

BTF Profibus adaptor

Type	Part no..	Description
AD-ATM60-KA3PR	2029225	Bus adaptor KA3, 3 x PG
AD-ATM60-SR3PR	2031985	Bus adaptor SR3, 1 x M12, 4 pin 2 x M12, 5 pin

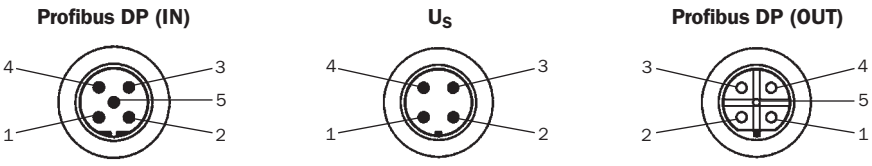
1 PIN and wire allocation for Profibus adaptor

Terminal strip	Connector 4 pin	Connector 5 pin	Conn. female 5 pin	Signal	Explanation
1	1	–	–	U_s (24 V)	Supply voltage 10 … 32 V
2	3	–	–	0 V (GND)	Ground (0 V)
3	–	–	4	B	Profibus DP B line (out)
4	–	–	2	A	Profibus DP A line (out)
5	–	4	–	B	Profibus DP B line (in)
6	–	2	–	A	Profibus DP A line (in)
7	–	–	1	2P5 [1]	+ 5 V (DC isolated)
8	–	–	3	2M [1]	0 V (DC isolated)
9	–	–	–	RTS [2]	Request To Send
–	2	1	–	N. C.	–
–	4	3	–	N. C.	–
–	–	5	5	Screen	Housing potential

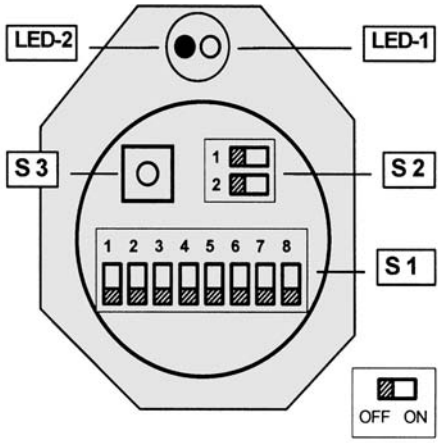
[1] Use for external bus termination or to supply the transmitter/receiver of an optical transmission link.

[2] Signal is optional, used to detect the direction of an optical connection.

Connector M12 (at Bus adaptor)



Switch settings



Switch settings
Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1 (1-7)	Address setting (0 … 127)
S 1 (8-8)	Counting direction (CW/CCW)
S 2	Bus termination
S 3	Preset push button (Number SET)

Status information via LEDs

LED-1	Operating voltage (green)
LED-2	Bus activity (red)

Implementation

DP Functionalities
in accordance with the Profibus DP basic functions

DP services
- Data interchange (Write_Read_Data)
- Address allocation (Set_Slave_Address)
- Control commands (Global_Control)
- Read the inputs (Read_Inputs)
- Read the outputs (Read_Outputs)
- Read diagnostic data (Slave_Diagnosis)
- Send configuration data (Set_Param)
- Check configuration data (Chk_Config)

Communication
- Cyclic master – slave data traffic

Protective mechanisms
- Data transfer with HD = 4
- Time monitoring of the data traffic

Configuration
Settings in accordance with Encoder Profile
- Counting direction (CW, CCW)
- Class-2 functionality (ON, OFF)
- Scaling function (ON, OFF)
- Steps per turn (1 … 8192)
- Total resolution (GA) -- 1 … 67,108,864 steps, with GA = 2^n x SpU. -- (n=0 … 13)
- "Activation of SSA-service" [2)]
- Selection of the station address [2)]

Configuration
Setting the formats (IN/OUT)
for the cyclic data interchange via configuration byte (K-1)

2 words IN/OUT data (I-1/O-1) [1)]
4 words IN/OUT data (I-1, I-2, I-3/O-1) [2)]

Data interchange: - Input Data (IN)

I-1	Position value [1)]	4 bytes
I-2	Speed (rev/min) [2)]	2 bytes
I-3	Time stamp [2)]	2 bytes

Data interchange: - Output data (OUT)

O-1	PRESET Value [1)]	4 bytes

Diagnostic information
- Station-related diagnosis (63 bytes in acc. with Encoder Profile Class 2)

Setting: - PRESET value
The PRESET function is used for set into operation and to allocate a specific position value to the current physical angular position.
The following settings are possible:
- by hardware (PRESET push button: S3)
- by software: -- (see Output data)

Setting: - Counting direction
- by hardware via DIP switch S1-(8)
- by software via Telegram

Counting direction increasing:
Rotation of the shaft in the clockwise direction (CW) as viewed on the shaft

Setting: - Station address
- by hardware via DIP switch S1
- by software via Telegram

The setting by software is carried out only if the "SSA-service" has been previously activated.

Setting: - Bus termination
The 2-way DIP switch (S2) permits an internal bus termination to be switched in and out (ON/OFF).
If the bus is terminated externally, switch S2 must be in the OFF position.

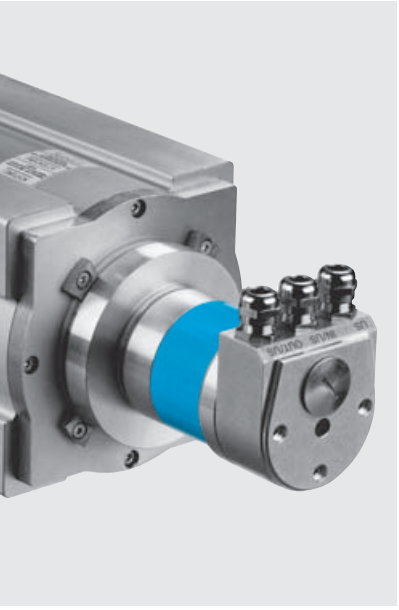
Device-specific file (GS.)
For the purpose of automatic set into operation of the encoder, use is made of the GS file.
All the characteristic features of the device are defined in it.
STEG 5952.GSD German
STEG 5952.GSE English

[1)] As per Encoder Profile
[2)] Manufacturer specific function

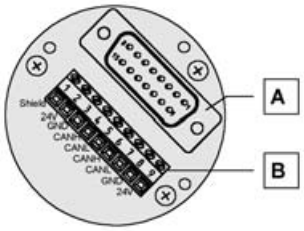
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

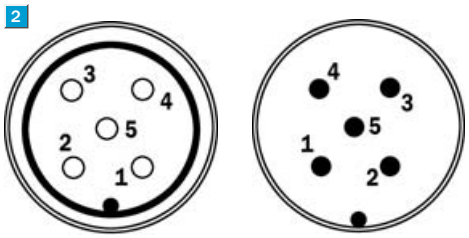


CE



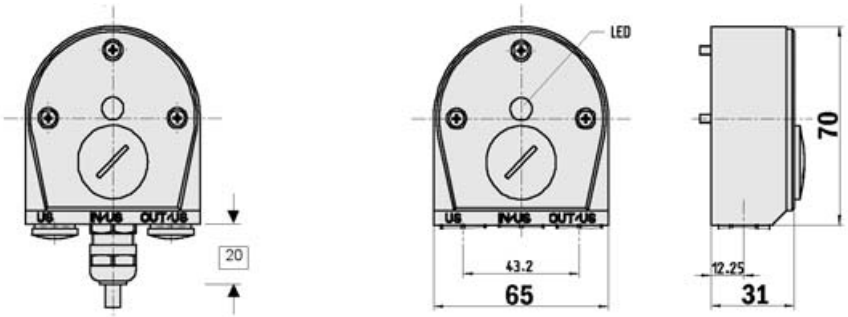
A Internal plug connection to the encoder
B External connection to the bus

2



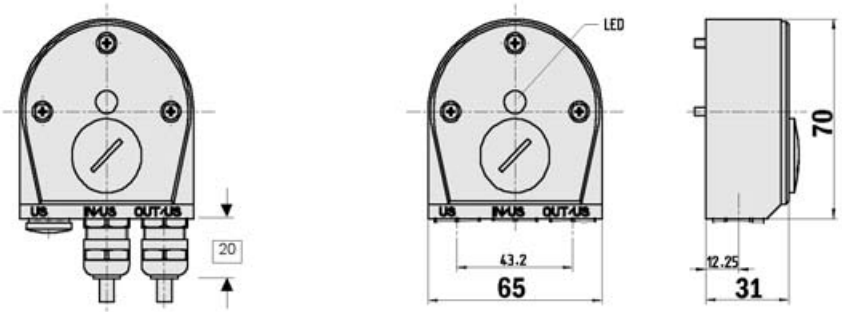
OUT/U_S (female) IN/U_S (male)
Connector M12 (Bus adaptor)

Dimensional drawing CANopen adaptor KR1



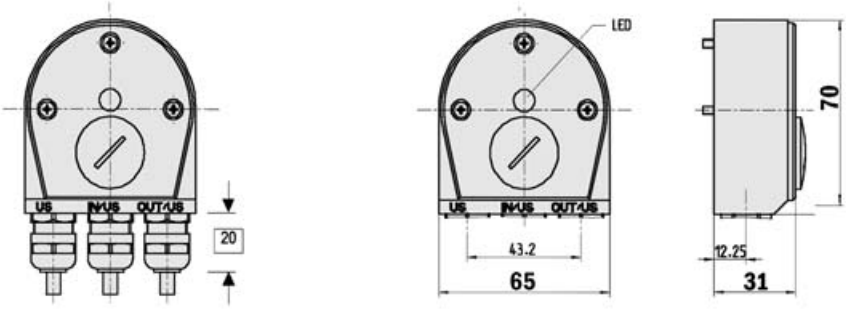
General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR2



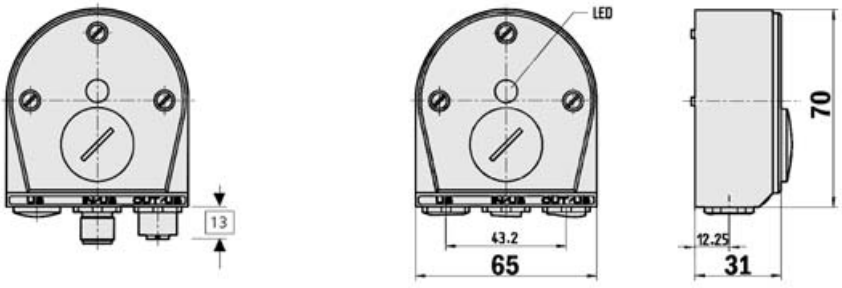
General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR3



General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor SR2



General tolerances to DIN ISO 2768-mk

Order information

BTF CANopen adaptor

Type	Part no.	Description
AD-ATM60-KR1CO	2029230	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2CO	2029231	Bus adaptor KR2, 2 x PG
AD-ATM60-KR3CO	2029232	Bus adaptor KR3, 3 x PG
AD-ATM60-SR2CO	2020935	Bus adaptor SR2, 2 x M12, 5 pin

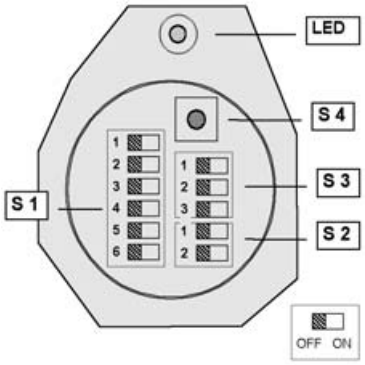
1 PIN and wire allocation for CANopen adaptor

Terminal Strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0 V (Gnd)
4	4	CAN_H	CAN-Bus-Signal HIGH
5	5	CAN_L	CAN-Bus-Signal LOW
6		CAN_H	CAN-Bus-Signal HIGH
7		CAN_L	CAN-Bus-Signal LOW
8		GND (COM)	0 V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V

1 Encoders with a CANbus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the CANbus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

2 See page 142 below

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1	Address setting (Node ID)
S 2	Bus termination
S 3	Baud rate setting (Data Rate)
S 4	Preset push button (Number zero SET)

Status information via LED

LED	2-colour red/green CAN Controller status

Implementation

CANopen Functionality

Predefined Connection Set
- Sync Object
- Emergency Object
- NMT Network Object (Error Control services, Boot-Up service)
- One Service Data Object (SDO)
- Two Process Data Object (PDO)

I/O-Operating Modes
- Synchronic: -- Depends on Sync Object
- Asynchronous. -- No reference to Sync Object. Triggered by "Timer" (Cyclic) or by event (COS)
- Remote Transmission (RTR)

Encoder Parameters

according the Device Profile for Encoders:
- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Steps per revolution (CPR) - 1 … 8,192
- Total resolution (TR) -- 1 … 67,108,864 steps, with TR = 2^n x CPR -- (n=0 … 13)
- Limits for the working range
- Cycle Timer for asynchronous PDOs
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific Profile:
- Node commissioning. -- Location and values for Node-ID and Baud rate
- Hysteresis to position change required for Async PDOs with COS mode
- Limits and display format for the speed and acceleration values

PDO Data Mapping

Mapping of up to four data objects to each of the two Transmit PDOs. The resulting data length within one PDO is limited to 8 Byte.

(1)	Object 1/Pos Val[1)]	I-1
(n)	Object 2 … Object 4	I-1 to I-7

Input Data Objects

I-1	Position value [Pos Val]	4 Byte
I-2	Status of cam	1 Byte
I-3	Status of working range	1 Byte
I-4	Alarms	1 Byte
I-5	Warnings	1 Byte
I-6	Speed value	4 Byte
I-7	Acceleration value	4 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch) or EEPROM

Setting: - Baud rate

10kb, 20kb, 50kb, 125kb, 250kb, 500kb, 1 MB by Hardware (DIP Switch) or EEPROM

Setting: - Bus Termination

The DIP-Switch (S2) is used to switch on/ off an internal bus termination (ON/OFF).
Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]
The adjustment is carried out in 2 ways:
- by Hardware (PRESET push button)
- by Software (CANopen Protocol)

Equipment Configuration

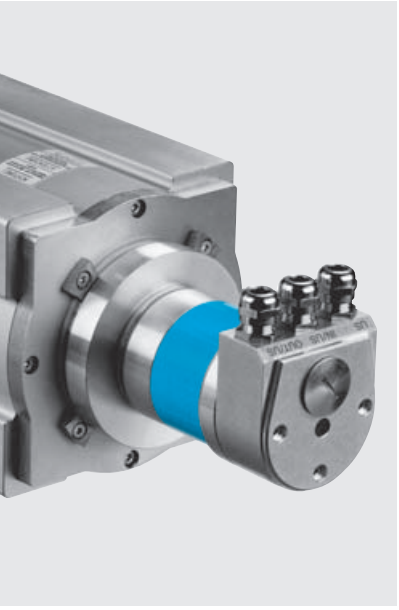
Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

1) Setting cannot be changed

Resolution up to 0.025 mm

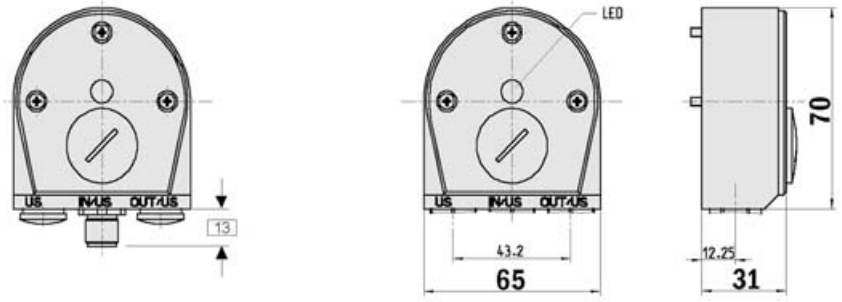
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



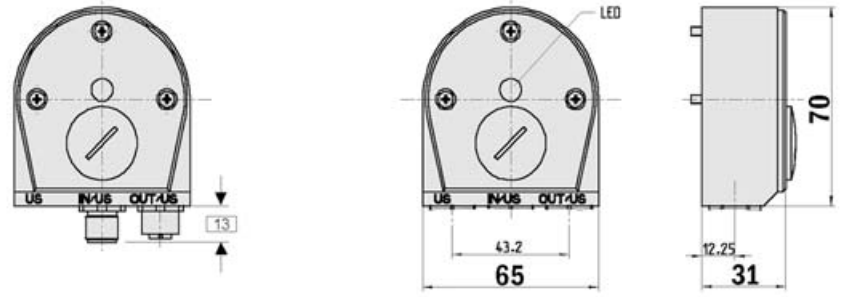
CE

Dimensional drawing DeviceNet adaptor SR1



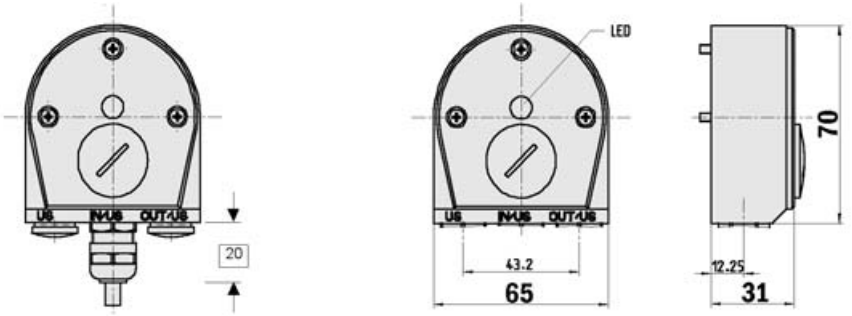
General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor SR2



