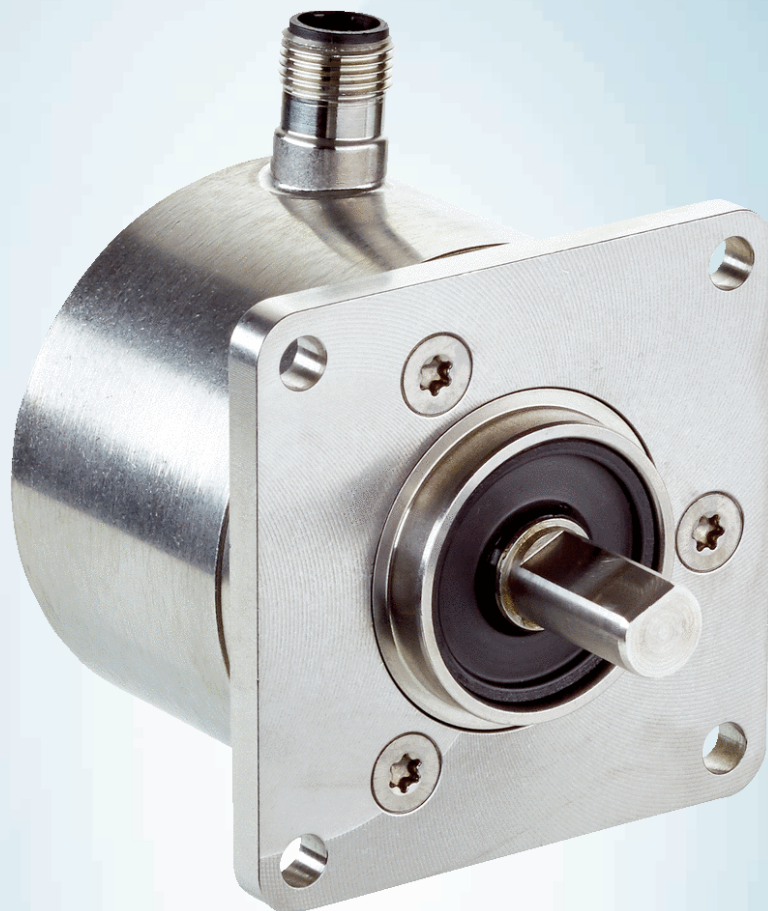




DFS60I-Q4MC65536

DFS60

INCREMENTAL ENCODERS

SICK
Sensor Intelligence.

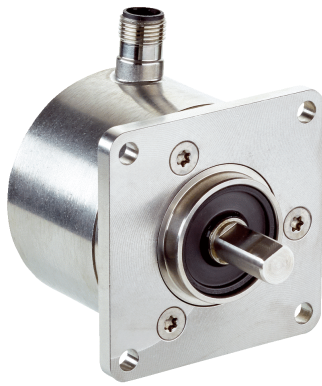
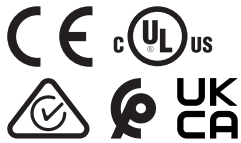


Illustration may differ



Ordering information

Type	part no.
DFS60I-Q4MC65536	1083945

Other models and accessories → www.sick.com/DFS60

Detailed technical data

Safety-related parameters

MTTF_D (mean time to dangerous failure)	300 years (EN ISO 13849-1) ¹⁾
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¹⁾ 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.

Performance

Pulses per revolution	65,536 ¹⁾
Measuring step	90°, electric/pulses per revolution
Measuring step deviation at binary number of lines	± 0.0015°
Error limits	± 0.03°

¹⁾ See maximum revolution range.

Interfaces

Communication interface	Incremental
Communication Interface detail	TTL / HTL
Factory setting	Factory setting: output level TTL
Number of signal channels	6-channel
0-set function via hardware pin	✓
0-SET function	H-active, L ≡ 0 - 3 V, H ≡ 4.0 - U _s V ¹⁾
Programmable/configurable	✓
Initialization time	32 ms, 30 ms ²⁾
Output frequency	≤ 820 kHz

¹⁾ Only with devices with M12 connector in connection with electrical interfaces M, V and W.

²⁾ With mechanical zero pulse width.

Load current	≤ 30 mA
Operating current	40 mA (without load)
Power consumption	≤ 0.7 W (without load)
Load resistance	≥ 120 Ω

¹⁾ Only with devices with M12 connector in connection with electrical interfaces M, V and W.

²⁾ With mechanical zero pulse width.

