



# DBS60E-S4FC01000

DBS60

INCREMENTAL ENCODERS

**SICK**  
Sensor Intelligence.

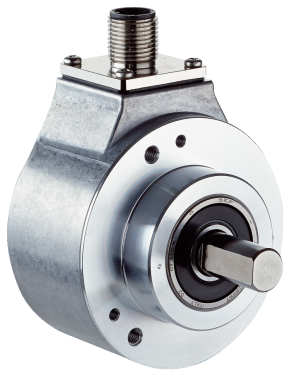


Illustration may differ



### Ordering information

Type	Part no.
DBS60E-S4FC01000	1090474

Other models and accessories → [www.sick.com/DBS60](http://www.sick.com/DBS60)

### Detailed technical data

#### Performance

<b>Pulses per revolution</b>	1,000
<b>Measuring step</b>	≤ 90°, electric/pulses per revolution
<b>Measuring step deviation</b>	± 18° / pulses per revolution
<b>Error limits</b>	Measuring step deviation x 3
<b>Duty cycle</b>	≤ 0.5 ± 5 %

#### Interfaces

<b>Communication interface</b>	Incremental
<b>Communication Interface detail</b>	TTL / HTL <sup>1)</sup>
<b>Number of signal channels</b>	6-channel
<b>Initialization time</b>	< 5 ms <sup>2)</sup>
<b>Output frequency</b>	+ 300 kHz <sup>3)</sup>
<b>Load current</b>	≤ 30 mA, per channel
<b>Power consumption</b>	≤ 0.5 W (without load)

<sup>1)</sup> Output level depends on the supply voltage.

<sup>2)</sup> Valid signals can be read once this time has elapsed.

<sup>3)</sup> Up to 450 kHz on request.

#### Electrical data

<b>Connection type</b>	Male connector, M12, 8-pin, radial
<b>Supply voltage</b>	4.5 ... 30 V
<b>Reference signal, number</b>	1
<b>Reference signal, position</b>	90°, electric, logically gated with A and B
<b>Reverse polarity protection</b>	✓

<sup>1)</sup> Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

<sup>2)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40°C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

<b>Short-circuit protection of the outputs</b>	✓ <sup>1)</sup>
<b>MTTFd: mean time to dangerous failure</b>	500 years (EN ISO 13849-1) <sup>2)</sup>

<sup>1)</sup> Short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

<sup>2)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40 °C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

## Mechanical data

<b>Mechanical design</b>	Solid shaft, face mount flange
<b>Shaft diameter</b>	10 mm
<b>Shaft length</b>	19 mm
<b>Flange type / stator coupling</b>	Flange with 3 x M3 and 3 x M4
<b>Weight</b>	+ 0.3 kg <sup>1)</sup>
<b>Shaft material</b>	Stainless steel
<b>Flange material</b>	Aluminum
<b>Housing material</b>	Aluminum
<b>Start up torque</b>	+ 1.2 Ncm (+20 °C)
<b>Operating torque</b>	1.1 Ncm (+20 °C)
<b>Permissible shaft loading</b>	100 N (radial) <sup>2)</sup> 50 N (axial) <sup>2)</sup>
<b>Operating speed</b>	6,000 min <sup>-1</sup> <sup>3)</sup>
<b>Maximum operating speed</b>	9,000 min <sup>-1</sup> <sup>4)</sup>
<b>Moment of inertia of the rotor</b>	33 gcm <sup>2</sup>
<b>Bearing lifetime</b>	3.6 x 10 <sup>9</sup> revolutions
<b>Angular acceleration</b>	≤ 500,000 rad/s <sup>2</sup>

<sup>1)</sup> Based on encoder with male connector or cable with male connector.

<sup>2)</sup> Higher values are possible using limited bearing life.

<sup>3)</sup> Allow for self-heating of 3.2 K per 1,000 rpm when designing the operating temperature range.

<sup>4)</sup> Maximum speed which does not cause mechanical damage to the encoder. Impact on the service life and signal quality is possible. Please note the maximum output frequency.

