PRODUCT OVERVIEW

ENCODERS AND INCLINATION SENSORS

PATH-, ANGLE- AND SPEED MEASUREMENT IN PERFECTION

**Incremental encoders, Absolute encoders, Safety encoders,
Linear encoders, Wire draw encoders, Measuring wheel encoders,
Inclination sensors**

SICK
Sensor Intelligence.

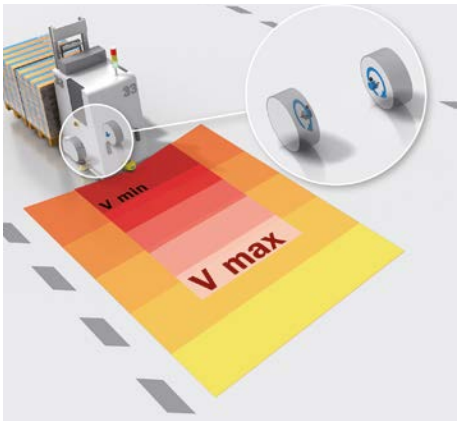
ENCODER AND INCLINATION SENSORS

Paths, position, angle – an encoder is the ideal solution when it comes to precise position detection in industrial automation.

The same applies to measuring revolutions and rpm as well as speed and acceleration. High-resolution optical encoders and extremely rugged magnetic encoders complement one another perfectly and permit exact measurements in all kinds of applications. Rotary encoders are available as incremental and absolute encoders. Wire draw encoders and linear encoders with a measuring element are available in linear measuring technology.

The range is capped off by inclination sensors that enable non-contact detection of angles in one or two axes.

→ Catalogue

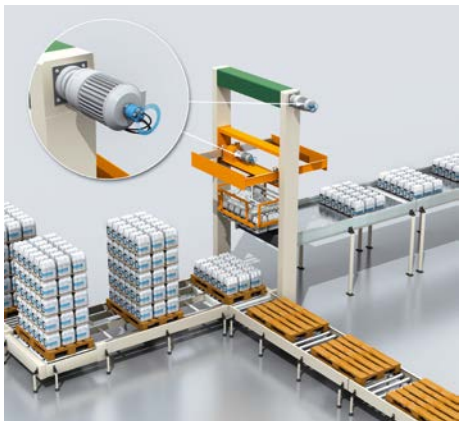


Industrial trucks and forklifts – positioning in storage and transport halls

INCREMENTAL ENCODER

Incremental encoders are used to detect speed, position, or angle. Thanks to their versatility, they are used in various applications in factory, logistics, and process automation.

The incremental encoder provides information on the direction of travel and the speed of the automated guided system (AGS). The encoder can either be directly mounted on the motor, on an axle (see figure), or on a revolving wheel. Solid shaft encoders are normally used in this context. The speed that is measured is used to calculate the position and to ensure the security field is observed using



Palletizer system – positioning the gripper

ABSOLUTE ENCODER

Absolute encoders can be used in any factory and logistics automation setting, where shaft rotational movement requires absolute detection. Depending on the protocol of each interface, additional information, such as speed or diagnostic data, can also be provided.

For example, plastic bottles are stacked in multiple layers on pallets in a palletizer system. The gripper of the pallet handling machine must be positioned in the X and Y directions. An absolute encoder is used to determine the position of the gripper. Multiturn absolute encoders with an Ethernet-based interface from the AFM60 product family can be used for this type of application. Or alternatively, you could also used an encoder with a SSI interface, such as the AFM60 SSI.

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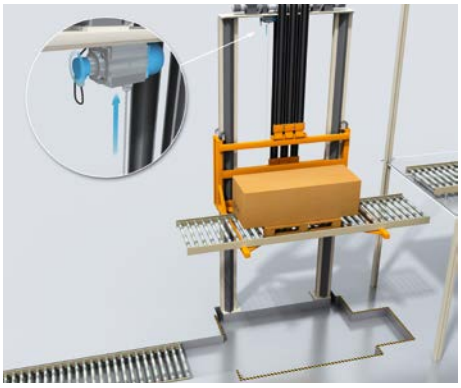
Safety functions in stationary machines

SAFETY ENCODER

Incremental encoders for functional safety generate information about position, angle, and revolution counts. When combined with a safe evaluation unit, this enables users to meet the safety function requirements set out in IEC61800-5-2. Safety encoders can be used in a variety of applications in factory and logistics automation.

Stationary machines are often equipped with mechanical solutions, such as doors or flaps, to separate the user from hazardous points. When working on machines in maintenance or setup mode, the safe speed monitor reduces the risk of injury and increases productivity. To achieve this, the machine speed is reduced and monitored for safety, enabling the operator to conduct manual work safely in the hazardous area.
The DFS60S Pro safety encoder provides information on the speed and rotational direction of the axis and enables the corresponding safety functions to be carried out.

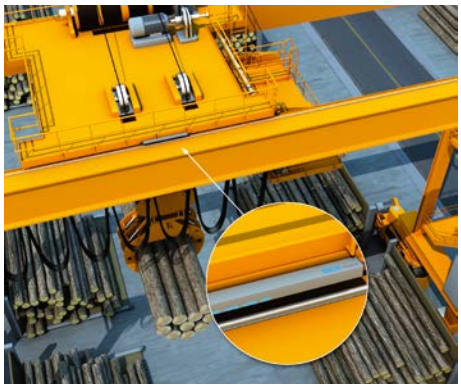


Lifts - flush placement of platform and target level

WIRE DRAW ENCODER

Within logistics processes, such as in the automotive industry, levels often have to be passed over to continue to convey goods. Lifts are used for this purpose, and their platforms must be accurately positioned flush to the target level.

