



Encoder Solutions

Innovative Encoders for Measurable Results

SICK — A Technology Leader for More than 60 Years

A Technology Leader in Factory and Logistics Automation

SICK is one of the world's leading manufacturers of sensors, safety systems and automatic identification solutions. Our high quality products range from simple sensors and laser-based bar code scanners... to machine vision, encoders, and safety laser scanners... to complex camera arrays.

Our superior technological expertise, broad product line, and vast application experience enable us to continually find new and better ways to help our customers achieve their goals.

A Continuous Drive for Innovative Solutions

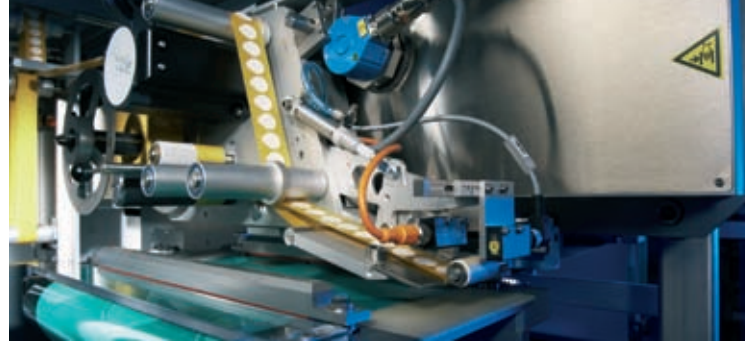
Since its humble beginning more than 60 years ago, SICK has made research and development a priority and central strategic component – spending nine percent of revenue on R&D. More than 450 people at SICK are dedicated to R&D, constantly creating new ways to solve customers' applications.

Application Diversity

SICK encoders are found in a wide range of applications:

- Wind turbines
- Solar panels
- Servo motors
- Packaging machines
- Machine tools
- Conveyors
- Automated storage/retrieval systems
- Elevators
- Sheet and web offset presses
- Medical equipment
- Robotic systems
- Food handling equipment
- Valves/flow metering
- Overhead cranes
- Process monitoring equipment
- Steel making/foundry equipment
- Textile machinery
- Tire making equipment
- Test stands
- Construction equipment
- Transportation





Features and Highlights of SICK Encoders

PROGRAMMABILITY

Get any resolution at the click of a button.

FAST LEAD TIMES

Many encoder families are manufactured in the US, so we can get an encoder out to you very quickly.

CUSTOMIZATION OPTIONS

Need a different shaft, connector, etc... ask for a specially made encoder.

TECHNICAL SUPPORT

Our team of application engineers are ready to help answer your questions.

Innovative Encoder Technology

Incremental Encoders

Use an incremental encoder when retention of absolute position upon power loss is not required. Examples include velocity control and simple point-to-point applications.

Absolute Encoders

Use absolute encoders when position data must be retained after loss of power. Examples include robotics, lead ball screws, overhead cranes, and rack and pinion applications.

Linear Encoders

Use linear encoders and wire-draw systems to measure incremental or absolute position along any axis. Linear encoders can be used in applications up to 1.7 km long.

Format Adjustment Drives

Use format adjustment drives for automation of auxiliary axes usually found in packaging, machine tooling and food and beverage machines.

Stand-alone Motor Feedback Encoders

Use stand-alone motor feedback encoders for absolute feedback with high resolution on motors.

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Incremental Encoders

Use an incremental encoder when retention of absolute position upon power loss is not required.

Basic Operation of Optical Rotary Incremental Encoders

Incremental encoders have five main components:

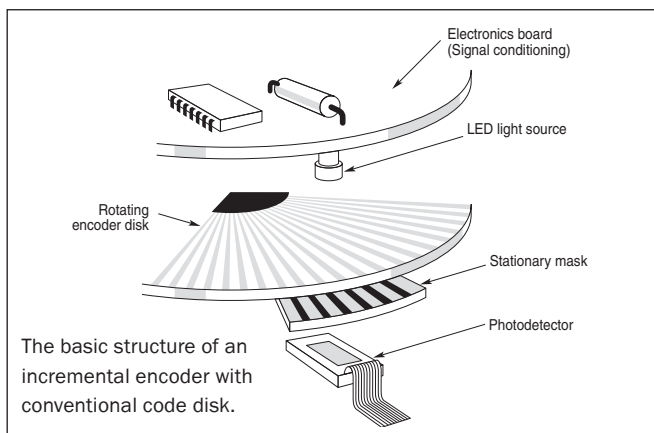
- LED light source
- Rotating code disk
- Stationary mask
- Photodetector(s)
- Amplifying/squaring electronics

As the code disk rotates in front of the stationary mask, it shutters light from the LED. The light that passes through the mask is received by the photodetector, which produces pulses in the form of a quasi-sine wave. The encoder electronics convert the sine wave into a square signal, ready for transmission to a counter. Application examples include velocity control and simple point-to-point applications.

Conventional Code Disks

Conventional incremental code disks contain a fixed number of equally spaced opaque lines that produce a corresponding number of pulses per revolution (PPR). Each line count requires a unique code disk. The position and spacing of the lines on the disk requires a high degree of precision. Physical limitations determine the maximum number of lines that can be created on a code disk of a given size.

However, using new technology, our new DFS family will allow up to 65,536 lines and certain versions of the encoder will allow the customer to program it and reprogram it to various line counts, as needed.

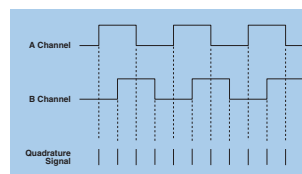


Tachometer Encoders

A single channel (e.g. A) incremental encoder, or tachometer, is used in systems that operate in only one direction and require simple velocity information. Velocity can be determined from the time interval between pulses, or by the number of pulses within a given time period.

Quadrature Encoders

Quadrature encoders have dual channels, A and B, which are electrically phased 90° apart. Thus, direction of rotation can be determined by monitoring the phase relationship between the two channels. In addition, with a dual-channel encoder, a four times multiplication of resolution can be achieved by externally counting the rising and falling edges of each channel (A and B). For example, an encoder that produces 2,500 pulses per revolution can generate 10,000 counts after quadrature.

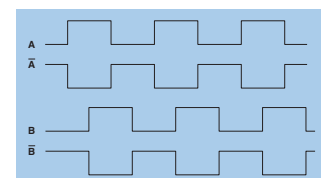


Differential Outputs

Correct position information can depend on eliminating false signals caused by external electrical noise. An encoder with complemented outputs, in combination with a control that uses differential operational-amplifiers, can minimize noise problems. When channel A goes high, its complement channel A-bar goes low. Electrical noise will affect both channels in the same way, and can thus be ignored by the differential op-amps.

