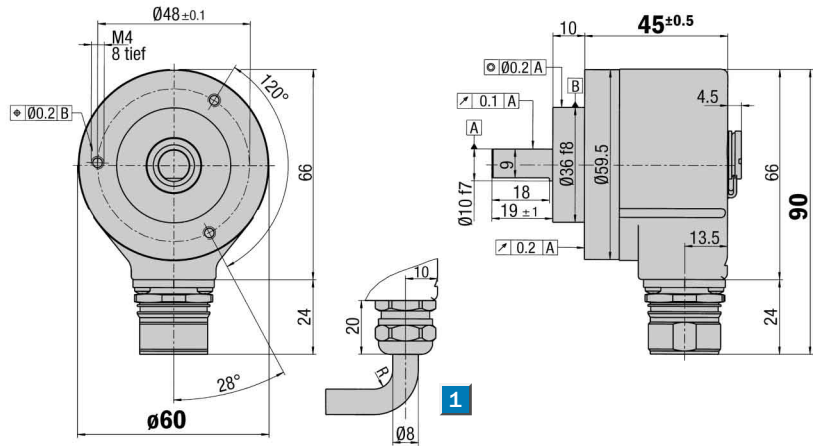


Number of lines
1 up to 8,192

Incremental Encoder

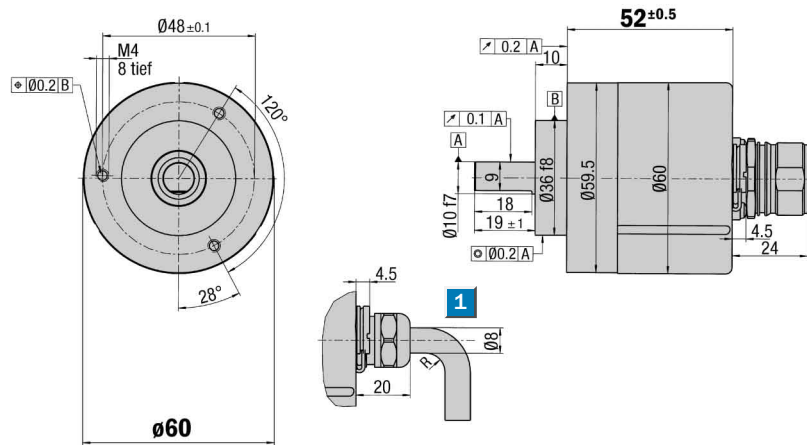
- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces
TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS61: number of lines and zero pulse width can be freely programmed by the customer

Dimensional drawing face mount flange radial



1 R = bending radius min. 40 mm General tolerances according to DIN ISO 2768-mk

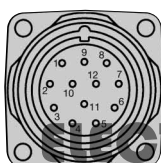
Dimensional drawing face mount flange axial



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	\bar{B}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	A	white	Signal line
6	\bar{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



Accessories

- Connection systems
- Mounting systems
- Programming Tool

Technical Data acc. to DIN 32878		DRS60/DRS61 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 connector²⁾ Electrical, logically linked to A and B³⁾ In case, that shaft seal has been removed by customer⁴⁾ Condensation of the optical scanning not permitted⁵⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3⁶⁾ To DIN EN 60068-2-27⁷⁾ To DIN EN 60068-2-6⁸⁾ With mating connector fitted⁹⁾ Only with shaft stationary