This positioning is primarily carried out with SICK wire draw encoders. The HighLine product family is suited for measuring lengths over 10 m. Through its rugged design and high reproducibility, particularly accurate positioning is possible. Like the EcoLine product family, it is suited for measuring lengths over 10 m.



Cranes - positioning of the trolley and track

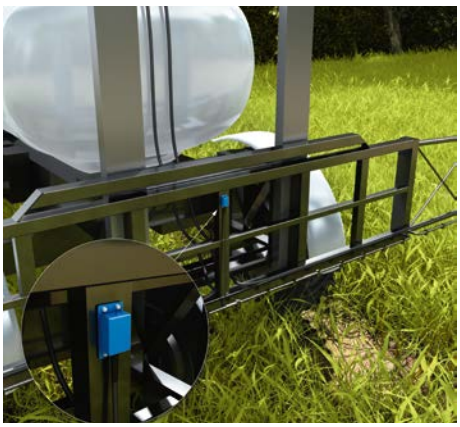
LINEAR ENCODER

The field of application for cranes encompasses nearly all areas of logistics from indoor to outdoor. This means that fine dust in cement factories or seawater from ship-to-shore cranes can quickly become a problem. Resistance to dirt, shock, vibration, and salt water is therefore a basic requirement for crane positioning systems.
The KH53 linear encoder was designed specifically for such ambient conditions. It is used to position the trolley on the crane and to position the path of the crane itself. Due to its excellent repeatability, the largest possible reading distances and a measuring length of up to 1.7 km, the KH53 linear encoder has been successfully used in this area for years.

Printing machines – positioning of printed images

MEASURING WHEEL ENCODER

Measuring wheel systems use a wheel to record linear movements, which they then convert to speed or position values. These systems do not require a reference point on the surface to be measured, making them well-suited to measuring a wide range of surfaces. The integrated spring ensures that the wheel exerts a consistent pressure on the surface, thereby guaranteeing slip-free measurement.
Measuring wheel encoders detect the speed of the print media and provide key information on the correct position for the print and the quality of the printed image. Whether you require clearly legible bar codes or high resolution printed check cards, gift cards, or brochures – accurate speed monitoring ensures print quality.



Leveling of the field spray linkage

INCLINATION SENSORS

Inclination sensors use capacitive MEMS technology to take a non-contact measurement of the inclination angle of an object in relation to the earth‘s gravity.

The compact TMS/TMM61 inclination sensor is used to level the spray boom. Thanks to the sensor, the spray boom level can be adjusted for different terrains, for example. The TMS/TMM61 is suitable for this precise leveling task as it offers high accuracy across the entire measuring range, outstanding temperature stability and compensated cross sensitivity as well as configurable vibration suppression.

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Incremental encoder	DBS36 Core	DBS50 Core	DKS40	DBS60 Core	DFS60	DFS60S Pro	DGS34/ DGS35	DBV50 Core	DKV60	DFV60
Which interface connection is required?										
TTL	■	■	■	■	■		■	■	■	■
HTL	■	■	■	■	■		■	■	■	■
TTL/HTL Universal				■	■					■
Open Collector	■	■	■				■	■		
Sin/Cos					■	■				
What is the maximum amount of space available for installation (diameter)?										
Up to 37 mm	■									
Up to 40 mm	■		■							
Up to 50 mm	■	■	■							
Up to 60 mm	■	■	■	■	■	■				
Up to 90 mm	■	■	■	■	■	■	■			
Which type of flange or shaft is required?										
Face mount flange	■	■	■	■	■	■				
Servo flange	■			■	■	■				
Blind hollow shaft	■			■	■	■	■			
Through hollow shaft				■	■	■	■			
Measuring wheel system								■	■	■
What hollow shaft diameter is required?										
Up to 8 mm	■			■	■	■				
Up to 10 mm				■	■	■				
Up to 12 mm				■	■	■				
Up to 15 mm				■	■	■				
Up to 5/8"				■	■					
> 5/8"							■			
What resolution is required? (pulses per revolution/steps per revolution)										
Up to 2500	■	■	■	■	■		■	■	■	■
Up to 5000				■	■		■			■
Up to 8192					■		■			■
Up to 16,384					■		■			■
> 16,384					■					■
1024 sin/cos periods					■	■				
Should programming/configuration be performed by the customer?										
Yes, using a hand-held device					■					■
Yes, using software and PC tool					■					■
Yes, via RS-485					■					■
No	■	■	■	■	■	■	■	■	■	■
Is a safety certificate required for the encoder?										
Yes						■				
No	■	■	■	■	■		■	■	■	■