Marker Pulse

The zero, or marker pulse is a rectangular pulse that is transmitted once per revolution. It is used as a reference to a defined mechanical position, mainly during commissioning or start-up after power loss. With our Coretech series, this can be set by a push button or by applying on a signal wire.



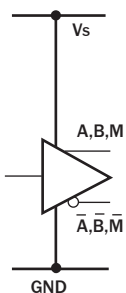
Bandwidth Considerations

Encoder resolution and shaft speed determine the frequency of the output signals. Careful consideration of the application requirements and the encoder capabilities is required.



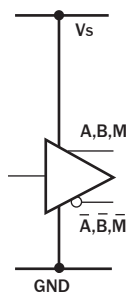
Electronic Interface Options

3487
LINE DRIVER
 $V_s = 5V$



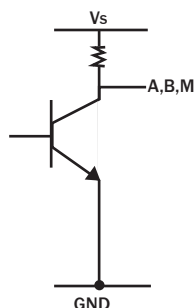
The 3487 RS422 driver has 5V supply and supplies a TTL output.

7272
LINE DRIVER
 $V_s = 8-24V$



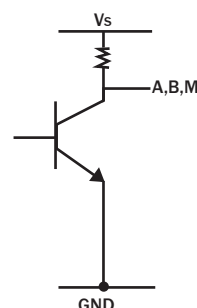
The 7272 line driver can sink or source 40 mA. It has both PNP and NPN transistors on the IC.

7406
OPEN COLLECTOR
 $V_s = 8-24V$



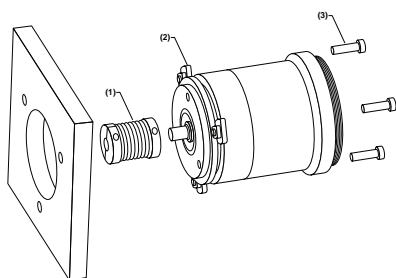
The 7406 line driver can sink 40 mA. It has an NPN transistor on board the IC.

7273
OPEN COLLECTOR
 $V_s = 8-24V$

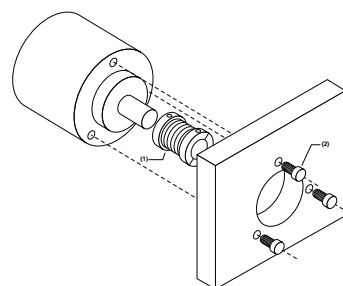


The 7273 is similar to the 7406 and can sink 40 mA of current.

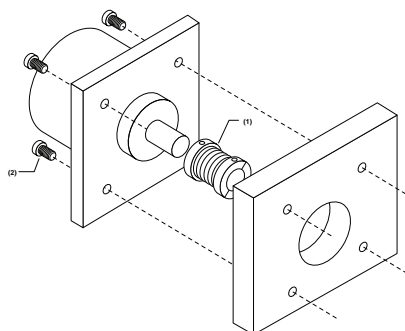
Mechanical Interface Options



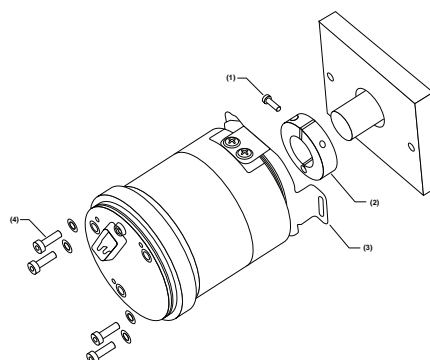
Mounting of encoders with servo mount



Mounting of encoders with face mount flange



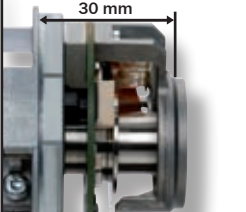




Mounting of encoders with square flange



Mounting of encoders with blind or through hollow shaft

Advantages of Using DFS Encoders Versus Conventional Encoders

	Conventional Encoders	The DFS Solution	
Limited Pulses Per Revolution	Many industrial applications require a higher line count than has been available with traditional incremental encoders. In the past, there were several ways to increase resolution: quadrature, interpolation, or using a larger encoder.	The DFS has a completely new ASIC design, which provides 1 to 65,536 pulses per revolution, and up to 262,144 counts after quadrature; significantly increasing resolution available in incremental encoders.	
Shock, Vibration & Temperature Limitations	The rotating discs used in encoders are typically glass or plastic. Glass discs can shatter when exposed to excessive vibration or shock. Plastic discs, while they won't shatter, cannot achieve the same level of accuracy as glass discs. Additionally, they are limited to a lower working temperature, rendering them unsuitable for the temperature tolerances often required in harsh environments.	The DFS encoder features a nickel code disc designed both for increased robustness and a higher temperature tolerance (-20...+100 °C).	
Bearing Lifetime and Run Out	The life of an encoder bearing can be shortened by several factors: high shaft loads, high speeds of rotation, and shaft misalignment. Once a bearing fails, the encoder needs to be replaced.	The loads on the bearings have been greatly reduced on the DFS due to the 30 mm distance between the bearings. This greater bearing distance also decreases vibration of the encoder, which helps extend the life of the bearings.	
Programmability	Typical encoders are shipped by the manufacturer with the customers' desired line count, pulse and electrical interface preset and unchangeable. This means that if customers need several encoders with various line counts and/or electrical interfaces, they will need to have several encoders for backup in inventory.	The programmable versions of the DFS allow the user to program the encoder to the line count desired and reprogram it, as needed. Additionally, zero set and electrical interface (to either TTL or HTL) can be programmed, which is very unique to SICK STEGMANN DFS encoders. A simple programming tool connected to a PC with a USB cable is used for all programming functions.	
Axial and Radial Cable Outlets	Currently, when users require cable outlets for their encoders, they have the choice of a radial or axial outlet. It is possible they will need encoders with both in the same environment requiring additional inventory. Also, if the cable is somehow damaged, the encoder has to be returned to the manufacturer who will repair the encoder by replacing the cable.	The DFS encoders are available with a pluggable outlet that can be used in either a radial or axial direction which requires less installation depth. Since it is detachable, if the cable is damaged, no repair is necessary by the manufacturer. The customer can simply order a new cable and plug it into the encoder. Various cable lengths and connectors at the end of the cable are also available.	



