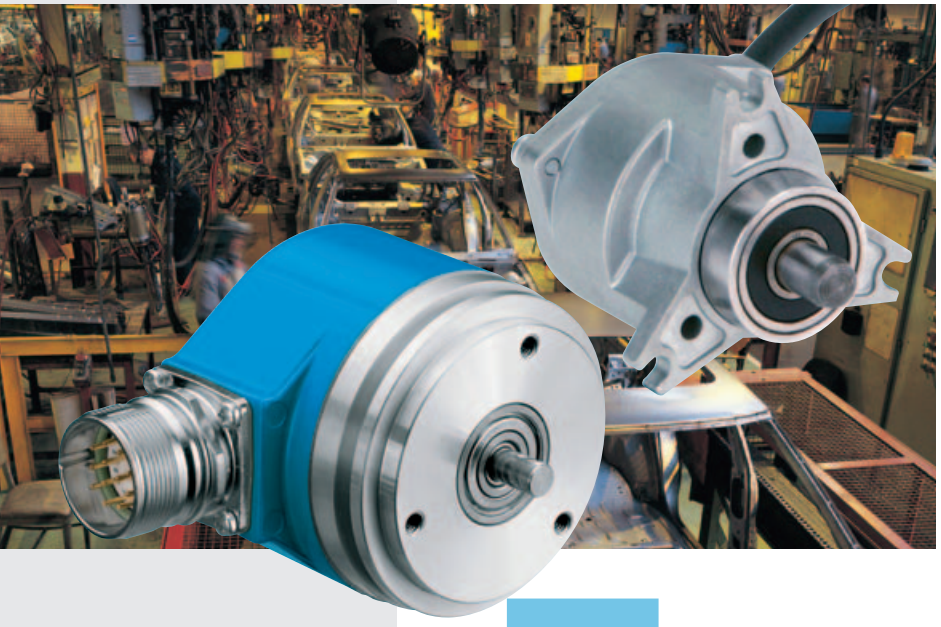
Number of lines 1 up to 8,192

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.

▲ 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.

▲ 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.

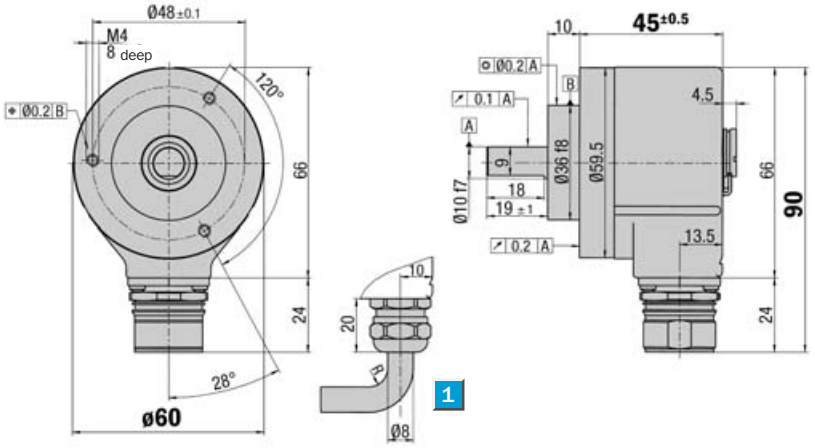
Number of lines
1 up to 8,192

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

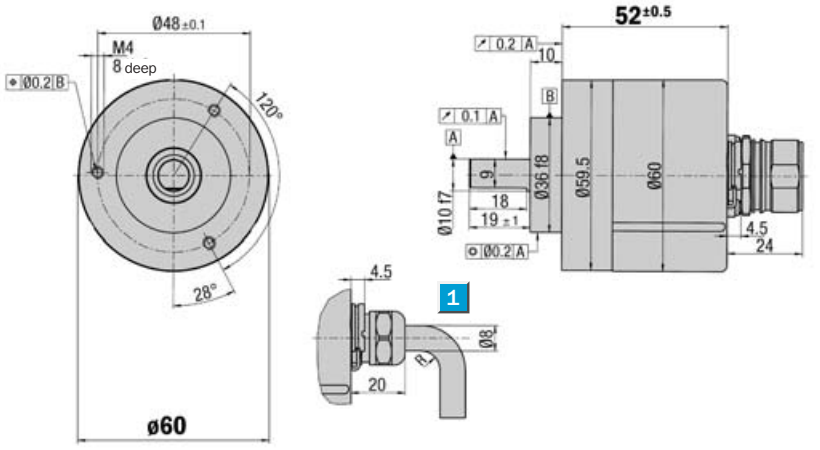
Dimensional drawing face mount flange radial



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing face mount flange axial

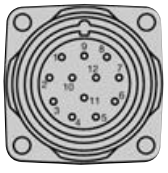


1 R = bending radius min. 40 mm

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

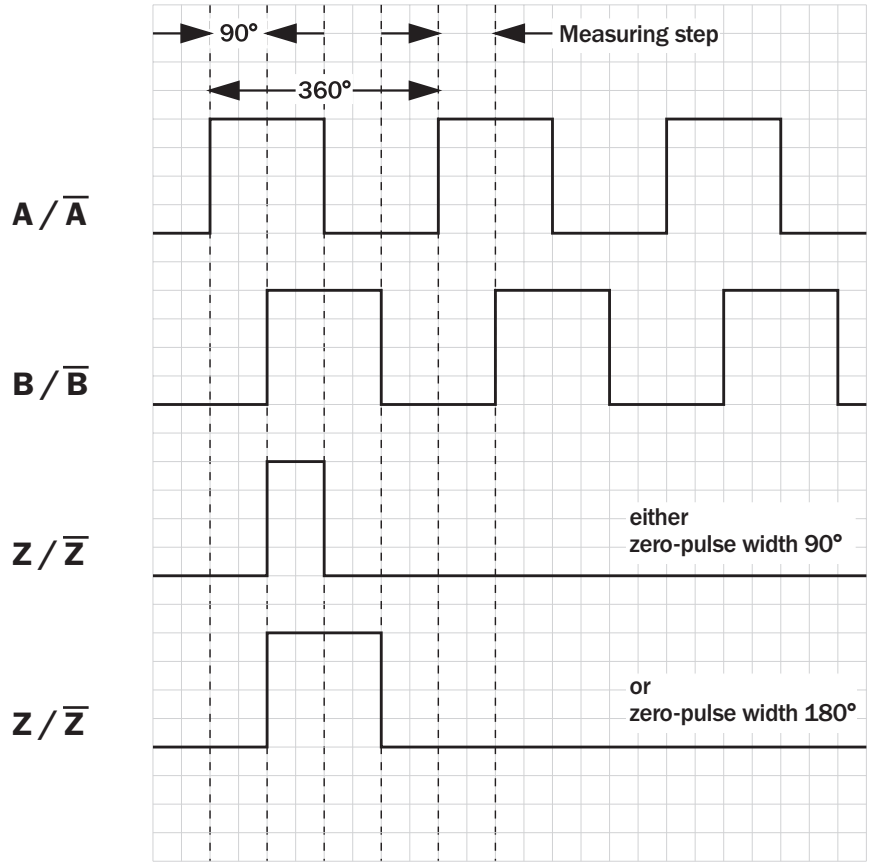
Order information see page 73

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**

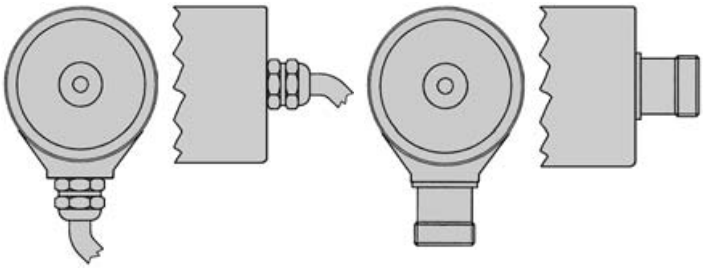
Incremental pulse diagram



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)

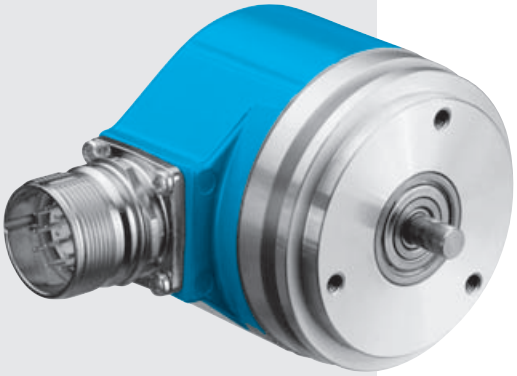
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	R	S	6	1	–	A	4	A	0	8	1	9	2