Electronics

Connection type	Male connector, M12, 12-pin, radial
Supply voltage	4.5 ... 32 V
Reference signal, number	1
Reference signal, position	90 °, electric, logically gated with A and B
Reverse polarity protection	✓
Short-circuit protection of the outputs	✓ ¹⁾ ²⁾

¹⁾ Programming TTL with ≥ 5.5 V: short-circuit opposite to another channel or GND permissible for maximum 30 s.

²⁾ Programming HTL or TTL with < 5.5 V: short-circuit opposite to another channel, US or GND permissible for maximum 30 s.

Mechanics

Mechanical design	Solid shaft, Square flange
Shaft diameter	10 mm With flat
Shaft length	19 mm
Weight	+ 0.5 kg
Shaft material	Stainless steel V2A
Flange material	Stainless steel V2A
Housing material	Stainless steel V2A
Start up torque	1 Ncm (+20 °C)
Operating torque	0.5 Ncm (+20 °C)
Permissible shaft loading	80 N (radial) 40 N (axial)
Operating speed	≤ 9,000 min ⁻¹ ¹⁾
Moment of inertia of the rotor	6.2 gcm ²
Bearing lifetime	3.6 x 10 ¹⁰ revolutions
Angular acceleration	≤ 500,000 rad/s ²

¹⁾ Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

Ambient data

EMC	According to EN 61000-6-2 and EN 61000-6-3
Enclosure rating	IP67, housing side (IEC 60529) ¹⁾ IP67, shaft side (IEC 60529)
Permissible relative humidity	90 % (Condensation not permitted)
Operating temperature range	-40 °C ... +100 °C ²⁾

¹⁾ With mating connector fitted.

²⁾ Stationary position of the cable.

³⁾ Flexible position of the cable.

	-30 °C ... +100 °C ³⁾
Storage temperature range	-40 °C ... +100 °C, without package
Resistance to shocks	100 g, 6 ms (EN 60068-2-27)
Resistance to vibration	10 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)

¹⁾ With mating connector fitted.

²⁾ Stationary position of the cable.

³⁾ Flexible position of the cable.

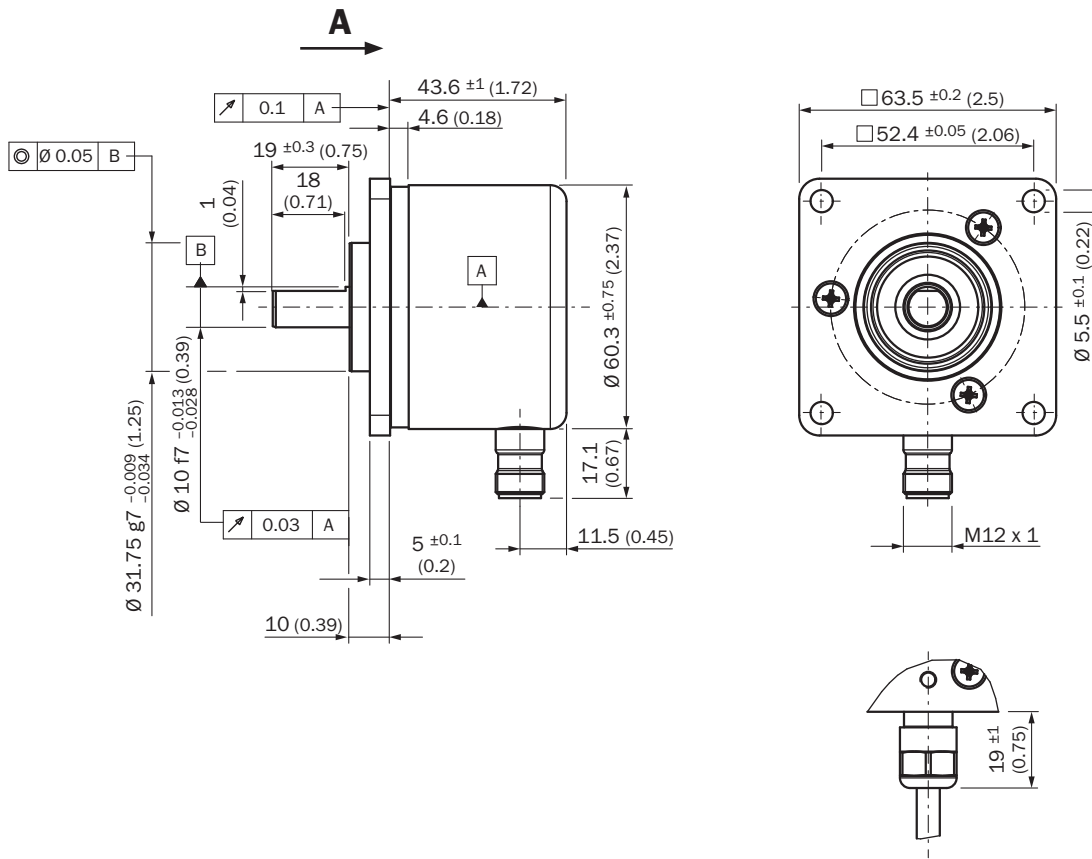
Certificates

EU declaration of conformity	✓
UK declaration of conformity	✓
ACMA declaration of conformity	✓
Moroccan declaration of conformity	✓
China RoHS	✓
cULus certificate	✓
Information according to Art. 3 of Data Act (Regulation EU 2023/2854)	✓