Other Features of the DFS

- RoHS compliant
- High shaft loading
- High frequency response
- High operating speed
- IP 65 protection class
- Programmable versions come with diagnostic function that reads shaft position
- Excellent concentricity

Incremental Encoders Selection Guide



DFS60 Incremental Encoders

Newly available, the DFS60 line offers a complete range of high resolution, freely programmable incremental encoders that can be programmed to accommodate any value from 1 to 65,536 pulses per revolution (PPR). The DFS60 also offers output voltage and zero set position programming through the software interface. The DFS60 has an operating temperature range up to 100° C.

DFS60
Heavy Duty Incremental Encoders



Incremental Encoders

	DFS 60	DFS 60	DFS 60
	Blind Hollow Shaft	Through Hollow Shaft	Heavy Duty Shaft
Resolution	1...65,536 ppr	1...65,536 ppr	1...65,536 ppr
Diameter Size	60 mm	60 mm	60 mm
Interface	TTL/RS 422, HTL	TTL/RS 422, HTL	TTL/RS 422, HTL
Supply Voltage	5 V or 10...32 V	5 V or 10...32 V	5 V or 10...32 V
Shaft Size/Bore	0.375 in, 0.5 in, or 10, 12, 14 and 15 mm	0.375 in, 0.5 in, or 10, 12, 14 and 15 mm	6 mm or 10 mm
Mounting	Integral flex mount	Integral flex mount	Servo mount or face mount
Protection Class	IP 65	IP 65	IP 65
Electrical Connections	M23 or M12 connectors; shielded cable	M23 or M12 connectors; shielded cable	M23 or M12 connectors; shielded cable
Optional Customer Programmability	Pulses per revolution, zero pulse set & electrical interface	Pulses per revolution, zero pulse set & electrical interface	Pulses per revolution, zero pulse set & electrical interface
RoHS Compliance	Yes	Yes	Yes

AVAILABLE ACCESSORIES

- Adapters
- Cable assemblies
- Collets
- Couplings
- Programming tool

Incremental Encoders

Selection Guide

DRS Incremental Encoders

The DRS line of encoders combines user-defined resolutions and simple set up, enabling the user to create custom resolutions at the click of a mouse button. This encoder line contains CoreTech®, an unprecedented blend of custom-designed OPTO-ASIC technology and a modular mechanical concept. Customers can choose from a large variety of encoders with different mechanical interfaces, housing styles, resolutions and electronic features.



Incremental Encoders Featuring CoreTech

	DRS 20	DRS 25	DRS 60
	DRS 21*	DRS 26*	DRS 61*
Resolution	1...8,192 ppr	1...8,192 ppr	1...8,192 ppr
Diameter Size	2.0 in	2.5 in	60 mm
Interface	Differential line drivers	Differential line drivers	Differential line driver or push-pull
Supply Voltage	5 V or 8...24 V	5 V or 8...24 V	5 V or 10...32 V
Shaft Size/Bore	0.25 in, 0.375 in or 10 mm	0.25 in, 0.375 in or 10 mm	6 mm or 10 mm
Mounting	Square flange or servo mount with face holes	Square flange or servo mount with face holes	Servo mount or face mount
Protection Class	IP 66	IP 66	IP 66
Electrical Connections	6, 7 or 10-pin MS connector; shielded cable	6, 7 or 10-pin MS connector; shielded cable	MS23 12-pin connector; shielded cable
RoHS Compliance	Yes	Yes	Yes

* Customer programmable versions



DGS Incremental Encoders

The DGS family of heavy duty incremental encoders are built using traditional code disk technology. They are built to last under tough environmental conditions.



Incremental Encoders

	DGS 20	DGS 25	DGS 60
Resolution	1...3,000 ppr	1...5,000 ppr	100...10,000 ppr
Diameter Size	2.0 in	2.5 in	60 mm
Interface	Differential line drivers or open collector	Differential line drivers or open collector	TTL/RS 422, HTL push-pull
Supply Voltage	5 V or 8...24 V	5 V or 8...24 V	5 V or 10...32 V
Shaft Size/Bore	0.25 in, 0.375 in or 10 mm	0.25 in, 0.375 in or 10 mm	6 mm or 10 mm
Mounting	Square flange or servo mount with face holes	Square flange or servo mount with face holes	Servo mount or face mount
Protection Class	IP 66	IP 66	IP 67
Electrical Connections	6, 7 or 10-pin MS connector; shielded cable	6, 7 or 10-pin MS connector; shielded cable	MS23 12-pin connector; shielded cable
RoHS Compliance	Yes	Yes	No

Incremental Encoders

Selection Guide

Hub Shaft/Hollow Shaft Incremental Encoders



Hub Shaft/Hollow Shaft Encoders

	DGS 21/ DGS 22	DGS 35/ DGS 34	DFS 60	DRS 60/ DRS 61 CoreTech®	DGS 65	DGS 66
			Programmable	Programmable		
Resolution	1...2,500 ppr	120...16,384 ppr	1...65,536 ppr	1...8,192 ppr	100...10,000 ppr	100...10,000 ppr
Diameter Size	2.0 in	3.5 in	60 mm	60 mm	60 mm	60 mm
Interface	Differential line driver or open collector	Differential line driver or open collector	TTL/RS 422 or HTL	TTL/RS 422, HTL push-pull	TTL/RS 422 or HTL push-pull	TTL/RS 422 or HTL push-pull
Supply Voltage	5 V or 8...24 V	5 V, 5...15 V or 8...24 V	5 V or 10...32 V	5 V or 10...32 V	5 V or 10...30 V	5 V or 10...30 V
Shaft Size/Bore	0.375 or 0.5 in	1 in or 30 mm with collets for 0.5, 0.625, 0.75 and 0.875 in	0.375 or 0.5 in or 10, 12, 14 and 15 mm	15 mm hub shaft or 14 mm hollow shaft with collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in	15 mm hub shaft with collets for 6, 8, 10 and 12 mm	15 mm hub shaft with collets for 6, 8, 10 and 12 mm; hollow shaft with 6, 8, 10, 12, 14 and 15 mm or 0.375 or 0.5 in
Mounting	Integral flex mount	Tether arm or anti-rotational pin	Integral flex mount	Integral flex mount	Compression shaft with servo mount	Integral flex mount
Protection Class	IP 50	IP 66	IP 65	IP 66	IP 65	IP 65
Electrical Connections	Shielded cable	10-pin MS connector; shielded cable	MS23 or M12 connectors; shielded cable	MS23 12-pin connector; shielded cable	MS23 12-pin connector; shielded cable	Shielded cable
Customer Programmability	N/A	N/A	Pulses per revolution, zero set function & electrical interface	Pulses per revolution and zero pulse (available only on the DRS 61)	N/A	N/A
ROHS Compliance	Yes	Yes	Yes	No	No	No