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

Number of lines
1 up to 8,192

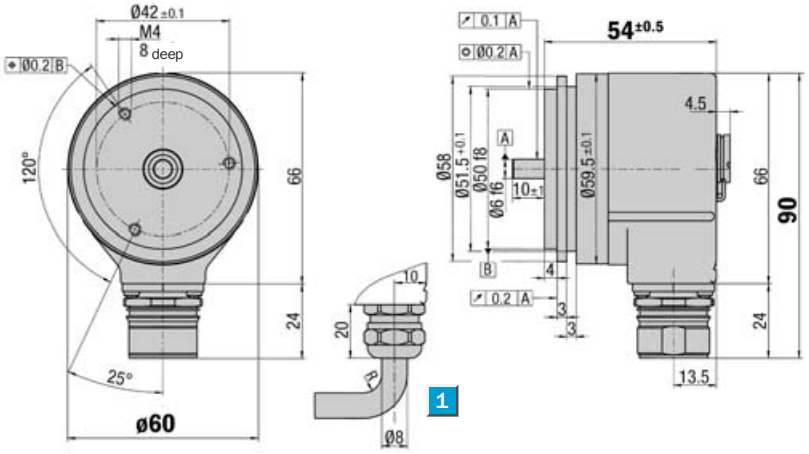
Incremental Encoder

- 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**



See chapter Accessories
Accessories for encoders

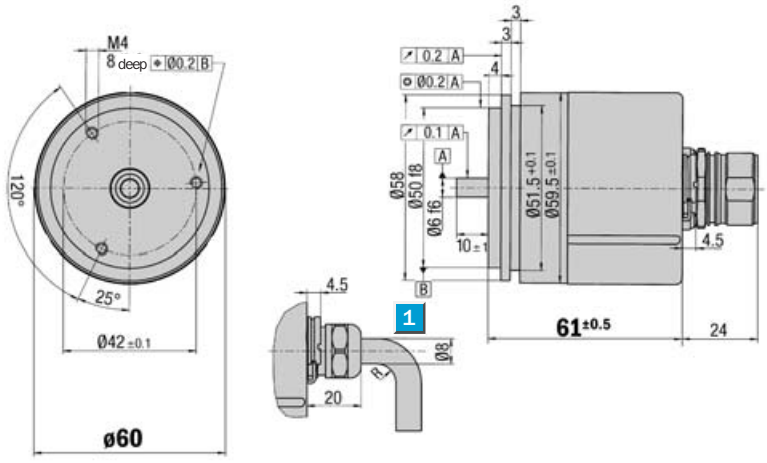
Dimensional drawing servo flange radial



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing servo flange axial

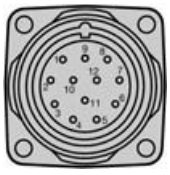


1 R = bending radius min. 40 mm

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

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	

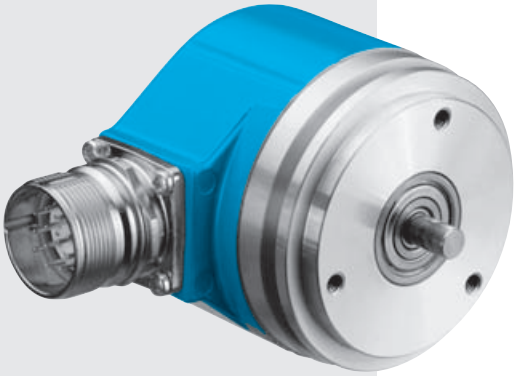
1) Concerning encoder with connector
2) Electrical, logically linked to A and B
3) In case, that shaft seal has been removed by customer
4) Condensation of the optical scanning not permitted
5) To DIN EN 61000-6-2 and DIN EN 61000-6-3
6) To DIN EN 60068-2-27
7) To DIN EN 60068-2-6
8) With mating connector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

Order information see page 77

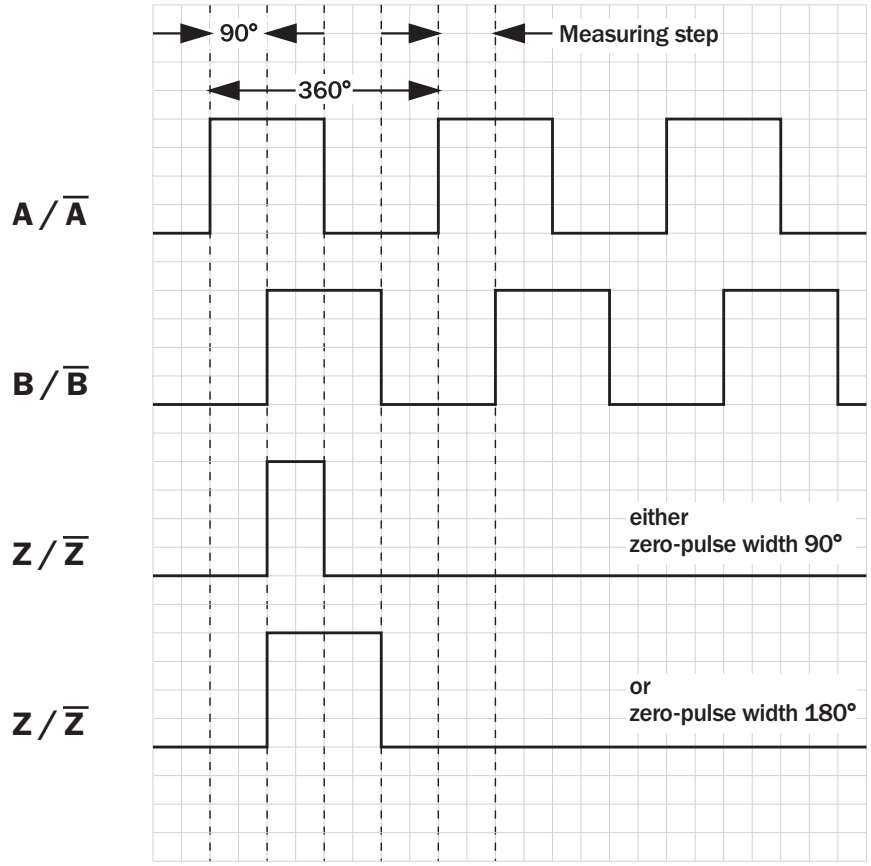
Number of lines
1 up to 8,192

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**



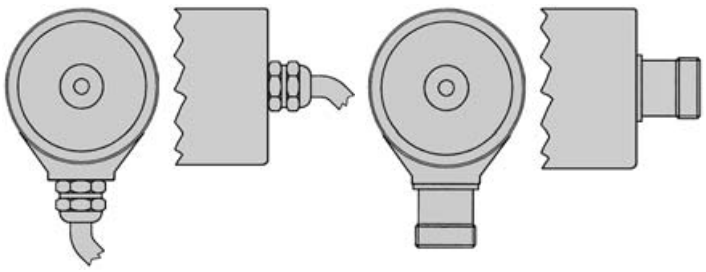
Incremental pulse diagram



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)

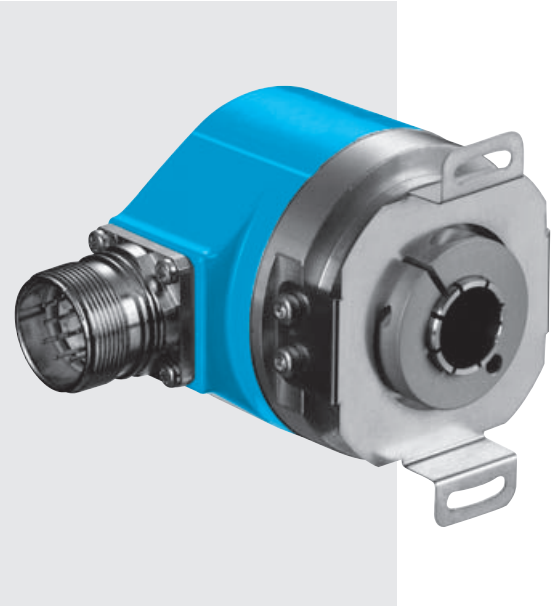
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	**R**	**S**	**6**	**1**	**–**	**A**	**1**	**A**	**0**	**8**	**1**	**9**	**2**

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

Number of lines
1 up to 8,192

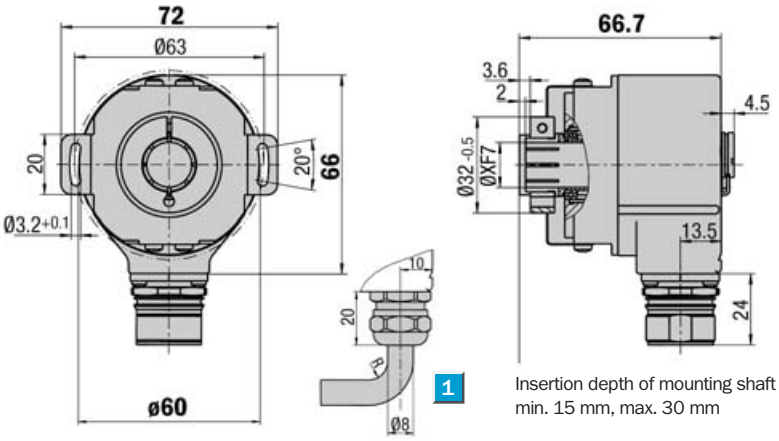
Incremental Encoder

- 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

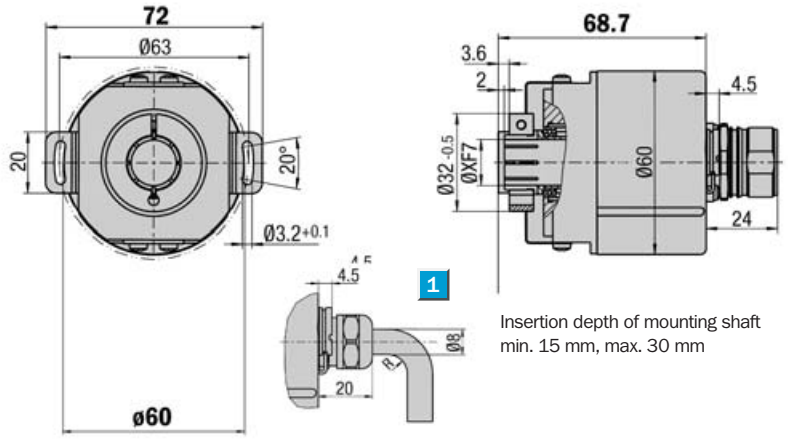


Insertion depth of mounting shaft min. 15 mm, max. 30 mm

1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing blind hollow shaft axial



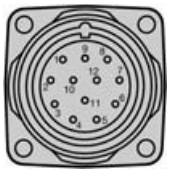
Insertion depth of mounting shaft min. 15 mm, max. 30 mm

