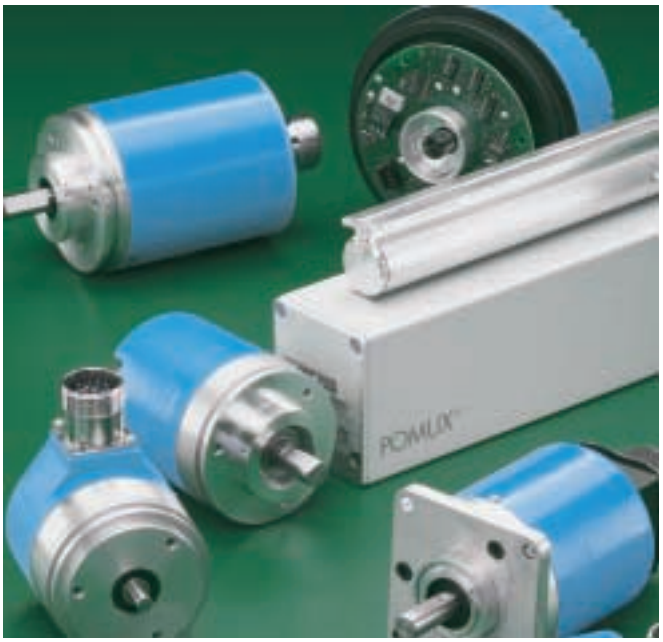
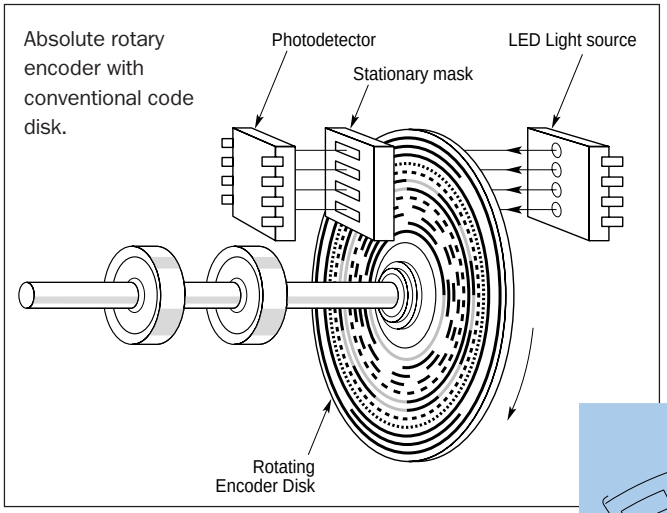
Absolute Encoders

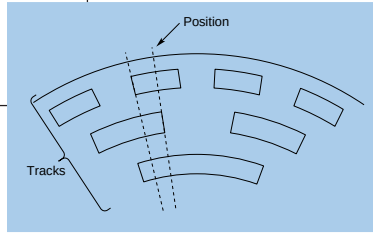
Use absolute encoders when position data must be retained after loss of power. Examples include robotics, lead/ball screws, overhead cranes, and rack and pinion applications.



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.

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.



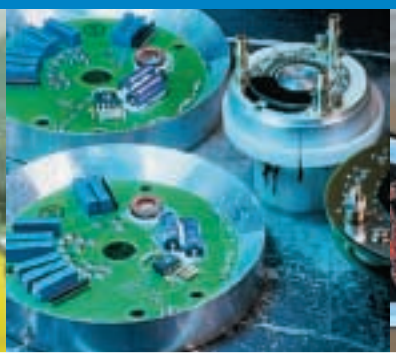


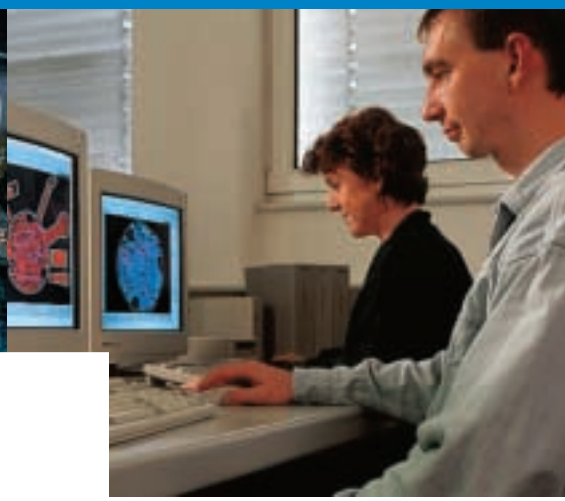
Typical disk pattern showing radial scanning method used to read position

CoreTech® Technology
The CoreTech® concept uses a minimum number of very sophisticated components to achieve maximum variety: A proprietary hybrid OPTO-ASIC, designed by SICK|STEGMANN, and a small, unique disk with a barcode track.

Unique Code Disk Design
The small CoreTech® code disk condenses absolute position information into one non-repeating circular barcode pattern. A second track with 1024 analog sine/cosine signals is used to enhance resolution and accuracy. Any absolute number of positions from 2 to 32,768 can be configured via internal software based on the single unique code disk design.

