



Application book for Motion Control Sensors

APPLICATIONS IN FACTORY-, LOGISTICS-, AND PROCESS-AUTOMATION

Motion Control Sensors

SICK
Sensor Intelligence.

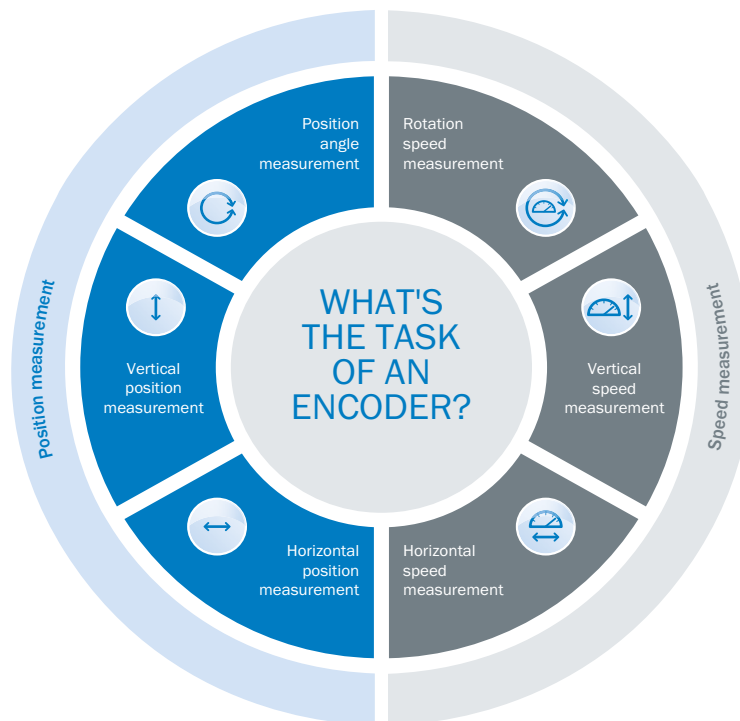


TYPICAL APPLICATIONS

This chapter describes typical applications for motion control sensors. Arranged according to industry, you will find application examples with a brief description of the typical application as well as a product recommendation from our varied

product portfolio. The motion control sensor types suggested have already been used in the application, however they are to be understood first and foremost as examples. Depending on the control concept and the mechanical requirements of the application, other

motion control sensors can also present a better option. Should you need additional assistance with selecting one of our products, our motion control sensor specialists around the world will be glad to advise you.

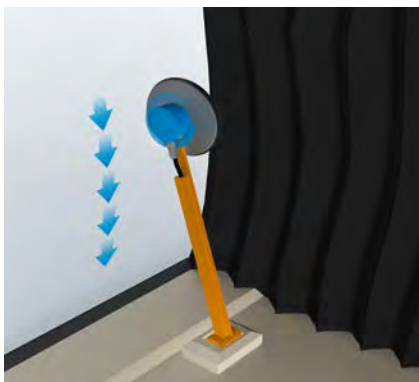




| | | | |
|---|----|---------------------------------|----|
| Airport | 4 | Metal and steel | 43 |
| Automotive and parts suppliers | 7 | Mining | 53 |
| Battery | 10 | Mobile automation | 55 |
| Building management. | 11 | Packaging | 62 |
| Building materials. | 13 | Print | 64 |
| Cement | 17 | Ports and cranes | 66 |
| Consumer care | 18 | Power | 68 |
| Courier, express, parcel and postal | 20 | Rubber and plastics. | 70 |
| Drives and controls | 21 | Semiconductor | 71 |
| Electrical data | 24 | Stone, ceramic, glass | 73 |
| Electronics and solar | 25 | Storage and conveyor. | 74 |
| Food and beverage | 28 | Textile | 77 |
| Handling and assembly technology | 31 | Tire | 78 |
| Industrial vehicles. | 33 | Traffic. | 80 |
| Maritime | 36 | Waste and recycling. | 81 |
| Machine tools | 38 | Wind energy | 82 |
| Material transport vehicles. | 41 | Wood. | 84 |