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

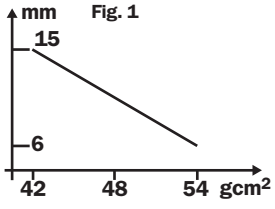


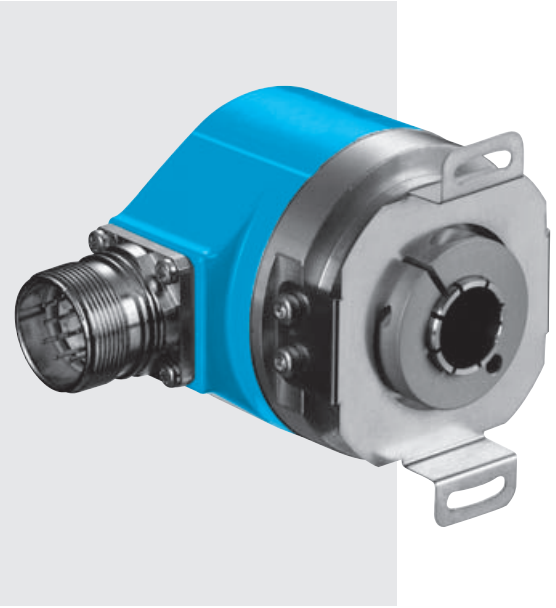
Fig. 1

Order information see page 81

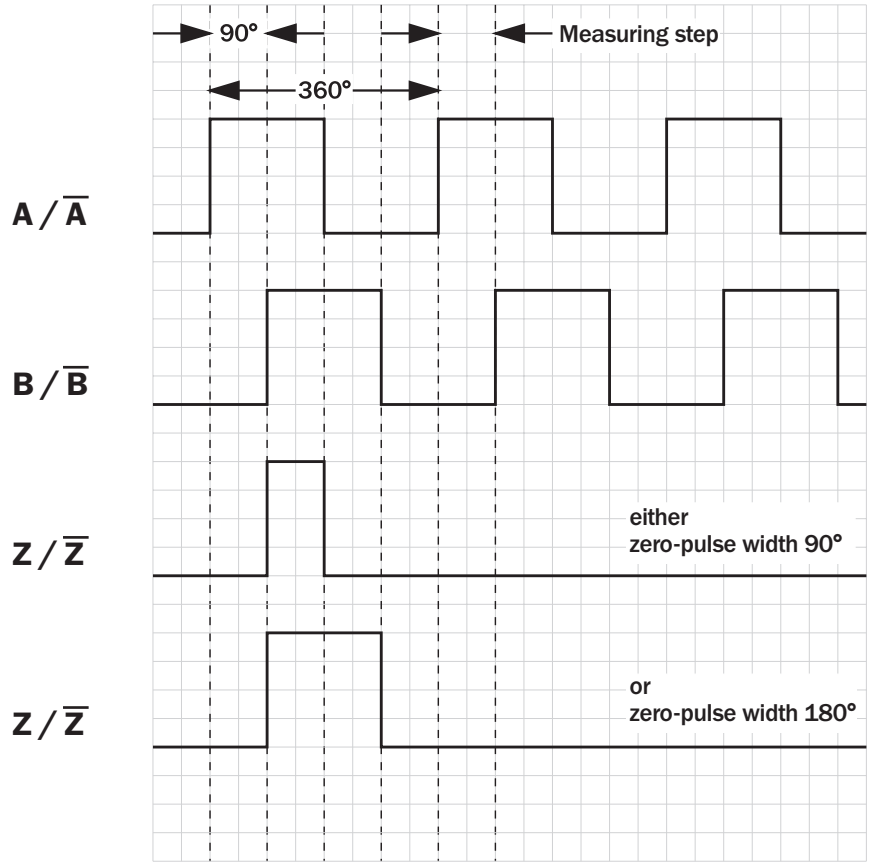
Number of lines
1 up to 8,192

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**



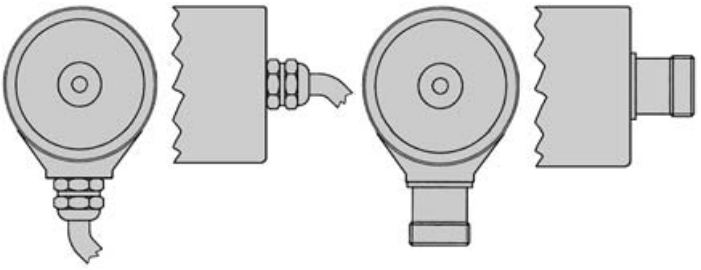
Incremental pulse diagram



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)

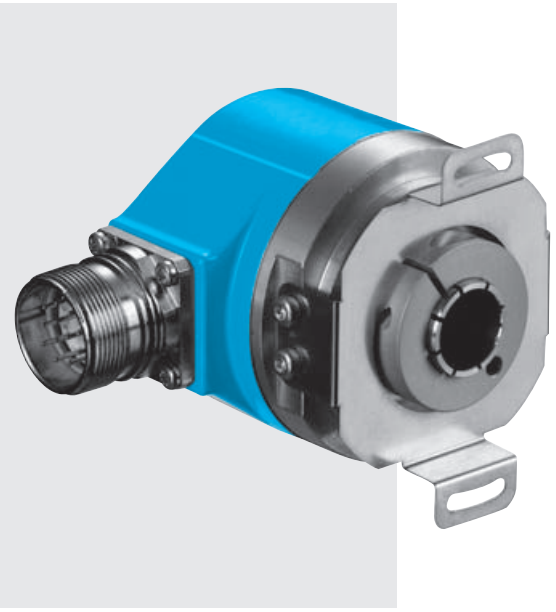
Blind hollow shaft collets

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"

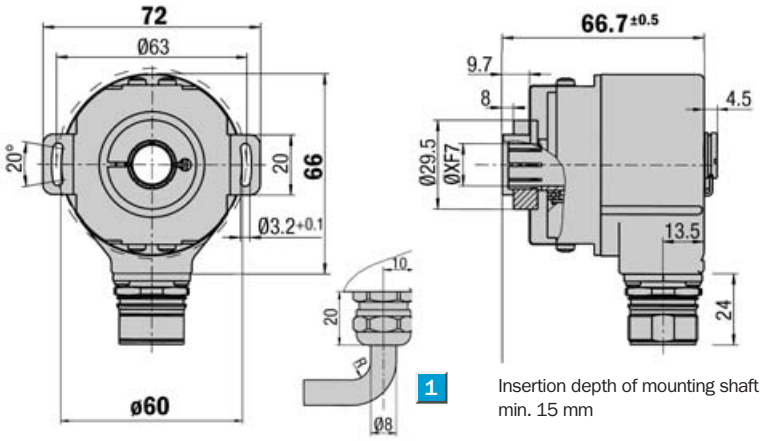
Number of lines
1 up to 8,192

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



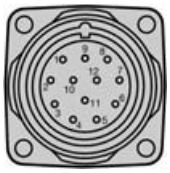
1 Insertion depth of mounting shaft min. 15 mm

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

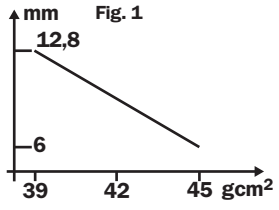


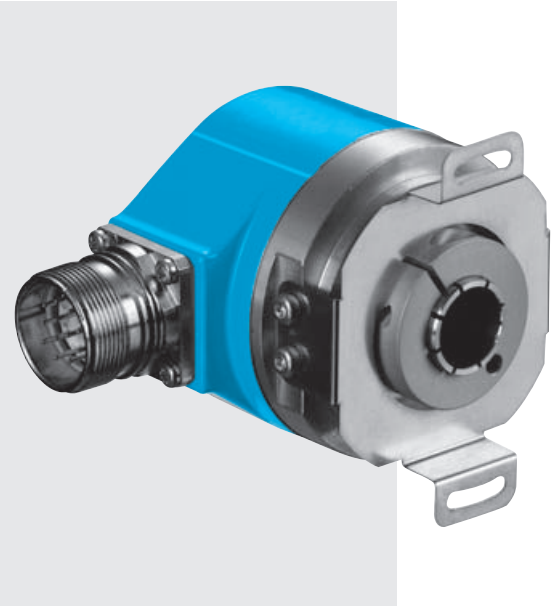
Fig. 1

Order information see page 81

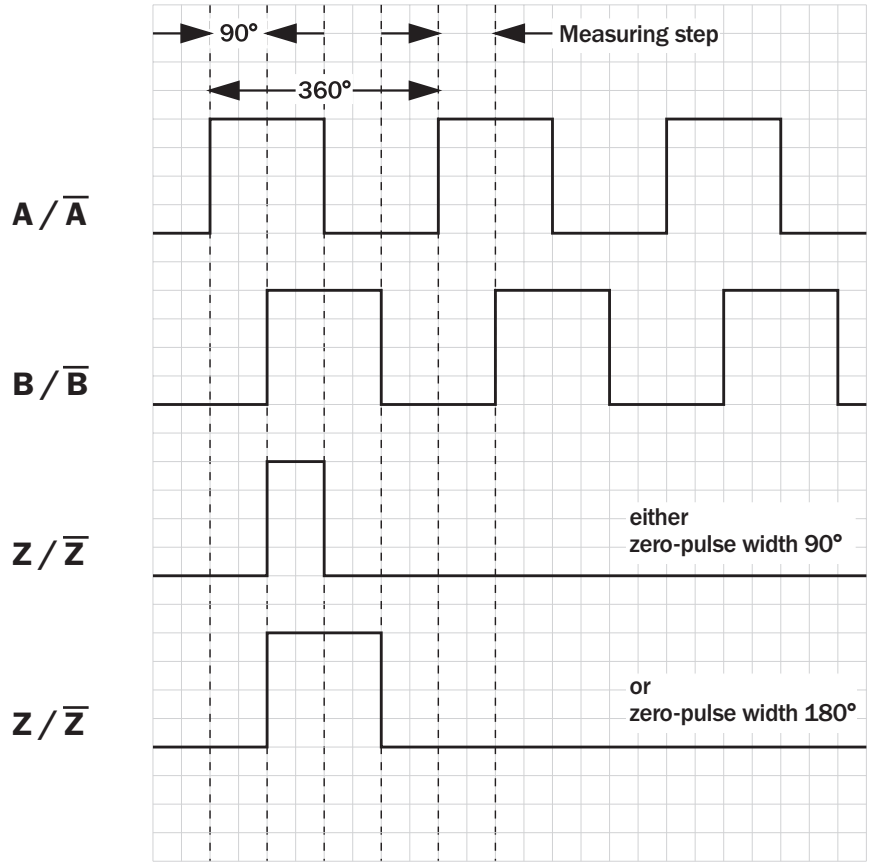
Number of lines
1 up to 8,192

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)