## Ambient data

<b>EMC</b>	According to EN 61000-6-2 and EN 61000-6-3
<b>Enclosure rating</b>	IP67, housing side (IEC 60529) <sup>1)</sup> IP65, shaft side (IEC 60529)
<b>Permissible relative humidity</b>	90 % (Condensation not permitted)
<b>Operating temperature range</b>	-30 °C ... +100 °C, at maximum 3,000 pulses per revolution <sup>2)</sup>
<b>Storage temperature range</b>	-40 °C ... +100 °C, without package
<b>Resistance to shocks</b>	250 g, 3 ms (EN 60068-2-27)
<b>Resistance to vibration</b>	30 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

<sup>1)</sup> With mating connector fitted.

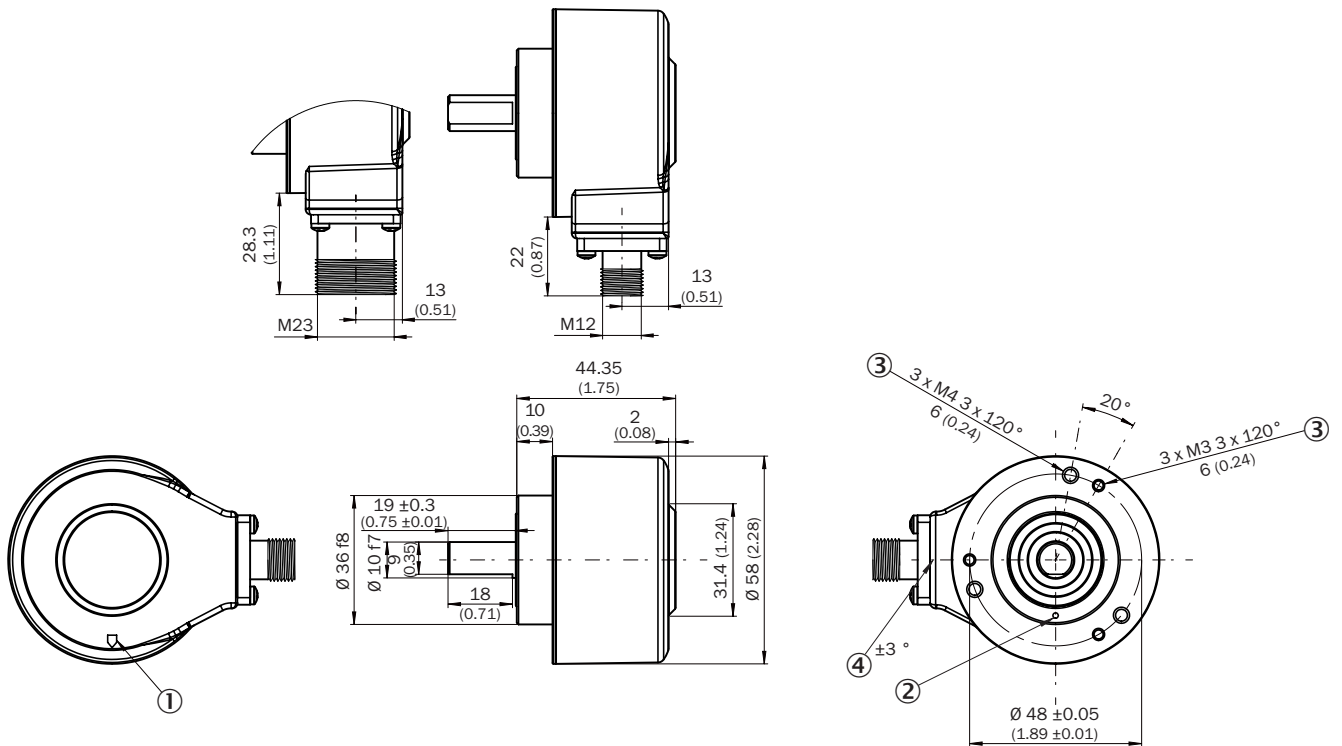
<sup>2)</sup> These values relate to all mechanical versions including recommended accessories unless otherwise noted.