| Airport | Absolute encoders | | Incremental encoders | | | Measuring wheel encoders | | | | Wire draw encoders |
|---|-------------------|--------------------|----------------------|-------|-------|--------------------------|-------|-------|--------|--------------------|
| | AHS/AHM36 | AFS/AFM60 PROFINET | DBS36 Core | DLS40 | DFS60 | DBV50 Core | DFV60 | DUV60 | MWS120 | HighLine |
| Automated height readjustment of the passenger boarding bridge | | | | | ■ | ■ | | | ■ | |
| Dynamic freight measuring | | | | | ■ | | | | | |
| Positioning of the ULD cab | | | | | | | | | | ■ |
| Positioning the lift | ■ | | | | | | | | | |
| Recording the rotational movement of the bridgehead rotation system | | ■ | | | | | | | | |
| Speed measurement on the conveyor belt | | | | | | | ■ | ■ | | |
| Speed measurement on the transport vehicle | | | | | ■ | | | | | |
| Static freight measuring | | | | | ■ | | | | | |
| Überwachen des Rolltors zur Gepäckhalle | ■ | | ■ | ■ | | | | | | |
| Vermessen von Frachtobjekten | | | | | ■ | | | | | |

Automated height readjustment of the passenger boarding bridge



The distance between the aircraft and the ground changes both when boarding and disembarking. The height of the passenger boarding bridge needs readjustment to prevent damage to the aircraft

door. A DFS60 incremental encoder installed on a measuring wheel that is placed at the aircraft fuselage provides the data for this readjustment.

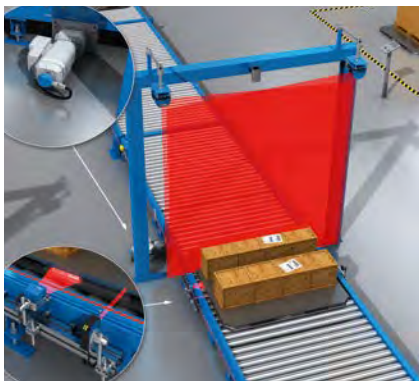
Recommended products

DFS60

DBV50 Core

MWS120

Dynamic freight measuring



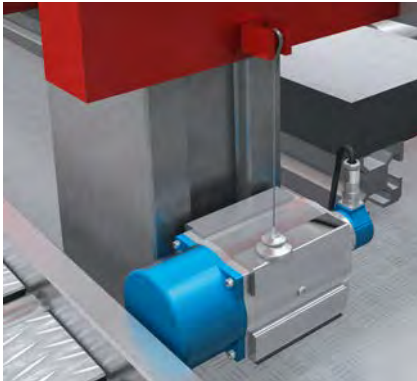
Two LMS5xx 2D LiDAR sensors installed above the conveyor belt scan the freight during transit through the measuring system. A three-dimensional image is produced using the two-dimensional scan data from the LMS5xx scanners and the precise speed data of the DFS60

high-resolution incremental encoder. This makes it possible to determine the dimensions and volume of the air freight cargo. The CLV62x fixed mount bar code scanner reads the freight identification number attached to a load carrier.

Recommended products

DFS60

Positioning of the ULD cab



The HighLine wire draw encoder provides the information necessary to precisely position the ULD lift at the individual

storage levels in the ULD warehouse. The encoder features high resistance to shocks and vibrations.

Recommended products

HighLine

Positioning the lift



The AHM36 absolute encoder provides the data to position the lift with high accuracy and high repeatability. The encoder is available with CANopen, IO-Link or SSI interface - depending on the used control architecture of the early baggage accumulator. Intelligent diagnostic functions enable evaluations

for the maintenance of the early baggage accumulator and thus a high system reliability. The mechanical installation of the AHM36 is highly flexible due to the rotatable connector or line connection, different mounting hole patterns and many different shafts.

Recommended products

AHM36

Recording the rotational movement of the bridgehead rotation system



The AFS/AFM60 PROFINET absolute encoder determines the rotation of the passenger boarding bridge's bridgehead rotation system. The encoder's data

enables the bridgehead to be maneuvered exactly parallel to the aircraft and be precisely docked.