Light Duty and Special Purpose Incremental Encoders



Light Duty Shaft Encoders

Special Purpose Encoders

	LD 20	DKS 40	HD 32	HD 52	DKV 60 Measuring Wheel
Resolution	10...2,500 ppr	1...1,024 ppr	10...2,500 ppr	10...2,500 ppr	1...2048 ppr
Diameter Size	2.0 in	40 mm	3.25 in cube	3.25 in x 3.25 in x 5.7 in long	60 mm
Interface	Differential line driver or open collector	TTL/RS 422, HTL push-pull or open collector	Differential line driver or open collector	Differential line driver or open collector	TTL/RS 422, HTL push-pull
Supply Voltage	5 V or 8...24 V	5 V or 10...30 V	5 V or 8...24 V	5 V or 8...24 V	5 V or 10...30 V
Shaft Size/Bore	0.25 in	8 mm	0.375 in single or double ended	0.375 in or 0.625 in	N/A
Mounting	Face mount	Face mount flange, servo flange	Foot mount or face mount	Face mount	Wheeled encoder
Protection Class	IP 50	IP 64	IP 65	IP 66	IP65
Electrical Connections	Shielded cable	Shielded cable	6 or 10-pin MS connector	7 or 14-pin MS connector	Shielded cable
ROHS Compliance	Yes	No	Yes	Yes	No

Absolute Encoders

Single and Multi-Turn

Use absolute encoders when position data must be retained after loss of power.

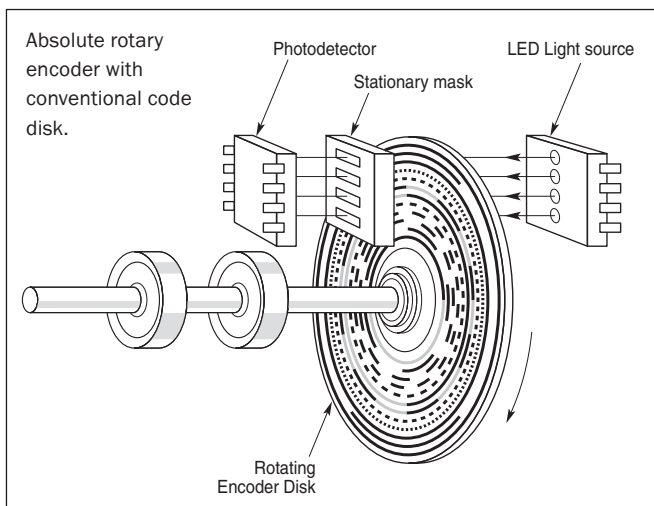
Basic Operation of Optical Rotary Absolute Encoders

As with incremental encoders, absolute optical rotary encoders use a rotating disk to interrupt the light path to a photodetector, which produces an output signal. However, absolute encoders read uniquely coded tracks to generate position information. No two adjacent positions are alike. Therefore, absolute encoders do not lose position data when power is lost. True position is available as soon as power is restored. Application examples include robotics, lead/ball screws, overhead cranes, and rack and pinion applications.

Conventional Optical Absolute Encoder Disks

A conventional absolute encoder disk features a series of concentric tracks, each consisting of a pattern of transparent and opaque segments. These independent tracks provide a unique combination of absolute values for each resolvable position. One track is needed for each “bit” of position information that is output as either a serial or parallel data “word.”

The preferred code format is Gray Code, in which only one bit of information changes between adjacent positions on the disk. This limits the position error from the track sensors to plus or minus one count. Other available codes, such as Natural Binary or Binary Coded Decimal (BCD), may have several bits change between adjacent positions.



Magnetic Absolute Encoders

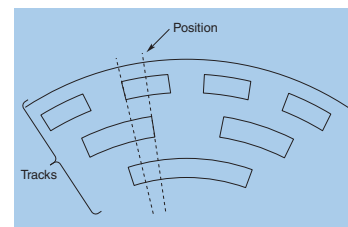
Many applications require resistance to extremely high shock and vibration, wide temperature variations, or high humidity with condensation. Our magnetic absolute encoders meet these unique challenges.

Magnetic field strength of a proprietary 32-pole magnetic ring is measured using two strategically spaced magneto-resistors that pick up variation of the magnetic field intensity along the circumference of the ring. The resulting 32 sine/cosine signals per turn (5-bit) are then enhanced by 8-bit interpolation. A single north-south pole magnet, read by a Hall effect sensor, is used to assign absolute values to individual sine/cosine cycles. Thus, the 32-pole magnetic

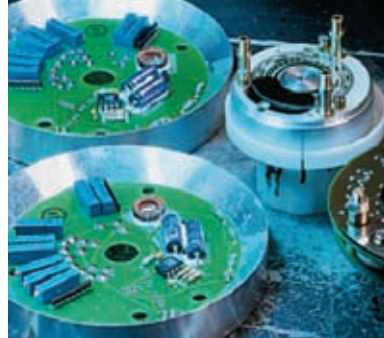
ring is calibrated for a 13-bit single-turn absolute position feedback. Additional software is used to compensate for temperature variation and resulting differential thermal expansion to insure data integrity.

Electronic Zero Position Teach

With all our absolute encoders, the zero position is electronically assigned by the user to the current mechanical position by activation of a pushbutton or set line. No mechanical detachment or rotation of the encoder is necessary.



Typical disk pattern showing radial scanning method used to read position



Serial Transmission

We developed SSI (Synchronous Serial Interface) to offer a cost-effective solution for long cable runs. The encoder produces serial data which is transmitted using only six wires, regardless of encoder resolution. This is ideal for transmission at high speed over long distances – up to 3000 feet. Superior noise immunity is achieved using differential clock and data signals.

Single- and Multi-Turn Absolute Encoders

Use single-turn encoders when the full range of motion in the application occurs within one full revolution (360°) of the encoder shaft. Multi-turn encoders are recommended for applications involving multiple revolutions of the encoder shaft.