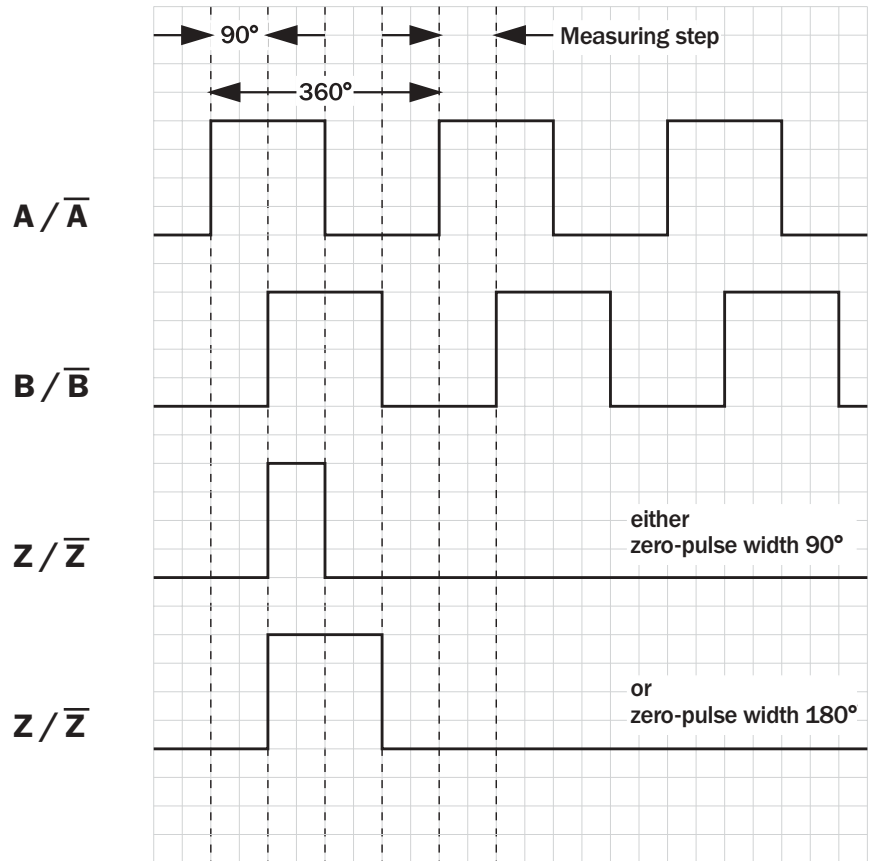
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces
TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS61: number of lines and zero pulse width can be freely programmed by the customer



Incremental pulse diagram

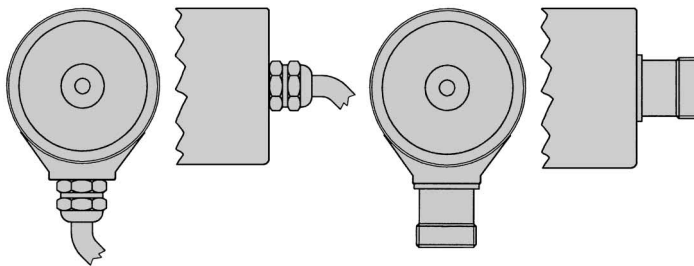


Electrical interface

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



Accessories

Connection systems
Mounting systems
Programming Tool



Order information

Incremental Encoder DRS60, 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						

<p>Electrical interface</p> <p>4.5 ... 5.5 V, TTL/RS 422 Zero-pulse width 90° = A</p> <p>4.5 ... 5.5 V, TTL/RS 422 Zero-pulse width 180° = B</p> <p>10 ... 32 V, TTL/RS 422 Zero-pulse width 90° = C</p> <p>10 ... 32 V, TTL/RS 422 Zero-pulse width 180° = D</p> <p>10 ... 32 V, HTL/push-pull Zero-pulse width 90° = E</p> <p>10 ... 32 V, HTL/push-pull Zero-pulse width 180° = F</p>	<p>Mechanical interface</p> <p>Face mount flange, solid shaft 10 mm = 4</p>	<p>Connection type</p> <p>Connector M23, 12 pin, radial = A</p> <p>Connector M23, 12 pin, axial = B</p> <p>Cable 11 core, radial 1.5 m = K</p> <p>Cable 11 core, radial 3 m = L</p> <p>Cable 11 core, radial 5 m = M</p> <p>Cable 11 core, radial 10 m = N</p> <p>Cable 11 core, axial 1.5 m = R</p> <p>Cable 11 core, axial 3 m = S</p> <p>Cable 11 core, axial 5 m = T</p> <p>Cable 11 core, axial 10 m = U</p>	<p>Number of lines</p> <p>Each number of lines from 00001 up to 08192 possible. Always 5 characters in clear text.</p>
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Order example Incremental Encoder DRS60

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



Incremental-Encoder DRS61 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

<p>Electrical interface</p> <p>4.5 ... 5.5 V, TTL/RS 422 = A</p> <p>10 ... 32 V, TTL/RS 422 = C</p> <p>10 ... 32 V, HTL/push-pull = E</p>	<p>Mechanical interface</p> <p>Face mount flange, solid shaft 10 mm = 4</p>	<p>Connection type</p> <p>Connector M23, 12 pin, radial = A</p> <p>Connector M23, 12 pin, axial = B</p> <p>Cable 11 core, radial 1.5 m = K</p> <p>Cable 11 core, axial 1.5 m = R</p>	<p>Number of lines</p> <p>Factory-programmed to 8,192.</p>
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Order example Incremental Encoder DRS61