Recommended products

AFM60 PROFINET

Speed measurement on the conveyor belt



A DFV60 high-resolution, incremental measuring wheel-encoder installed under the conveyor belt provides information about the transport speed of a piece

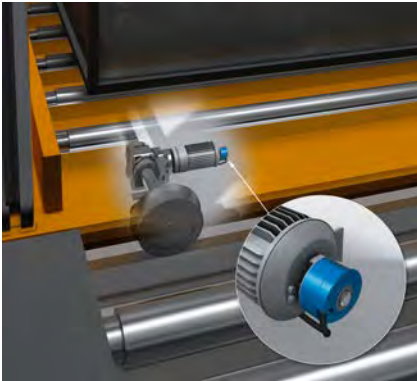
of luggage. The DFV60 is very rugged, allowing it to be used even in areas with high levels of vibrations.

Recommended products

DFV60

DUV60

Speed measurement on the transport vehicle



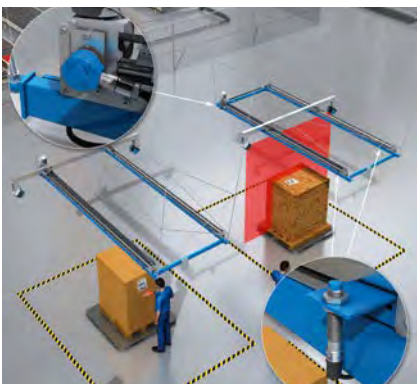
The DFS60 incremental encoder supplies information for controlling the speed of the transfer vehicle. With its high resolution, the DFS60 encod-

er ensures maximum reproducibility. There are numerous encoder variants to accommodate nearly all mechanical and electrical interfaces.

Recommended products

DFS60

Static freight measuring



Two LMS5xx 2D LiDAR sensors are installed on a positioning unit above the cargo. This positioning unit is evenly maneuvered along over the cargo, during which two-dimensional scan data of the cargo is recorded. In addition, a DFS60 incremental encoder provides precise speed information. This makes

it possible to determine the dimensions and volume of the air freight cargo. The measuring process is activated by scanning the freight identification number. This is done using an IDM16x mobile hand-held scanner. Inductive proximity sensors detect the end positions of the positioning unit.

Recommended products

DFS60

Monitoring the roll-down gate to the baggage hall



During periods when no luggage is being fed from the collecting belt to the baggage hall, a shutter door secures the baggage hall from unauthorized access.

Two G6 miniature photoelectric sensors monitor the opening and closing of the shutter door.

Recommended products

AHS/AHM36

DBS36 Core

DLS40

Measurement of freight objects



Two 2D LiDAR sensors on a positioning unit are evenly maneuvered over the cargo to provide space-saving static measurement of individual freight objects that are not positioned on a load carrier. Two LMS4000 scanners record two-dimensional scan data of the cargo. A DFS60 incremental encoder provides

the positioning unit with high-precision speed information. This makes it possible to calculate the dimensions and volume of the cargo. IME inductive proximity sensors determine the end positions. A IDM16x mobile hand-held scanner reads the identification number of the air freight cargo.

Recommended products

DFS60

| Automotive and part suppliers | Incremental encoders | | | Measuring wheel encoders | | Safety encoders | Wire draw encoders | | |
|---|----------------------|-------|-------|--------------------------|--------|-----------------|--------------------|----------|---------|
| | DBS60 Core | DFS60 | DUS60 | DBV50 Core | MWS120 | DFS60S Pro | EcoLine | HighLine | Compact |
| Detecting printed circuit boards | | ■ | | | | | | | |
| Height and vertical positioning of electrical overhead conveyer | | | | | | | ■ | | |
| Height monitoring at the scissor lift table | | | | | | | ■ | | |
| Measurement of the vehicle speed | | ■ | | | | | | | |
| Positioning the height of the lifter | | | | | | | | ■ | |
| Positioning the height of the scissor lift table | | | | | | | | | ■ |
| Safety locking function with standstill monitoring for maximum productivity | | | | | | ■ | | | |
| Safety solutions allowing automated guided carts to travel at high speeds | | | | | | ■ | | | |
| Speed measurement of belt for detecting circuit boards | ■ | | ■ | ■ | ■ | | | | |
| Speed measurement of electrical overhead conveyer | ■ | | | | | ■ | | | |