A Photodetector Array
The CoreTech® pickup system is also different from conventional encoder systems. The sensitive area of the OPTO-ASIC consists of a sophisticated sensor array, where individual sensors are selectively accessible. The sensor array reads complete serial data strings from the barcode track. At the same time a separate section of the array reads the very precise sine/cosine information, which is transformed into a high-resolution ARCTAN value within the hardwired ASIC. After synchronization of the two signals, the desired resolution and accuracy for the position data is obtained. Absolutely no angular movement is required to read the position information. Due to the high integration level of the custom ASIC, the complete operation is processed in real-time. Customer-specific resolutions are factory-selected for the CoreTech® module via firmware.





CoreTech® by SICK|STEGMANN

Magnetic Absolute Encoders
Many applications require resistance to extremely high shock and vibration, wide temperature variations, or high humidity with condensation. SICK|STEGMANN 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 ensure data integrity.

Electronic Zero Position Teach
With all SICK|STEGMANN 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.

Parallel or Serial Transmission
With parallel transmission, each position bit is transmitted over a separate data line, and all bits are read simultaneously into the control. Parallel transmission is generally used for shorter cable runs, or when real-time transmission of all data bits is required.

SICK|STEGMANN 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 3,000 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.

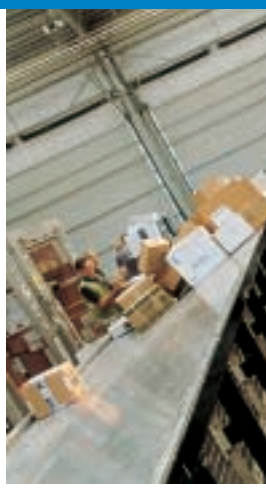
In SICK|STEGMANN multi-turn encoders, a high precision, miniaturized gear train, with a magnet on each gear stage, is used to mechanically store position information over as many as 8,192 turns. The position of each gear stage is determined with a pair of Hall sensors. This eliminates the need for costly 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
SICK|STEGMANN absolute encoders can also be supplied with popular fieldbus interfaces including DeviceNet, Profibus, and CAN Open.

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.
- **Safety.** 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

	Single-Turn Shaft/Hub Shaft/Hollow Shaft			Multi-Turn Hollow Shaft	
	ARS 20	**ARS 25**	**ARS 60**	**ATM 90-A**	**ATM 90-P**
	(CoreTech)	**(CoreTech)**	**(CoreTech)**	**(SSI)**	**(Profibus)**
Resolution	2...32,768 cpr	2...32,768 cpr	2...32,768 cpr	13 bits per turn x 8,192 turns (24 bit max), programmable	13 bits per turn x 8,192 turns (26 bit max), programmable
Diameter Size	2.0 in	2.5 in	60 mm	93 mm	93 mm
Interface	SSI, Push-pull, Open collector, TTL	SSI, Push-pull, Open collector, TTL	SSI, Push-pull	SSI	Profile for encoders (07hex), Class 2
Supply Voltage	10...30 V, 8...24 V, 5 V	10...30 V, 8...24 V, 5 V	10...32 V	10...32 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	Gray or Natural Binary	
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	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
Protection Class	IP 66	IP 66	IP 66	IP 65	IP 65
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	MS23 12-pin connector	Three M14 7-pin connectors or three PG cable glands

HVS
PRÉCONISATEUR DE SOLUTIONS DEPUIS 1985
2 rue René Laennec 51500 Taissy France
Fax: 03 26 85 19 08, Tel : 03 26 82 49 29
E-mail:hvssystem@hvssystem.com
Site web : www.hvssystem.com

Multi-Turn Shaft and Hub Shaft

	ATM 60-A (SSI)	ATM 60-D (DeviceNet)	ATM 60-C (CanOpen)	ATM 60-P (Profibus)
Resolution	13 bits per turn x 8,192 turns (24 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	60 mm	60 mm	60 mm	60 mm
Interface	SSI	DeviceNet specification release 2.0	Communication Profile DS 301 V4.0; Device Profile DSP 406 V2.0	Profile for encoders (07hex), Class 2
Supply Voltage	10...32 V	10...32 V	10...32 V	10...32 V
Output Code Formats	Gray or natural binary			Gray or natural binary
Bore/Shaft Size and Mounting	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 67	IP 67	IP67	IP 67
Electrical Connections	MS23 12-pin connector; shielded cable	Separate bus connector with single or dual 5-pin micro connectors, or single or dual PG glands	Separate bus connector with one, two or three PG cable glands	Separate bus connector with three PG cable glands

HVS
PRECONISATEUR DE SOLUTIONS DEPUIS 1985
2 rue René Laennec 51500 Taissy France
Fax: 03 26 85 19 08, Tel : 03 26 82 49 29
E-mail:hvssystem@hvssystem.com
Site web : www.hvssystem.com