In our multi-turn encoders, a high precision, miniaturized gear train, with a magnet on each gear stage, is used to mechanically store position information over as many as 8,192 turns. The position of each gear stage is determined with a pair of Hall sensors. This eliminates the need for costly and often unreliable counters and battery back up systems. Also, position changes that occur while the power is off are automatically tracked.

Serial to Parallel Conversion Module

The AD-SSI-PA converter module can be used with our SSI absolute encoders to convert the transmitted data from serial to parallel format. These devices can be used if the control does not directly accept the SSI format.

Fieldbus Systems

Our absolute encoders can also be supplied with popular fieldbus interfaces including DeviceNet, Profibus, and CANopen.

Advantages of Absolute Encoders



NON-VOLATILE MEMORY

Absolute encoders are non-volatile position verification devices. True position is not lost if the power fails. Continuous reading of position is not required.

PROTECTION

In some applications, a loss of position could result in damage to the machinery or injury to the operator. An absolute encoder provides position verification the moment power is applied without requiring movement to a reference position.

NOISE IMMUNITY

Absolute encoders determine position by continually reading a coded signal. Stray pulses will not accumulate and accurate position is available again on the next reading.

Absolute Encoders Selection Guide

ARS CoreTech Single-Turn Encoders

The CoreTech concept uses a minimum number of components to achieve maximum variety: proprietary hybrid OPTO-ASIC technology, designed by SICK | STEGMANN, and a small, unique disk with a bar code track.

CoreTech[®]
by SICK | STEGMANN



CoreTech Single-Turn Encoders

	ARS 20 (CoreTech)	ARS 25 (CoreTech)	ARS 60 (CoreTech)
Resolution	2...32,768 cpr	2...32,768 cpr	2...32,768 cpr
Diameter Size	2.0 in	2.5 in	60 mm
Interface	SSI, Push-pull, Open collector, TTL	SSI, Push-pull, Open collector, TTL	SSI or parallel
Supply Voltage	10...30 V, 8...24 V, 5 V	10...30 V, 8...24 V, 5 V	10...32 V
Output Code Formats	Gray, Gray Excess, Natural Binary, Binary Coded Decimal	Gray, Gray Excess, Natural Binary, Binary Coded Decimal	Gray, Gray Excess, Natural Binary, Binary Coded Decimal
Bore/Shaft Size and Mounting	0.25 in, 0.375 in, 10 mm; Square flange, servo mount with face holes	0.25 in, 0.375 in, 10 mm; Square flange, servo mount with face holes	6 mm with servo mount or 10 mm with face mount; 15 mm hub shaft or 14 mm hollow shaft with integral flex mount and collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in
Protection Class	IP 66	IP 66	IP 66
Electrical Connections	17, 19 or 23-pin MS connector; MS23 12-pin connector; shielded cable	17, 19 or 23-pin MS connector; MS23 12-pin connector; shielded cable	MS23 12-pin connector; shielded cable
ROHS Compliance	Yes	Yes	No

AVAILABLE ACCESSORIES

- Adapters
- Cable assemblies
- Collets
- Couplings
- Bus adapters
- Programming tool



ATM Absolute Multi-Turn Encoders



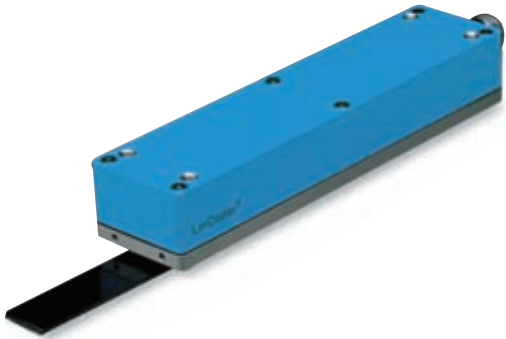
Absolute Multi-Turn Encoders

	ATM 90-A	ATM 90-P	ATM 60-A	ATM 60-D	ATM 60-C	ATM 60-P
	(SSI)	(Profibus)	(SSI)	(DeviceNet)	(CANopen)	(Profibus)
Resolution	13 bits per turn x 8,192 turns (26 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable
Diameter Size	93 mm	93 mm	60 mm	60 mm	60 mm	60 mm
Interface	SSI, RS 422	RS 485 bus coupling to Profibus DP specifications	SSI	DeviceNet specification release 2.0	Communication Profile DS 301 V4.0; Device Profile DSP 406 V2.0	RS 485 bus coupling to Profibus DP specifications
Supply Voltage	10...32 V	10...32 V	10...32 V	10...32 V	10...32 V	10...32 V
Output Code Formats	Gray or Natural Binary		Gray or Natural Binary			Gray or Natural Binary
Bore/Shaft Size and Mounting	12 mm, 16 mm or 0.5 in hollow shaft with anti-rotational pin mount	12 mm, 16 mm or 0.5 in hollow shaft with anti-rotational pin mount	6 mm with servo mount or 10 mm with face mount; 15 mm hub shaft with integral flex mount and collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in	6 mm with servo mount or 10 mm with face mount; 15 mm hub shaft with integral flex mount and collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in	6 mm with servo mount or 10 mm with face mount; 15 mm hub shaft with integral flex mount and collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in	6 mm with servo mount or 10 mm with face mount; 15 mm hub shaft with integral flex mount and collets for 6, 8, 10 or 12 mm and 0.25, 0.375 or 0.5 in
Protection Class	IP 65	IP 65	IP 67	IP 67	IP 67	IP 67
Electrical Connections	MS23 12-pin connector	Three M14 7-pin connectors or three PG cable glands	MS23 12-pin connector; shielded cable	Separate bus connector with single or dual 5-pin micro connectors, or single or dual PG gland	Separate bus connector with one, two or three PG cable glands	Separate bus connector

Length Measuring Systems

Linear Encoders and Wire-Draw Systems

Use linear encoders to measure incremental or absolute position along any axis. Linear encoders can be used in applications up to 1.7 kilometers long.



L 230 Magnetic (Lincoder®)

The Lincoder system consists of a magnetic tape and sensor head. The magnetic tape provides the scale for measuring systems up to 40 meters long. The absolute information is magnetized onto the tape in a 12-bit sequential code. This position information is enhanced by interpolation of sine/cosine signals provided by an additional incremental track that is magnetized on the tape. The magnetic tape is laminated onto a ferromagnetic steel strip, which is used both as a magnetic return path and a dimensionally stable mounting aid. The magnetic tape is supplied with an adhesive back for mounting by the user.