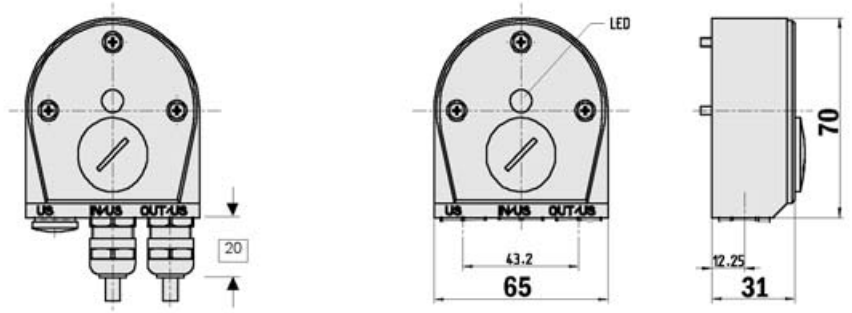
General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR1



General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR2



General tolerances to DIN ISO 2768-mk

Order information

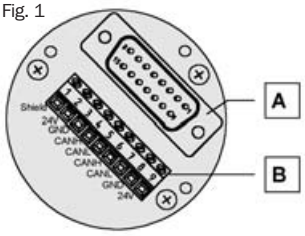
BTF DeviceNet adaptor

Type	Part no.	Description
AD-ATM60-SR1DN	2029226	Bus adaptor SR1, 1 x M12, 5 pin
AD-ATM60-SR2DN	2029227	Bus adaptor SR2, 1 x M12, 5 pin
AD-ATM60-KR1DN	2029228	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2DN	2029229	Bus adaptor KR2, 2 x PG

1 PIN and wire allocation for DeviceNet adaptor

Terminal Strip	2 Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U_S (24 V)	Supply voltage 10 … 32 V
3	3	GND (COM)	0 V (Gnd)
4	4	CAN_H	CAN-Bus signal HIGH
5	5	CAN_L	CAN-Bus signal LOW
6		CAN_H	CAN-Bus signal HIGH
7		CAN_L	CAN-Bus signal LOW
8		GND (COM)	0 V (Gnd)
9		U_S (24 V)	Supply voltage 10 … 32 V

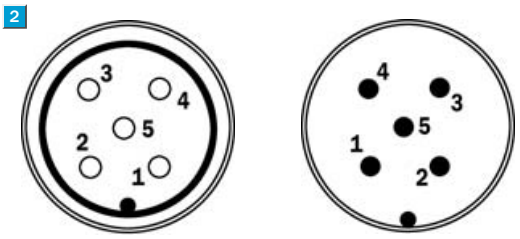
Fig. 1



A Internal plug connection to the encoder
B External connection to the bus

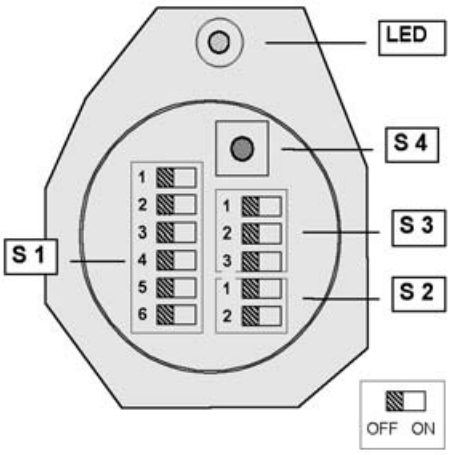
1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

2



OUT/U_S (female) IN/U_S (male)
Connector M12 (Bus adaptor)

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1	Address setting (Node ID)
S 2	Bus termination
S 3	Baud rate setting (Data Rate)
S 4	Preset push button (Number zero SET)

Status information (NS) via LED

LED	2-colour red/green
	Network communication status

Implementation

DN Functionality

Object model
- Identity Object
- Message Router Object
- DeviceNet Object
- Assembly Object
- Connection Object
- Acknowledge Handler Object
- Encoder Object

I/O-Operating Modes
- Polling
- Change of State/Cyclic
- Bits Strobe

Encoder Parameters

according the Device Profile for Encoders:
- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Hysteresis to position change of required for COS communication
- Steps per revolution (CPR) - 1 … 8,192
- Total resolution (TR) -- 1 … 67,108,864 steps, with TR = 2^n x CPR -- (n=0 … 13)
- Limits for the working range (software limit switches)
- Limits and display format for the speed and acceleration values
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific parameters:
- Assignment of the I/O Data Assembly to the different I/O operating modes
- Diagnostic data indicating the current maximum results of the encoder
- Device-specific data

I/O Data Assembly

1)	Pos Val (Position Value) [1]	I-1
2)	Pos Val + Flag	I-1, I-2
3)	Pos Val + Speed	I-1, I-3
4)	Pos Val + Status of Cam	I-1, I-4

Input Data Objects

I-1	Position value [Pos Val]	4 Byte
I-2	Flag (Alarm, Warning)	1 Byte
I-3	Speed	4 Byte
I-4	Status of cam	1 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch)

Setting: - Baud rate

125kb, 250kb, 500kb by Hardware (DIP Switch)

Setting: - Bus Termination

The DIP Switch (S2) is used to switch on/off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

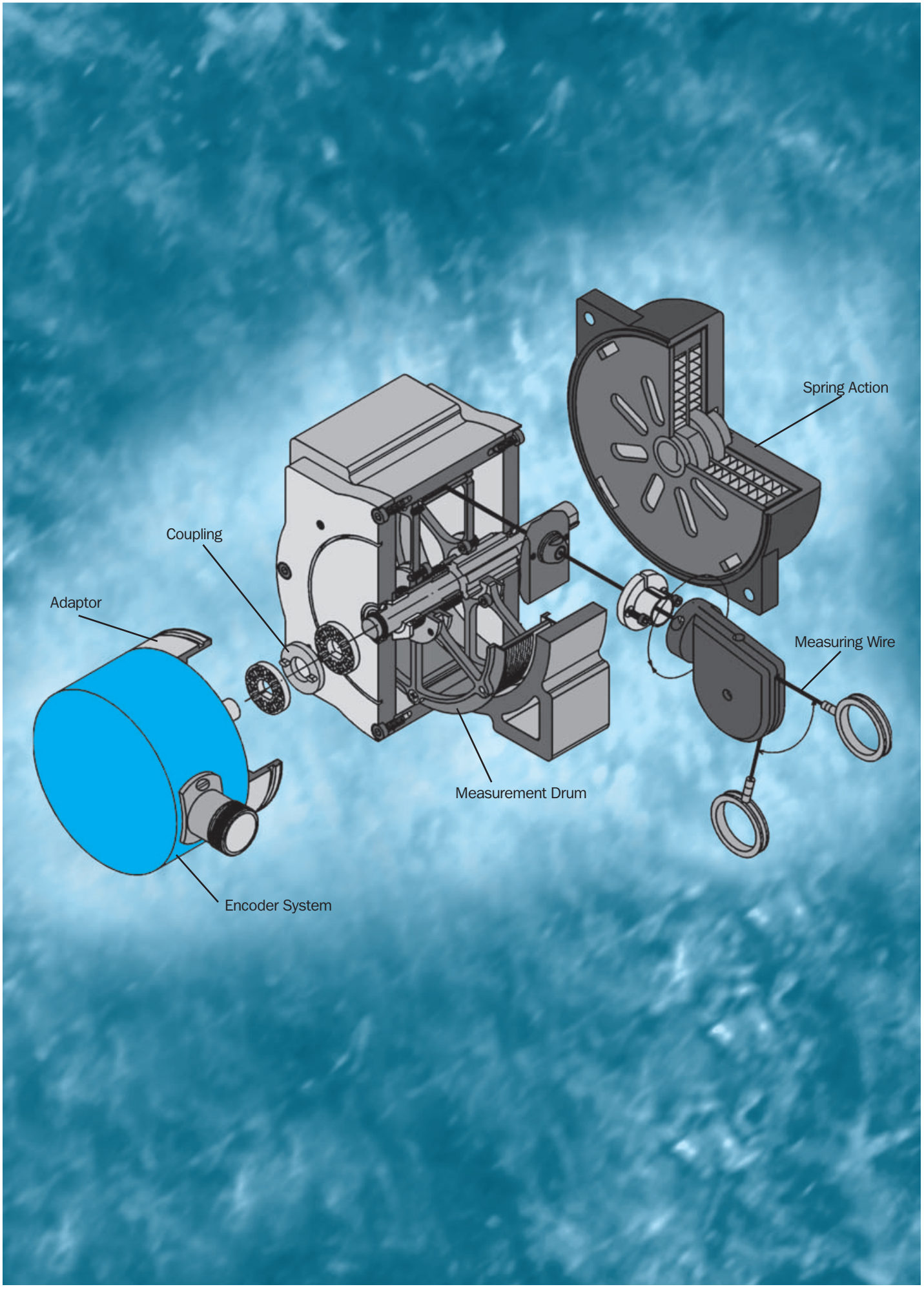
Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]
The adjustment is carried out in 2 ways:
- by Hardware (PRESET push button)
- by Software (DeviceNet Protocol)

Equipment Configuration

Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

[1] Setting cannot be changed

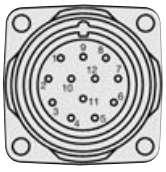

Spring Action
Coupling
Adaptor
Measuring Wire
Measurement Drum
Encoder System

Resolution up to 0.025 mm

Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

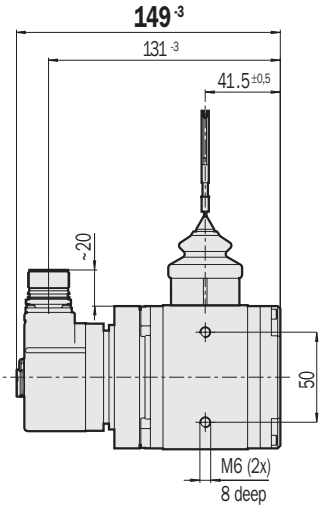
CE

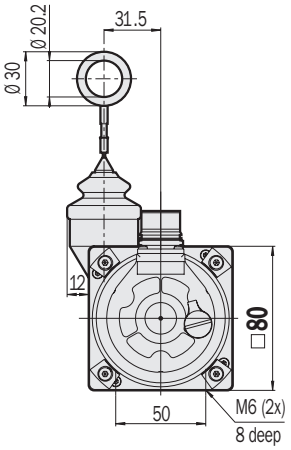


View of the connector M23 fitted to the encoder body

See chapter Accessories
Accessories for encoders

Dimensional drawing wire draw encoder PRF08 TTL, HTL, measuring length 2 m

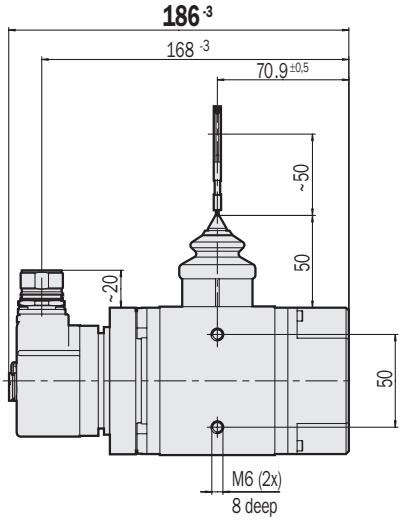


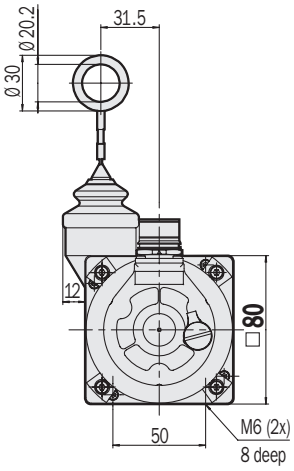


1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder PRF08 TTL, HTL, measuring length 3 m





1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	$\overline{A}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	B	white	Signal line
6	$\overline{B}$	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]

[1] Volt-free to the housing
N. C. = Not connected

Technical data		PRF08	TTL 2m	TTL 2m	HTL 2m	TTL 3m	TTL 3m	HTL 3m
Drum housing		Anodised Aluminium	■	■	■	■	■	■
Spring housing		Die-cast zinc	■	■	■	■	■	■
Measuring wire (stainless)		Highly flexible stranded steel, Ø 1.35 mm	■	■	■	■	■	■
Measuring length		2 m max.	■	■	■			
		max. 3 m				■	■	■
Mass		1.6 kg approx.	■	■	■			
		ca. 1,8 kg				■	■	■
Electrical Interfaces		TTL/RS422, 6 channels	■	■		■	■	
		HTL/push-pull, 6 channels			■			■
Measuring step		0.025 mm 1	■	■	■	■	■	■
Reference signal		Number: 1/position 90°	■	■	■	■	■	■
Linearity		0.05 % typ.	■	■	■	■	■	■
Repeatability		± 1 measuring step	■	■	■	■	■	■
Operating speed		4 m/sec.	■	■	■	■	■	■
Spring return force (typ.)								
start/finish [1]		6 N/14 N	■	■	■	■	■	■
Working temperature range		– 20 … + 70 °C	■	■	■	■	■	■
Storage temperature range		– 40 … + 100 °C	■	■	■	■	■	■
Life of wire draw mechanism [2]		1 million cycles	■	■	■	■	■	■
EMC [3]			■	■	■	■	■	■
Resistance								
to shocks [4]		50/11 g/ms	■	■	■	■	■	■
to vibration [5]		20/10 … 150 g/Hz	■	■	■	■	■	■
Protection to IEC 60529		IP 64 (wire draw mechanism)	■	■	■	■	■	■
		IP 65 (encoder)	■	■	■	■	■	■
Operating voltage range (U_s)								
load	TTL/RS422, 4.5 … 5.5 V	20 mA max.	■			■		
current	TTL/RS422, 10 … 32 V	20 mA max.		■			■	
	HTL/push-pull, 10 … 32 V	60 mA max.			■			■
Operating current, no load								
at 5 V		120 mA typ.	■			■		
at 10 … 32 V		100 mA typ.		■	■		■	■
Operating Set button [6]		≥ 100 ms	■	■	■	■	■	■
Initialisation time after power on		40 ms	■	■	■	■	■	■

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

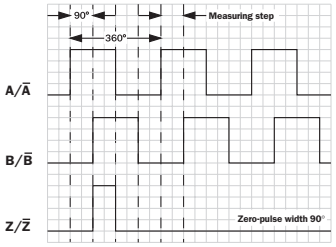
2) Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) For stationary shaft only.



1 Based on the control/counter evaluating the flanks of the A+B pulses.

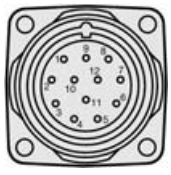
Order information		
PRF08; connector M23, 12 pin		
Type	**Part no.**	**Description**
PRF08-A1AM0240	1034323	TTL 4.5 … 5.5 V; measuring length 2 m
PRF08-C1AM0240	1034329	TTL 10 … 32 V; measuring length 2 m
PRF08-E1AM0240	1034335	HTL 10 … 32 V; measuring length 2 m
PRF08-A1AM0340	1034896	TTL 4.5 … 5.5 V; measuring length 3 m
PRF08-C1AM0340	1034897	TTL 10 … 32 V; measuring length 3 m
PRF08-E1AM0340	1034898	HTL 10 … 32 V; measuring length 3 m

Resolution up to 0.025 mm

Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

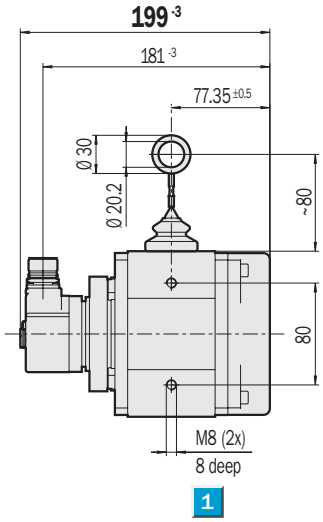
CE

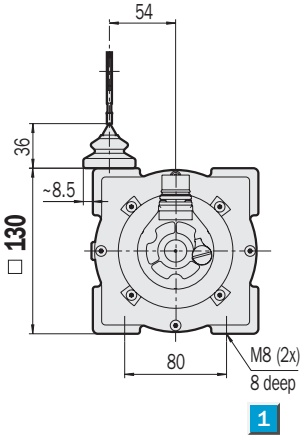


View of the connector M23 fitted to the encoder body

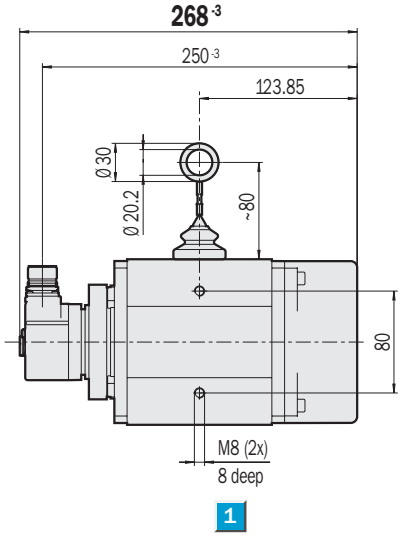
See chapter Accessories
Accessories for encoders

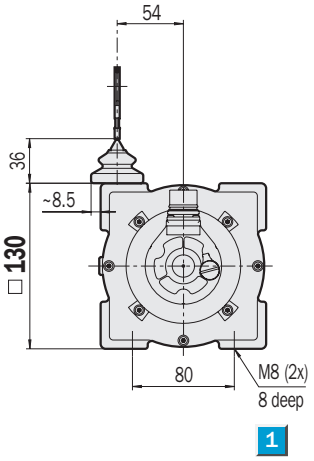
Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 5 m





Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 10 m





1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	$\overline{A}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	B	white	Signal line
6	$\overline{B}$	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]

[1] Volt-free to the housing
N. C. = Not connected

Technical data	PRF13	TTL 5m	TTL 5m	HTL 5m	TTL 10m	TTL 10m	HTL 10m
Drum housing	Anodised Aluminium	■	■	■	■	■	■
Spring housing	Plastic	■	■	■	■	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■	■	■	■	■
Measuring length	5 m max.	■	■	■			
	10 m max.				■	■	■
Mass	3.1 kg approx.	■	■	■			
	3.8 kg approx.				■	■	■
Electrical Interfaces	TTL/RS422, 6 channels	■	■		■	■	
	HTL/push-pull, 6 channels			■			■
Measuring step	0.05 mm 1	■	■	■	■	■	■
Reference signal	Number: 1/position 90°	■	■	■	■	■	■
Linearity	0.05 % typ.	■	■	■	■	■	■
Repeatability	± 1 measuring step	■	■	■	■	■	■
Operating speed	4 m/sec.	■	■	■	■	■	■
Spring return force (typ.)							
start/finish [1]	15 N/20 N	■	■	■			
start/finish [1]	10 N/20 N				■	■	■
Working temperature range	– 20 … + 70 °C	■	■	■	■	■	■
Storage temperature range	– 40 … + 100 °C	■	■	■	■	■	■
Life of wire draw mechanism [2]	1 million cycles	■	■	■	■	■	■
EMC [3]		■	■	■	■	■	■
Resistance							
to shocks [4]	50/11 g/ms	■	■	■	■	■	■
to vibration [5]	20/10 … 150 g/Hz	■	■	■	■	■	■
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■	■	■	■	■
	IP 65 (encoder)	■	■	■	■	■	■
Operating voltage range (U_s)							
load TTL/RS422, 4.5 … 5.5 V	20 mA max.	■			■		
current TTL/RS422, 10 … 32 V	20 mA max.		■			■	
HTL/push-pull, 10 … 32 V	60 mA max.			■			■
Operating current, no load							
at 5 V	120 mA typ.	■			■		
at 10 … 32 V	100 mA typ.		■	■		■	■
Operating Set button [6]	≥ 100 ms	■	■	■	■	■	■
Initialisation time after power on	40 ms	■	■	■	■	■	■

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

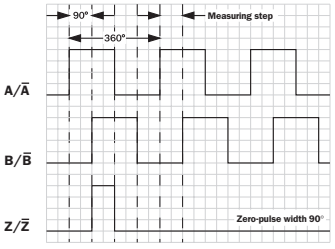
2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) For stationary shaft only.