Classifications

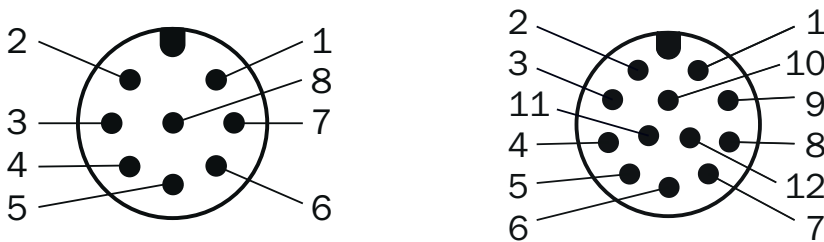
ECLASS 5.0	27270501
ECLASS 5.1.4	27270501
ECLASS 6.0	27270590
ECLASS 6.2	27270590
ECLASS 7.0	27270501
ECLASS 8.0	27270501
ECLASS 8.1	27270501
ECLASS 9.0	27270501
ECLASS 10.0	27270501
ECLASS 11.0	27270501
ECLASS 12.0	27270501
ETIM 5.0	EC001486
ETIM 6.0	EC001486
ETIM 7.0	EC001486
ETIM 8.0	EC001486
UNSPSC 16.0901	41112113

Dimensional drawing



Dimensions in mm (inch)

PIN assignment

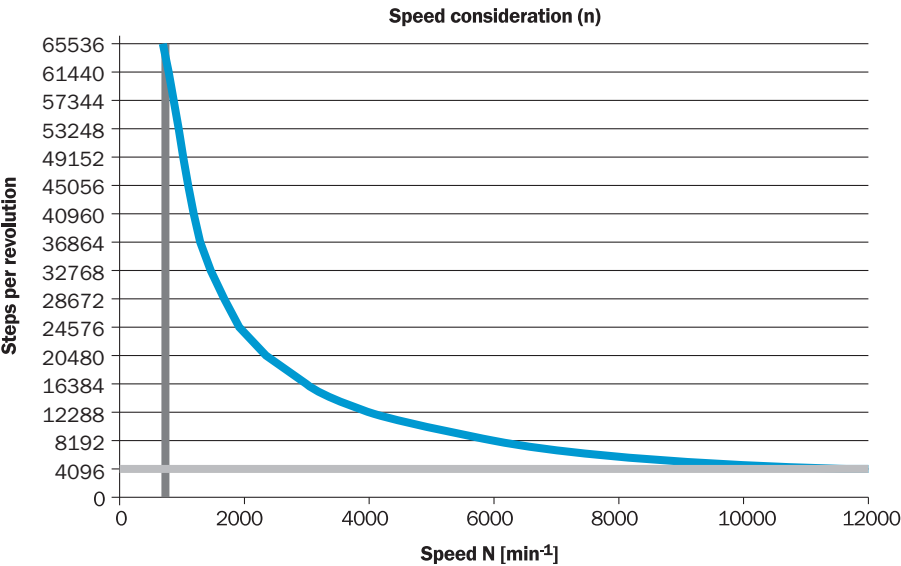


view of M12 male device connector on encoder

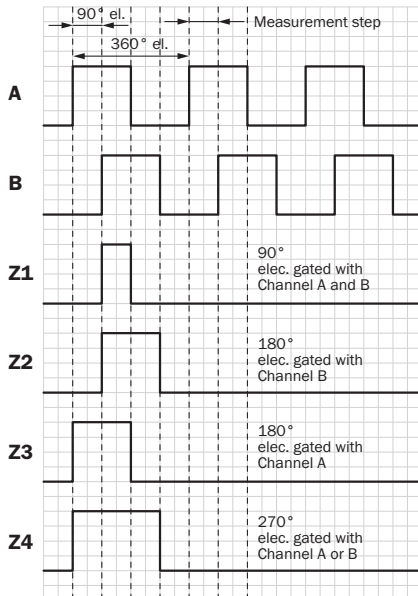
Male connector M12, 8-pin	Connector M12, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V _{PP}	Explanation
1	7	Brown	$\bar{A}$	COS-	Signal wire
2	6	White	A	COS+	Signal wire
3	9	Black	$\bar{B}$	SIN-	Signal wire
4	8	Pink	B	SIN+	Signal wire
5	4	Yellow	$\bar{Z}$	$\bar{Z}$	Signal wire
6	11	Purple	Z	Z	Signal wire