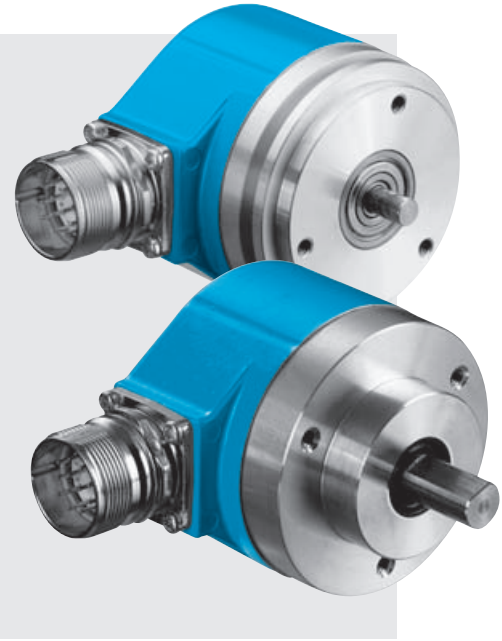
Through hollow shaft collets

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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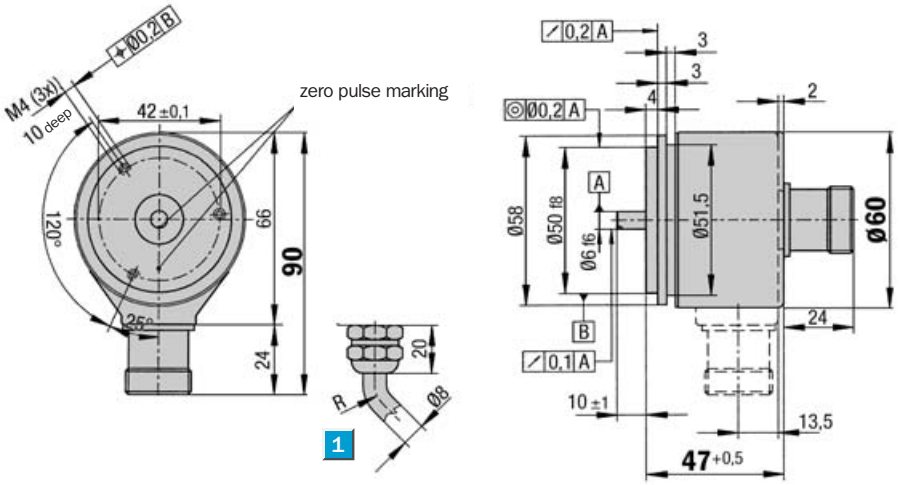
See chapter Accessories
Accessories for encoders

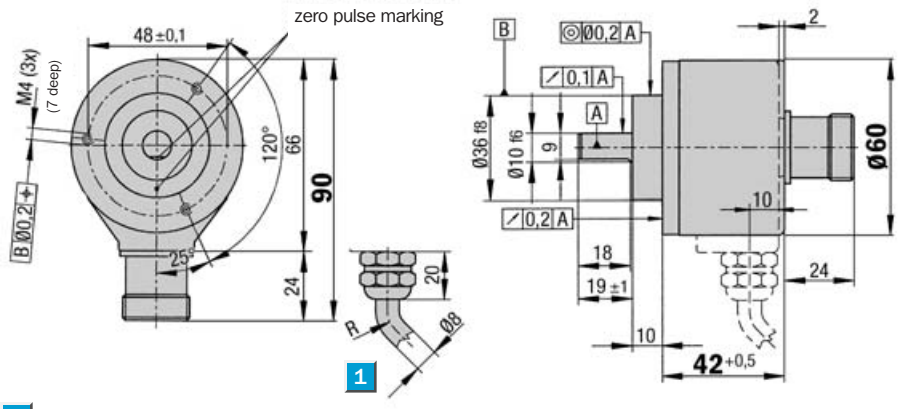
Dimensional drawing servo flange



1 R = bending radius min. 40 mm

General tolerances according to DIN ISO 2768-mk

Dimensional drawing face mount flange

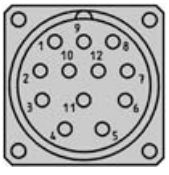


1 R = bending radius min. 40 mm

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

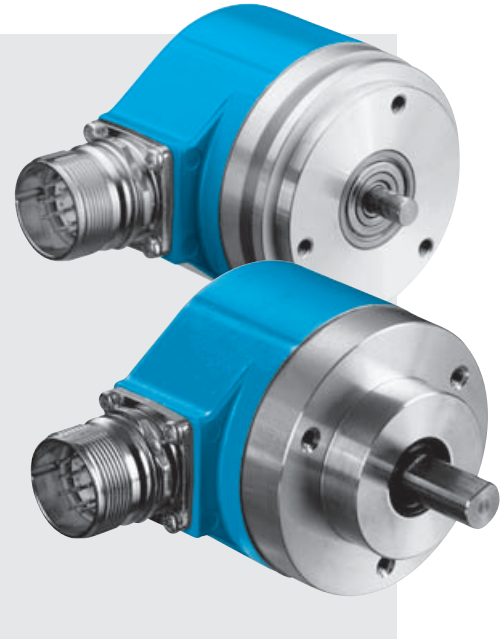
7) With mating connector fitted

Order information see page 89

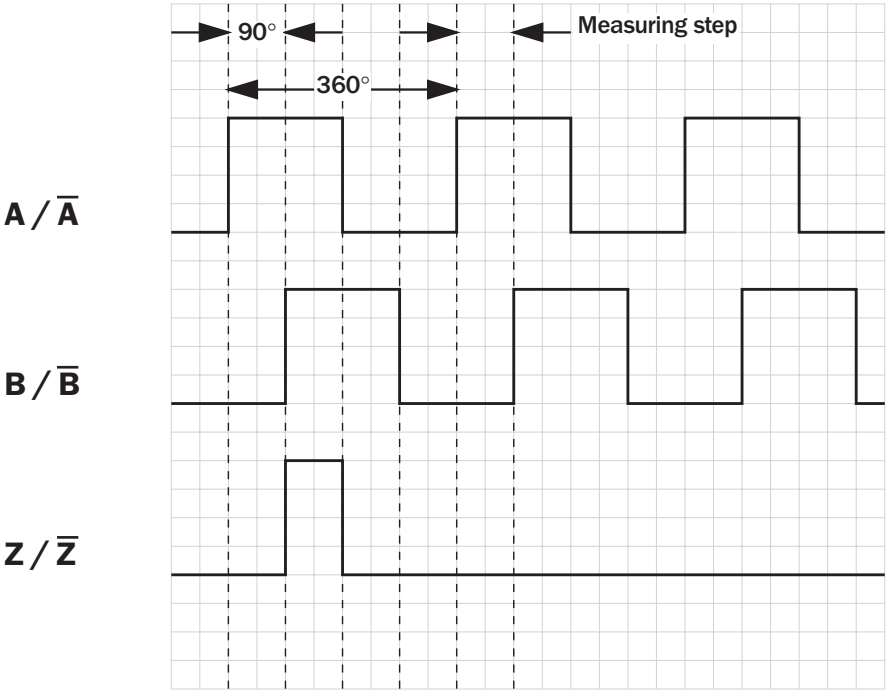
Number of lines
100 to 10,000

Incremental Encoder

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

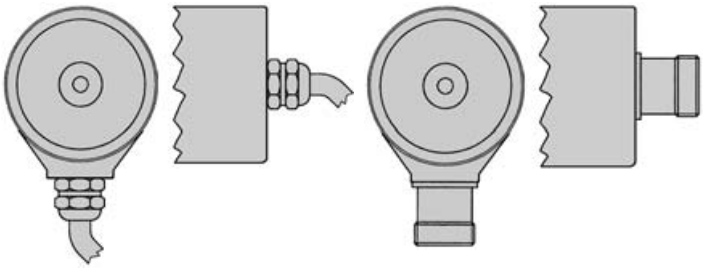


Incremental pulse diagram



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**	**–**								

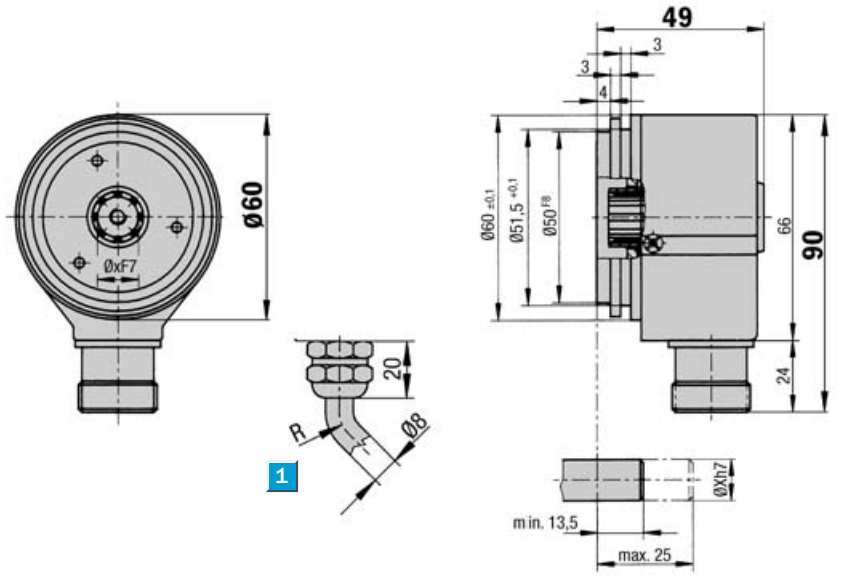
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	**G**	**S**	**6**	**0**	**–**								