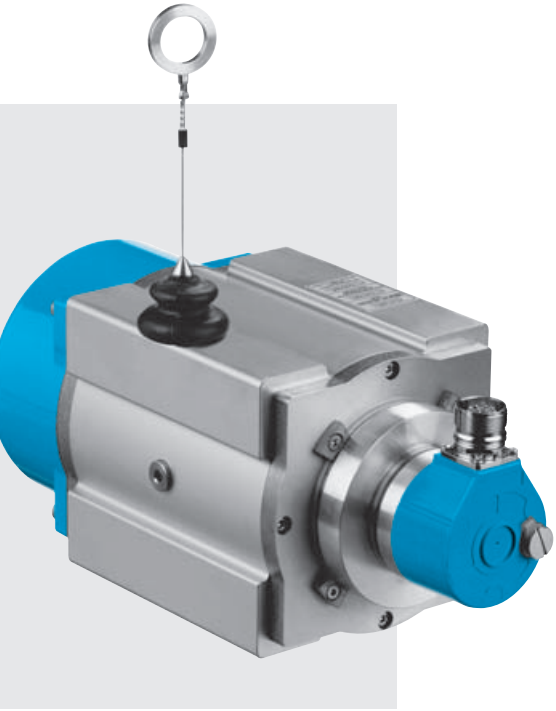
1 Based on the control/counter evaluating the flanks of the A+B pulses.

Order information		
PRF13; connector M23, 12 pin		
Type	**Part no.**	**Description**
PRF13-A1AM0520	1034324	TTL 4.5 … 5.5 V; measuring length 5 m
PRF13-C1AM0520	1034330	TTL 10 … 32 V; measuring length 5 m
PRF13-E1AM0520	1034336	HTL 10 … 32 V; measuring length 5 m
PRF13-A1AM1020	1034325	TTL 4.5 … 5.5 V; measuring length 10 m
PRF13-C1AM1020	1034331	TTL 10 … 32 V; measuring length 10 m
PRF13-E1AM1020	1034337	HTL 10 … 32 V; measuring length 10 m

Resolution up to 0.025 mm

Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



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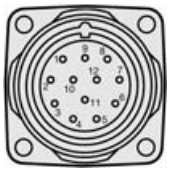
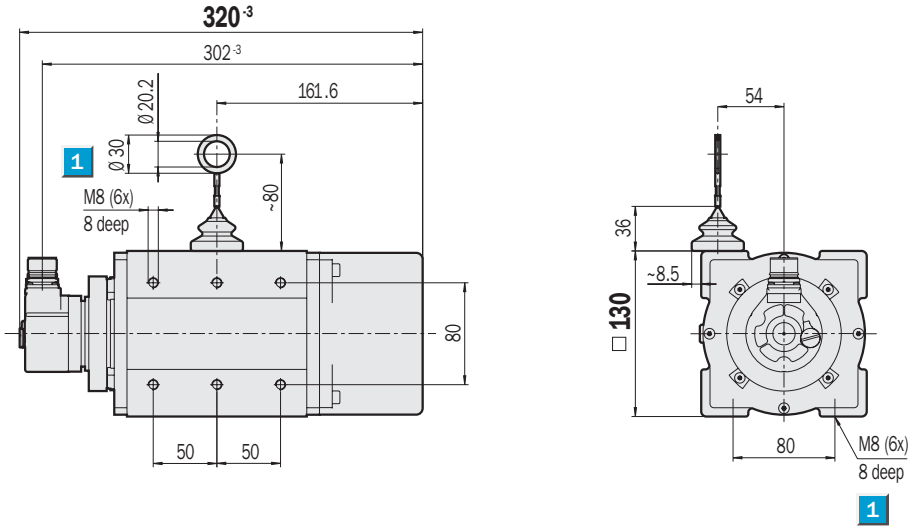


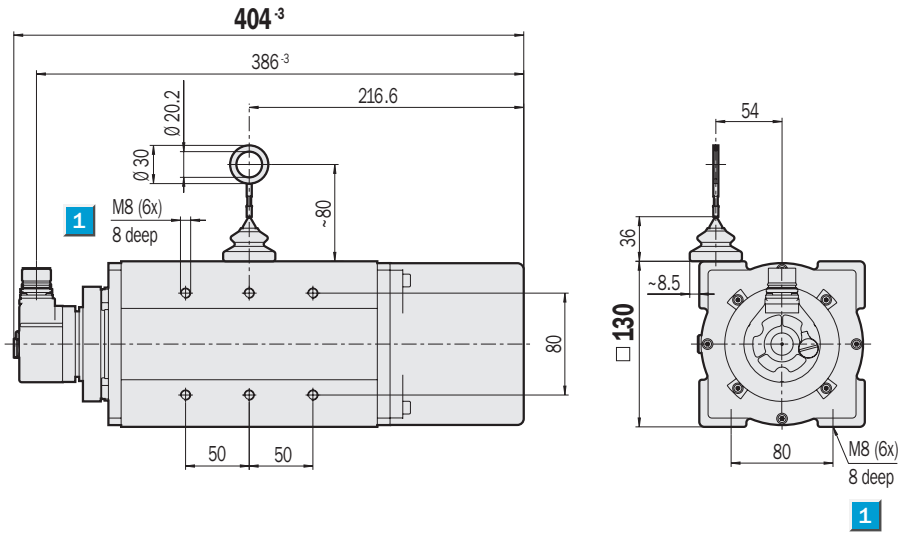
View of the connector M23 fitted to the encoder body

See chapter Accessories
Accessories for encoders

Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 20 m



Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 30 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	$\overline{A}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	B	white	Signal line
6	$\overline{B}$	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]

[1] Volt-free to the housing
N. C. = Not connected

Technical data	PRF13	TTL 20 m	TTL 20 m	HTL 20 m	TTL 30 m	TTL 30 m	HTL 30 m
Drum housing	Anodised Aluminium	■	■	■	■	■	■
Spring housing	Plastic	■	■	■	■	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm	■	■	■	■	■	■
Measuring length	20 m max.	■	■	■			
	30 m max.				■	■	■
Mass	5.3 kg approx.	■	■	■			
	6.5 kg approx.				■	■	■
Electrical Interfaces	TTL/RS422, 6 channels	■	■		■	■	
	HTL/push-pull, 6 channels			■			■
Measuring step	0.05 mm 1	■	■	■	■	■	■
Reference signal	Number: 1/position 90°	■	■	■	■	■	■
Linearity	0.05 % typ.	■	■	■	■	■	■
Repeatability	± 1 measuring step	■	■	■	■	■	■
Operating speed	4 m/sec.	■	■	■	■	■	■
Spring return force (typ.)							
start/finish [1]	10 N/20 N	■	■	■	■	■	■
Working temperature range	– 20 … + 70 °C	■	■	■	■	■	■
Storage temperature range	– 40 … + 100 °C	■	■	■	■	■	■
Life of wire draw mechanism [2]	1 million cycles	■	■	■	■	■	■
EMC [3]		■	■	■	■	■	■
Resistance							
to shocks [4]	50/11 g/ms	■	■	■	■	■	■
to vibration [5]	20/10 … 150 g/Hz	■	■	■	■	■	■
Protection to IEC 60529	IP 64 (wire draw mechanism)	■	■	■	■	■	■
	IP 65 (encoder)	■	■	■	■	■	■
Operating voltage range (U_s)							
load TTL/RS422, 4.5 … 5.5 V	20 mA max.	■			■		
current TTL/RS422, 10 … 32 V	20 mA max.		■			■	
HTL/push-pull, 10 … 32 V	60 mA max.			■			■
Operating current, no load							
at 5 V	120 mA typ.	■			■		
at 10 … 32 V	100 mA typ.		■	■		■	■
Operating Set button [6]	≥ 100 ms	■	■	■	■	■	■
Initialisation time after power on	40 ms	■	■	■	■	■	■

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

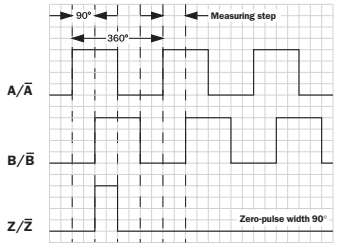
2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) For stationary shaft only.



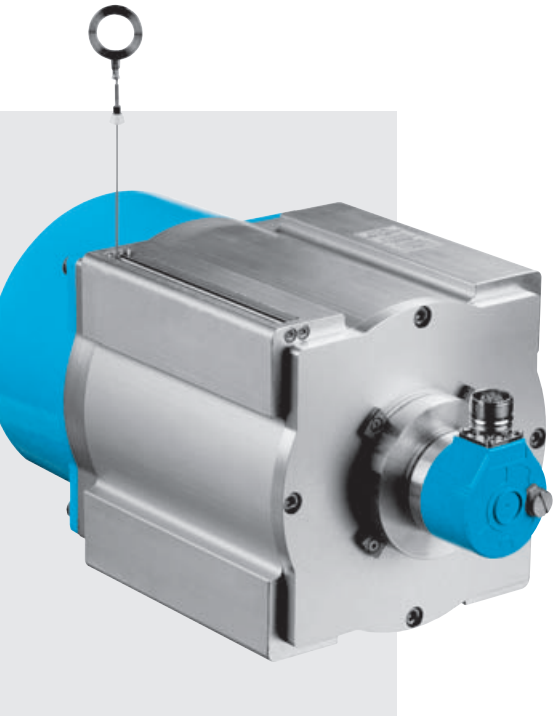
1 Based on the control/counter evaluating the flanks of the A+B pulses.

Order information		
PRF13; connector M23, 12 pin		
Type	**Part no.**	**Description**
PRF13-A1AM2020	1034326	TTL 4.5 … 5.5 V; measuring length 20 m
PRF13-C1AM2020	1034332	TTL 10 … 32 V; measuring length 20 m
PRF13-E1AM2020	1034338	HTL 10 … 32 V; measuring length 20 m
PRF13-A1AM3020	1034327	TTL 4.5 … 5.5 V; measuring length 30 m
PRF13-C1AM3020	1034333	TTL 10 … 32 V; measuring length 30 m
PRF13-E1AM3020	1034339	HTL 10 … 32 V; measuring length 30 m

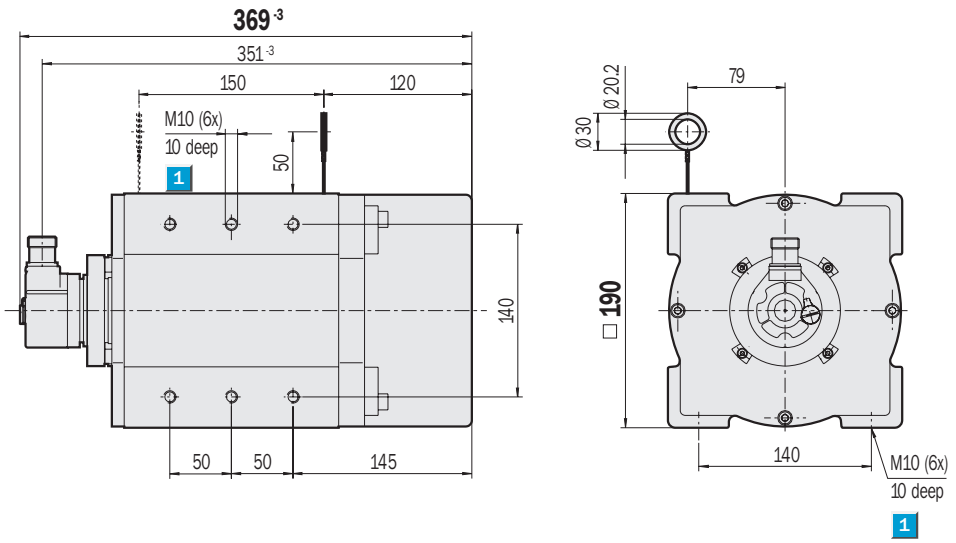
Resolution up to 0.025 mm

Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire



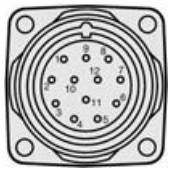
Dimensional drawing wire draw encoder PRF19 TTL, HTL, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

CE



View of the connector M23 fitted to the encoder body

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	$\overline{A}$	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	B	white	Signal line
6	$\overline{B}$	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense –	green	Connected internally to GND
12	U_s	red	Supply voltage [1]

[1] Volt-free to the housing
N. C. = Not connected

See chapter Accessories
Accessories for encoders

Technical data		PRF19	TTL 50 m	TTL 50 m	HTL 50 m
Drum housing		Anodised Aluminium	■	■	■
Spring housing		Die-cast zinc	■	■	■
Measuring wire (stainless)		Highly flexible stranded steel, Ø 1.35 mm	■	■	■
Measuring length		50 m max.	■	■	■
Mass		16.8 kg approx.	■	■	■
Electrical Interfaces		TTL/RS422, 6 channels	■	■	
		HTL/push-pull, 6 channels			■
Measuring step		0.1 mm 1	■	■	■
Reference signal		Number: 1/position 90°	■	■	■
Linearity		0.05 % typ.	■	■	■
Repeatability		± 1 measuring step	■	■	■
Operating speed		4 m/sec.	■	■	■
Spring return force (typ.)					
start/finish [1]		18 N/37 N	■	■	■
Working temperature range		– 20 … + 70 °C	■	■	■
Storage temperature range		– 40 … + 100 °C	■	■	■
Life of wire draw mechanism [2]		1 million cycles	■	■	■
EMC [3]			■	■	■
Resistance					
to shocks [4]		50/11 g/ms	■	■	■
to vibration [5]		20/10 … 150 g/Hz	■	■	■
Protection to IEC 60529		IP 31 (wire draw mechanism)	■	■	■
		IP 65 (encoder)	■	■	■
Operating voltage range (U_s)					
load	TTL/RS422, 4.5 … 5.5 V	20 mA max.	■		
current	TTL/RS422, 10 … 32 V	20 mA max.		■	
	HTL/push-pull, 10 … 32 V	60 mA max.			■
Operating current, no load					
at 5 V		120 mA typ.	■		
at 10 … 32 V		100 mA typ.		■	■
Operating Set button [6]		≥ 100 ms	■	■	■
Initialisation time after power on		40 ms	■	■	■

1) These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

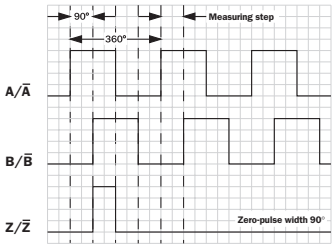
2) Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

3) To DIN EN 61000-6-2 and DIN EN 61000-6-3

4) To DIN EN 60068-2-27

5) To DIN EN 60068-2-6

6) For stationary shaft only.