Male connector M12, 8-pin	Connector M12, 12-pin	Wire colors (cable connection)	TTL/HTL signal	Sin/Cos 1.0 V _{pp}	Explanation
7	12	Blue	GND	GND	Ground connection
8	5	Red	+U _S	+U _S	Supply voltage
-	2	-	N.c.	N.c.	Not assigned
-	3	-	N.c.	N.c.	Not assigned
-	1	-	N.c.	N.c.	Not assigned
-	10 ¹⁾	-	0-SET ¹⁾	N.c.	Set zero pulse1)
Screen	Screen	Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

maximum revolution range



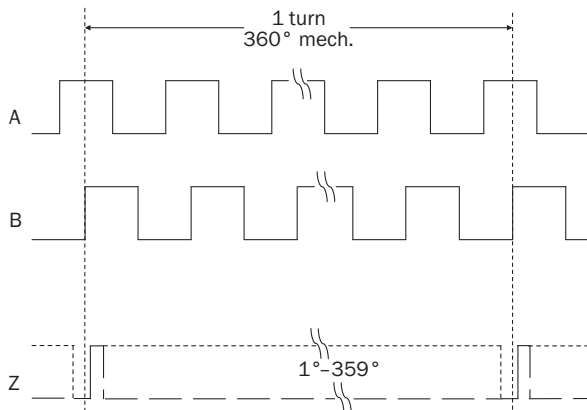
Diagrams Electrical zero pulse width can be configured to 90°, 180°, or 270°. Width of the zero pulse in relation to a pulse period.



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

Supply voltage	Output
4,5 V ... 32 V	TTL/HTL programmable

Diagrams Mechanical zero pulse width 1° to 359° programmable. Width of the zero pulse in relation to a mechanical revolution of the shaft.

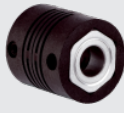


Supply voltage	Output
4,5 V ... 32 V	TTL/HTL programmable

Recommended accessories

Other models and accessories → www.sick.com/DFS60

	Brief description	Type	part no.
shaft adaptation			
	Product segment: Shaft adaptation Product: Shaft couplings Description: Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. speed 10,000 rpm, -30°C to $+120^\circ\text{C}$, max. torque 120 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982
	Product segment: Shaft adaptation Product: Shaft couplings Description: 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
	Product segment: Shaft adaptation Product: Shaft couplings Description: Spring washer coupling, shaft diameter 6 mm / 10 mm, Maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular $\pm 2.5^\circ$; max. speed 12,000 rpm, -10° to $+80^\circ\text{C}$, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-0610-F	5312985
	Product segment: Shaft adaptation Product: Shaft couplings Description: Bar coupling, shaft diameter 6 mm / 10 mm, max. shaft offset: radial ± 0.3 mm, axial ± 0.3 mm, angular $\pm 3^\circ$; max. speed 10,000 rpm, -10° to $+80^\circ\text{C}$, max. torque: 80 Ncm, material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
	Product segment: Shaft adaptation Product: Shaft couplings Description: Claw coupling, shaft diameter 6 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10°, -30°C to $+80^\circ\text{C}$, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0610-J	2127056
	Product segment: Shaft adaptation Product: Shaft couplings Description: Double loop coupling, shaft diameter 10 mm / 12 mm, Maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, -30° to $+80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1012-D	5326702
	Product segment: Shaft adaptation Product: Shaft couplings Description: 10 mm / 12 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, -30° to $+120^\circ\text{C}$, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1012-B	5312984
	Product segment: Shaft adaptation Product: Shaft couplings Description: Spring coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial ± 1.5 mm, axial ± 1.0 mm, angular $\pm 5^\circ$, max. speed 3,000 rpm, -30° to $+120^\circ\text{C}$, nominal torque 150 Ncm, rotational angle at half nominal torque, direction of rotation right viewed on driving shaft 40°, left viewed on driving shaft 60°, material: spring steel 1.0600 nickel plated, zinc die cast hubs	KUP-1010-W	5319914
	Product segment: Shaft adaptation Product: Shaft couplings	KUP-1010-S	2056408