Absolute encoders	Singleturn									Multiturn															
	ACS36	AFS60				AHS36		ARS60		A3M60	ACM36	ACM60	AFM60				AHM36		ATM60				ATM90	
	Analog	SSI	EtherNet/IP	EtherCAT®	PROFINET	SSI	CANopen	SSI	Parallel	PROFIBUS	Analog	Analog	SSI	EtherNet/IP	EtherCAT®	PROFINET	SSI	CANopen	SSI	PROFIBUS	CANopen	DeviceNet	SSI	PROFIBUS
How many revolutions are to be absolutely measured?																								
≤ 1	■	■	■	■	■	■	■	■	■															
> 1										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Which interface connection is required?																								
Analog 4 to 20 mA / Analog 0 to 10 V	■										■	■												
Parallel									■															
SSI		■				■		■					■				■		■				■	
SSI + incremental													■											
SSI + Sin/Cos													■											
Fieldbus/Ethernet			■	■	■		■			■				■	■	■		■		■	■	■		■
What is the maximum amount of space available for installation (diameter)?																								
Up to 36 mm	■					■	■				■						■	■						
Up to 40 mm	■					■	■				■						■	■						
Up to 50 mm	■					■	■				■						■	■						
Up to 60 mm	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Up to 90 mm	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Which type of flange or shaft is required?																								
Face mount flange		■	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■		
Servo flange	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Blind hollow shaft		■	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■		
Through hollow shaft		■						■	■				■										■	■
What hollow shaft diameter is required?																								
Up to 8 mm		■	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
Up to 10 mm		■	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
Up to 12 mm		■	■	■	■			■	■	■			■	■	■	■			■	■	■	■	■	■
Up to 15 mm		■	■	■	■					■			■	■	■	■			■	■	■	■	■	■
Up to 5/8"		■	■	■	■					■													■	■
> 5/8"																							■	■
What resolution is required? (pulses per revolution/steps per revolution)																								
1024	[1]										[1]	[1]												
Up to 2500	[1]	■	■	■	■	■	■	■	■	■	[1]	[1]	■	■	■	■	■	■	■	■	■	■	■	■
Up to 5000	[1]	■	■	■	■	■	■	■	■	■	[1]	[1]	■	■	■	■	■	■	■	■	■	■	■	■
Up to 8192	[1]	■	■	■	■	■	■	■	■	■	[1]	[1]	■	■	■	■	■	■	■	■	■	■	■	■
Up to 16,384	[1]	■	■	■	■	■	■	■	■	■	[1]	[1]	■	■	■	■	■	■						
> 16,384	[1]	■	■	■	■			■	■		[1]	[1]	■	■	■	■								
Should programming/configuration be performed by the customer?																								
Yes, using a hand-held device		■				■							■				■							
Yes, using software and PC tool		■				■							■				■		■				■	
Yes, via RS-485		■				■							■				■							
Yes, via BUS (fieldbus or Ethernet)			■	■	■		■			■				■	■	■		■		■	■	■		■
Yes, via a web server			■											■										
Yes, using the teach-in function on the encoder	■										■	■												
No	■[2]	■	■[2]	■[2]	■[2]	■	■[2]	■	■	■[2]	■[2]	■[2]	■	■[2]	■[2]	■[2]	■	■[2]	■[2]	■[2]	■[2]	■[2]	■[2]	■[2]

[1] Analog resolution dependent on programmed measuring range.

[2] Encoders can in principle be programmed/configured, but can also be used with the default factory settings without configuration.

	Wire draw encoders			Linear encoders with measurement element or magnetic tape		
	EcoLine	Compact	HighLine	KH53	KH53A	TTK70
How many measuring cycles are needed?						
Up to 1,000,000	■	■	■			
Unlimited				■	■	■
What kind of position measurement is required?						
Absolute	■	■	■	■	■	■
Incremental	■	■	■			■
Which interface connection is required?						
TTL	■	■	■			
HTL	■		■			
Analog	■		■			
HIPERFACE®	■ [1]	■	■ [1]			■
SSI	■	■	■	■	■	■
SSI + Sin/Cos	■ [1]		■ [1]			■
PROFIBUS	■		■	■	■	
CANopen	■		■			
DeviceNet	■		■			
EtherNet/IP	■		■			
PROFINET	■		■			
EtherCAT®	■		■			
Is a consistent mounting surface available over the measuring distance?						
Yes	■	■	■	■	■	■
No	■	■	■			
What are the mounting tolerances like?						
Low	■	■	■	■		■
Medium	■	■	■	■	■	
High					■	
What measuring length is required?						
≤ 4 m	■	■	■	■	■	■
≤ 5 m	■	■	■	■	■	
≤ 10 m	■		■	■	■	
≤ 50 m			■	■	■	
≤ 548 m				■	■	
≤ 1700 m				■		
What resolution is required?						
≤ 0.1 mm	■	■	■	■	■	
≤ 0.05 mm	■	■	■			
≤ 1 µm		■				■
How reliable does the measuring system need to be?						
Low	■	■	■	■	■	■
Medium		■	■	■	■	■
High			■	■	■	
Which installation size can be used?						
Small	■					■
Medium		■	■			
Large			■	■	■	

[1] Available upon request.

	 **DBS36 Core**	 **DBS50 Core**	
	The MultiFit Incremental Encoder	The MultiFit Incremental Encoder	
Technical data overview			
Numbers of lines / pulses from...to...	10 ... 2,500	10 ... 2,500	
Mechanical design	Solid shaft, face mount flange Blind hollow shaft	Solid shaft, face mount flange	
Electrical interface	4.5 V ... 5.5 V, TTL/RS422 7 V ... 30 V, TTL/RS422 7 V ... 30 V, HTL/Push Pull 7 V ... 27 V, HTL/Push Pull, 3 channel 4.5 V ... 5.5 V, Open Collector NPN 4.5 V ... 30 V, Open Collector NPN	4.5 V ... 5.5 V, TTL/RS422 7 V ... 30 V, TTL/RS422 7 V ... 30 V, HTL/Push Pull 7 V ... 27 V, HTL/Push Pull, 3 channel 4.5 V ... 5.5 V, Open Collector NPN 4.5 V ... 30 V, Open Collector NPN	
Permissible shaft load (solid shaft)	20 N axial/ 40 N radial	30 N axial/ 50 N radial	
Enclosure rating up to	IP 65	IP 65	
Programmable	–	–	
Maximum output frequency	≤ 300 kHz	≤ 300 kHz	
Ambient temperature	–20 °C ... +85 °C	–20 °C ... +85 °C	
At a glance			
	• Connection with universal cable outlet • Designs with blind hollow shaft or face-mount flange with solid shaft • Face mount flange with 6 mounting hole patterns and servo groove • Hollow shaft with universal stator coupling • Compact housing diameter of 37 mm with-compact construction depth, • Electrical interfaces: TTL/RS-422, HTL/ Push Pull and Open Collector NPN • Number of lines: 10 to 2,500 • Temperature range: –20 °C... +85 °C • Enclosure rating: IP 65	• Connection with universal cable outlet • Face mount flange with 8 mm solid shaft • Face mount flange with 2 mounting hole patterns and servo groove • Compact housing diameter of 37 mm with compact construction depth, flange diame-ter 50 mm • Various electrical interfaces: TTL/RS-422, HTL/Push Pull and Open Collector NPN • Number of lines from 10 to 2,500 possible • Temperature range: –20 °C... +85 °C • Enclosure rating: IP 65	
Detailed information	➜ www.sick.com/DBS36_Core	➜ www.sick.com/DBS50_Core	