## Classifications

<b>eCl@ss 5.0</b>	27270501
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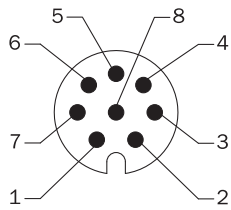
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<b>eCl@ss 6.2</b>	27270590
<b>eCl@ss 7.0</b>	27270501
<b>eCl@ss 8.0</b>	27270501
<b>eCl@ss 8.1</b>	27270501
<b>eCl@ss 9.0</b>	27270501
<b>eCl@ss 10.0</b>	27270501
<b>eCl@ss 11.0</b>	27270501
<b>eCl@ss 12.0</b>	27270501
<b>ETIM 5.0</b>	EC001486
<b>ETIM 6.0</b>	EC001486
<b>ETIM 7.0</b>	EC001486
<b>ETIM 8.0</b>	EC001486
<b>UNSPSC 16.0901</b>	41112113

### Dimensional drawing (Dimensions in mm (inch))



- ① Zero pulse mark on housing
- ② Zero pulse mark on flange
- ③ Depth
- ④ Male connector tolerance in relation to hole pattern

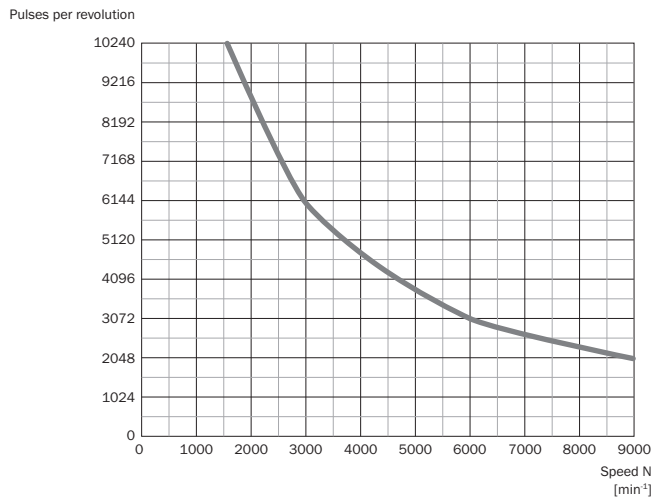
### PIN assignment



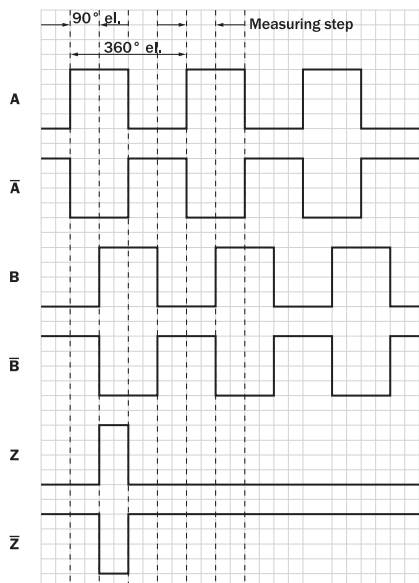
View of M12 male device connector on cable / housing

Wire colors (cable connection)	Male connector M12, 8-pin	Male connector M23, 12-pin	TTL/HTL 6-channel signal	Explanation
Brown	1	6	A-	Signal wire
White	2	5	A	Signal wire
Black	3	1	B-	Signal wire
Pink	4	8	B	Signal wire
Yellow	5	4	Z-	Signal wire
Purple	6	3	Z	Signal wire
Blue	7	10	GND	Ground connection
Red	8	12	+U <sub>s</sub>	Supply voltage
-	-	9	Not assigned	Not assigned
-	-	2	Not assigned	Not assigned
-	-	11	Not assigned	Not assigned
-	-	7	Not assigned	Not assigned
Screen	Screen	Screen	Screen	Screen connected to encoder housing

### Diagrams



Signal outputs for electrical interfaces TTL and HTL

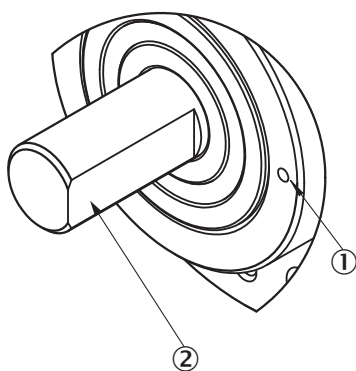


Cw with view on the encoder shaft in direction "A", compare dimensional drawing.