Detecting printed circuit boards



The WLL180T fiber-optic sensor in combination with the LL3-TS fibers is ideal for detecting the front edges of printed circuit boards on conveyor belts. This system supplies the position data

of the printed circuit boards quickly and reliably. The DFS60 incremental encoder transfers the position of the conveyor for synchronization of both sensor signals.

Recommended products

DFS60

Height and vertical positioning of electrical overhead conveyer



The electrical overhead conveyer brings the car bodies to designated workplaces. The compact BCG wire draw encoder ensures that the defined height position

is approached accurately. Eliminating the coupling between the wire draw encoder and suspension mechanism enables highly accurate positioning.

Recommended products

EcoLine

Height monitoring at the scissor lift table



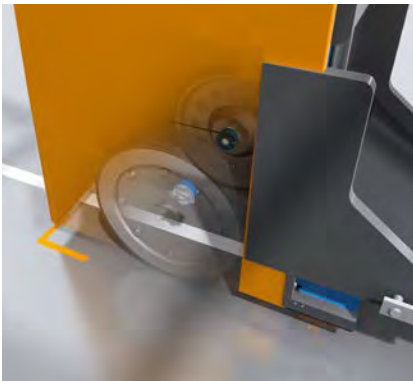
Following machining, residual grids are placed on a scissor lift table. To ensure a smooth transfer, the height of the stack must be aligned with that of the machining table. The analog signal values of the

EcoLine wire draw encoder are used to determine the lifting height. When the maximum load has been reached, the worker removes the stack of residual grids.

Recommended products

EcoLine

Measurement of the vehicle speed



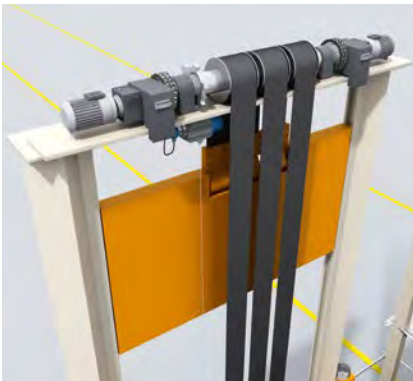
The route of the automated guided vehicle (AGV) is stipulated by the higher-level control system. The DFS60 incremental encoder determines the speed of the

wheels of the AGV. This information is used to control the safety laser scanners.

Recommended products

DFS60

Positioning the height of the lifter



Distance sensors with reflectors or wire draw encoders are used for measuring the height position of the lift. The BTF wire draw encoder determines the direct

position and speed at the drive control of the lift using a variety of selectable interfaces.

Recommended products

HighLine

EcoLine

Positioning the height of the scissor lift table



The scissor lift table brings the power-train with the drive unit to the correct height position for installation on the car body. The compact BKS wire draw en-

coder measures the height precisely and passes this on to the scissor lift table controller via the SSI interface.

Recommended products

Compact

Safety locking function with standstill monitoring for maximum productivity



The safe standstill monitoring function only unlocks the locking device when the system has come to a standstill. Thanks to SOS (safe operating stop), the drive does not need to be disconnected from the power supply. Safe Interlocking saves precious space and ensures maximum productivity: no unnecessary downtimes,

while ensuring safe, cost-effective, and standard-compliant operation of the system. The “safe monitoring of machine speed” function can be used when carrying out maintenance. Proven safety components from SICK increase availability and avoid follow-up costs.

Recommended products

DFS60S Pro

Safety solutions allowing automated guided carts to travel at high speeds



Automated guided carts (AGC) manage high speeds even when going around curves thanks to the switching of protective fields. Reliable detection of speed

and direction of travel with safety solutions from SICK also reduces the number of components and thereby the required installation space in AGCs.