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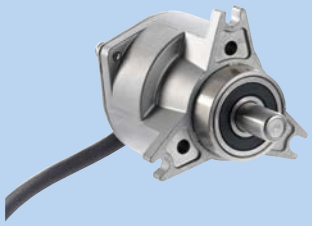
	DKS40	DBS60 Core
		
	Rugged, high-performance incremental encoder	Rugged, versatile incremental encoder for industrial applications
	1 ... 2,048	4 ... 5,000
	Solid shaft, face mount flange	Solid shaft, face mount flange Solid shaft, servo flange Blind hollow shaft Through hollow shaft Through hollow shaft clamping at the back
	4.5 ... 5.5 V, TTL/RS422, 6 channel 10 ... 30 V, HTL/Push Pull, 6 channel 4.5 ... 5.5 V, Open Collector NPN, 3 channel 10 ... 30 V, Open Collector NPN, 3 channel	4.5 V ... 5.5 V, TTL/RS422 10 V ... 30 V, TTL/RS422 10 V ... 27 V, HTL/Push Pull 4.5 V ... 30 V, TTL/HTL universal
	20 N axial / 40 N radial	50 N axial/100 N radial
	IP 64	IP 67
	–	–
	≤ 50 kHz/ ≤ 200 kHz ≤ 300	≤ 300 kHz
	0 °C ... +60 °C	–20 °C ... +85 °C
	• Compact diameter • Rugged, low-cost design • Interfaces: Open collector NPN, TTL/RS–422 or HTL/Push Pull. • Connection via cable outlet, for radial or axial use with open ends or fitted with an M12 connector • Face mount flange with solid shaft • Housing for simple clamping ring mounting • Any number of lines possible from 1 to 2,048	• Face mount flange, servo flange, blind and through hollow shaft • Housing unit: Ø 58 mm; compact mounting depth, large bearing distance • Flange and stator couplings enable diverse mounting options • Number of lines: up to 5,000 pulses • Cable outlet, radial M23 or M12 male connector • TTL/RS-422 and HTL/Push-Pull, universal interface TTL/HTL with 4.5 V DC to 30 V DC • Hollow shafts: metal up to Ø 5/8“, insulated up to • Ø 15 mm; clamping at the front and back
	→ www.sick.com/DKS40	→ www.sick.com/DBS60_Core

	 **DFS60**	 **DGS34/35**
	High resolution, programmable encoder for demanding applications	Encoder with a large hollow shaft for harsh ambient conditions
Technische Daten im Überblick		
Numbers of lines / pulses from...to...	Type E 100 ... 2,048 Type B 1 ... 10,000 Type A 1 ... 65,536	120 ... 16,384
Mechanical design	Solid shaft, face mount flange Solid shaft, servo flange Blind hollow shaft Through hollow shaft	Blind hollow shaft, through hollow shaft
Electrical interface	4.5 V ... 5.5 V, TTL /RS 422 10 V ... 32 V, HTL /Push pull 10 V ... 32 V, TTL /RS 422 4.5 V ... 32 V, TTL /HTL programmable 4.5 V ... 5.5 V, Sin/Cos 1,0 V_{SS}	5 V, TTL 5 ... 15 V, HTL /TTL 8 ... 24 V, HTL
Permissible shaft load (solid shaft)	40 N axial/ 80 N radial	–
Enclosure rating up to	IP 65	IP 66
Programmable	✔	–
Maximum output frequency	≤ 820 kHz	≤ 600 kHz
Ambient temperature	Up to –40 °C ... +100 °C	–20 °C ... +70 °C
Auf einen Blick		
	• Compact installation depth • High resolution up to 16 bits • Optionally programmable: Output voltage, zero pulse position, zero pulse width and number of pulses • Connection: Radial or axial cable outlet, M23 or M12 connector, axial or radial • Electrical interfaces: 5V & 24V TTL/RS-422, 24 V HTL/push pull • Mechanical interfaces: face mount or servo flange, blind or through hollow shaft • Remote zero set possible	• Incremental encoder with 3.5“ diameter • Pulses per revolution: 120 ... 16,384 • Selection of various electrical interfaces: TTL/RS-422, HTL/Push Pull and OpenCollector • High enclosure rating:IP 66 • Blind hollow shaft for shaft diameters up to 30 mm or 1–1/8“ • Connection via cable outlet or 10-pin MIL male connector
Detailed information	➜ www.mysick.com/de/DFS60	➜ www.sick.com/DGS34