Supply voltage	Output
4,5 V ... 5,5 V	TTL
10 V ... 30 V	TTL
10 V ... 27 V	HTL
4,5 V ... 30 V	TTL/HTL universal
4,5 V ... 30 V	TTL

### Operation note












Solid shaft, face mount flange













- ① Zero pulse mark on flange
- ② Zero pulse active when the surface of the shaft shows the zero pulse mark on the flange

## Recommended accessories















Other models and accessories → [www.sick.com/DBS60](http://www.sick.com/DBS60)

	Brief description	Type	Part no.
<b>Flanges</b>			
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M3 x 10	BEF-FA-036-050	2029160
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 8, Aluminum, including 3 countersunk screws M4 x 8	BEF-FA-036-060REC	2029162
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum, Aluminum	BEF-FA-036-060RSA	2029163
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10, Aluminum, including 3 countersunk screws M3 x 10	BEF-FA-036-063REC	2034225
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum, Aluminum	BEF-FA-036-100	2029161
<b>Mounting brackets and plates</b>			
	Mounting bracket for encoder with spigot 36 mm for face mount flange, mounting kit included	BEF-WF-36	2029164
	Mounting angle spring-loaded, for flange with centerring collar 36 mm, working temperature range -40 ° ... +120 °C, Aluminum	BEF-WF36F	4084775
<b>Other mounting accessories</b>			
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227
	Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AK	4084737
	Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AP	4084738
	Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APG	4084740
	Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APN	4084739
	Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AK	4084733
	Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AP	4084734

	Brief description	Type	Part no.
	Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500APG	4084736
	Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500APN	4084735
	O-ring for measuring wheels (circumference 200 mm)	BEF-OR-053-040	2064061
	O-ring for measuring wheels (circumference 300 mm), 2x O-ring	BEF-OR-083-050	2064076
	O-ring for measuring wheels (circumference 500 mm)	BEF-OR-145-050	2064074
	SICK modular measuring wheel system for face mount flange encoder with S4 mechanical design (10 mm x 19 mm solid shaft), e.g., DFS60-S4: with O-ring measuring wheel, circumference 200 mm	BEF-MRS-10-U	2085714
	Flange adapter (adapts size 60 face mount flange encoder to bearing block with part. no. 2044591)	BEF-FA-036-050-019	2063378
	Bearing block for servo and face mount flange encoder. The heavy-duty bearing block is used to absorb very large radial and axial shaft loads. Particularly when using belt pulleys, chain sprockets, friction wheels. Operating speed max. 4,000 rpm <sup>-1</sup> , axial shaft load 150 N, radial shaft load 250 N, bearing service life 3.6 x 10 <sup>9</sup> revolutions	BEF-FA-LB1210	2044591
	Mounting kit for servo flange encoder on the bearing block, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911	BEF-MK-LB	5320872
<b>Plug connectors and cables</b>			
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, HIPERFACE <sup>®</sup> , PUR, halogen-free, shielded	LTG-2308-MWENC	6027529
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, PUR, shielded	LTG-2411-MW	6027530
	Head A: cable Head B: Flying leads Cable: SSI, Incremental, PUR, halogen-free, shielded	LTG-2512-MW	6027531
	Head A: cable Head B: Flying leads Cable: SSI, TTL, HTL, Incremental, PUR, halogen-free, shielded	LTG-2612-MW	6028516
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 2 m	DOL-1208-G02MAC1	6032866
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 5 m	DOL-1208-G05MAC1	6032867
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 10 m	DOL-1208-G10MAC1	6032868
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 20 m	DOL-1208-G20MAC1	6032869
	Head A: female connector, M12, 8-pin, straight Head B: Flying leads Cable: Incremental, SSI, PUR, halogen-free, shielded, 25 m	DOL-1208-G25MAC1	6067859