Recommended products

DFS60S Pro

Speed measurement of belt for detecting circuit boards



The DBS60 incremental encoder transfers the position of the belt for synchronization of both sensor signals. Alternative-

ly, the belt speed can be taken directly on the belt using a measuring wheel encoder. This can reduce slippage.

Recommended products

DBS60 Core

DUS60

DBV50 Core

MWS120

Speed measurement of electrical overhead conveyor



The electrical overhead conveyor brings the car bodies to designated workplaces. The speed is specified by the higher-level control; an incremental encoder determines the speed. In case of requirements

for secure speed, the DFS60S Pro assists with the realization of collision protection in combination with a safety laser scanner.

Recommended products

DBS60 Core

DFS60S Pro

| Battery | Incremental encoders | | Safety encoders |
|--|----------------------|-------|-----------------|
| | DBS36 Core | DLS40 | DFS60S Pro |
| Length monitoring of deflectors with Smart Sensors | ■ | ■ | |
| Protection of automated guided vehicles | | | ■ |
| Spliceband detection | ■ | ■ | |

Length monitoring of deflectors with Smart Sensors



Smart Sensors generate and receive more than classical switching signals and measurands. Thanks to the A72 Smart Task, a Smart Sensor of the W4 product family delivers a length measurement result through internal offset-

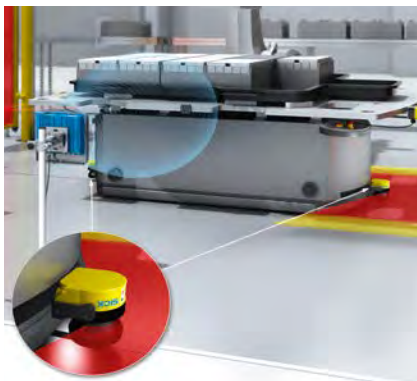
ting of an encoder signal (e.g. DBS36) with its own detection signal. This allows for cost-effective and intelligent inspection of deflector flags for completeness and reference length.

Recommended products

DBS36 Core

DLS40

Protection of automated guided vehicles



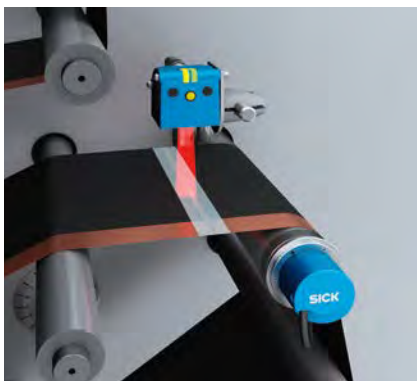
SICK offers an extensive portfolio of products for the protection of automated guided vehicles in the production of battery packs. When used in combination with a safety controller, safety encoder

and emergency stop pushbutton, the S300 Mini Remote safety laser scanner ensures protection of both human and machine.

Recommended products

DFS60S Pro

Spliceband detection



When changing the roll, the beginning and end of two consecutive rolls are joined together using splicing tape. Color, contrast, luminescence, and glare sensors from SICK detect the tape. As a

result, it can be removed when the film is processed further during cell production. A SICK encoder also increases the position detection accuracy.

Recommended products

DBS36 Core

DLS40

| Building management | Absolute encoders | | Incremental encoders | | | Linear encoders |
|--|-------------------|---------------|----------------------|-------|------------|-----------------|
| | AHS/AHM36 | AFS/AFM60 SSI | DBS36 Cor | DLS40 | DBS60 Core | KH53 |
| Position determination of high speed gates | ■ | ■ | ■ | ■ | | |
| Position determination on a revolving door | ■ | | | | | |
| Positioning stadium roofs | | | | | | ■ |
| Speed measurement on the elevator engine | | ■ | | | ■ | |
| Speed and position monitoring of elevator cars | | ■ | | | ■ | |
| Speed monitoring in escalators with incremental encoders | | | ■ | ■ | ■ | |

Position determination of high speed gates



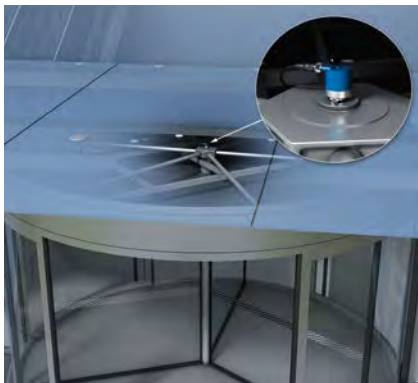
A DBS36 incremental encoder precisely monitors the upper and lower end position as well as the speed of the high speed gate. The encoder can be assem-

bled easily using face mount flanges or hollow shafts and saves on installation space due to its compact size.