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	 **AHS/AHM36 SSI**	 **AHS/AHM36 CANopen**	
	Flexible, smart, compact	Flexible, smart, compact	
Technical data overview			
Electrical interface	SSI	CANopen	
Resolution	Up to a maximum of 14-bit singleturn and 12-bit multiturn	Up to a maximum of 14-bit singleturn and 12-bit multiturn	
Mechanical interface	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	
Connection type	Universal male connector Universal cable	Universal male connector Universal cable	
Ambient temperature	–40 °C ... +100 °C	–40 °C ... +85 °C	
Enclosure rating	Up to IP 67	Up to IP 67	
Programmable	✔	✔	
At a glance			
	• Compact 36 mm absolute encoder with max. 26 bits (singleturn: 14 bits, multiturn: 12 bits) • Face mount flange, servo flange, blind hollow shaft • Rotatable M12 connector or rotatable cable outlet • SSI interface • Programmable SSI version: Resolution, preset value, etc. can be programmed (depending on the type) • Protection class up to IP 67 (depending on the type) • Operating temperature: –40 °C to +100 °C (depending on the type)	• Compact 36 mm absolute encoder with max. 26 bits (singleturn: 14 bits, multiturn: 12 bits) • Face mount flange, servo flange, blind hollow shaft • Rotatable M12 connector or rotatablecable outlet • CANopen interface with programmable configuration • Diagnostic functions: temperature, operating time, etc. (depending on the type) • Protection class up to IP 67 (depending on the type) • Operating temperature: –40 °C to +85 °C (depending on the type)	
Detailed information	➜ www.sick.com/AHS_AHM36_SSI	➜ www.sick.com/AHS_AHM36_CANopen	

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	AFS/AFM60 SSI	**AFS/AFM60 EtherNet/IP**	**AFS/AFM60 PROFINET**
	Precise, flexible, versatile	IIntelligent, powerful, precise	IIntelligent, powerful, precise
	SSI/Gray SSI/Gray + Incremental, HTL SSI/Gray + Incremental, TTL SSI/Gray + Sin/Cos, 1,024 periods SSI/Gray, programmable SSI/Gray + Incremental TTL/HTL, programmable SSI/Gray + Sin/Cos, 1,024 periods, programmable	EtherNet/IP	PROFINET
	Up to a maximum of 18-bit singleturn and 12-bit multiturn	Up to a maximum of 18-bit singleturn and 12-bit multiturn	Up to a maximum of 18-bit singleturn and 12-bit multiturn
	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft Through hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft
	Radial male connector Universal cable Radial cable	Axial male connector	Axial male connector
	–40 °C ... +100 °C	–40 °C ... +85 °C	–40 °C ... +85 °C
	Up to IP 67	Up to IP 67	Up to IP 67
	✔	✔	✔
	• High-resolution absolute encoders with up to 30 bits (AFM60) or up to 18 bits (AFS60) • Face mount flange, servo flange, blind or through hollow shaft • SSI, SSI + Incremental or SSI + Sin/Cos interface • Programmable resolution and offset (dependent on type) • Connection system: M12, M23 connector or cable outlet • Enclosure rating: IP 67 (housing), IP 65 (shaft) • Operating temperature: –30 °C to +100 °C (depends on type)	• High-resolution, 30-bit absolute encoder (18 bit singleturn and 12 bit multiturn) • Device Level Ring (DLR functionality) • Extensive diagnostics: Min/max values for temperature, position, speed. Operating hours counter, display of flags, alarms and warnings using e.g. a fault header (32 bit) • Status display via 5 duo LEDs • Rotary axis function • IP address via DHCP / DEC switches • Ethernet/IP interface (extended profile 0x22) • Function block	• High-resolution 30-bit absolute encoder (18-bit singleturn and 12-bit multiturn) • Face mount flange, servo flange and blind hollow shaft • Connection type: 3 x M12 axial male connector • PROFINET-IO-RT interface • Less than 5 ms data update time • Round axis functionality • Alarms, warnings and diagnostics functions for speed, position, temperature, operating time, etc. • Status display via 5 LEDs
	➜ www.sick.com/AFS_AFM60_SSI	➜ www.sick.com/AFS_AFM60_EtherNet_IP	➜ www.sick.com/AFS_AFM60_PROFINET

	 **AFS/AFM60 EtherCAT®**	 **A3M60 PROFIBUS**	
	Intelligent, powerful, precise	Compact, rugged, powerful	
Technical data overview			
Electrical interface	EtherCAT®	PROFIBUS	
Resolution	Up to a maximum of 18-bit singleturn and 12-bit multiturn	Up to a maximum of 14-bit singleturn and 17-bit multiturn	
Mechanical interface	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	
Connection type	Axial male connector	Axial male connector	
Ambient temperature	–40 °C ... +85 °C	–30 °C ... +80 °C	
Enclosure rating	Up to IP 67	Up to IP 67	
Programmable	✔	✔	
At a glance			
	• High-resolution 30-bit absolute encoder (18-bit singleturn and 12-bit multiturn) • Face mount flange, servo flange and blind hollow shaft • Connection type: 3 x M12 axial connector • Data tranfer speed “ on the fly” in the range of µs • EtherCAT® interface CoE (CiA DS-301) Device profile (CiA DS-406) • Round axis functionality • Alarms, warnings and diagnostics functions for speed, position, temperature, operating time, etc. • Status display via 5 LEDs • Up to 16 adjustable electronic cam switches	• Rugged absolute multiturn encoder with up to 31 bits (14-bit singleturn and 17-bit multiturn) • Face mount flange, servo flange or blind hollow shaft • Compact design (<70 mm) • Integrated PROFIBUS interface with DP V0, V1, and V2 functionality (depending on type) • Connectivity: 3 x M12 male connector • Protection class up to IP67 • Operating temperature: –30 to +80 °C (depending on type)	
Detailed information	➜ www.sick.com/AFS_AFM60_EtherCAT	➜ www.sick.com/A3M60_PROFIBUS	