	Brief description	Type	Part no.
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: PVC, shielded, 2 m	DOL-1208-W02MA	6020992
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: HIPERFACE <sup>®</sup> , Incremental, PUR, halogen-free, shielded, 2 m	DOL-1208-W02MAC1	6037724
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: Sensor/actuator cable, PUR, halogen-free, shielded, 2 m	DOL-1208-W02MAS01	6029224
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: PUR, halogen-free, unshielded, 2 m	DOL-1208-W02MC	6035623
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: PVC, shielded, 5 m	DOL-1208-W05MA	6021033
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: HIPERFACE <sup>®</sup> , Incremental, PUR, halogen-free, shielded, 5 m	DOL-1208-W05MAC1	6037725
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: PUR, unshielded, 5 m	DOL-1208-W05MC	6035624
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: HIPERFACE <sup>®</sup> , Incremental, PUR, halogen-free, shielded, 10 m	DOL-1208-W10MAC1	6037726
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: PUR, halogen-free, unshielded, 10 m	DOL-1208-W10MC	6035625
	Head A: female connector, M12, 8-pin, angled Head B: Flying leads Cable: HIPERFACE <sup>®</sup> , Incremental, PUR, shielded, 20 m	DOL-1208-W20MAC1	6037727
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 2 m Drag chain use	YF2AA8-020S01MKA18	2099207
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 5 m Drag chain use	YF2AA8-050S01MKA18	2099209
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 10 m Drag chain use	YF2AA8-100S01MKA18	2099210
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: male connector, M12, 8-pin, straight, A-coded Cable: PUR, halogen-free, shielded, 20 m Drag chain use	YF2AA8-200S01MKA18	2099208
	Head A: female connector, M12, 8-pin, straight, A-coded Cable: Incremental, SSI, shielded	DOS-1208-GA01	6045001
<b>Shaft adaptation</b>			
	Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial $\pm$ 0.25 mm, axial $\pm$ 0.4 mm, angular $\pm$ 4°; max. speed 10,000 rpm, -30 °C to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982

	Brief description	Type	Part no.
	Double loop coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radially +/- 2,5 mm, axially +/- 3 mm, angle +/- 10 degrees; max. speed 3.000 rpm, -30 to +80 degrees Celsius, torsional spring stiffness of 25 Nm/rad	KUP-0610-D	5326697
	Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial +/- 0.3 mm, axial +/- 0.4 mm, angular +/- 2.5°; max. speed 12,000 rpm, -10° to +80 °C, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-0610-F	5312985
	Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0610-J	2127056
	Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial ± 0,3 mm, axial ± 0,3 mm, angular ± 3°; max. speed 10.000 rpm, -10° to +80 °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
	Double loop coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radially +/- 0,25 mm, axially +/- 0,4 mm, angle +/- 4 degrees; max. speed 10.000 rpm, -30 to +120 degrees Celsius, torsional spring stiffness of 150 Nm/rad	KUP-0810-D	5326704
	Claw coupling, shaft diameter 8 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0810-J	2128267
	Bar coupling, shaft diameter 8 mm / 10 mm, max. shaft offset: radial ± 0,3 mm, axial ± 0,3 mm, angular ± 3°; max. speed 10.000 rpm, -10° to +80 °C, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0810-S	5314178
	Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1010-B	5312983
	Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial +/- 2.5 mm, axial +/- 3 mm, angular +/- 10°; max. speed 3,000 rpm, -30° to +80 °C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1010-D	5326703
	Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle ± 2.5°, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-F	5312986
	Claw coupling, shaft diameter 10 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular ± 1.3°, max. speed 19,000 rpm, angle of twist max. 10°, -30 °C to +80 °C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-1010-J	2127054
	Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular ± 3°; speed 10,000 rpm, -10° to +80° Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub	KUP-1010-S	2056408
	Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle ± 2.5°, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-W	5319914
	10 mm / 12 mm; maximum shaft offset: radial +/- 0.25 mm, axial +/- 0.4 mm, angular +/- 4°; max. revolutions 10,000 rpm, -30° to +120 °C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1012-B	5312984

## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

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