A non-contact magnetic sensor with integrated electronics is mounted to the apparatus whose position is to be measured. As the sensor moves over the measuring tape, its position is output with a resolution as low as 1 μm over a 16 meter range, or 10 μm over a 40 meter range. Position data is output via real-time compensated SSI (Synchronous Serial Interface), HIPERFACE, or RS 485. The Lincoder is also programmable via RS 485, and a number of parameters such as offset, resolution and start points can be configured by the user.



KH 53 (Pomux®) and Advanced KH 53

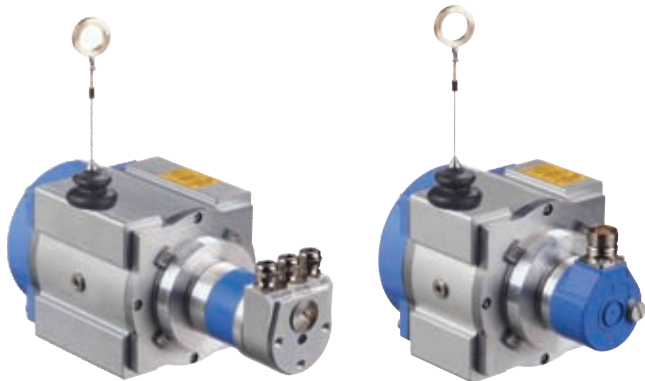
Long Distance Linear Encoders

This style of encoder is unique to SICK | STEGMANN and allows absolute measurement of up to 1.7 kilometers! The KH 53 consists of two basic components: Omega Profile sections and the sensor head. Each Omega Profile section contains a number of powerful permanent magnets. The separation between each magnet is unique and never repeated. These unique separations build up a code over the complete measurement path. In a working system, several Omega Profile sections are placed end to end along the complete measurement path. The total length of the system determines the number of profiles required. Each profile section is labeled with an identification number indicating the order in which the sections should be mounted.

The sensor head moves over the Omega Profile sections without contact, and produces absolute positional data. The KH 53 allows a generous vertical tolerance of ± 10 mm around a 25 mm nominal value, and a horizontal tolerance of ± 10 mm around the centerline. The output is available in SSI, and Profibus. Other networks can be realized using commercially available I/O modules.

In addition, this modular system offers several benefits to the user. If the measurement length of the system needs to increase in the future, the user simply needs to mount the extra profiles required. If the Omega Profile becomes damaged, only the damaged sections need to be replaced.

The Advanced KH 53 has 54 m or 548 m measuring lengths, a positional/mounting tolerance to ± 20 mm, and an operating temperature of -30 to 70°C . The Advanced KH 53 has the added advantage of requiring less installation time than the standard KH 53.



BTB/PRF Wire-Draw Encoders

Wire-draw encoders are linear-to-rotational, industrial motion conversion modules, coupled with encoder feedback, to provide cost-effective linear position measurement solutions that precisely fit your requirements. These systems are housed in rugged industrial enclosures, and contain a stainless steel or thermoplastic composite cable wound on a precise, constant-diameter spool. The cable is attached to the apparatus whose position is being measured, and is extended and retracted as the apparatus moves. A spring on the spool maintains cable tension. Position feedback is provided by a standard incremental or absolute rotary shaft encoder.

These position transducers allow very flexible measuring paths, since the cable can be guided around obstacles using pulleys, etc. The heavy-duty enclosure of the encoder and spool housing provide excellent protection against contaminants, shock and other abuses.

BKS/PKS Wire-Draw Encoders

In these compact wire-draw encoders, the encoder is integrated into the wire-draw mechanism to minimize the size of the unit.

The number of drum rotations, which is proportional to the length being measured, is counted by an encoder and converted to a standard encoder output signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult mounting conditions.

Precise linear guidance, as required for other length measurement systems, is not necessary.

The choice between absolute and incremental wire-draw encoders enables made-to-measure solutions for many applications: SSI interface for absolute wire-draw encoders, TTL interface for incremental wire-draw encoders. Both interfaces are common in automation technology and meet its exacting requirements.

The measuring lengths up to 5 m cover most of the possible applications, for example in:

Presses, punching and injection machines, storage technology, wood and sheet metal processing machines, construction machinery, medical technology and many other industries.

Linear Encoders and Wire-Draw Systems Selection Guide

Linear Absolute Encoders

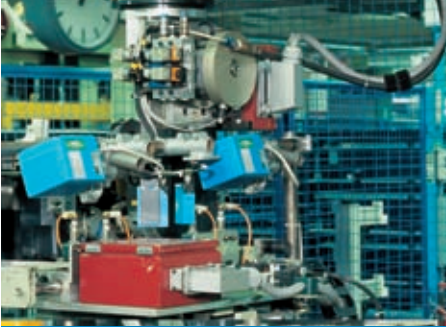


Linear Absolute Encoders

	L 230 Lincoder		KH 53 Pomux	KH 53 Pomux Advanced
Resolution	For SSI: 1 micron with calibrated tape, 10 micron with uncalibrated tape; For Hiperface: 156.25 micron	Resolution	0.1 mm	0.1 mm
Reproducibility	± 10 micron	Reproducibility	± 0.3 mm	± 1.00 mm
Measuring Length/Speed	40 m max, 6 m/sec	Accuracy Within a Measuring Element	± 1000 + ME (Tu -25°C) TK micron	± 2000 + ME (Tu -25°C) TK micron
Interface	SSI; Hiperface	Positional Tolerance	± 10 mm	± 20 mm
Supply Voltage	SSI: 10...32 V; Hiperface: 7...12 V	Operating Temperature	-20° to 60°C	-30° to 70°C
Measurement Scale Type	Stationary magnetic tape with or without glue	Measuring Length/Speed	1700 m max, 6.6 m/sec	54 m or 548 m, 6.6 m/sec
Protection Class	IP 65	Interface	SSI, Profibus DP (07hex), Class 2	SSI, Profibus DP (07hex), Class 2
Electrical Connections	M23 12-pin connector	Supply Voltage	10...32 V	10...32 V
		Measurement Scale Type	Stationary Omega profiles with embedded magnets	Stationary Omega profiles with embedded magnets
		Protection Class	IP 66	IP 66
		Electrical Connections	SSI: M23 12-pin connectors; Profibus: 3 PG cable glands	SSI: M23 12-pin connectors; Profibus: 3 PG cable glands

AVAILABLE ACCESSORIES

- Cable assemblies
- Magnetic tape
- Couplings
- Programming tool
- Wire-draw mechanism accessories