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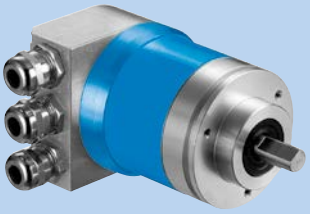
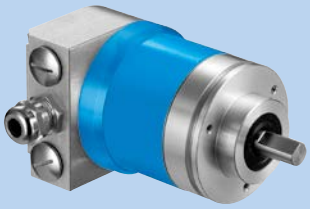
	ATM60 PROFIBUS	ATM60 SSI	ATM60 CANopen
			
	Reliable, established, and modular	Reliable, established, and modular	Reliable, established, and modular
	PROFIBUS	SSI	CANopen
	Up to a maximum of 13-bit singleturn and 13-bit multiturn	Up to a maximum of 13-bit singleturn and 13-bit multiturn	Up to a maximum of 13-bit singleturn and 13-bit multiturn
	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft
	Bus connection adapters	Radial male connector Radial cable	Bus connection adapters
	–20 °C ... +80 °C	–20 °C ... +85 °C	–20 °C ... +80 °C
	Up to IP 67	Up to IP 67	Up to IP 67
	–	✔	✔
	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: face mount flange, servo flange, blind hollow shaft, and extensive adapter accessories • Zero-set and preset functions via hardware or software • No battery required • Electrical interface: PROFIBUS DP as per IEC61158 / RS 485 , electrically isolated. • Electronically adjustable, configurable resolution • Magnetic scanning	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: face mount flange, servo flange, blind hollow shaft, and extensive adapter accessories • Zero-set and preset functions via hardware or software • No battery required • Electrical interface: SSI with gray or binary code type • Electronically adjustable, configurable resolution • Round axis functionality (optional) also for non-binary resolutions (per revolution) and decimal numbers (number of revolutions) • Magnetic scanning	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: face mount, servo flange, blind hollow shaft, adapter accessories • Zero-set and preset functions via hardware/software • No battery • Electrical interface: CAN specification 2. 0B, electrically isolated; DS 301, V4.01, DSP 406, V2.0, Class 2 • Electronically adjustable, configurable resolution • Network status info via duo LED • Magnetic scanning
	→ www.sick.com/ATM60_PROFIBUS	→ www.sick.com/ATM60_SSI	→ www.sick.com/ATM60_CANopen

	 **ATM60 DeviceNet**	 **ATM90 SSI**	
	Reliable, established, and modularr	Reliable, established, and modular	
Technical data overview			
Electrical interface	DeviceNet	SSI	
Resolution	Up to a maximum of 13-bit singleturn and 13-bit multi-turn	Up to a maximum of 13-bit singleturn and 13-bit multiturn	
Mechanical interface	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft	Through hollow shaft	
Connection type	Bus connection adapters	Radial male connector Radial cable	
Ambient temperature	–20 °C ... +80 °C	–20 °C ... +70 °C	
Enclosure rating	Up to IP 67	IP 65	
Programmable	✔	✔	
At a glance			
	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: face mount, servo flange, blind hollow shaft, and adapter accessories • Zero-set and preset functions via hardware/ software • No battery • Electrical interface: CAN/DeviceNet specification 2.0B, electrically isolated; device profile: Generic [0] • Electronically adjustable, configurable resolution • Network status info via duo LED • Magnetic scanning	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: through hollow shaft with shallow installation depth • Zero-set and preset functions via hardware or software • No battery required • Electrical interface: SSI with gray or binary code type • Electronically adjustable, configurable resolution • Magnetic scanning	
Detailed information	➜ www.sick.com/ATM60_DeviceNet	➜ www.sick.com/ATM90_SSI	

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	ATM90 PROFIBUS	**ARS60 SSI/Parallel**	**ACS/ACM36**	**ACM60**
	Reliable, established, and modular	Reliable and established	Compact, universal, intuitive	Compact, universal, intuitive
	PROFIBUS	SSI/Gray SSI/Gray capped Parallel/Gray Parallel/Gray capped Parallel/BIN, Parallel/BCD	Analog, 4 mA ... 20 mA Analog, 0 V ... 10 V	Analog, 4 mA ... 20 mA Analog, 0 V ... 10 V
	Up to a maximum of 13-bit singleturn and 13-bit multiturn	Up to a maximum of 13 bit	5.4 ... 40.2 µA 2.7 ... 25.1 mV 5.2 µA 2.7 mV	1,5 ... 8,8 µA 0,8 ... 5,5 mV
	Through hollow shaft	Solid shaft, servo flange Solid shaft, face mount flange Blind hollow shaft Through hollow shaft	Solid shaft, servo flange	Solid shaft, servo flange
	3 x radial male connectors 3 x radial PG	Radial male connector Axial male connector Radial cable Axial cable	Radial cable	Universal or radial male connector
	–20 °C ... +80 °C	–20 °C ... +85 °C	–30 °C ... +80 °C	–30 °C ... +80 °C
	IP 65	Bis IP 66	IP 65	IP 68
	✔	–	✔	✔
	• Extremely rugged, tried-and-tested absolute multiturn encoder with a resolution of up to 26 bits • Mechanical interface: through hollow shaft with shallow installation depth • Zero-set and preset functions via hardware or software • No battery required • Electrical interface: PROFIBUS DP as per IEC61158 / RS-485 , electrically isolated. • Electronically adjustable, configurable resolution • Magnetic scanning	• Absolute singleturn encoder • Resolution: up to 15 bits (32,768 increments) • Electrical interface: SSI with gray code type or gray capped • Electrical interface: Parallel with gray, gray capped, binary, BCD code type • Zero-set function • Mechanical interfaces: face mount flange, servo flange, blind and through hollow shaft • Enclosure rating: Up to IP66	• Compact 36 mm absolute encoder with up to 3723 steps (for singleturn and multiturn) • Servo flange • Radial cable outlet • Analog interface 4 to 20 mA or 0 to 10 V • Programming via keypad on the encoder • IP 65 protection class • Operating temperature: –30 °C to +80 °C	• Compact 60 mm absolute encoder with up to 13107 steps • Servo flange • Radial connector outlet • Analog interface 4 to 20 mA or 0 to 10 V • Programming via keypad on the encoder • IP 68 protection class • Operating temperature: –30 °C to +80 °C
	→ www.sick.com/ATM90_PROFIBUS	→ www.sick.com/ARS60_SSI_Parallel	→ www.sick.com/ACS_ACM36	→ www.sick.com/ACM60