Recommended products

DBS36 Core DLS40 AHS/AHM36 AFS/AFM60 SSI

Position determination on a revolving door



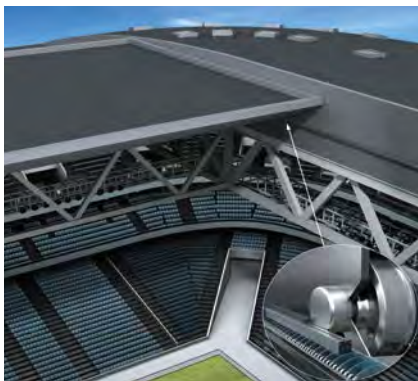
Encoders detect the absolute position of the rotation axis . They precisely position the revolving door and reliably monitor

its rotation speed. Various interfaces are available for transmitting the recorded data to the door control.

Recommended products

AHS/AHM36

Positioning stadium roofs



The KH53 linear encoder monitors the opening and closing of large stadium roofs without making contact. It precisely determines the position of the heavy

roofelements even under tough ambient conditions such as contamination, dust, fog, shock and vibrations.

Recommended products

KH53

Speed measurement on the elevator engine



DBS60 incremental encoders are mounted directly on the elevator engine and deliver precise speed measurement data

to the elevator control. Diverse installation options due to different flange and shaft versions make mounting easy.

Recommended products

DBS60 Core

AFM60 SSI

Speed and position monitoring of elevator cars



AFM60 absolute encoders offer a large selection of mechanical interfaces and electrical contacting options. Mounted on a measuring wheel, the encoder

transmits absolute position information to the elevator control, which monitors the speed and can precisely position the elevator car.

Recommended products

AFM60 SSI

DBS60 Core

Speed monitoring in escalators with incremental encoders



The DBS60 Core incremental encoders monitor the movement of escalators and control the speed. The sensors have

many installation options thanks to the various flange and shaft types as well as the universal cable connections.

Recommended products

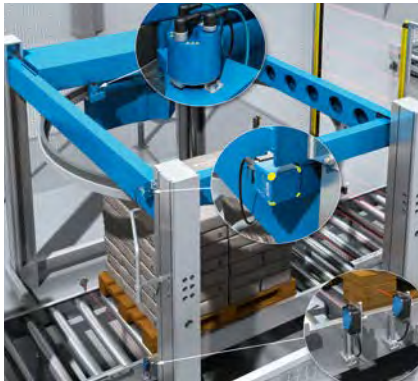
DBS36 Core

DLS40

DBS60 Core

| Building materials | Absolute encoders | | Incremental encoders | Linear encoders | Laser surface motion sensors |
|---|--------------------------|-----------------------|----------------------|-----------------|------------------------------|
| | AFS/AFM60 EtherNet/IP | AFS/AFM60 PROFINET | DFS60 | KH53 | SPEETEC 1D |
| Controlling the wrapping process | ■ | | | | |
| Determining the belt speed | | | ■ | | |
| Detecting the position of overhead traveling crane gears | | ■ | | | |
| Filling of gypsum transport tanks | | | ■ | | |
| Monitoring conveyor belt operation during material handling | | | ■ | | |
| Monitoring rotary valve operation during material discharge | | ■ | | | |
| Monitoring the bucket conveyor at the clinker cooler outlet | | | ■ | | |
| Monitoring the conveyor belt for secondary fuels | | | ■ | | |
| Monitoring the coal conveyor belt operation | | | ■ | | |
| Monitoring the fan speed | | | ■ | | |
| Positioning outdoor overhead traveling cranes | | | | ■ | |
| Positioning the stacker | | | | ■ | |
| Positioning the trolley | | | | ■ | |
| Speed and length measurement of plasterboard | | | | | ■ |