Wire-Draw Encoders



Wire-Draw Encoders				
	BTF	BKS	PRF	PKS
	(Absolute)	(Absolute)	(Incremental)	(Incremental)
Resolution	0.025 mm	0.05 mm	0.025 mm	0.05 mm
Reproducibility	± 1 measuring step	± 3 measuring step	± 1 measuring step	± 3 measuring step
Measuring Length/Speed	50 m max, 4 m/sec	5 m max, 3.5 m/sec	50 m max, 4 m/sec	5 m max, 3.5 m/sec
Interface	SSI, Profibus, DeviceNet, CANopen	SSI	TTL/RS 422 HTL push-pull	TTL
Supply Voltage	10...32 V	12...30 V	5 V or 10...32 V	4.5...5.5 V
Measurement Scale Type	Includes multi-turn absolute encoder, model ATM 60	Integrated encoder	Includes incremental encoder, model DRS 60	Integrated encoder
Protection Class	IP 64	IP 52	IP 64	IP 52
Electrical Connections	SSI: M23 12-pin connector; Profibus, DeviceNet and CANopen: Separate bus adapter with connectors or PG glands	M23 12-pin connector	M23 12-pin connector	M23 12-pin connector



Wire-Draw Mechanism	
MRA-F	
Total Measuring Length	10 m
Measuring Length/Turn	2 m, 3 m, 5 m, 10 m
Accuracy/Repeatability (% of full stroke)	0.05% drum precision
Wire Diameter/Type	1.35 mm or 0.81 mm stranded stainless steel
Encoder Options	Any 60 mm incremental or absolute servo mount encoder
Housing	Anodized aluminum
Options	Cable guides

Measuring Wheel Encoder	
DKV 60	
(Incremental)	
Resolution	1...2,048 PPR
Interface	TTL/RS 422 HTL push-pull
Supply Voltage	TTL: 4...5 V; or push-pull: 10...30 V
Measurement Scale Type	Integrated encoder
Protection Class	IP 65
Electrical Connections	Shielded cable

HIPERDRIVE®

Format Adjustment Positioning Drives



HIPERDRIVE

HIPERDRIVE (Highly Integrated Performance Drive) is an integrated drive system with absolute positioning, suitable for all kinds of format adjustment in machines and installations. The operations system includes a motor, gears, absolute encoder and field bus communication capability.

Modern logistic concepts call for smaller batch sizes in many production areas, with numerous adjustments being performed during product changeovers. The HIPERDRIVES ensure efficient, cost-effective and high-precision automation of adjustments to auxiliary axes. This process is normally called “format adjustment,” but in some markets, “automatic size change” is more familiar.

The HDA family, with a maximum torque rating of 20 Nm, and the HRA family, with a torque rating of 1 Nm to 12 Nm, are the results of a consistent and complete integration of power transmission, brushless DC motor, absolute encoder and power electronics into one positioning drive.

HIPERDRIVE ADVANTAGES

ABSOLUTE POSITION ENCODER

Absolute position available immediately after return of operating voltage

Reference traverse not required

Protection of mechanical machine elements from damage

Machine settings can always be safely logged

HIGH HOLDING TORQUE IN DE-ENERGIZED STATE

No additional brake components required for the HIPERDRIVE

Very secure process

COMPLETE INTEGRATED SYSTEM

Reduced installation and commissioning costs

Low cabling requirements: 24V DC and serial data interface only

No additional external control electronics

Separate voltage supply to motor and bus logic

“Manual” adjustment without controller, using JOG button(s)

HIPERDRIVE®

Format Adjustment Positioning Drives

Selection Guide



HIPERDRIVE Selection Guide

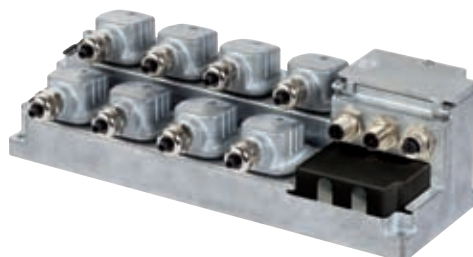
	HIPERDRIVE			
	HRA25	HRA35	HDA30	HDA45
Nominal Power Output	25 W	35 W	30 W	45 W
Maximum Torque	1 Nm 3.9 Nm 6.4 Nm 8.6 Nm	1.4 Nm 5.5 Nm 9 Nm 12 Nm	13 Nm	20 Nm
Nominal Torque	0.85 Nm 3.2 Nm 5 Nm 6.6 Nm	1.2 Nm 4.5 Nm 7.1 Nm 9.3 Nm	10 Nm	15 Nm
Nominal Speed	280 rpm 75 rpm 46 rpm 36 rpm	280 rpm 75 rpm 46 rpm 36 rpm	27 rpm	27 rpm
Static Holding Torque	0.5 Nm 3.5 Nm 4.5 Nm 5 Nm	0.5 Nm 3.5 Nm 4.5 Nm 5 Nm	25 Nm	25 Nm
Number of Steps/Revolution	16 128 1024 based on type	16 128 1024 based on type	16 128 1024 based on type	16 128 1024 based on type
Operating Voltage/Current	24 V / 2.2 A	24 V / 3A	24 V / 3.5 A	24 V / 4.8 A
Interface	Profibus, DeviceNet	Profibus, DeviceNet	Profibus, DeviceNet	Profibus, DeviceNet

1 Nm = 0.737 lbf-ft (pound-force foot)
1 Nm = 8.8507 lbf-in (pound-force inch)

HIPERDRIVE-HUB for Profibus DP

- HIPERDRIVE-HUB is the central connecting station for up to eight HIPERDRIVES
- Only one cable required per drive (the data and the driving power are transmitted in the same cable).
- Voltage Required: 24 V auxiliary supply for bus interface and control module

Type	Description
ADM-HH7XPK8SXX	HIPERFACE®-HUB Profibus, 8 outputs, fused
DOL-HH06W2M5A	Cable length 2.5 m
DOL-HH06W05MA	Cable length 5 m
DOL-HH06W10MA	Cable length 10 m
DOL-HH06W15MA	Cable length 15 m
SIK-HH10A32VN	Fuse kit HD-HUB 10A, 32VDC (cannot be reset)



Motor Feedback Systems (SinCos® series STAND ALONE)*

The Innovative HIPERFACE® Interface

Today's high-performance digital servo drive systems require absolute feedback for position control and high-resolution incremental feedback for speed control. Both are available.