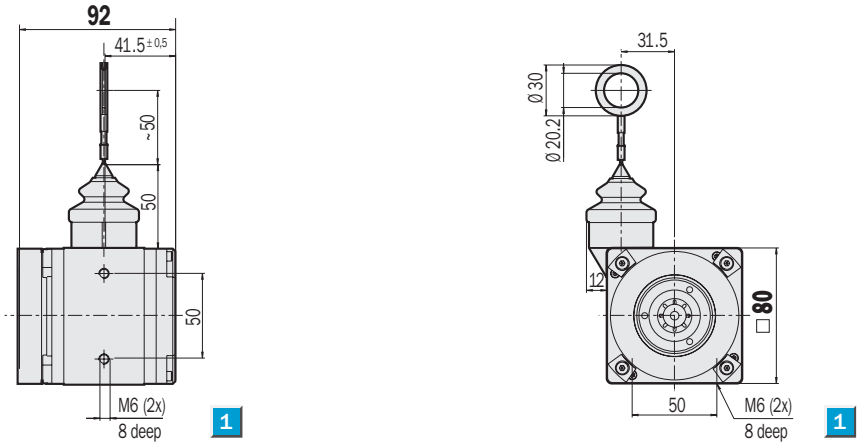


1 Based on the control/counter evaluating the flanks of the A+B pulses.

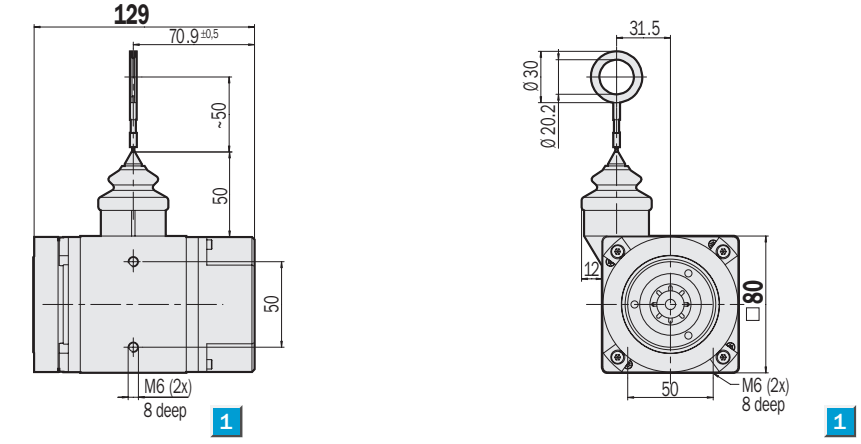
Order information		
PRF19; connector M23, 12 pin		
Type	**Part no.**	**Description**
PRF19-A1AM5010	1034328	TTL 4.5 … 5.5 V; measuring length 50 m
PRF19-C1AM5010	1034334	TTL 10 … 32 V; measuring length 50 m
PRF19-E1AM5010	1034340	HTL 10 … 32 V; measuring length 50 m

- Linear path measurement using a wire draw mechanism
- Easy mounting of the encoder
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

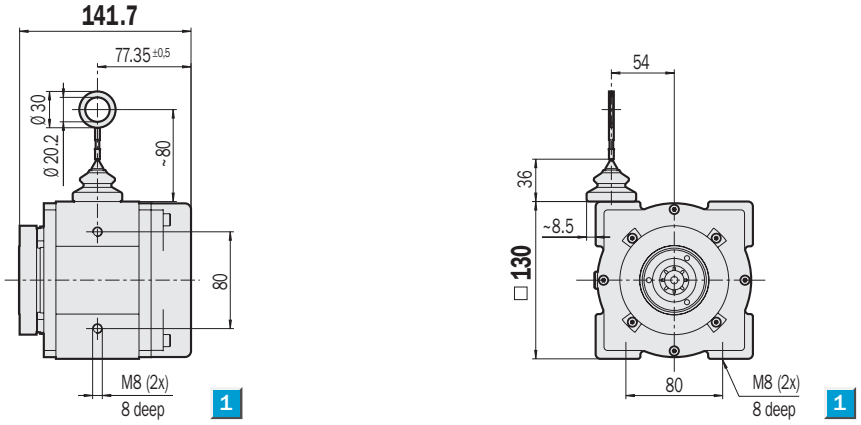
Dimensional drawing wire draw mechanism 2 m; measuring wire Ø 1.35 mm, servo flange



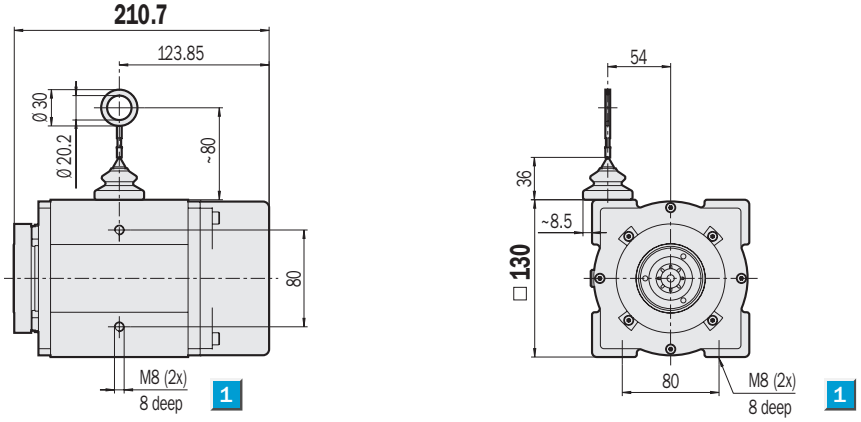
Dimensional drawing wire draw mechanism 3 m; measuring wire Ø 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 5 m; measuring wire Ø 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 10 m; measuring wire Ø 1.35 mm, servo flange

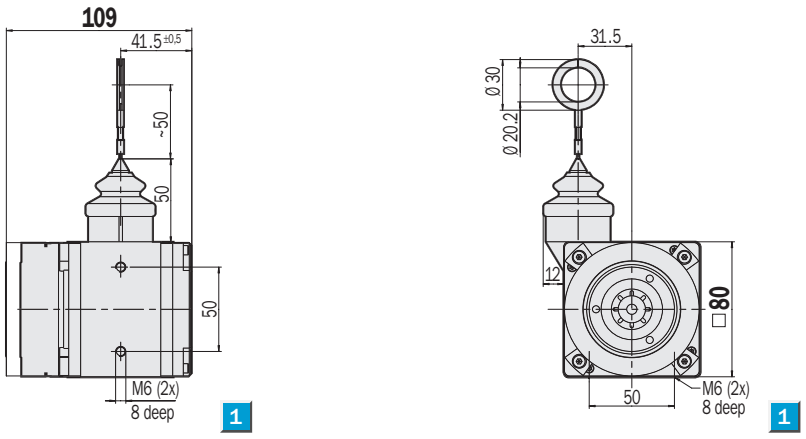


Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

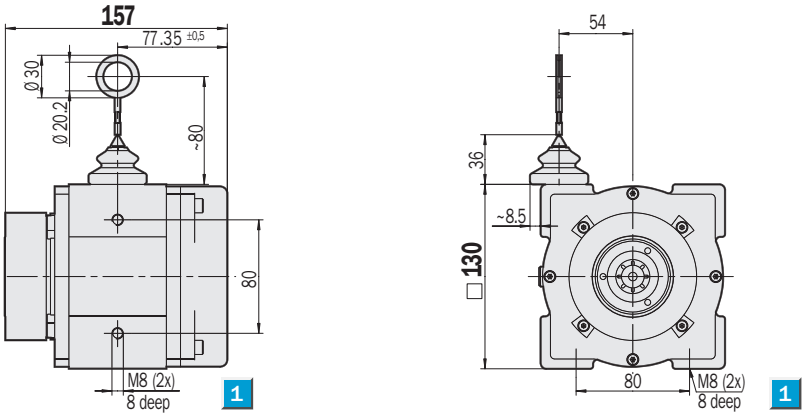
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

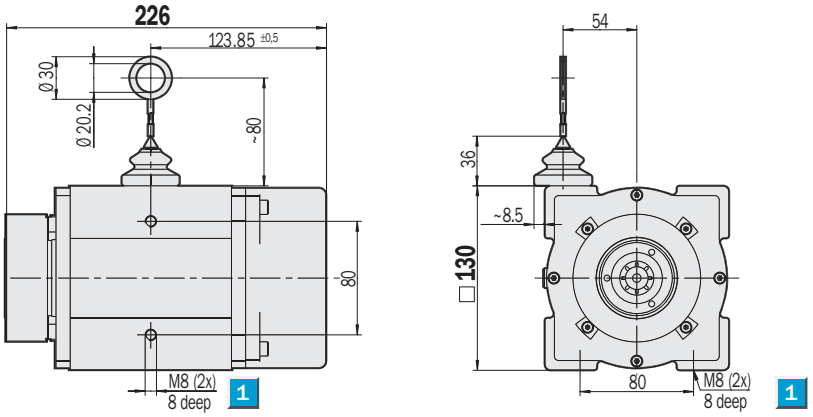
Dimensional drawing wire draw mechanism 2 m; measuring wire Ø 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 5 m; measuring wire Ø 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 10 m; measuring wire Ø 1.35 mm, Face mount flange



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

Technical data	Wire draw mechanism	Measuring length 2 m	3 m	5 m	10 m
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm	■	■	■	■
Drum housing	Anodised Aluminium	■	■	■	■
Spring housing	Die-cast zinc	■	■		
	Plastic			■	■
Drum diameter	62.31 mm	■	■		
	105 mm			■	■
Number of turns for full extension	10 approx.	■			
	15 approx.		■	■	
	30 approx.				■
Drum precision	0.05 %	■	■	■	■
Operating speed	4 m/sec.	■	■	■	■
Spring return force (typ.)					
start/finish [1]	6 N/14 N	■	■		
start/finish [1]	15 N/20 N			■	
start/finish [1]	10 N/20 N				■
Working temperature range	– 20 … + 70 °C	■	■	■	■
Protection to IEC 60529	IP 64	■	■	■	■
Life [2]	1 million cycles	■	■	■	■
Masse	1.3 kg	■		■	■
	1.5 kg		■		
	2.8 kg			■	
	3.5 kg				■

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease;
at slow operating speeds over short lengths, it can increase.

Absolute encoders: determining the matching number of steps of the encoder for the required linear resolution

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{\text{Linear resolution per measuring step}}$$

Example: required linear resolution 0.05 mm; wire draw mechanism 5 m

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (105\ \text{mm} + 1.35\ \text{mm})}{0.05\ \text{mm}} = 6682$$

Incremental encoders: determining the matching number of pulses of the encoder for the required linear resolution

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{4 \times \text{Linear resolution per measuring step}} \quad [1]$$

Example: required linear resolution 0.025 mm; wire draw mechanism 2 m

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (62.31\ \text{mm} + 1.35\ \text{mm})}{4 \times 0.025\ \text{mm}} = 2000$$

[1] Based on the control/counter evaluating the flanks of the A+B pulses.

Order information

MRA-F wire draw mechanism for attaching encoders with servo flange (or compatible flanges)

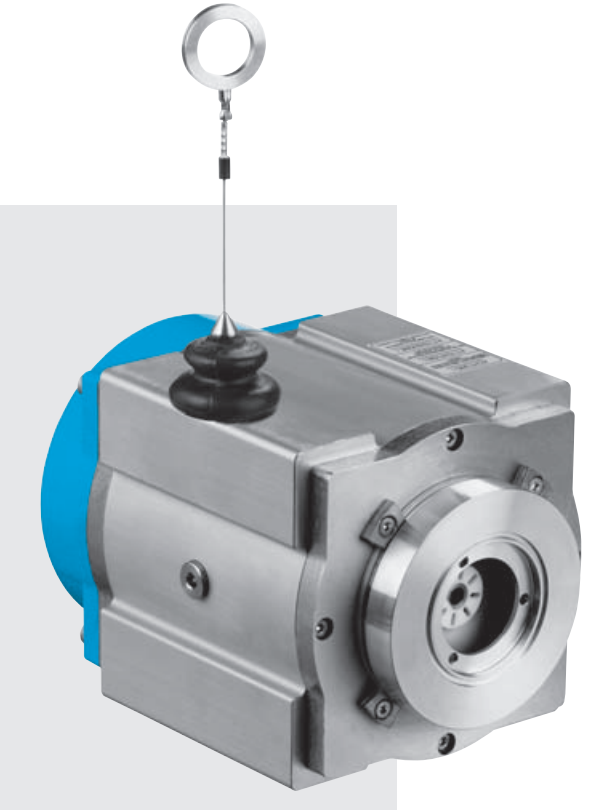
Type	Part no.	Description
MRA-F080-102D2	6028625	measur. length 2 m
MRA-F080-103D2	6030125	measur. length 3 m
MRA-F130-105D2	6028626	measur. length 5 m
MRA-F130-110D2	6028627	measur. length 10 m

Order information

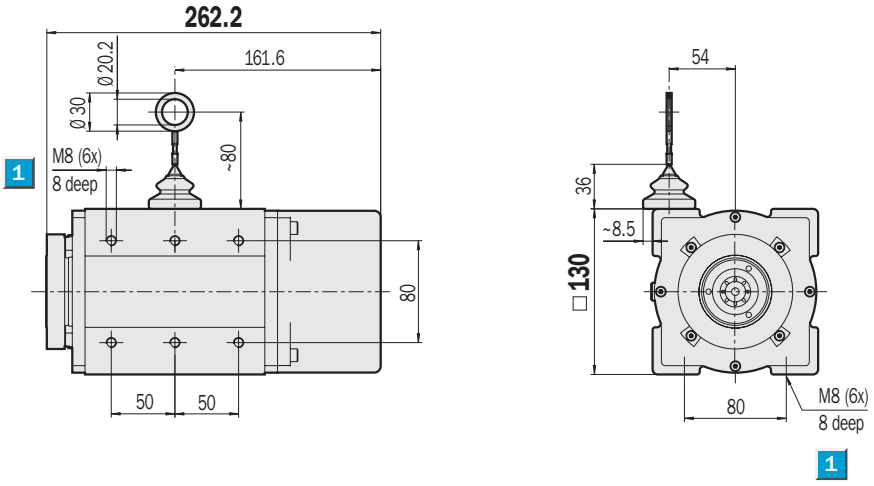
MRA-F wire draw mechanism for attaching encoders with face mount flange (or compatible flanges)

Type	Part no.	Description
MRA-F080-402D2	6029788	measur. length 2 m
MRA-F130-405D2	6029789	measur. length 5 m
MRA-F130-410D2	6029790	measur. length 10 m

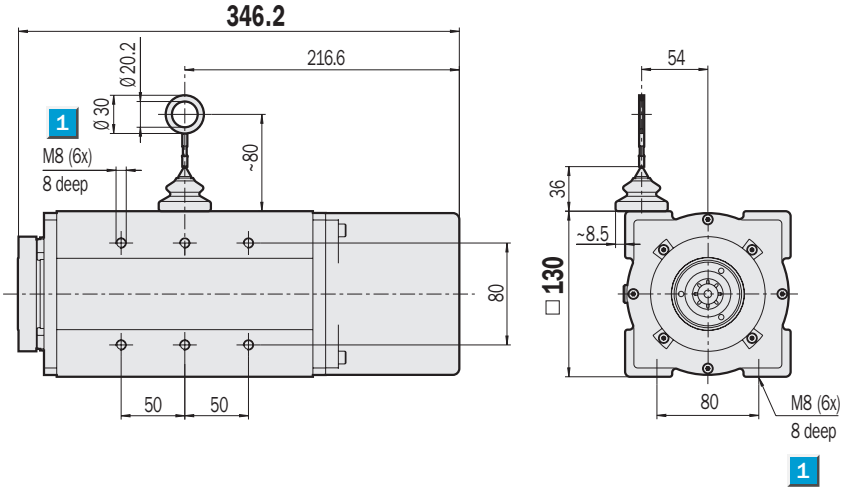
- Linear path measurement using a wire draw mechanism
- Easy mounting of the encoder
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



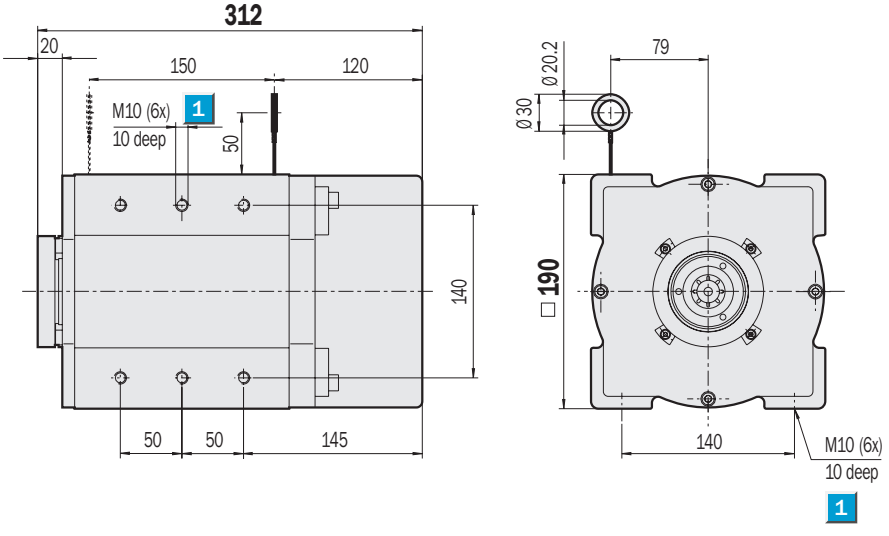
Dimensional drawing wire draw mechanism 20 m; measuring wire Ø 0.81 mm, servo flange



Dimensional drawing wire draw mechanism 30 m; measuring wire Ø 0.81 mm, servo flange



Dimensional drawing wire draw mechanism 50 m; measuring wire Ø 1.35 mm, servo flange