DFS60S Pro

Safe, easy, flexible: Encoders for functional safety

Technical data overview	
Safety integrity levell	SIL2 (IEC 61508), SILCL2 (IEC 62061)
Performance Level	PL d (EN ISO 13849)
Category	3 (EN ISO 13849)
Encoder interface	4.5 V ... 32 V, SinCos 1.0 VSS (differential)
Mechanical design	Solid shaft, flattened, servo flange Solid shaft, flattened, face mount flange Solid shaft with feather key, servo flange Solid shaft with feather key, face mount flange Blind hollow shaft with feather key groove Through hollow shaft with feather key groove
Connection type	M23 male connector, 12-pin M12 male connector, 8-pin Cable, 8-wire (depends on type)
Operating temperature range	–30 °C ... +95 °C (depends on type)
Enclosure ratingt	IP 65 (nach IEC 60529)

At a glance

- Encoders for functional safety technology: SIL2 (IEC 61508), SILCL2 (EN 62061), PL d (EN ISO 13849)
- Electrical interface: 4.5 V ... 32 V; sine/cosine 1 V_{PP}; 1,024 periods
- Clamping flange or servo flange, blind hollow shaft or through hollow shaft (assembly options with feather key)
- Universal cable outlet, M23 or M12 male connector, axial or radial
- Enclosure rating: IP 65
- Working temperature range: –30°C ... +95°C (depending on type)

Detailed information → www.sick.com/DFS60S_Pro

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EcoLine

Modular wire draw encoders in smallest design

Technical data overview		
Sub-product family	BCG	BCG / PFG
Measuring length	≤ 10 m	≤ 10 m
Resolution	Up to 0,001 mm	Up to 0,001 mm
Reproducibilityt	≤ 0,2 mm	≤ 0,2 mm
Electrical interface	4 mA ... 20 mA, analog 0 V ... 10 V, analog SSI CANopen DeviceNet PROFIBUS EtherNet/IP PROFINET EtherCAT®	4,5 V ... 5,5 V, TTL/RS422 HTL/Push pull
Modularity (wire draw mechanism and encoder)	✔	✔

At a glance

- Measured lengths: 1.25 m ... 10 m
- Modular measuring system with a wide selection of interfaces/measuring lengths
- Very small, slim housing (55 mm ... 190 mm) with spring integrated in the measurement drum
- Light yet shock-proof and temperature-resistant plastic housing
- Analog interface with teach-in function at the encoder

Detailed information → **www.sick.com/EcoLine**

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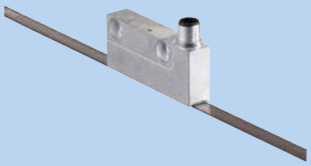
	Compact	HighLine
		
	Compact, rugged design - with integrated encoder	Rugged design measures distances up to 50 m - the heavy-duty wire draw encoder
	BKS	XKS	PKS	BTF	BTF / PRF
	≤ 5 m	≤ 5 m	≤ 5 m	≤ 50 m	≤ 50 m
	Up to 0,295 µm	Up to 0,295 µm	Up to 0,295 µm	Up to 0,001 mm	Up to 0,001 mm
	0,15°	0,15°	0,15°	≤ 5 mm	≤ 5 mm
	SSI	7 V ... 12 V, HIPERFACE®	4.5 V ... 5,5 V, TTL/RS422	4 mA ... 20 mA, analog 0 V ... 10 V, analog SSI CANopen DeviceNet PROFIBUS EtherNet/IP PROFINET EtherCAT®	4.5 V ... 5.5 V, TTL/RS422 10 V ... 32 V, HTL/Push pull
	–			✔	✔
	• Measuring lengths from 2 m ... 5 m • Integrated measuring system • Compact housing (90 mm x 90 mm x 90 mm) • Incremental and absolute versions • High resolution	• Measuring lengths: 2 m ... 50 m • Modular measuring system with a wide selection of interfaces/measuring lengths • Very rugged system (dirt scraper, integrated brushes) • High-quality winding mechanism and wire input • High enclosure rating • High shock and vibration resistance • Extremely high resolution possible • Expandable using external accessories
	➜ www.sick.com/Compact	➜ www.sick.com/HighLine