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

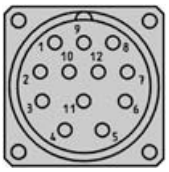


1 R = bending radius min. 40 mm

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

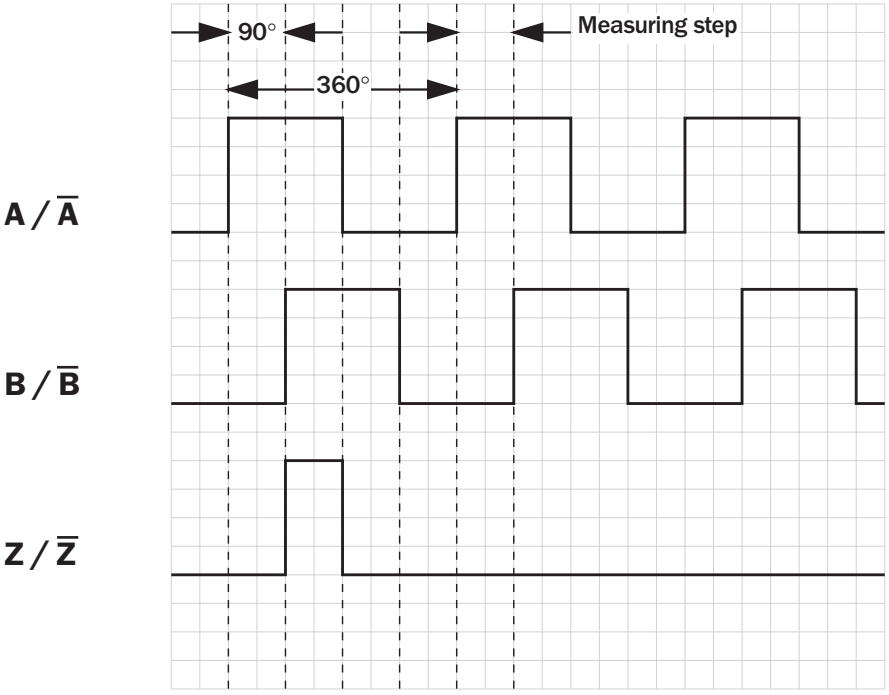
Order information see page 93

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

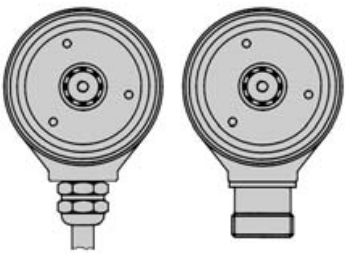
Incremental pulse diagram



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**	**–**								

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**

1) **Collets for 6, 8, 10, 11, 12 mm and 3/8" 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**

Number of lines
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**	**–**								

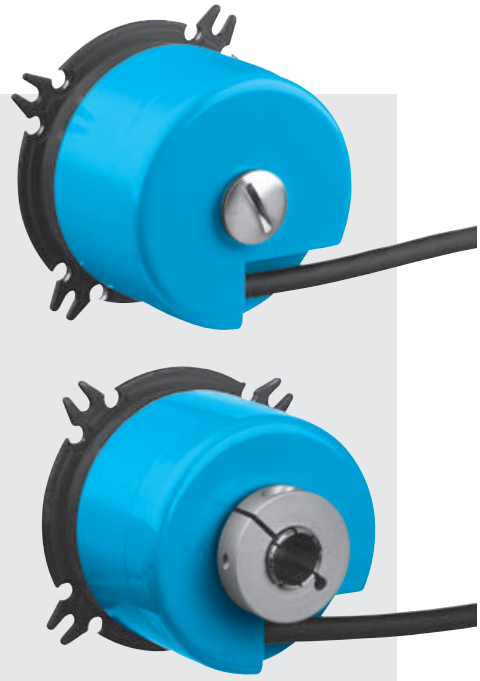
Collets for DGS65 Encoder with blind hollow shaft

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

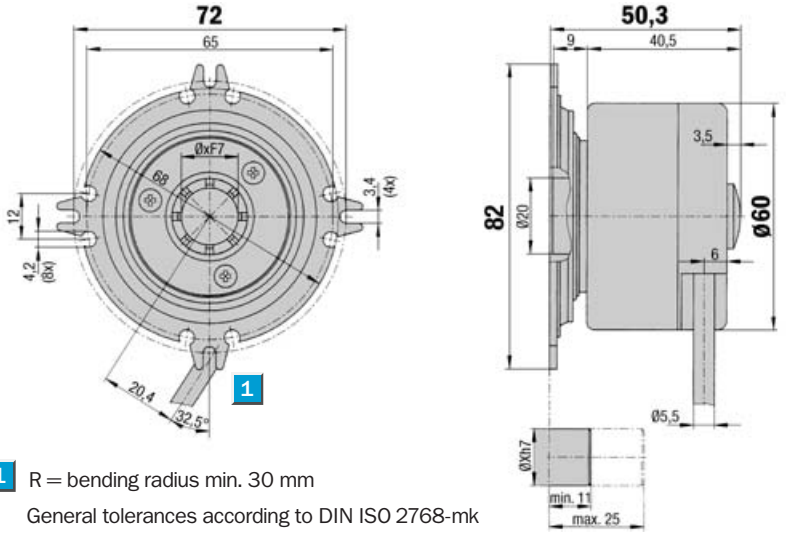


CE cULus

See chapter Accessories

Accessories for encoders

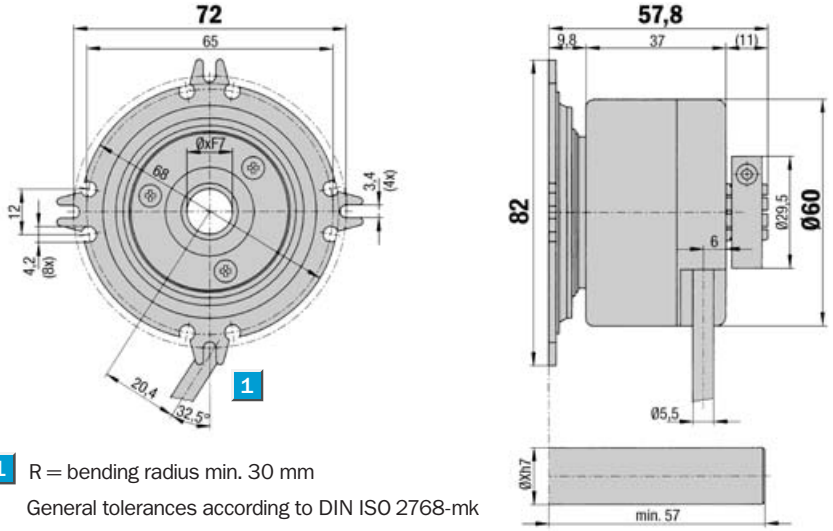
Dimensional drawing blind hollow shaft



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

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

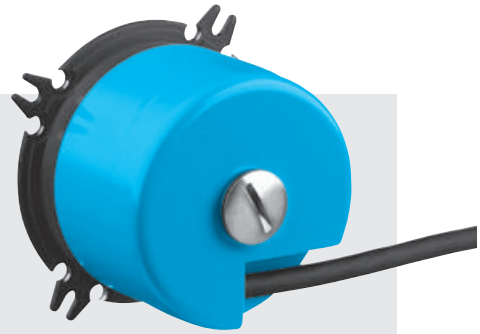
[4] To DIN EN 60068-2-6

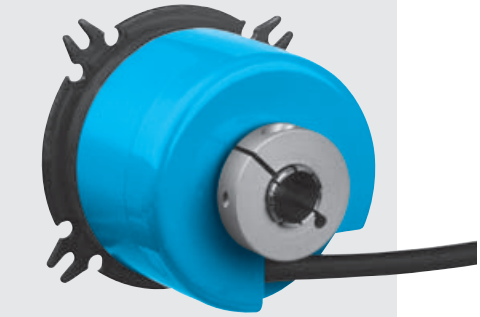
Order information see page 97

Number of lines
100 to 10,000

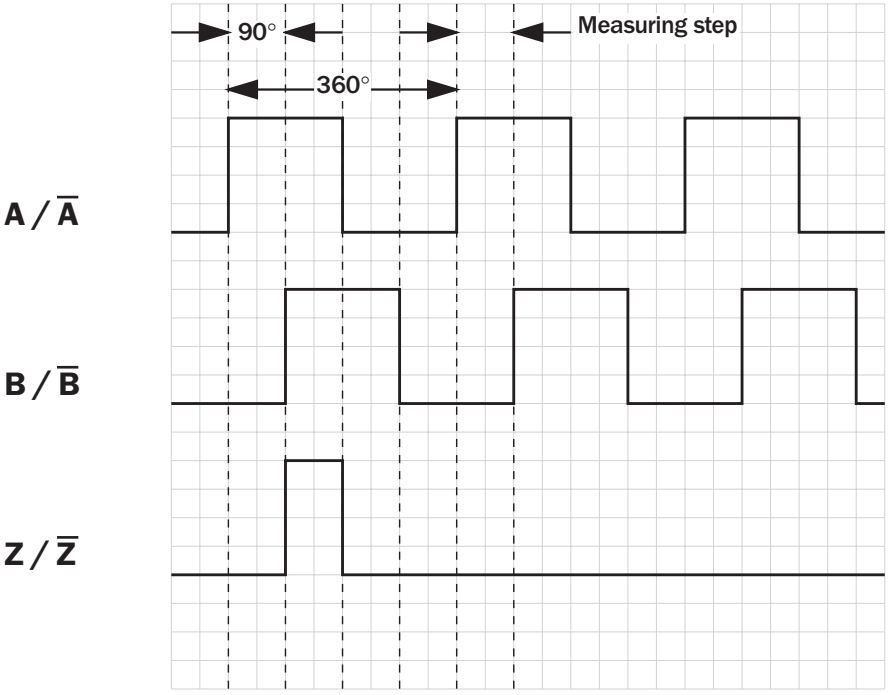
Incremental Encoder

- 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 shaft1)	= **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**	**–**								