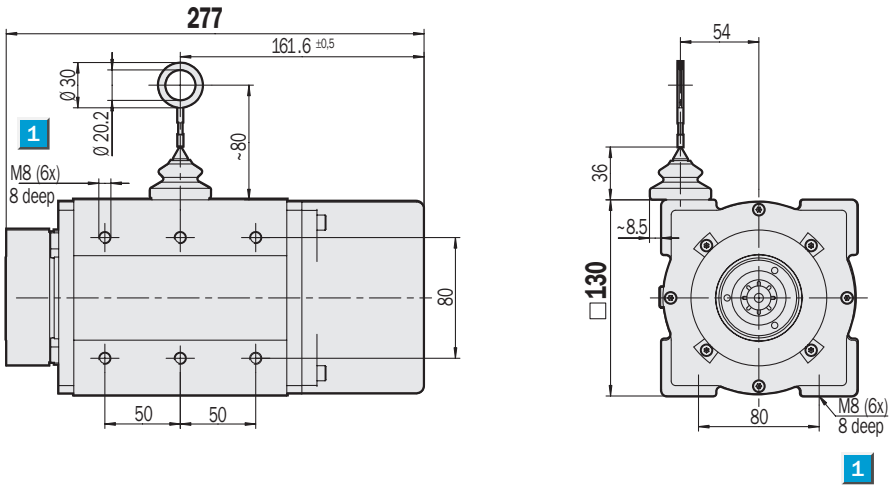


Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

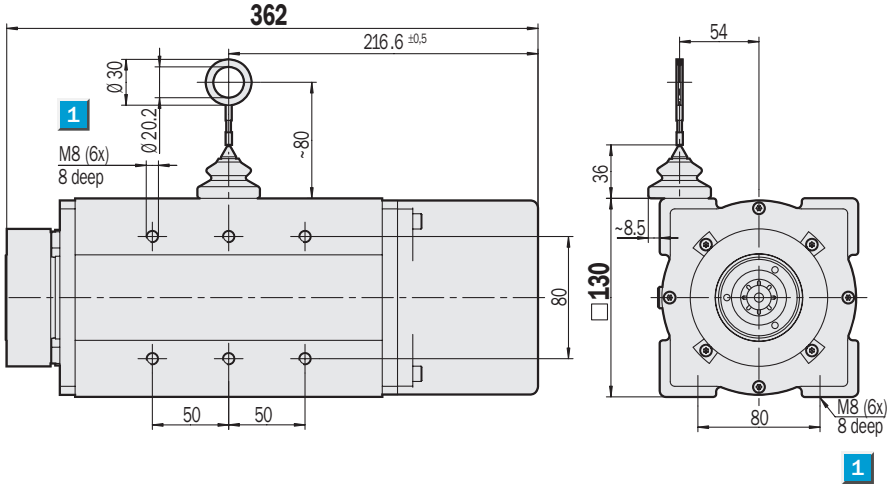
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

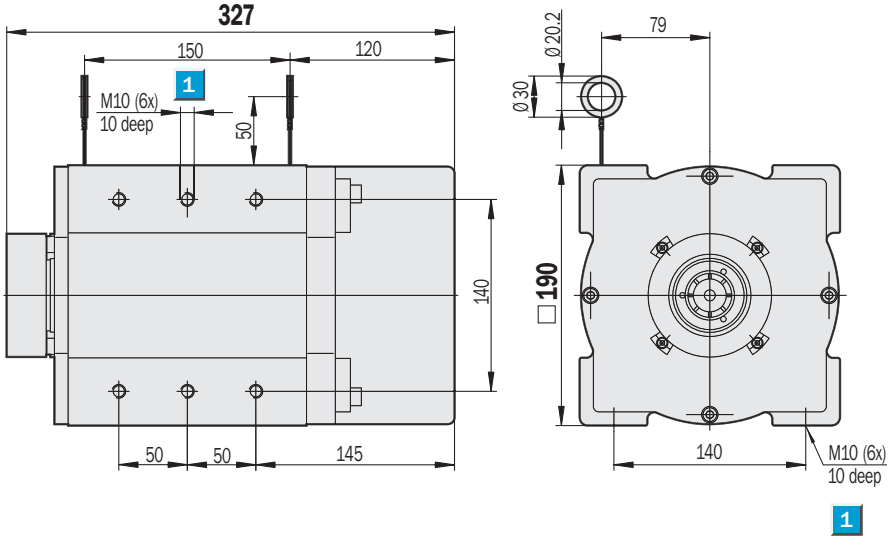
Dimensional drawing wire draw mechanism 20 m; measuring wire Ø 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 30 m; measuring wire Ø 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 50 m; measuring wire Ø 1.35 mm, Face mount flange



Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Technical data	Wire draw mechanism	Measuring length									
		20 m	30 m	50 m							
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm	■	■								
	Highly flexible stranded steel, Ø 1.35 mm			■							
Drum housing	Anodised Aluminium	■	■	■							
Spring housing	Plastic	■	■								
	Die-cast zinc			■							
Drum diameter	105 mm	■	■								
	155.1 mm			■							
Number of turns for full extension	61 approx.	■									
	91 approx.		■								
	102 approx.			■							
Drum precision	0.05 %	■	■	■							
Operating speed	4 m/sec.	■	■	■							
Spring return force (typ.)											
start/finish [1]	10 N/20 N	■	■								
start/finish [1]	18 N/37 N			■							
Working temperature range	– 20 … + 70 °C	■	■	■							
Protection to IEC 60529	IP 64	■	■								
	IP 31			■							
Life [2]	1 million cycles	■	■	■							
Mass	5.0 kg	■									
	6.2 kg		■								
	16.5 kg			■							

[1] These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

[2] Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease;
at slow operating speeds over short lengths, it can increase.

Absolute encoders: determining the matching number of steps of the encoder for the required linear resolution

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{\text{Linear resolution per measuring step}}$$

Example: required linear resolution 0.05 mm; wire draw mechanism 30 m

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (105\ \text{mm} + 0.81\ \text{mm})}{0.05\ \text{mm}} = 6648$$

Incremental encoders: determining the matching number of pulses of the encoder for the required linear resolution

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{4 \times \text{Linear resolution per measuring step}} \quad [1]$$

Example: required linear resolution 0.025 mm; wire draw mechanism 20 m

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (105\ \text{mm} + 0.81\ \text{mm})}{4 \times 0.05\ \text{mm}} = 1662$$

[1] Based on the control/counter evaluating the flanks of the A+B pulses.

Order information

MRA-F wire draw mechanism for attaching encoders with servo flange (or compatible flanges)

Type	Part no.	Description
MRA-F130-120D1	6028628	measur. length 20 m
MRA-F130-130D1	6028629	measur. length 30 m
MRA-F190-150D2	6028630	measur. length 50 m

Order information

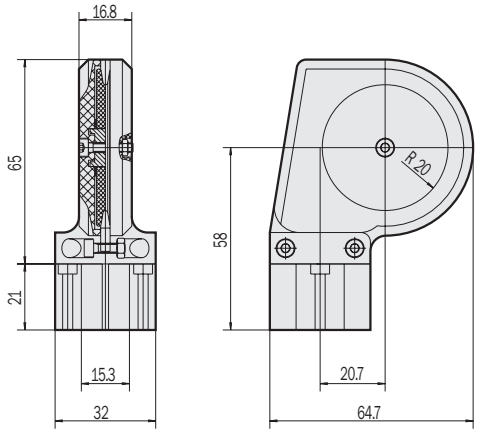
MRA-F wire draw mechanism for attaching encoders with face mount flange (or compatible flanges)

Type	Part no.	Description
MRA-F130-420D1	6029791	measur. length 20 m
MRA-F130-430D1	6029792	measur. length 30 m
MRA-F190-450D2	6029793	measur. length 50 m

Dimensional drawings and order information

Wire guiding roller for wire draw mechanism 2 m and 3 m

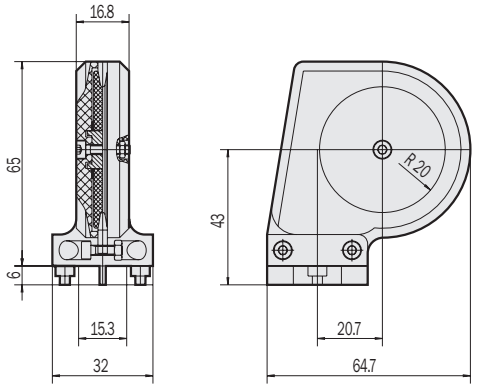
Type	Part no.
MRA-F080-R	6028632



General tolerances to DIN ISO 2768-mk

Wire guiding roller for wire draw mechanisms 5 m, 10 m, 20 m and 30 m

Type	Part no.
MRA-F130-R	6028631



General tolerances to DIN ISO 2768-mk

Spare parts kit for all versions of wire draw mechanisms

Type	Part no.	Description
MRA-F-K	6028633	Assembly fittings: 4 servo clamps + screws, 3 screws M4 x 8, coupling
		2 sealing rings to suit wire drive mechanisms for attaching encoders with servo flange
MRA-F-L	6030124	Assembly fittings: 4 servo clamps + screws, 3 screws M4 x 8, coupling
		2 sealing rings to suit wire drive mechanisms for attaching encoders with face mount flange

Dimensional drawings and order information

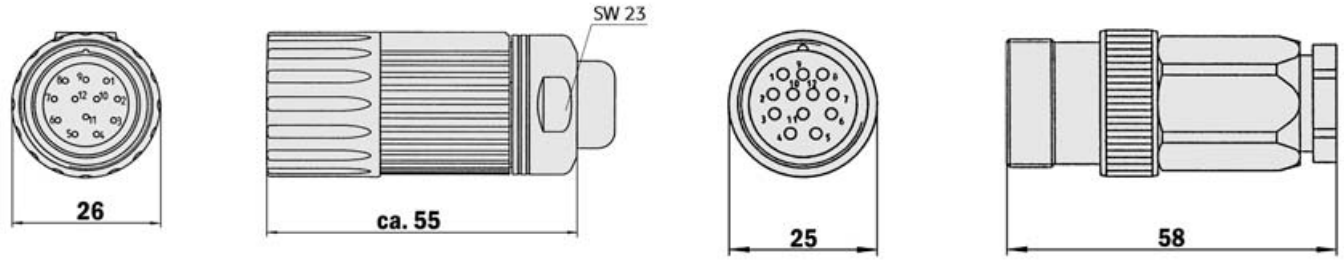
Round screw-in system M23, 12 pin for wire draw encoder BTF with SSI interface

Connector M23 female, 12 pin, straight, screened

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12 pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



Connector M23 female, 12 pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged, cable diameter 7.8 mm for wire draw encoders BTF with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2029200	12	1.5 m
DOL-2312-G03MMA1	2029201	12	3.0 m
DOL-2312-G05MMA1	2029202	12	5.0 m
DOL-2312-G10MMA1	2029203	12	10.0 m
DOL-2312-G20MMA1	2029204	12	20.0 m
DOL-2312-G30MMA1	2029205	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	UV- and salt water resistant

Dimensional drawings and order information

Adaptor modules for wire draw encoder BTF with SSI interface

Serial Parallel Adaptors

Type	Part no.	Description
AD-SSIG-PA	1030106	SSI Parallel adaptor module, in plastic housing
AD-SSI-PA	1030107	SSI Parallel adaptor module, without plastic housing
AD-SSIPG-PA	1030108	SSI Parallel adaptor module, programmable, in plastic housing
AD-SSIPF-PA	1030109	SSI Parallel adaptor module, programmable, without plastic housing, with front plate
AD-SSIP-PA	1030110	SSI Parallel adaptor module, programmable, without plastic housing, without front plate

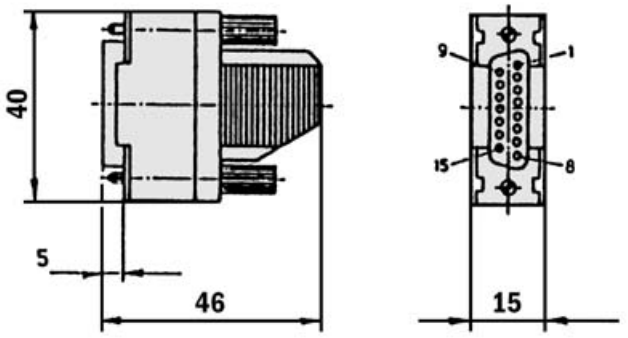
Programming tool for programmable serial parallel adaptor

Type	Part no.
PGT-02-S	1030112

Plug-in system Sub-D connectors for serial parallel adaptor

Cable connector Sub-D male, 15 pin, straight, screened

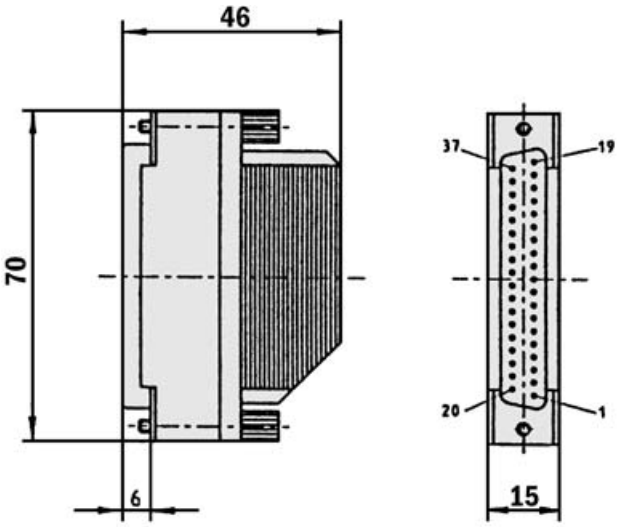
Type	Part no.	Contacts
STE-0D15-G	2029223	15



General tolerances to DIN ISO 2768-mk

Cable connector Sub-D female, 37 pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2029224	37



General tolerances to DIN ISO 2768-mk

Dimensional drawings and order information

Screw-in system M12 for BTF wire draw encoder with Profibus Interface

SENSICK circular connector M12, can be wired for operating voltage (BTF with Profibus Interface)

Type	Part no.	Contacts	Description
DOS-1204-G	6007302	4	Female connector, M12, 4 pin, straight

SENSICK circular connector M12, can be wired for bus cable (BTF with Profibus Interface)

Type	Part no.	Description
PR-DOS-1205-G	6021353	Profibus-female connector, M12, 5 pin, straight, shielded, B-coding
PR-STE-1205-G	6021354	Profibus-male connector, M12, 5 pin, straight, shielded, B-coding

SENSICK pre-wired female M12 connector, 4 pin, straight for operating voltage (BTF with Profibus Interface)

Type	Part no.	Description
DOL-1204-G05M	6009866	Cable 5 m, PVC

SENSICK pre-wired female M12 connector, 5 pin, straight, 2 core cable, with screening for wire draw encoder BTF with Profibus Interface

Type	Part no.	Description
DOL-12PR-G05M	6026006	Profibus cable 5 m, B-coding
DOL-12PR-G10M	6026007	Profibus cable 10 m, B-coding

SENSICK pre-wired male M12 connector, 5 pin, straight, 2 core cable, with screening for wire draw encoder BTF with Profibus Interface

Type	Part no.	Description
STL-12PR-G05M	6026005	Profibus cable 5 m, B-coding
STL-12PR-G10M	6026008	Profibus cable 10 m, B-coding

Bus cable 2 core, per metre, with screening, for BTF with Profibus interface

Type	Part no.	Wires
LTG-2102-MW	6021355	2

Screw-in system M23, 5 pin for BTF wire draw encoder with DeviceNet interface

Cable connector M12 female, 5 pin, straight, screened

Type	Part no.	Contacts
DOS-1205-G	6027534	5

Cable connector M12 male, 5 pin, straight, screened

Type	Part no.	Contacts
STE-1205-G	6027533	5

Dimensional drawings and order information

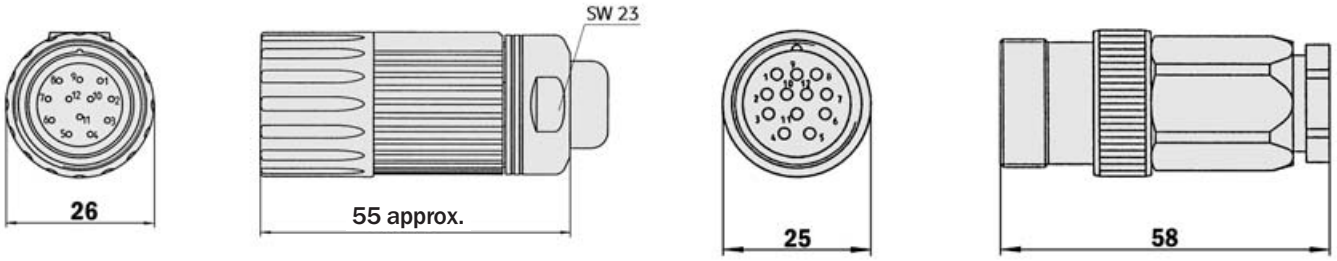
Round screw-in system M23, 12 pin for wire draw encoder PRF with TTL/HTL interface

Cable connector M23 female, 12 pin, straight, screened

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12 pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



Cable connector M23 female, 12 pin, straight, Cable 12 core, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2029212	12	1.5 m
DOL-2312-G03MMA3	2029213	12	3.0 m
DOL-2312-G05MMA3	2029214	12	5.0 m
DOL-2312-G10MMA3	2029215	12	10.0 m
DOL-2312-G20MMA3	2029216	12	20.0 m
DOL-2312-G30MMA3	2029217	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm2 with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PRF with TTL/HTL interface

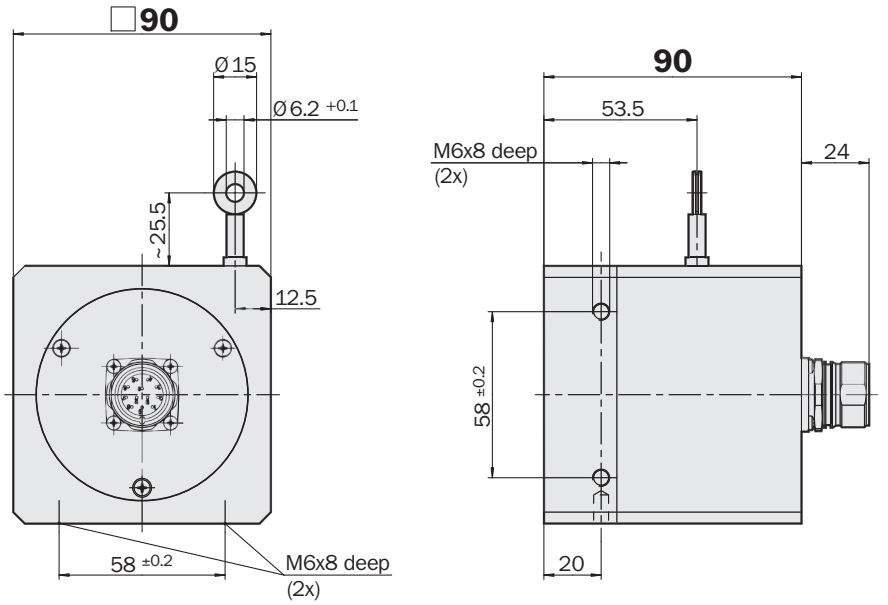
Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	UV- and salt water resistant

Resolution 0.05 mm

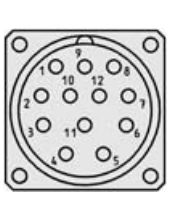
Absolute Wire draw encoder

- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing

Dimensional drawing of absolute wire draw encoder BKS09 SSI, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	N.C.	grey	Not connected
5	N.C.	green	Not connected
6	N.C.	pink	Not connected
7	N.C.	black	Not connected
8	U_S	red	Operating voltage
9	N.C.	orange	Not connected
10	Data –	brown	Interface signals
11	Clock –	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled “N. C.” must not be connected!