	Brief description	Type	part no.
	Description: Bar coupling, shaft diameter 10 mm / 10 mm; maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular $\pm 3^\circ$; speed 10,000 rpm, -10° to $+80^\circ$ Celsius, max. torque 80 Ncm; material: glass fiber-reinforced polyamide, aluminum hub	KUP-1010-F	5312986
	Product segment: Shaft adaptation Product: Shaft couplings Description: Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset, radial ± 0.3 mm, axial ± 0.4 mm, angle $\pm 2.5^\circ$, torsion spring stiffness 30 Nm/rad; material: aluminum flange, glass-fiber reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-D	5326703
	Product segment: Shaft adaptation Product: Shaft couplings Description: Double loop coupling, shaft diameter 10 mm / 10 mm, Maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, -30° to $+80^\circ$ C, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1010-B	5312983
	Product segment: Shaft adaptation Product: Shaft couplings Description: Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, -30° to $+120^\circ$ C, max. torque 120 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-0810-S	5314178
	Product segment: Shaft adaptation Product: Shaft couplings Description: 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
	Product segment: Shaft adaptation Product: Shaft couplings Description: Claw coupling, shaft diameter 8 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10°, -30° C to $+80^\circ$ C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-0810-J	2128267
	Product segment: Shaft adaptation Product: Shaft couplings Description: Claw coupling, shaft diameter 10 mm / 10 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10°, -30° C to $+80^\circ$ C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-1010-J	2127054
	Product segment: Shaft adaptation Product: Shaft couplings Description: Claw coupling, shaft diameter 10 mm / 12 mm, damping element 80 shore blue, maximum shaft offset: radial ± 0.22 mm, axial ± 1 mm angular $\pm 1.3^\circ$, max. speed 19,000 rpm, angle of twist max. 10°, -30° C to $+80^\circ$ C, max. torque 800 Ncm, tightening torque of screws: ISO 4029 150 Ncm, material: aluminum flange, damping element: polyurethane	KUP-1012-J	2128265

	Brief description	Type	part no.
measuring wheels and measuring wheel mechanics			
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AK	4084737
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200AP	4084738
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with ridged polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APG	4084740
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with studded polyurethane surface for 10 mm solid shaft, circumference 200 mm	BEF-MR10200APN	4084739
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with cross-knurled surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AK	4084733
	Product segment: Measuring wheels and measuring wheel mechanics Product: Measuring wheels Description: Aluminum measuring wheel with smooth polyurethane surface for 10 mm solid shaft, circumference 500 mm	BEF-MR10500AP	4084734

	Brief description	Type	part no.
programming devices			
	• Product segment: Programming devices • Product: PGT-10 Pro • Description: Programming unit display for programmable SICK DFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoder with DFS60, AFS/AFM60 and AHS/AHM36. Compact dimensions, low weight, and intuitive operation. • Items supplied: 1 x PGT-10-Pro stand-alone programming tool, 4 x alkaline type batteries, 1.5 V Mignon (AA)	PGT-10-Pro	1072254
	• Product segment: Programming devices • Product: PGT-08-S • Description: USB programming unit, for programmable SICK encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoders. Not compatible with the portable SOPAS ET versions.	PGT-08-S	1036616

	Brief description	Type	part no.
connectors and cables			
	• Description: Shielded • Connection type head A: Male connector, M12, 8-pin, straight, A-coded • Connection systems: Screw-type terminals • Permitted cross-section: ≤ 0.5 mm² • Application: Hygienic and washdown zones	YM12ES8-0050S5586A	2097337
	• Description: Shielded • Connection type head A: Female connector, M12, 8-pin, straight, A-coded • Connection systems: Screw-type terminals • Permitted cross-section: 0.25 mm² ... 0.5 mm² • Application: Hygienic and washdown zones	YF12ES8-0050S5586A	2097334
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, straight, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 2 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-G02MAC1	6053273
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, straight, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 5 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-G05MAC1	6053274
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, straight, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 10 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-G10MAC1	6053275
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, straight, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 20 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-G20MAC1	6053276
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, angled, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 2 m, 12-wire, PUR, halogen-free • Application: Zones with oils and lubricants	DOL-1212-W02MAC1	6039824
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, angled, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 5 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-W05MAC1	6039825
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, angled, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 10 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-W10MAC1	6039826
	• Description: SSI, shielded • Connection type head A: Female connector, M12, 12-pin, angled, A-coded • Connection type head B: Flying leads • Signal type: SSI • Cable: 20 m, 12-wire, PUR, halogen-free • Note: Drag chain use • Application: Zones with oils and lubricants	DOL-1212-W20MAC1	6039827

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.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

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