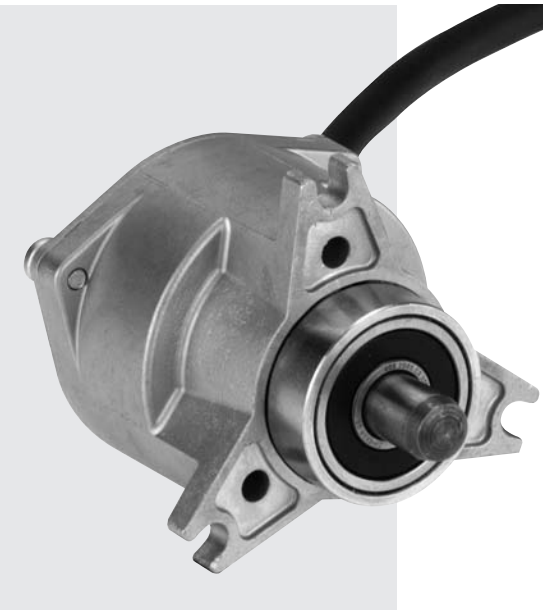
Collets for DGS66 Encoder with blind hollow shaft

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

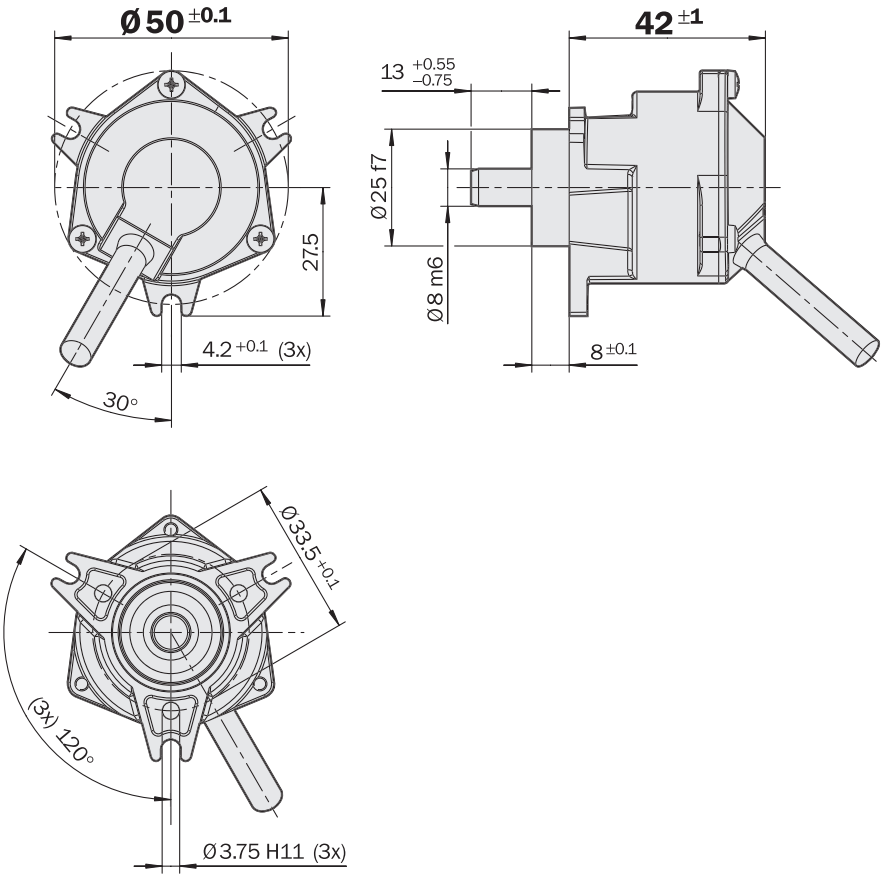
- Cable outlet
- Enclosure rating IP 64
- Electrical Interfaces Open Collector NPN, TTL, HTL



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

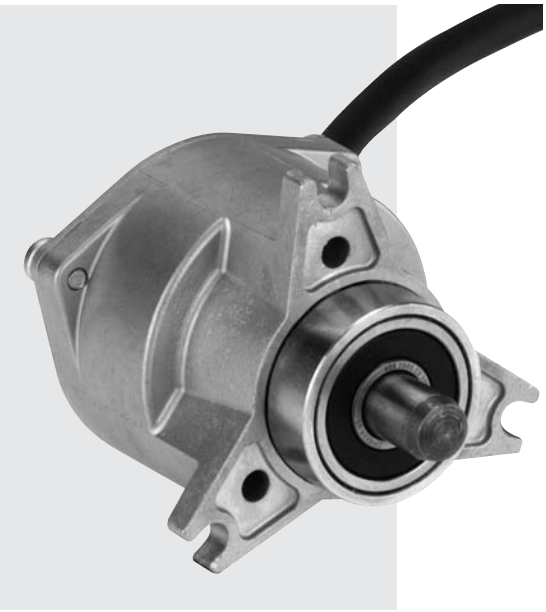
[5] To DIN EN 60068-2-27

[6] To DIN EN 60068-2-6

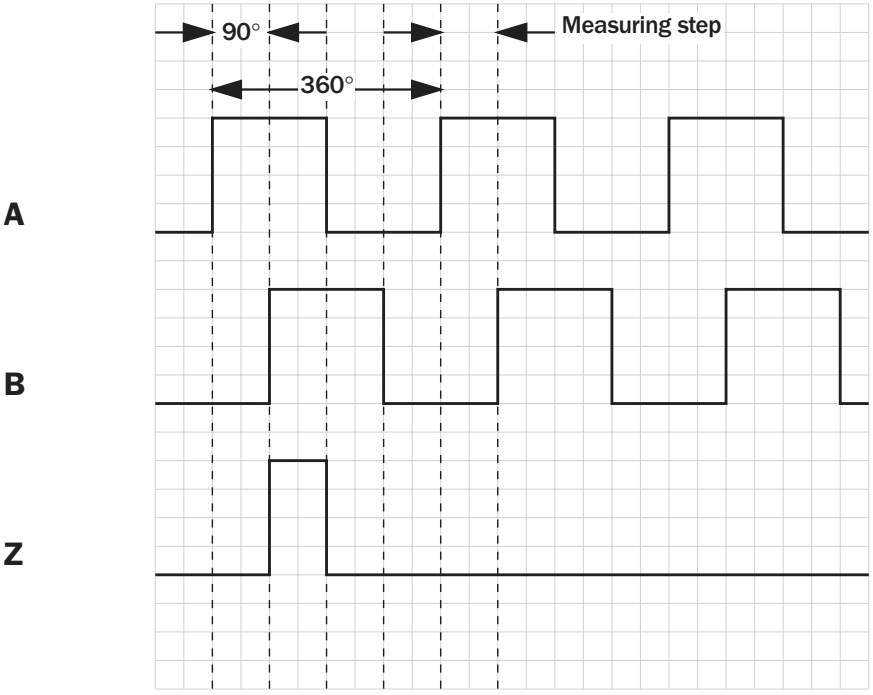
Number of lines
1 up to 2,048

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**					

Electrical interface (Point 7)

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 (Point 8)

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

Connection type (Point 9)

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

Number of lines (Points 10–14)

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**					

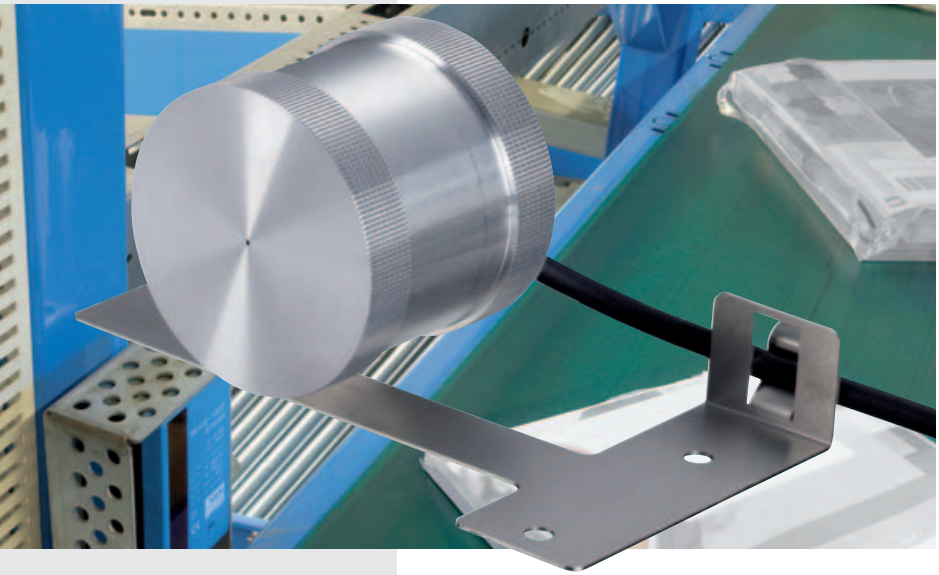
Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14
D	**K**	**S**	**4**	**0**	**–**		**5**	**J**					

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:

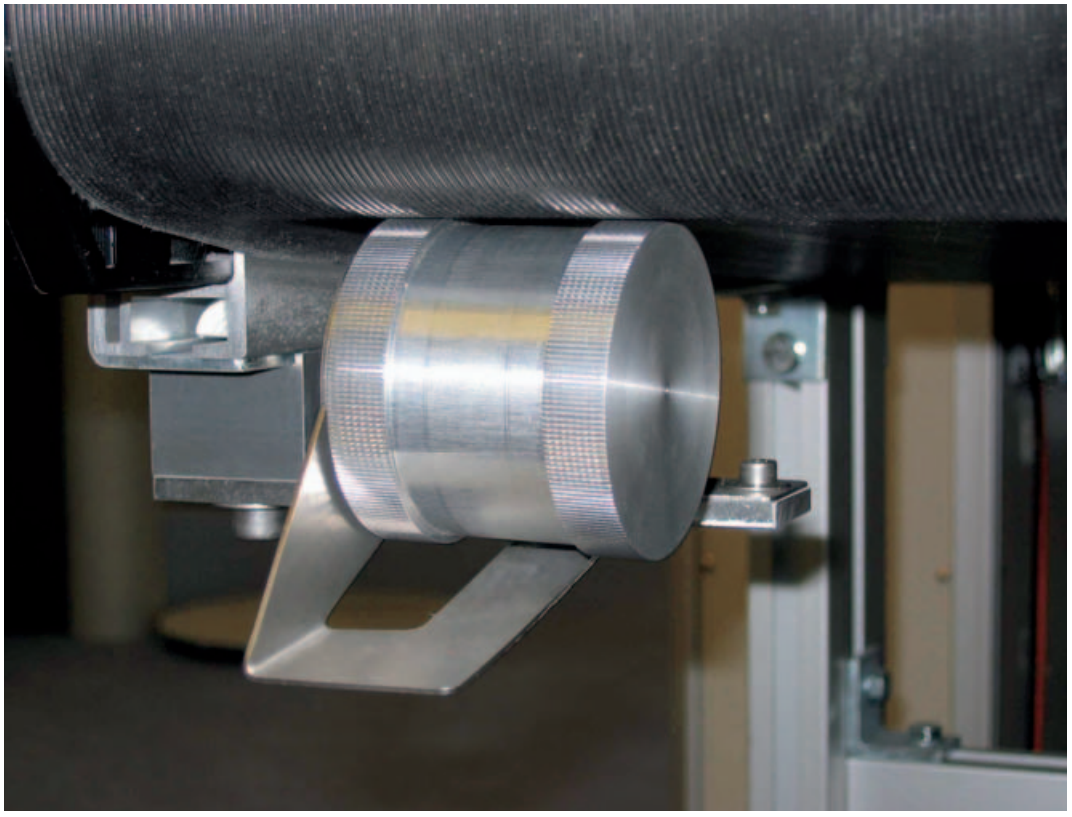
- Interface
  TTL/RS422, HTL/push-pull
- Measuring drum
  Knurled surface,
  'O' ring surface
- Cable outlet 1.5 m

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.

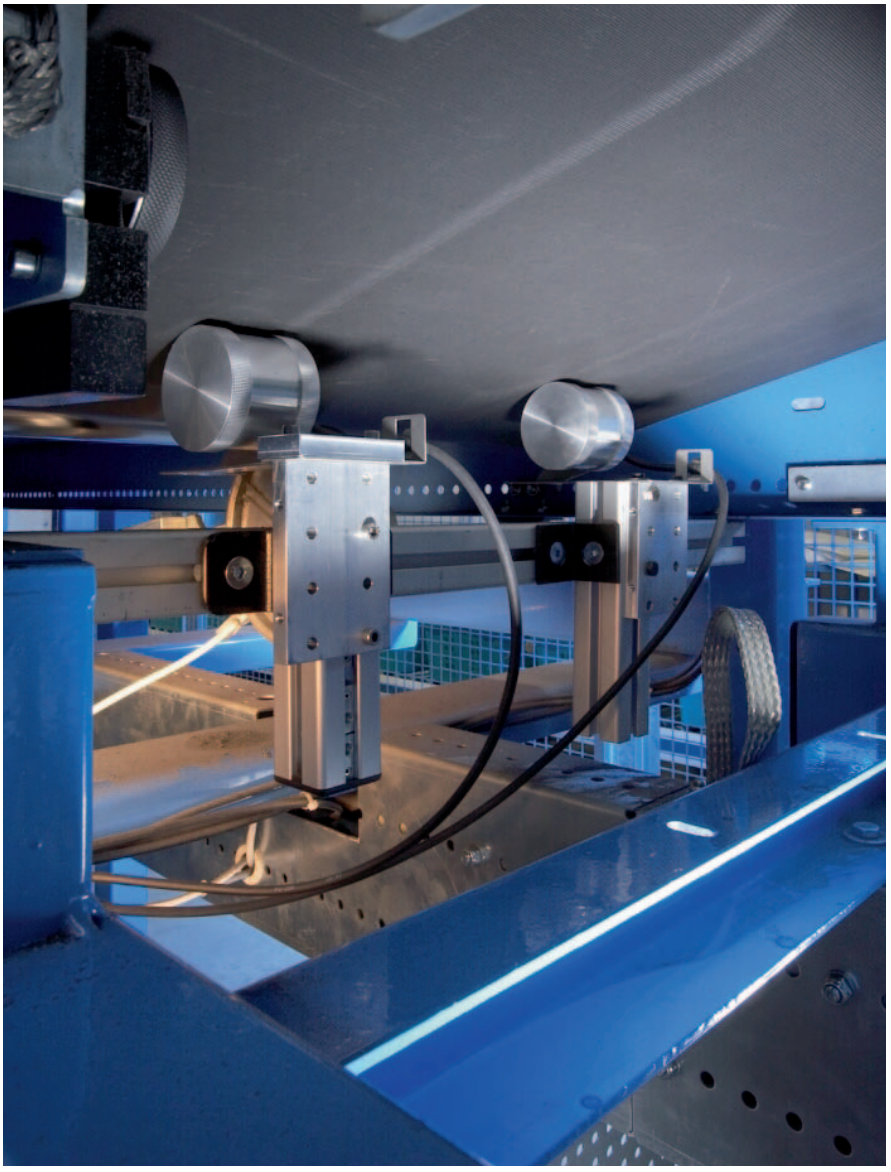
The DKV60 incremental measuring wheel encoder can be fitted directly to the conveyor belt, without the need of any mechanical accessories.

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.

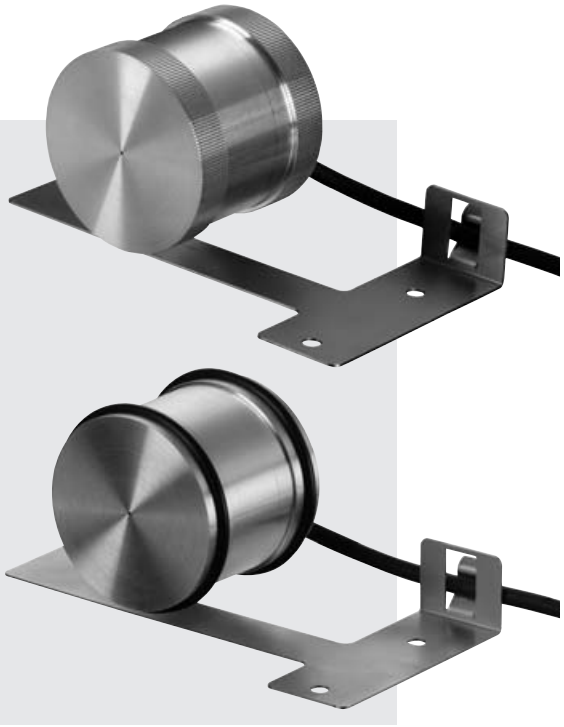


► The knurled version is suitable for rough surfaces, such as conveyor belts, and the 'O' ring version is suitable for hard, smooth and sensitive surfaces such as glass or plastic sheets.