See chapter Accessories
Accessories for encoders

Technical Data	BKS09	SSI 2 m	SSI 5 m
Housing	Aluminium	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)	■	■
Measuring length	2 m max.	■	
	5 m max.		■
Mass	1.5 kg approx.	■	■
Type of code	24 Bit/Gray	■	■
Path of code	Rising at wire pull-out	■	■
Measuring step	0.05 mm	■	■
Linearity	≤ ± 0.7 mm	■	■
Repeatability	± 3 measuring steps	■	■
Operating speed	3.5 m/sec. max.	■	■
Wire acceleration	20 m/s² max.	■	■
Position forming time	0.1 ms	■	■
Spring return force (typ.)			
Start/finish [1]	5 N/6 N	■	
Start/finish [1]	4 N/6 N		■
Working temperature range	– 10 … + 70 °C	■	■
Storage temperature range	– 20 … + 80 °C	■	■
Permitted relative humidity [2]	90 %	■	■
Life of wire draw mechanism [3]	800,000 cycles	■	■
EMC [4]		■	■
Resistance			
to shocks [5]	20/6 g/ms	■	■
to vibration [6]	10 g (10 … 2,000 Hz)	■	■
Protection to IEC 60529 [7]	IP 52	■	■
Operating voltage range (U_s)	12 … 30 V	■	■
Max. Power consumption	1.5 W	■	■
Initialisation time [8]	150 ms	■	■
Interface signals			
Clock +, Clock –, Data +, Data –	SSI max. clock frequency 1.0 MHz	■	■
	or min. LOW level (Clock +): 500 ns	■	■

1) These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

2) Condensation not permitted

3) Average values, which depend on the application. At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

4) To DIN EN 61000-6-2 and DIN EN 61000-6-3

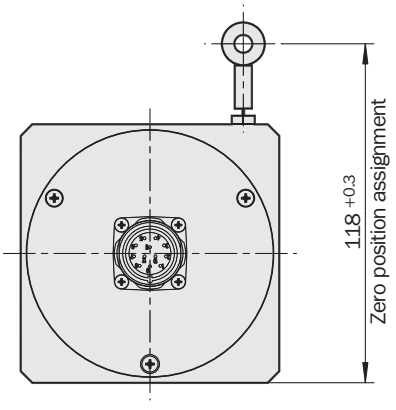
5 To DIN EN 60068-2-27

6) To DIN EN 60068-2-6

7) Note required mounting position

8) From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

Zero pulse assignment



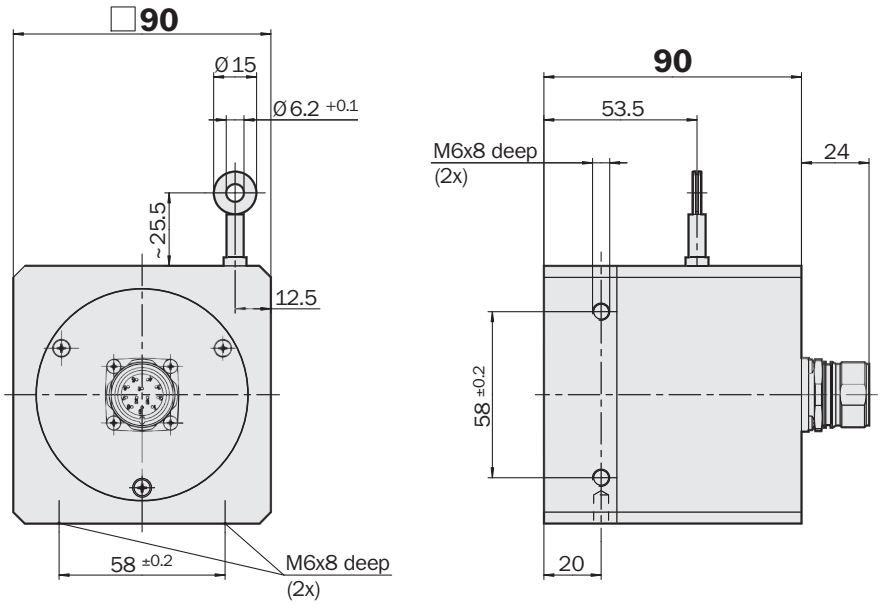
Order information		
BKS09; U_s 12 … 30 V; connector M23, 12 pin		
24 Bit SSI, Gray code, Measuring range starts at 0		
Type	**Part no.**	**Description**
BKS09-ATBM0220	1035240	SSI, measuring length 2 m
BKS09-ATBM0520	1035241	SSI, measuring length 5 m

Resolution 0.05 mm

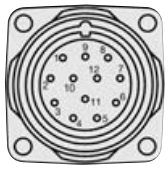
Incremental Wire draw encoder

- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing

Dimensional drawing of wire draw encoder PKS09 TTL, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	$\overline{A}$	black	Signal line
2	N. C.	grey	Not connected
3	Z	lilac	Signal line
4	$\overline{Z}$	yellow	Signal line
5	B	white	Signal line
6	$\overline{B}$	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	N. C.	green	Not connected
12	U_S	red	Supply voltage [1]

[1] Potential-free to housing

Caution! PINs labelled “N. C.” must not be connected!

See chapter Accessories
Accessories for encoders

Technical Data	PKS09	TTL 2m	TTL 5m
Housing	Aluminium	■	■
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)	■	■
Measuring length	2 m max.	■	
	5 m max.		■
Mass	1.5 kg approx.	■	■
Electrical interfaces	TTL/RS 422, 6 channels	■	■
Measuring step	0.05 mm 1	■	■
Reference signal	Number off 1/765 measuring steps	■	■
Linearity	≤ ± 0.7 mm	■	■
Repeatability	± 3 measuring steps	■	■
Operating speed	3.5 m/sec. max.	■	■
Wire acceleration	20 m/s² max.	■	■
Spring return force (typ.)			
Start/finish 1)	5 N/6 N	■	
Start/finish 1)	4 N/6 N		■
Working temperature range	– 10 … + 70 °C	■	■
Storage temperature range	– 20 … + 80 °C	■	■
Permitted relative humidity 2)	90 %	■	■
Life of wire draw mechanism 3)	800,000 cycles	■	■
EMC 4)		■	■
Resistance			
to shocks 5)	20/11 g/ms	■	■
to vibration 6)	10 g (10 … 150 Hz)	■	■
Protection to IEC 60529 7)	IP 52	■	■
Operating voltage range (U_s)			
TTL/RS 422, 4,5 … 5,5 V load current	max. 20 mA	■	■
Operating current, no load			
at 5 V	60 mA typ.	■	■
Initialisierungszeit nach Power on	40 ms	■	■

1) These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

2) Condensation not permitted

3) Average values, which depend on the application. At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

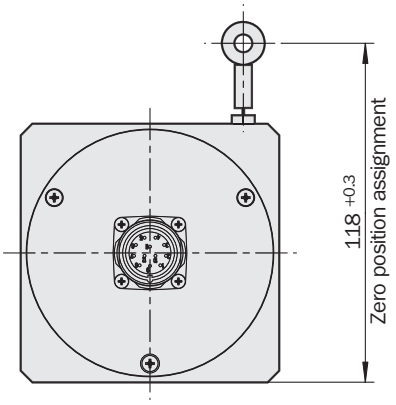
4) To DIN EN 61000-6-2 and DIN EN 61000-6-3

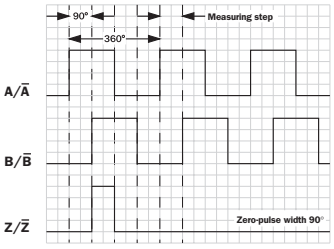
5 To DIN EN 60068-2-27

6) To DIN EN 60068-2-6

7) Note required mounting position

Zero pulse assignment





1 Based on the control/counter evaluating the edges of the A+B pulses.

Order information

PKS09; connector M23, 12 pin

Type	Part no.	Description
PKS09-ATBM0220	1035242	TTL 4.5 … 5.5 V; measuring length 2 m
PKS09-ATBM0520	1035243	TTL 4.5 … 5.5 V; measuring length 5 m

Dimensional drawings and order information

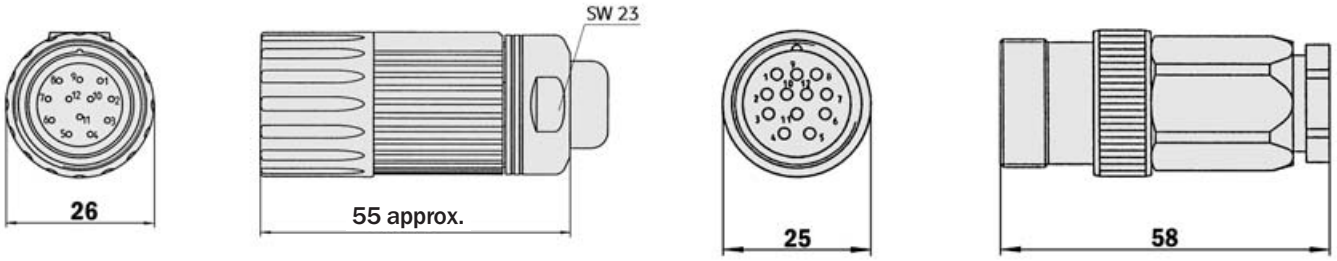
Round screw-in system M23, 12 pin for wire draw encoder BKS with SSI interface

Connector M23 female, 12 pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12 pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Connector M23 female, 12 pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2029200	12	1.5 m
DOL-2312-G03MMA1	2029201	12	3.0 m
DOL-2312-G05MMA1	2029202	12	5.0 m
DOL-2312-G10MMA1	2029203	12	10.0 m
DOL-2312-G20MMA1	2029204	12	20.0 m
DOL-2312-G30MMA1	2029205	12	30.0 m

Connector M23 female, 12 pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA5	2030680	12	2.0 m
DOL-2312-G07MLA5	2030683	12	7.0 m
DOL-2312-G10MLA5	2030686	12	10.0 m
DOL-2312-G15MLA5	2030690	12	15.0 m
DOL-2312-G20MLA5	2030693	12	20.0 m
DOL-2312-G25MLA5	2030697	12	25.0 m
DOL-2312-G30MLA5	2030700	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water

Dimensional drawings and order information

Adaptor modules for wire draw encoder BTF with SSI interface

Serial Parallel Adaptors

Type	Part no.	Explanation
AD-SSIG-PA	1030106	SSI Parallel Adaptor module, in plastic housing
AD-SSI-PA	1030107	SSI Parallel Adaptor module, without plastic housing
AD-SSIPG-PA	1030108	SSI Parallel Adaptor module, programmable, in plastic housing
AD-SSIPF-PA	1030109	SSI Parallel Adaptor module, programmable, without plastic housing, with front plate
AD-SSIP-PA	1030110	SSI Parallel Adaptor module, programmable, without plastic housing, without front plate

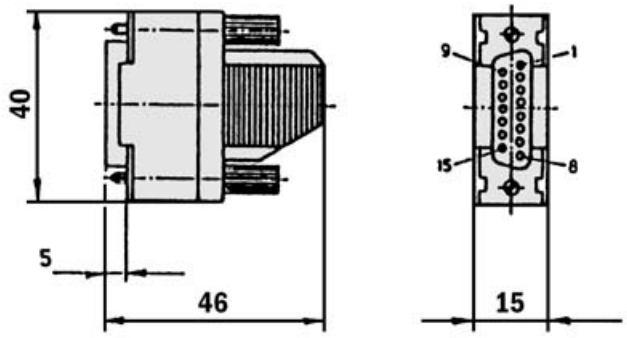
Programming tool for programmable serial parallel adaptor

Type	Part no.
PGT-02-S	1030112

Plug-in system Sub-D connectors for serial parallel adaptor

Cable connector Sub-D male, 15 pin, straight, screened

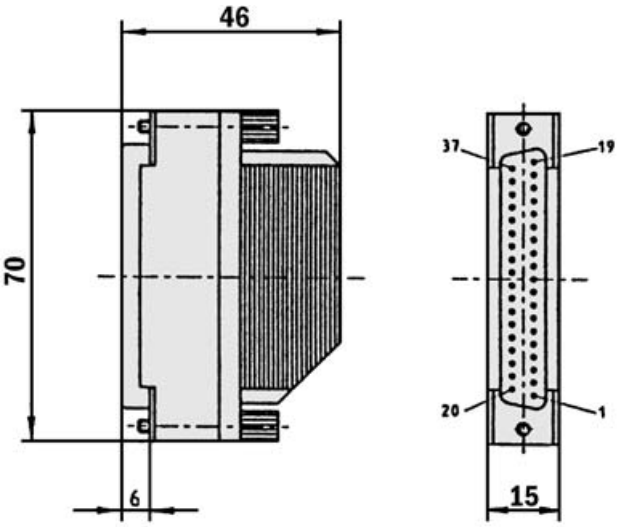
Type	Part no.	Contacts
STE-0D15-G	2029223	15



General tolerances to DIN ISO 2768-mk

Cable connector Sub-D female, 37 pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2029224	37



General tolerances to DIN ISO 2768-mk

Dimensional drawings and order information

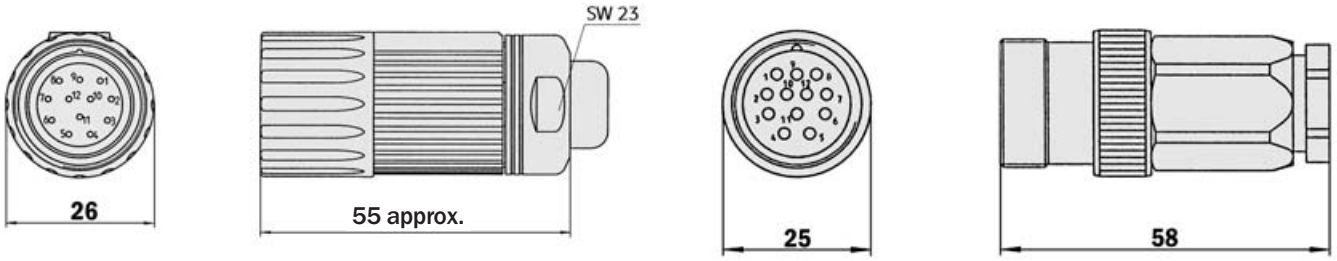
Round screw-in system M23, 12 pin for wire draw encoder PKS with TTL interface

Cable connector M23 female, 12 pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12 pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Cable connector M23 female, 12 pin, straight, Cable 12 core, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2029212	12	1.5 m
DOL-2312-G03MMA3	2029213	12	3.0 m
DOL-2312-G05MMA3	2029214	12	5.0 m
DOL-2312-G10MMA3	2029215	12	10.0 m
DOL-2312-G20MMA3	2029216	12	20.0 m
DOL-2312-G30MMA3	2029217	12	30.0 m

Connector M23 female, 12 pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA3	2030682	12	2.0 m
DOL-2312-G07MLA3	2030685	12	7.0 m
DOL-2312-G10MLA3	2030688	12	10.0 m
DOL-2312-G15MLA3	2030692	12	15.0 m
DOL-2312-G20MLA3	2030695	12	20.0 m
DOL-2312-G25MLA3	2030699	12	25.0 m
DOL-2312-G30MLA3	2030702	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm2 with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water

Dimensional drawings and order information

Screw-in system M12, 5-pin for ATM 60 DeviceNet

Cable connector M12 female, 5-pin, straight, screened

Type	Order no.	Contacts
DOS-1205-G	6 027 534	5

Cable connector M12 male, 5-pin, straight, screened

Type	Order no.	Contacts
STE-1205-G	6 027 533	5

Screw-in system M14 for ATM 90 Profibus

Type	Order no.	Explanation
DSC-1507-G	2 029 199	Cable connector male/female, Set 2 x male, 1 x female, M14, 7-pin, straight (screened)
STE-1507-G	6 027 535	Cable connector, M14 male, 7-pin, straight (screened)
DOS-1507-G	6 027 536	Cable connector, M14 female, 7-pin, straight (screened)

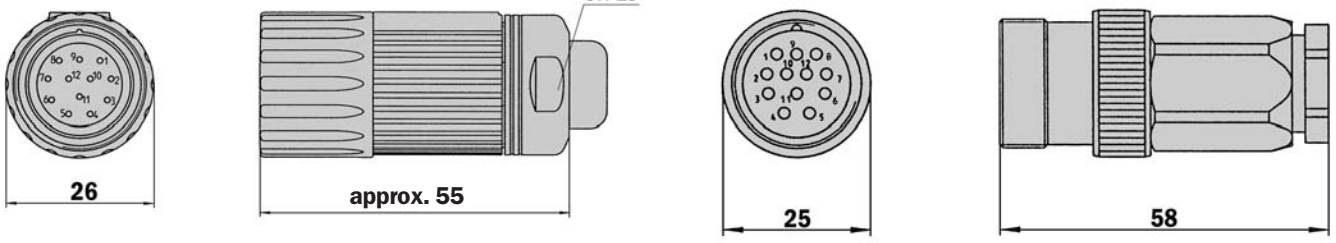
Screw-in system M23, 12-pin for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, DKV 60, DKS 40, ATM 60, ATM 90, KH 53

Female connector M23, 12-pin, straight, screened

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

Male connector M23, 12-pin, straight, screened

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



Female connector M23, 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 for ARS 60