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

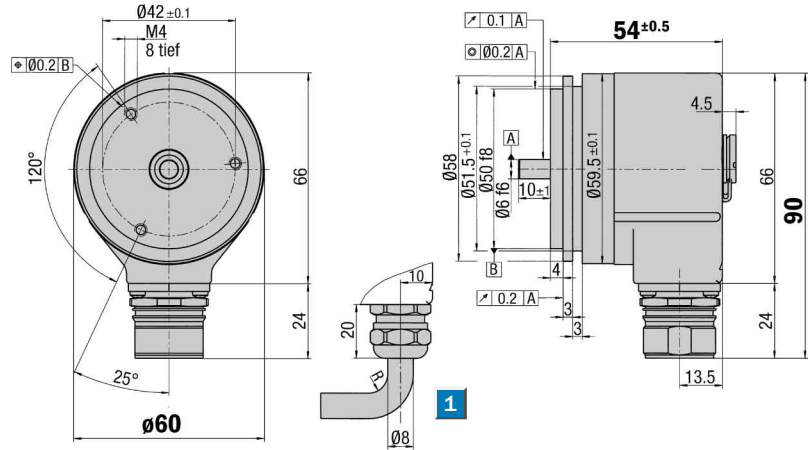
¹ Please order programming tool separately (see accessories page 18)

Number of lines
1 up to 8,192

Incremental Encoder

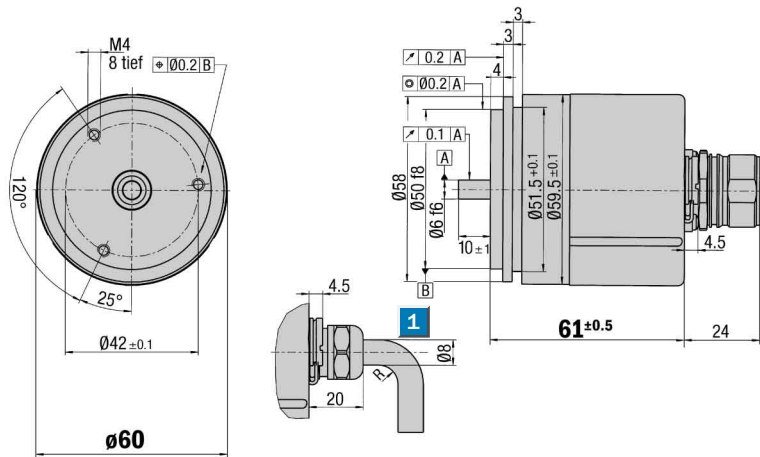
- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces
TTL and HTL
- Zero-Pulse-Teach via
pressing a button
- DRS61: number of lines and
zero pulse width can be freely
programmed by the customer

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

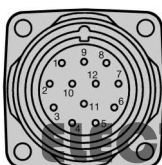


1 R = bending radius min. 40 mm General tolerances according to DIN ISO 2768-mk



PIN and wire allocation/cable 11 core

PIN	Signal	Wire colour (Cable outlet)	Explanation
1	\bar{B}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	A	white	Signal line
6	\bar{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

Accessories
Connection systems
Mounting systems
Programming Tool



Technical Data acc. to DIN 32878		DRS60/DRS61 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