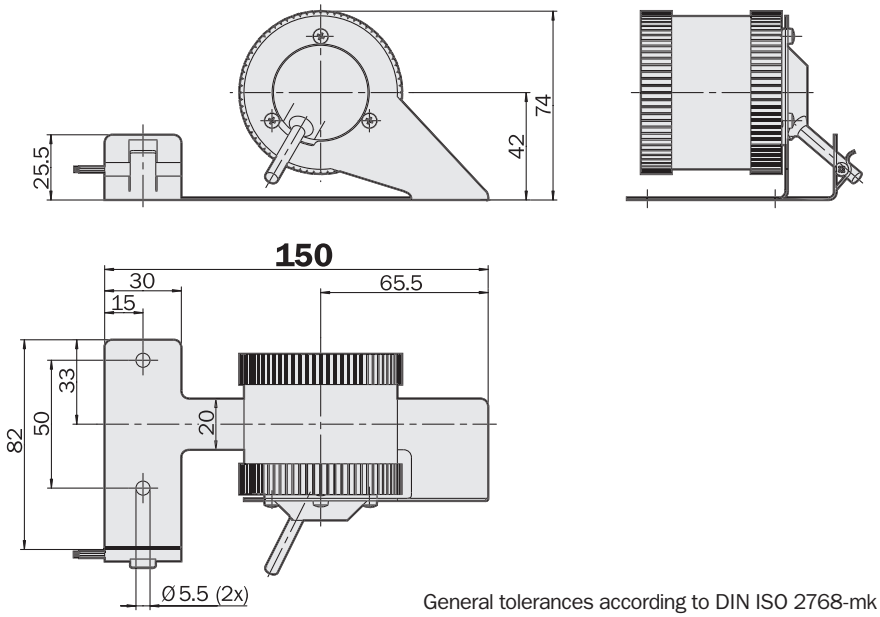
Number of lines
1 up to 2,048

Incremental Encoder

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

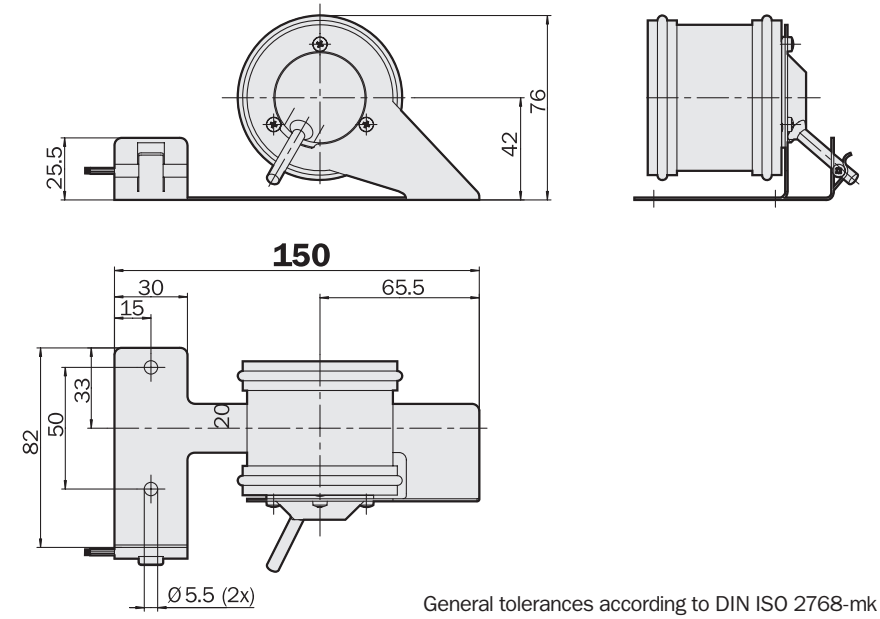


Dimensional drawing DKV 60 knurled surface



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

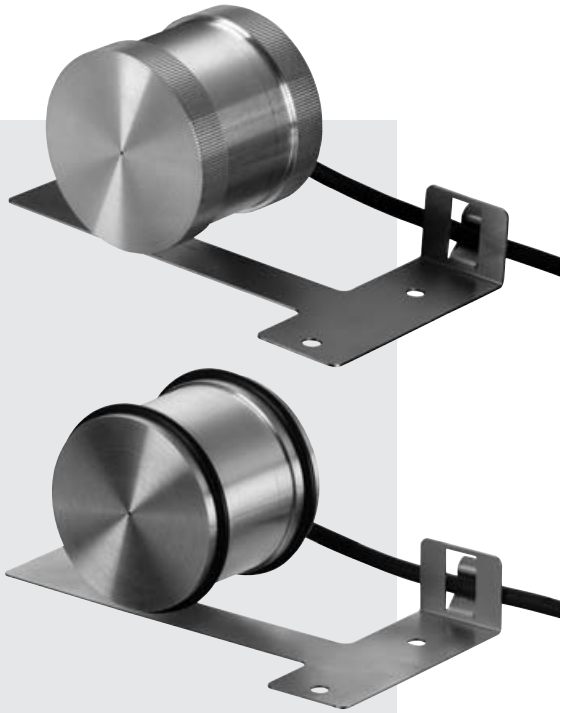
[4] To DIN EN 60068-2-6

Order information see page 107

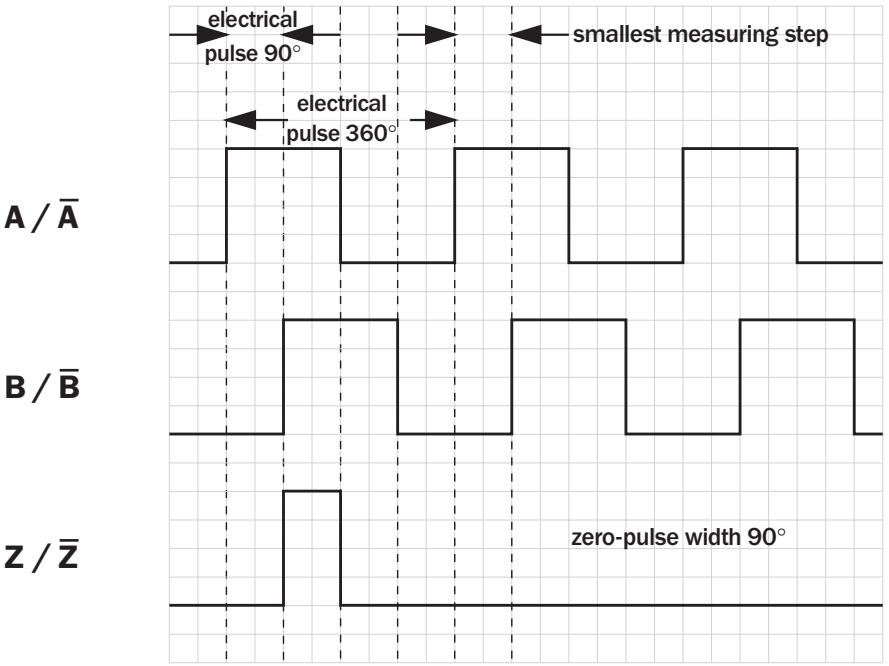
Number of lines
1 up to 2,048

Incremental Encoder

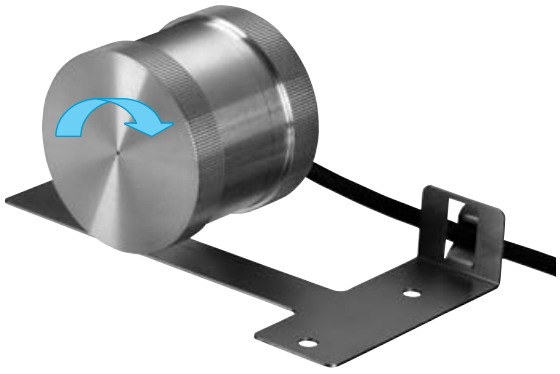
- Cable outlet
- Protection rating up to IP 65
- Electrical interfaces
  TTL and HTL



Signal outputs



Cw looking at the measuring drum

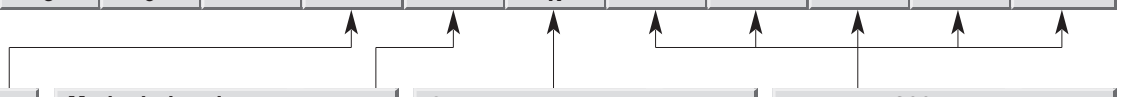


See chapter Accessories
Accessories for encoders

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

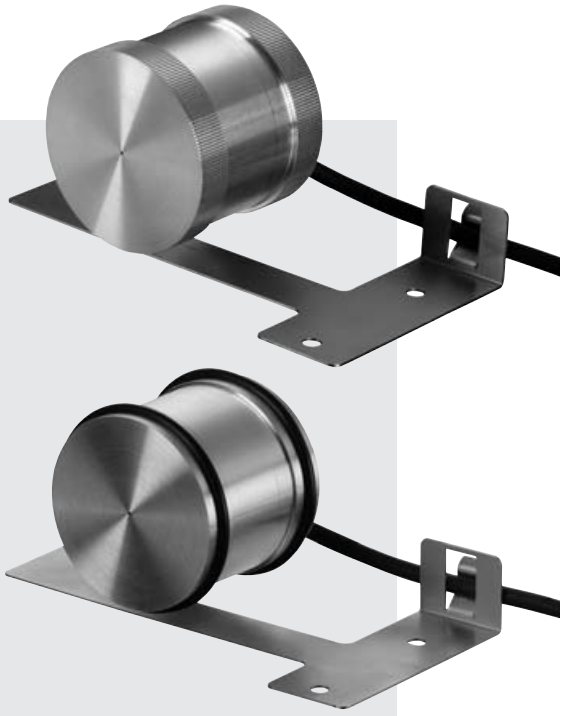
DKV 60; 10 … 30 V, HTL/push-pull; 6-channel; Measuring drum 'O' ring surface; EPDM, Highly abrasion-resistant

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

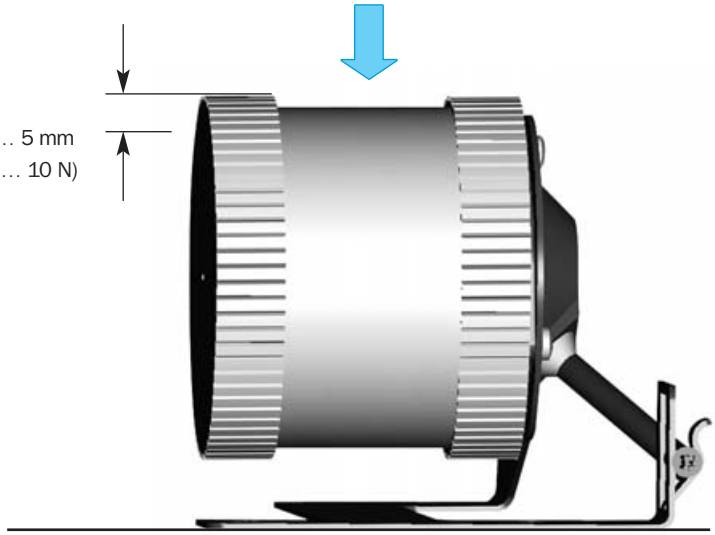


CE cULus

See chapter Accessories
Accessories for encoders

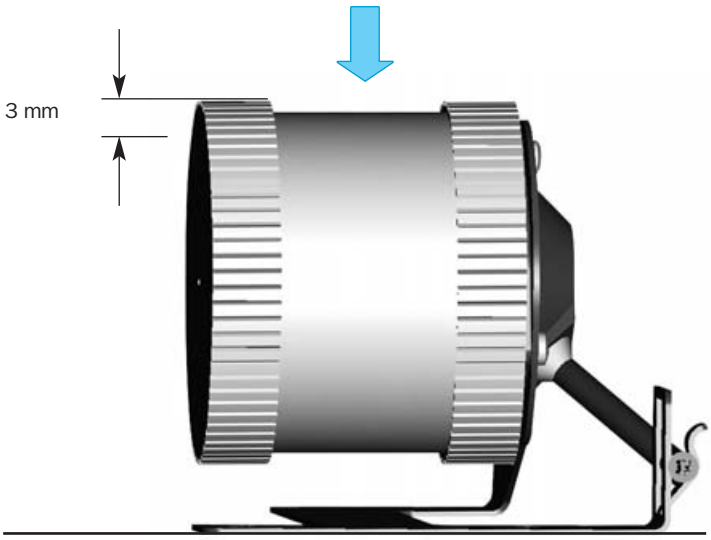
Working position/force

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



Max. deflection

Max. deflection Y = 3 mm



Max. deflection X = ± 10°