Our SinCos family of servo motor feedback devices combines communication, speed regulation, and position information in a single device.



Motor Feedback Systems

	SKS/SKM36	SRS/SRM50	SRS/SRM60
	STAND ALONE	STAND ALONE	STAND ALONE
	128 sine/cosine periods	1,024 sine/cosine periods	1,024 sine/cosine periods
	<ul style="list-style-type: none"> • Solid shaft 6 mm • Absolute position 4,096 steps per revolution • 4,096 revolutions can be measured (Multiturn) • Programming of the positional value • Electronic type label 	<ul style="list-style-type: none"> • Solid shaft 6 or 10 mm • Absolute position with a resolution of 32,768 steps per revolution • 4,096 revolutions can be measured (Multiturn) • Programming of the positional value • Electronic type label 	<ul style="list-style-type: none"> • Hollow shaft • Absolute position with a resolution of 32,768 steps per revolution • 4,096 revolutions can be measured (Multiturn) • Programming of the positional value • Electronic type label
# of sine/cosine periods per revolution	128	1,024	1,024
Total number of steps	Single SKS 4,096 Multi SKM 16.777.216 = 4.096 x 4.096	Single SRS 32,768 Multi SRM 134.217.728 = 32.768 x 4.096	Single SRS 32,768 Multi SRM 134.217.728 = 32.768 x 4.096
Non linearity	± 120 angular seconds	± 52 angular seconds	± 45 angular seconds
Working speed	6,000 min ⁻¹	6,000 min ⁻¹	6,000 min ⁻¹
Working temp range	-20 ... 100 °C	-20 ... 85 °C	20 ... 115 °C
Operating voltage range	7 ... 12 V	7 ... 12 V	7 ... 12 V
Type ID	Single SKS = 32h Multi SKM = 37h	Single SRS = 22h Multi SRM = 27h	Single SRS = 22h Multi SRM = 27h

*Only stand-alone versions of the motor feedback encoders are available. For other versions, please contact our team of application engineers.

Encoder Accessories and HIPERFACE® Adapters

Encoder Accessories

CABLES AND CABLE CONNECTORS

We manufacture our own cables with lead times of 6-8 days. We provide M12, M14, M23, MS6, MS7 and MS10 cable connectors with the number of pins you need, as well as mating cables and cable/connector assemblies of various lengths.



COUPLINGS

We sell helvetical curved beam, bellows, and spring disc couplings for all our encoders.



SHAFT INSERTS/COLLETS

We provide collets and shaft inserts of various sizes for our blind and through hollow shaft encoders.

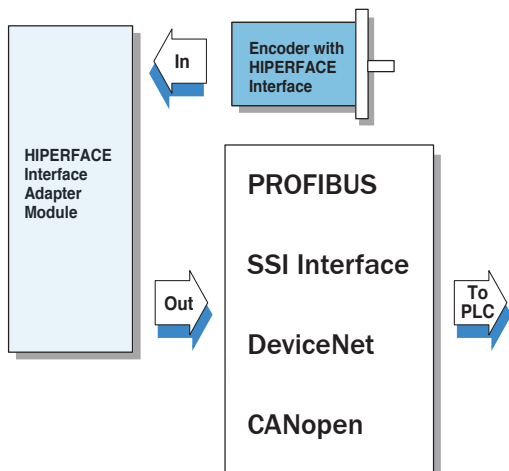
OTHER ACCESSORIES

We also offer mechanical adapters and hardware, SSI parallel adapter modules, measuring wheels, wire-draw encoder accessories, as well as programming tools and software for our programmable encoders.



Motor Feedback Meets Factory Automation

The HIPERFACE interface adapter modules allow users to connect single-turn or multi-turn encoders that have the HIPERFACE interface to systems using other communication protocols, opening up a variety of application options in all areas of automation technology.



In conjunction with a HIPERFACE interface adapter module, encoders can be used in a broad range of applications in automation technology. For example where:

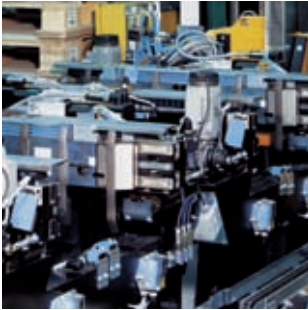
- High encoder resolutions are necessary – up to 262,000 counts per turn can be generated easily in the interface adapter via interpolation of the HIPERFACE encoder signals.
- Space is very limited.
- Environmental conditions such as dirt, temperature, shock and/or vibration must be isolated from the electronics.
- Customer-specific encoder flange and housing options are required, which must be realized quickly and at a low cost.

At the output of the interface adapter modules, SSI, Profibus, DeviceNet and CANopen are available, using standard M12 connectors. These interfaces fulfill the high requirements of automation technology. Further, the diverse range of possible combinations of interface adapter modules and encoders provides a high level of flexibility, coupled with low part replacement and stocking costs.

RANGE OF EXPERTISE

INDUSTRIAL SENSORS

Our complete range of sensors provides solutions for any application in the field of automation. Even under rugged ambient conditions, objects are reliably detected, counted and positioned in respect to their form, location and surface finish, as well as their distances.



SAFETY SYSTEMS

Comprehensive safeguarding of both personnel and machinery. As specialists in safety technology, SICK develops and manufactures pioneering products for providing protection in hazardous zones, dangerous locations and for safeguarding access points. By providing services, which encompass all aspects of machine safety and security, SICK is setting new standards in Safety Technology.



AUTOMATIC IDENTIFICATION

Whether the tasks involve identification, handling, classification or volume measurement, innovative automatic identification systems and laser measurement systems function extremely reliably, even under rapid cycle times. They conform to the latest standards and can be simply and quickly integrated in all industrial environments and external applications.



ANALYZERS AND PROCESS INSTRUMENTATION

SICK MAIHAK offers solutions for system control, maintaining setpoints, optimizing process control and monitoring the flow of materials. Our analysis and process measurement products are setting the standards for these applications in terms of technology and quality.



Worldwide presence with subsidiaries in the following countries:

Australia
Austria
Belgium/Luxembourg
Brazil
China
Czech Republic
Denmark
Finland
France
Germany
Great Britain
India
Italy
Japan
Netherlands
Norway
Poland
Republic of Korea
Republic of Slovenia
Russia
Singapore

Spain
Sweden
Switzerland
Taiwan
Turkey
USA/Canada/Mexico

Please find the detailed addresses and more representatives and agencies in all major industrial nations at www.sick.com