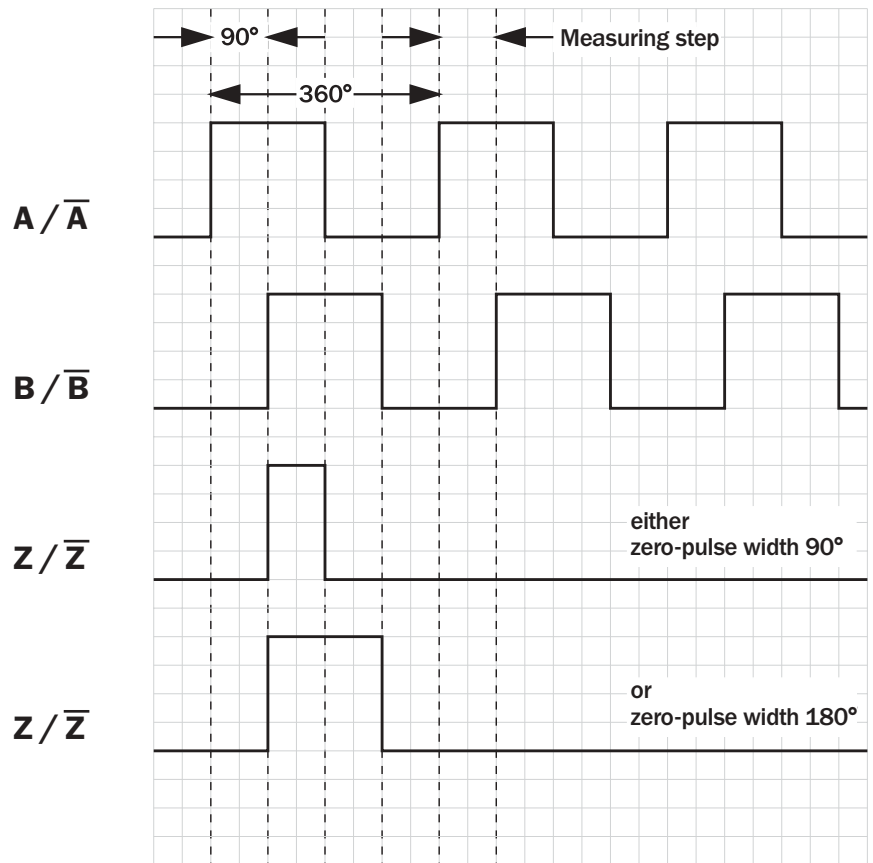
Number of lines
1 up to 8,192

Incremental Encoder

- Connector or cable outlet
- Protection class up to IP 66
- Electrical interfaces
TTL and HTL
- Zero-Pulse-Teach via pressing a button
- DRS61: number of lines and zero pulse width can be freely programmed by the customer



Incremental pulse diagram

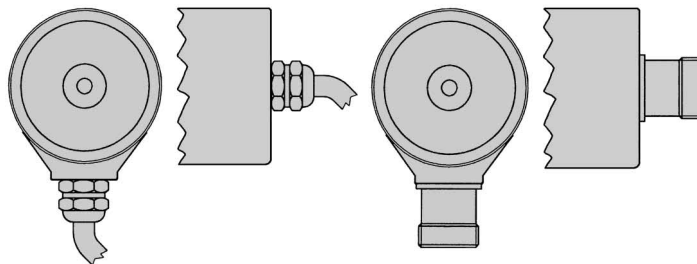


Electrical interface

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



Accessories

Connection systems
Mounting systems
Programming Tool



Order information

Incremental Encoder DRS60, 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	Mechanical interface	Connection type	Number of lines
4.5 ... 5.5 V, TTL/RS 422 Zero-pulse width 90° = A	Servo flange, solid shaft 6 mm = 1	Connector M23, 12 pin, radial = A	Each number of lines from 00001 up to 08192 possible. Always 5 characters in clear text.
4.5 ... 5.5 V, TTL/RS 422 Zero-pulse width 180° = B		Connector M23, 12 pin, axial = B	
10 ... 32 V, TTL/RS 422 Zero-pulse width 90° = C		Cable 11 core, radial 1.5 m = K	
10 ... 32 V, TTL/RS 422 Zero-pulse width 180° = D		Cable 11 core, radial 3 m = L	
10 ... 32 V, TTL/RS 422 Zero-pulse width 90° = E		Cable 11 core, radial 5 m = M	
10 ... 32 V, TTL/RS 422 Zero-pulse width 180° = F		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	

Order example Incremental Encoder DRS60

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



Incremental-Encoder DRS61, 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	Mechanical interface	Connection type	Number of lines
4.5 ... 5.5 V, TTL/RS 422 = A	Servo flange, solid shaft 6 mm = 1	Connector M23, 12 pin, radial = A	Factory-programmed to 8,192.
10 ... 32 V, TTL/RS 422 = C		Connector M23, 12 pin, axial = B	
10 ... 32 V, HTL/push-pull = E		Cable 11 core, radial 1.5 m = K	
		Cable 11 core, axial 1.5 m = R	

Order example Incremental Encoder DRS61

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 separately (see accessories page 18)