	 **KH53**	 **TTK70**
	For the harshest conditions - the heavy-duty linear encoder	Compact linear encoder with high resolution
Technical data overview		
Measuring length	0 m ... 1.700 m	≤ 4.000 mm
Resolution	0,1 mm	1 µm
Repeat accuracy	0.3 mm, 1 mm	≤ ± 2 µm
Electrical interface	SSI, PROFIBUS DP	SSI
Connection type	Male connector/cable	Male connector
Enclosure rating	Up to IP 67 (IEC 60529)	IP 67 (IEC 60529)
At a glance		
	• Non-contact length measurement – maintenance-free, rugged, long lifetime • High reproducibility (0.3 mm / 1 mm), high system resolution (0.1 mm) • SSI and PROFIBUS interfaces • Determination of absolute position • Measuring lengths of up to 1,700 m possible • Can be used in harsh environments • High travel speeds of up to 6.6 m/s • Distance tolerance between read head and measuring element: up to 55 mm ± 20 mm possible	• Non-contact determination of absolute position • Small, compact read head • Standard SSI interface, combined with SinCos output • Measuring lengths of up to 4 m • High level of accuracy (± 10 µm) • High resolution (1 µm) • High travel speed of up to 10 m/s
Detailed information	➜ www.sick.com/KH53	➜ www.sick.com/TTK70

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DBV50 Core

Compact measuring wheel system that is highly flexible and easy to mount

Technical data overview	
Pulses per revolution from...to..	0,1 ... 10
Spring deflection spring arm	± 3 mm
Measuring wheel circumference	200 mm
Measuring wheel surface	O ring NBR70
Electrical interface	4,5 V 5,5 V TTL/RS422 7 V 30 V TTL/RS422 7 V 30 V HTL/Push pull 4,5 V 30 V open Collector NPN, 3 Kanal
Connection type	Cable, 8-wire universal 0.5 m Cable, 8-wire universal 1.5 m Cable, 5-wire universal 1.5 m
Programmable	–

At a glance

- Axis distance: 63.5 mm
- Measuring wheel circumference: 200 mm
- Resolution: 0.08 mm per pulse, 12.5 pulses per mm
- Max. spring travel: 14 mm, mechanically limited, max. spring force: 21 N
- Encoder rotation in 30° increments
- The encoder can be mounted on both spring arm sides, wheel support from top and bottom
- Adjustable spring pretension

Detailed information → www.sick.com/DBV50_Core

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	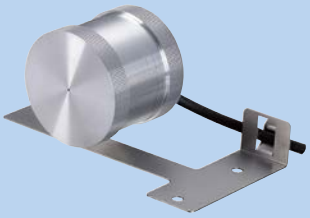	
	DKV60	**DFV60**
	Rugged, high-performance measuring wheel incremental encoder	High-resolution, programmable measuring wheel incremental encoder
	0,015 ... 10	218,45
	± 1,5 mm	± 10 mm
	200 mm	300 mm
	Knurled / O ring EPDM	O ring NBR70
	4,5 V 5,5 V TTL/RS422 10 V 30 V HTL/Push pull	4,5 V 32 V TTL/HTL programmierbar
	Cable, 8-wire universal 1.5 m Cable, 8-wire with male connector M12 universal 1.5 m	Male connector M12, 8-pin radial Cable, 8-wire universal 1.5 m Cable, 8-wire universal 3 m Cable, 8-wire universal 5 m
	–	✔
	• Complete, preassembled measuring system • Measuring wheel with knurl or O-ring for adaptation to the measuring surface • Mounting bracket made from anti-corrosive spring steel • High resolution up to 0.1 mm (1 ... 2.000 pulses/revolution) • Electrical interfaces: Open collector NPN, TTL/RS-422 or HTL/push pull. • Connection via cable outlet, for radial or axial use with open ends or fitted with an M12 connector	• Rotatable spring arm for universal use • 300 mm wheel circumference with o-ring made from NBR70 • Mounting arm and measurement wheels made from aluminum • Programmable output voltage, zero pulse position, zero pulse width and number of pulses • Connection: radial M12 connector outlet or radial/axial cable outlet • Electrical interfaces: 5V & 24V TTL/RS-422, 24 V HTL/push pull • Remote zero setting possible
	➜ www.sick.com/DKV60	➜ www.sick.com/DFV60

TMM55

Small, light, and rugged.

Technical data overview	
Number of axis	2
Measurement range	± 10°, ± 45°, ± 60°
Resolution	0.01°, 0.05°, 0.06°
Accuracy up to	±0.15°
Interfaces	4...20 mA, sinusoidal / 0...10 V, sinusoidal
Programmable	–

At a glance

- Compact, two-dimensional inclination sensor
- Fixed measuring ranges: ±10°, ±45°, ±60°
- Analog current or voltage interface
- Resolution as low as 0.01°
- Small and easy-to-mount ABS plastic housing
- Protection class up to IP 67

Detailed information → www.sick.com/TMM55

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	TMS/TMM61	TMS/TMM88
		
	Precise inclination measurement in a compact design	High-precision inclination measurement for harsh ambient conditions.
	1, 2	1, 2
	360°, ± 90°	360°, ± 90°
	0.01°	0.01°
	±0.1°	±0.02°
	CANopen	4...20 mA, linearised 0...10 V, linearised CANopen
	✔	✔
	• Compact inclination sensor with measuring range of 360° (single-axis) or ±90° (dual-axis) • Compensated cross sensitivity and configurable vibration suppression • Convenient CANopen interface • UV-resistant, impact-proof plastic housing • High resolution (0.01°) and accuracy (±0.1° typ.) • Programmable with the PGT-12-Pro	• Inclination sensor with measuring range of 360° (single-axis) or ±90° (dual-axis) • Compensated cross sensitivity and configurable vibration suppression • Freely configurable current or voltage interface or convenient CANopen interface • Accuracy up to ±0.02° • Plastic or aluminum housing
	➜ www.sick.com/TMS_TMM61	➜ www.sick.com/TMS_TMM88

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SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With almost 7,000 employees and over 50 subsidiaries and equity investments as well as numerous representative offices worldwide, we are always close to our customers. 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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Sensor Intelligence.