Type	Order no.	Contacts	Cable length
DOL-2312-G1M5MA2	2 029 206	12	1.5 m
DOL-2312-G03MMA2	2 029 207	12	3.0 m
DOL-2312-G05MMA2	2 029 208	12	5.0 m
DOL-2312-G10MMA2	2 029 209	12	10.0 m
DOL-2312-G20MMA2	2 029 210	12	20.0 m
DOL-2312-G30MMA2	2 029 211	12	30.0 m

Screw-in system M23, 12-pin for ATM 60/ATM 90 with SSI interface

Connector M23 female, 12-pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged cable diameter 7.8 mm for ATM 60/ATM 90 with SSI interface and KH 53

Type	Order no.	Contacts	Cable length
DOL-2312-G1M5MA1	2 029 200	12	1.5 m
DOL-2312-G03MMA1	2 029 201	12	3.0 m
DOL-2312-G05MMA1	2 029 202	12	5.0 m
DOL-2312-G10MMA1	2 029 203	12	10.0 m
DOL-2312-G20MMA1	2 029 204	12	20.0 m
DOL-2312-G30MMA1	2 029 205	12	30.0 m

Dimensional drawings and order information

Screw-in system M23, 12-pin

Connector M23 female, 12-pin, straight, cable 12 cores, 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 for DRS 60, DGS 60, DGS 65, DGS 66, DKV 60, DKS 40

Type	Order 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

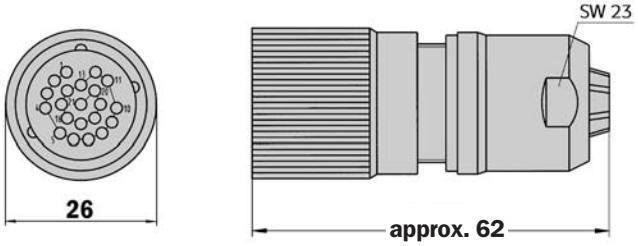
Connector M23 female, 12-pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screening, cable diameter 7.8 mm for DKV 60, DKS 40

Type	Order no.	Contacts	Cable length
DOL-2312-G02MLA3	2 030 682	12	2.0 m
DOL-2312-G07MLA3	2 030 685	12	7.0 m
DOL-2312-G10MLA3	2 030 688	12	10.0 m
DOL-2312-G15MLA3	2 030 692	12	15.0 m
DOL-2312-G20MLA3	2 030 695	12	20.0 m
DOL-2312-G25MLA3	2 030 699	12	25.0 m
DOL-2312-G30MLA3	2 030 702	12	30.0 m

Screw-in system M23, 21-pin for ARS 60

Female connector M23, 21-pin, straight, screened, capable of being dragged

Type	Order no.	Contacts
DOS-2321-G	6 027 539	21



Female connector M23, 21-pin, straight, cable 22 core, 20 x 0.14 + 2 x 0.5 mm² with screening, capable of being dragged cable diameter 7.8 mm for ARS 60

Type	Order 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

O-ring EPDM (for replacement demand), set (2 pieces) 55.0 x 4.0 mm for DKV 60

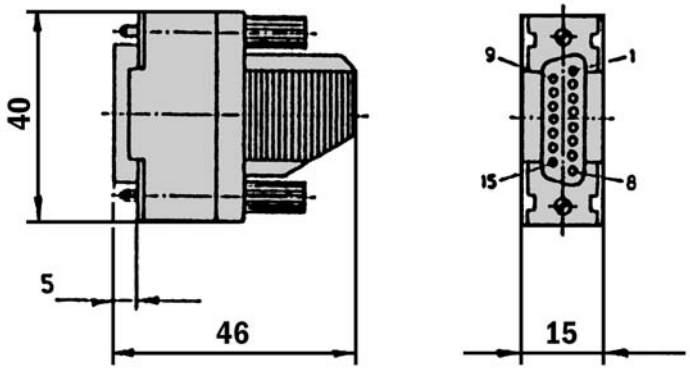
Type	Order no.
O-Ring SET DKV60	6 032 709

Dimensional drawings and order information

Screw-in systems Sub-D for Adaptor modules

Male connector Sub-D, 15-pin, straight, screened for ARS 60, ATM 60, ATM 90, KH 53

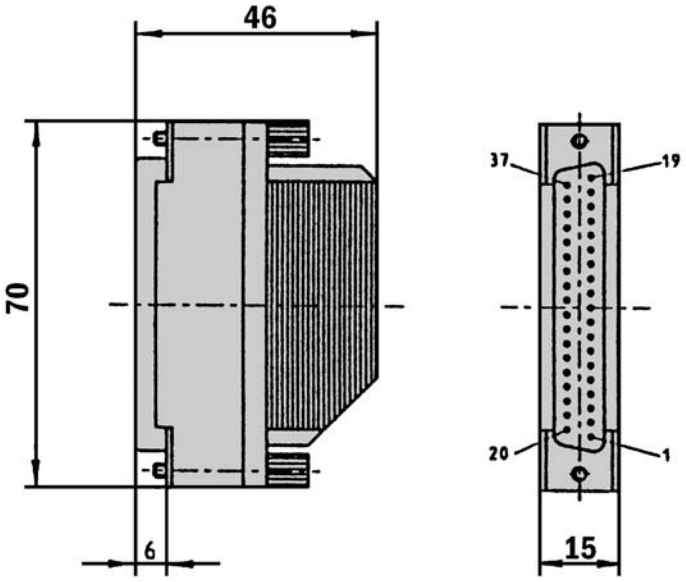
Type	Order no.	Contacts
STE-0D15-G	2 029 223	15



General tolerances according to DIN ISO 2768-mk

Female connector Sub-D, 37-pin, straight, screened for ARS 60 ATM 60, ATM 90, KH 53

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



General tolerances according to DIN ISO 2768-mk

Cables, per meter

Cable 8 core, per meter, 4 x 2 x 0.15 mm² with screening, cable diameter 5.6 mm for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, DKV 60, DKS 40

Type	Order no.	Wires
LTG-2308-MWENC	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 for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, DKV 60, DKS 40

Type	Order 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 for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, DKV 60, DKS 40, ATM 60, ATM 90, KH 53

Type	Order no.	Wires
LTG-2512-MW	6 027 531	12
LTG-2612-MW*	6 028 516	12

*Resistant to saltwater and uv

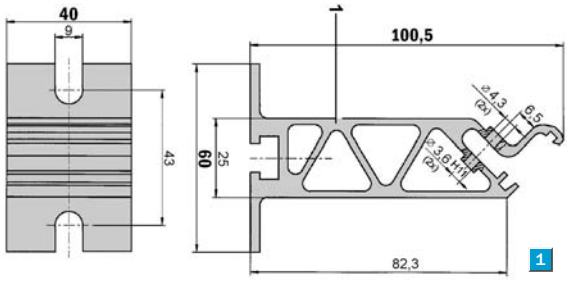
Cable 22 core, per meter, 20 x 0.14 + 2 x 0.5 mm² with screening, cable diameter 7.8 mm for ARS 60

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

Mounting systems

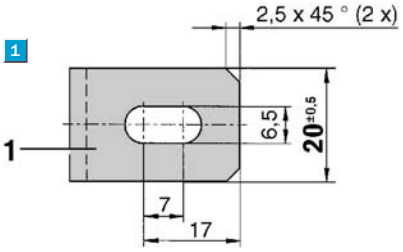
Spacer support, height 100 mm, for KH 53, bored with srews

Type	Order no.
BEF-KHK-KHT53	2 029 158



Fastening clamp for KH 53, screws not included

Type	Order no.
BEF-WK-KHT53	2 029 159



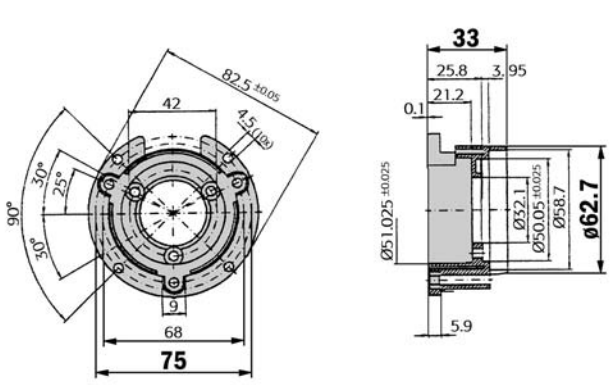
1 General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

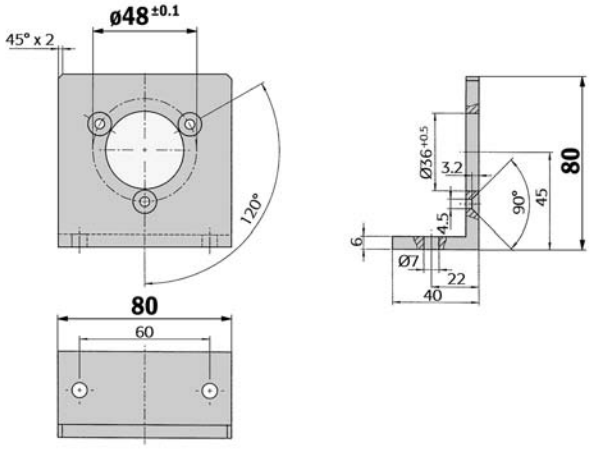
Mechanical Adaptors

Mounting bell incl. fixing set for encoder with servo flange for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60		
Type	**Order no.**	**Flange spigot**
BEF-MG-50	5 312 987	Diameter 50 mm

Mounting angle incl. fixing set for encoder with face mount flange for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60		
Type	**Order no.**	**Flange spigot**
BEF-WF-36	2 029 164	Diameter 36 mm



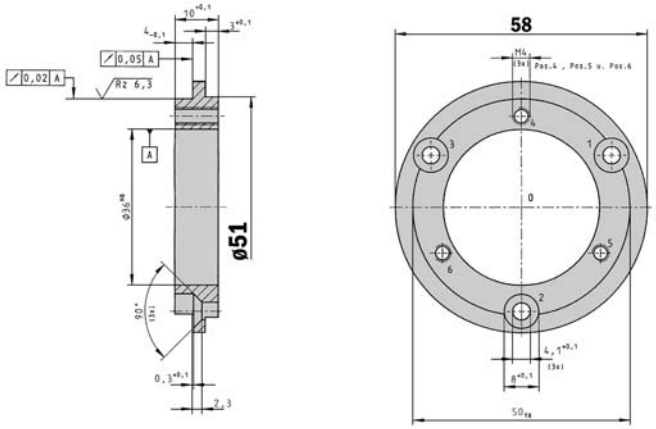
General tolerances according to DIN ISO 2768-mk



General tolerances according to DIN ISO 2768-mk

Mechanical Adaptors

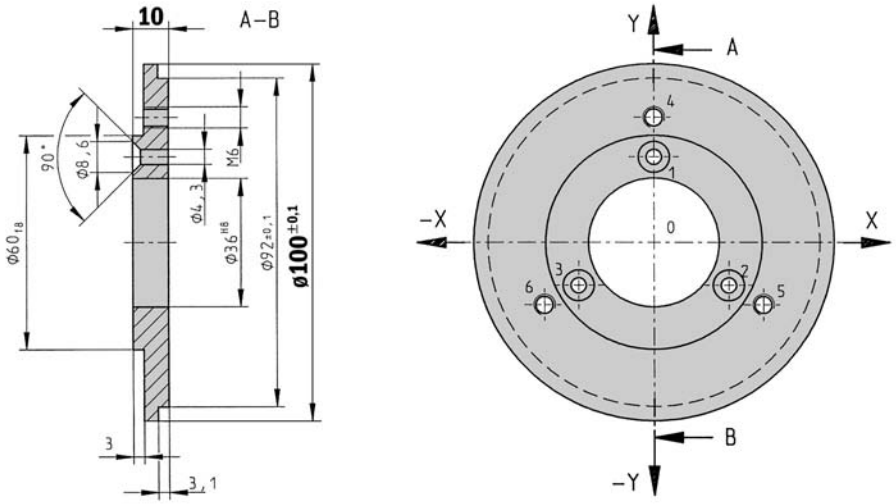
Adaptor flange of aluminium for face mount flange, spigot 36 mm for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60		
Type	**Order no.**	**Adaption**
BEF-FA-036-050	2 029 160	To 50 mm servo flange



General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

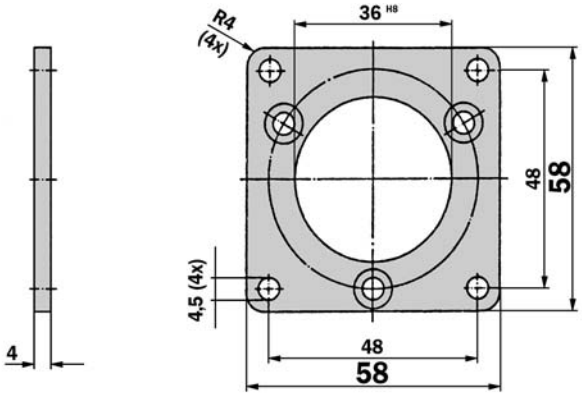
Adaptor flange of aluminium for face mount flange, spigot 36 mm for ARS 60, ATM 60		
Type	**Order no.**	**Adaption**
BEF-FA-036-100	2 029 161	To 100 mm servo flange



General tolerances according to DIN ISO 2768-mk

Mechanical Adaptors

Adaptor flange of aluminium for face mount flange, spigot 36 mm for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60		
Type	**Order no.**	**Adaption**
BEF-FA-036-060REC	2 029 162	To 60 mm square mounting plate



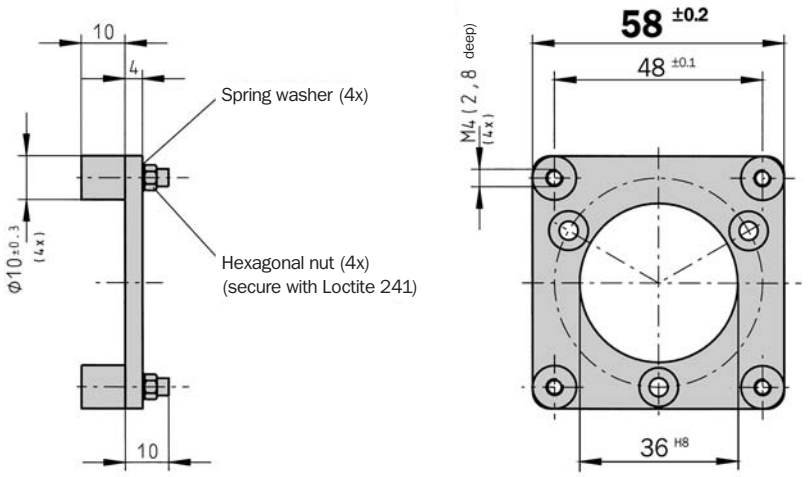
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Mechanical Adaptors for DRS 60, DGS 60, DGS 65, DGS 66

Adapter flange of aluminium for face mount flange, spigot 36 mm for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60

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

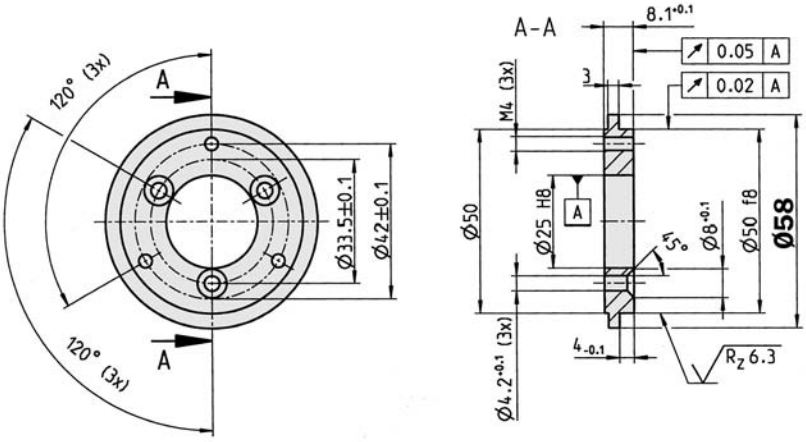


General tolerances according to DIN ISO 2768-mk

Mechanical Adaptors for DKS 40

Adapter flange of aluminium for face mount flange, spigot 25 mm

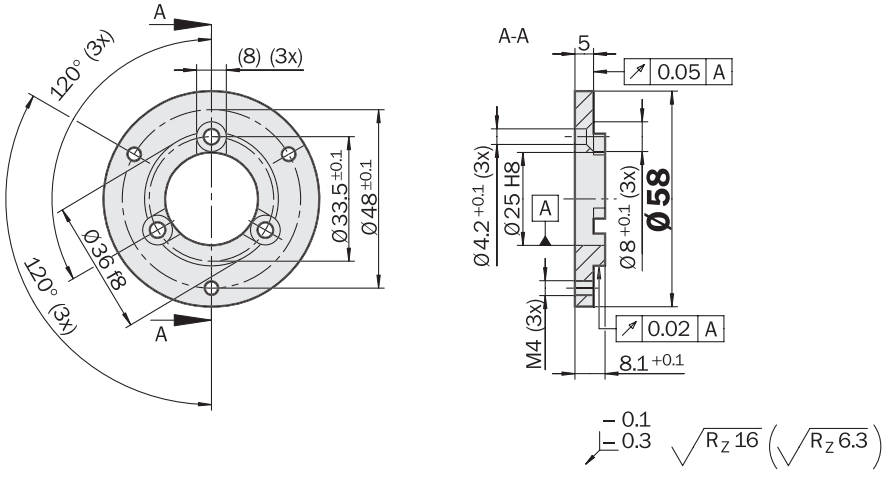
Type	Order no.	Adaption
BEF-FA-025-050	2 032 622	To 50 mm servo flange



General tolerances according to DIN ISO 2768-mk

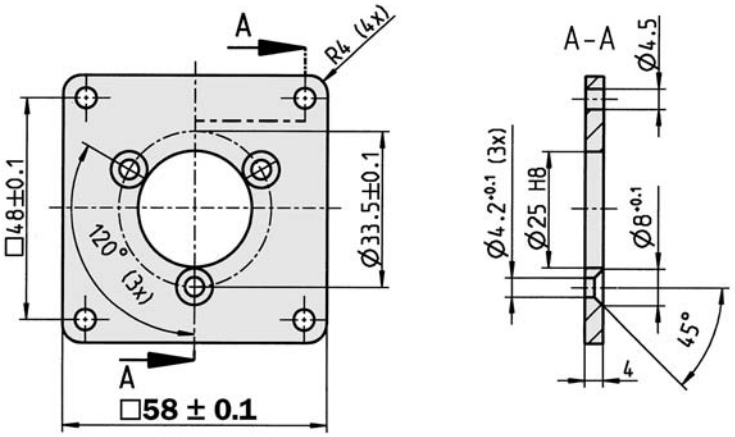
Adapter flange of aluminium for face mount flange, spigot 36 mm for DKS 40

Type	Order no.	Adaption
BEF-FA-025-036	2 034 226	To 50 mm servo flange



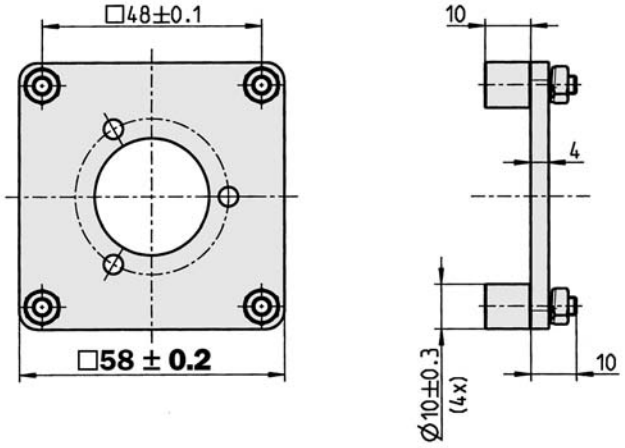
General tolerances according to DIN ISO 2768-mk

Adaptor flange of aluminium for face mount flange, spigot 25 mm for DKS 40		
Type	**Part no.**	**Adaption**
BEF-FA-025-060RCA	2 032 623	To 60 mm square mounting plate



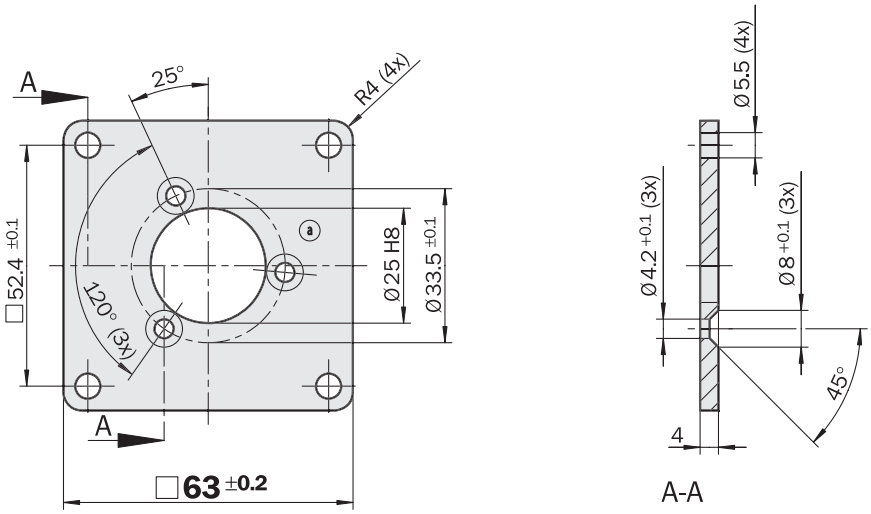
General tolerances according to DIN ISO 2768-mk

Adaptor flange of aluminium for face mount flange, spigot 25 mm for DKS 40		
Typ	**Part no.**	**Adaption**
BEF-FA-025-060RSA	2 032 624	To 60 mm square mounting plate with shock absorbers



General tolerances according to DIN ISO 2768-mk

Adaptor flange of aluminium for face mount flange, spigot 25 mm for DKS 40		
Typ	**Part no.**	**Adaption**
BEF-FA-025-063REC	2 033 631	To 63 mm square mounting plate



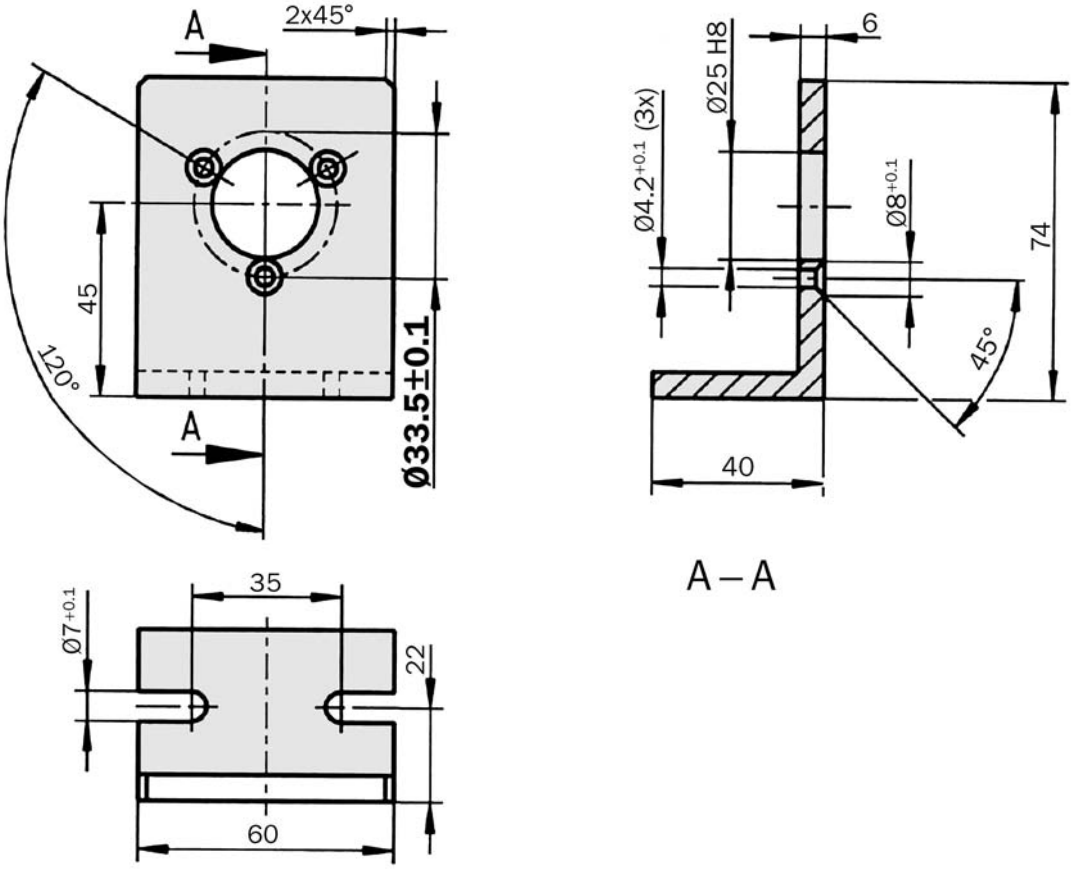
General tolerances according to DIN ISO 2768-mk

Dimensional drawings and order information

Mechanical Adaptors for DKS 40

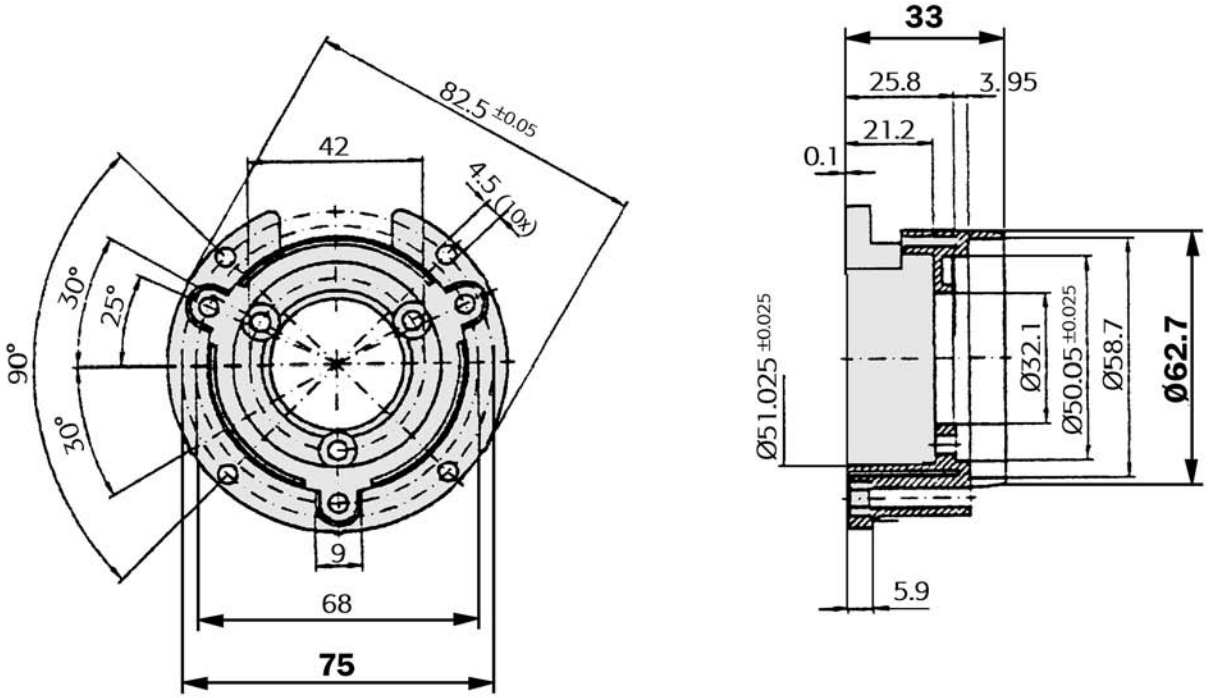
Mounting angle incl. fixing set for encoder with face mount flange

Type	Part no.	Flange spigot
BEF-WF-25	2 032 621	Diameter 25 mm



Mounting bell incl. fixing set for encoder with servo flange for DKS 40

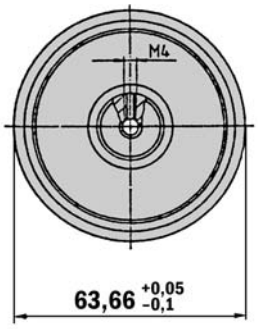
Type	Part no.	Flange spigot
BEF-MG-50	5 312 987	Diameter 50 mm



Dimensional drawings and order information

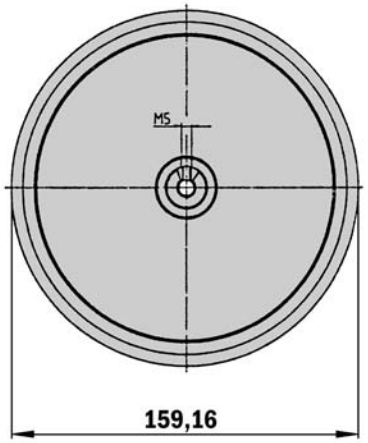
Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub

Type	Order no.	Circumference
BEF-MR-010020	5 312 988	0.2 m



Measuring wheel for encoder shafts with diameter 10 mm, type material plastic (Hytrel), wheel material plastic with aluminium hub

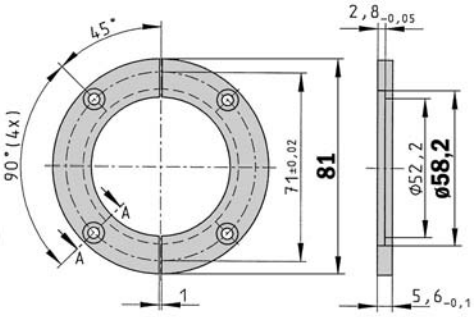
Type	Order no.	Circumference
BEF-MR-010050	5 312 989	0.5 m



Servo clamps

Servo clamps half ring, Set (comprises 2 pieces) for servo flanges with spigot diameter 50 mm for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60

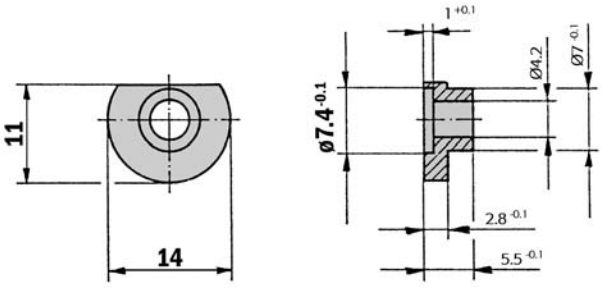
Type	Order no.
BEF-WG-SF050	2 029 165



General tolerances according to DIN ISO 2768-mk

Servo clamps small, Set (comprises 3 pieces) for servo flanges for ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60, DKS 40

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

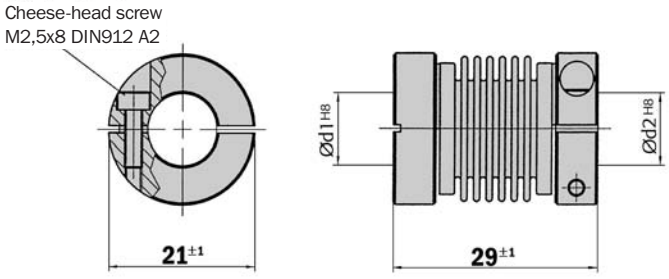


General tolerances according to DIN ISO 2768-mk

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. For ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60, ATM 90

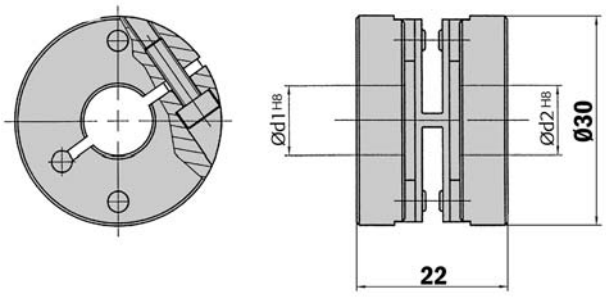
Type	Order no.	Shaft diameter
KUP-0606-B	5 312 981	6 mm - 6 mm
KUP-0610-B	5 312 982	6 mm - 10 mm
KUP-1010-B	5 312 983	10 mm - 10 mm
KUP-1012-B	5 312 984	10 mm - 12 mm



Dimensional drawings and order information

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 stainless steel, spring-discs of glass-fibre-reinforced plastic. For ARS 60, DRS 60, DGS 60, DGS 65, DGS 66, ATM 60, ATM 90

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

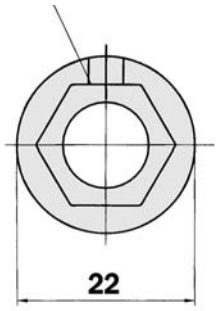


General tolerances according to DIN ISO 2768-mk

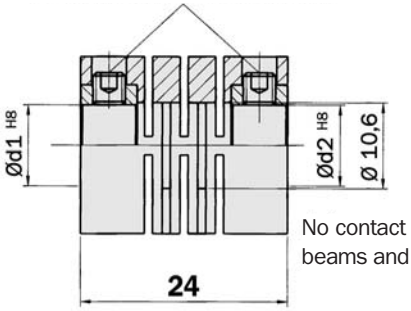
Beam coupling max. shaft displacement radially ± 0.3 mm, axially ± 0.2 mm, angular ± 3 degrees, torsional rigidity 38 Nm/rad, body: fibre glass reinforced polyamide, hubs made of brass for DKS 40

Type	Order no.	Type shaft diameter
KUP-0608-S	5 314 179	6 mm ... 8 mm
KUP-0808-S	5 314 177	8 mm ... 8 mm
KUP-0810-S	5 314 178	8 mm ... 10 mm

Shaft clamped around its circumference



Cheese-head screw M 4 x 4 DIN916



No contact between beams and shaft

Collets

Collets for blind hollow shaft for ARS 60, DRS 60, ATM 60

Type	Order 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 for ARS 60, DRS 60

Type	Order 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"

Collets for DGS65 blind hollow shaft encoder

Type	Order no.	Shaft diameter
SPZ-006-DD65-A	2 029 181	6 mm
SPZ-008-DD65-A	2 029 182	8 mm
SPZ-010-DD65-A	2 029 183	10 mm
SPZ-011-DD65-A	2 019 043	11 mm
SPZ-012-DD65-A	2 029 184	12 mm
SPZ-3E8-DD65-A	2 039 227	3/8 "

Collets for DGS66 through hollow shaft encoder

Type	Order no.	Shaft diameter
SPZ-006-DD66-A	2 029 185	6 mm
SPZ-008-DD66-A	2 029 186	8 mm
SPZ-010-DD66-A	2 029 187	10 mm
SPZ-012-DD66-A	2 029 188	12 mm
SPZ-1E2-DD66-A	2 029 189	1/2"
SPZ-014-DD66-A	2 029 190	14 mm
SPZ-015-DD66-A	2 029 191	15 mm

Dimensional drawings and order information

Adaptor modules for SSI Interface

Serial-Parallel Adaptor modules

Type	Order 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 plate7

Adaptor modules for SSI interface

Programming Tool für ATM 60/ATM 90, KH 53

Type	Order no.
PGT-01-S	1 030 111

Programming tool for Serial Parallel Adaptor for ATM 60, ATM 90 and KH 53 with SSI interface

Type	Order no.
PGT-02-S	1 030 112

Programming Tool (USB Version) for DRS 61

Type	Order no.
PGT-05-S	1 035 342