Controlling the wrapping process



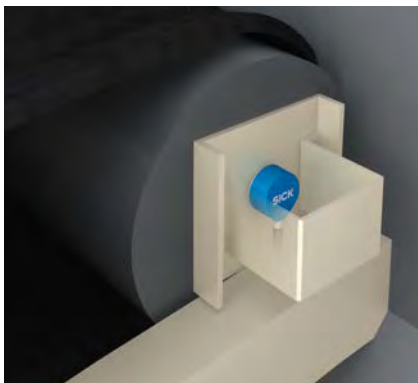
After the pallet has reached its position, the stretch film is secured to the pallet and wrapped using upward and downward movements of the film. SICK's measurement technology products handle both the measurement of pallet dimensions and detection tasks for controlling

the wrapping process. For this task, the IQ40 compact inductive proximity sensor is used as the end position switch. While two WL280-2 compact photoelectric sensors determine the position of the pallet, the AFM60 EtherNet/IP absolute encoder monitors the wrapping process.

Recommended products

AFM60 EtherNet/IP

Determining the belt speed



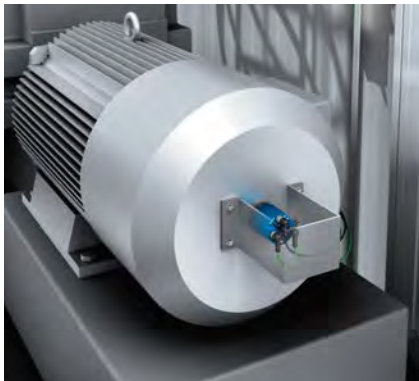
When fuel and raw materials are transported on conveyors to storage locations for further processing, the conveyor belt's speed is very important when it comes to controlling material flow. The DFS60 incremental encoder precisely calculates the speed and running direction of a belt, regardless of whether it is installed on a drive or deflection

roller. When monitoring the ends without a drive, reliable feedback can be given to see whether the conveyor system is working correctly. The encoder can either be configured via a PC or a separate programming tool. The DFS60 therefore provides comprehensive programming flexibility for all industrial requirements.

Recommended products

DFS60

Detecting the position of overhead traveling crane gears



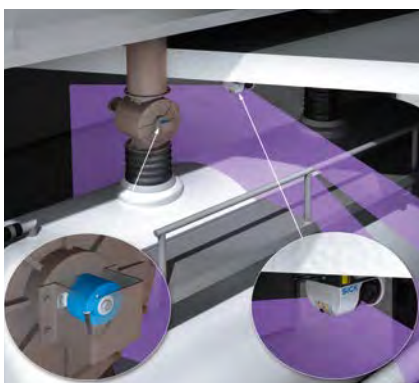
Combining multiple encoders makes it particularly easy to ensure the correct positioning of cranes. Linear encoders or long-range distance sensors can be used for the precise detection of the X-axis and Y-axis on the crane, while a multiturn absolute encoder can be used for the Z-axis. The AFM60 PROFINET absolute

encoder is a robust, durable solution for detecting the absolute position of traveling crane gears and the position of the crane harness. Absolute encoders measure unlimited path lengths by counting revolutions. They can be used in the harsh ambient conditions found in outdoor areas of cement plants.

Recommended products

AFM60 PROFINET

Filling of gypsum transport tanks



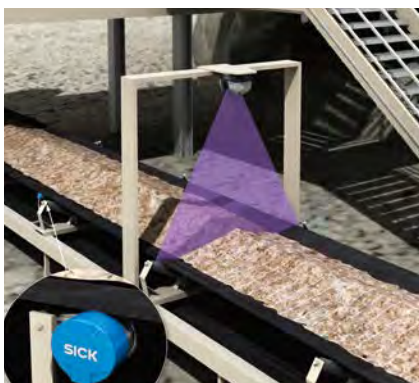
Gypsum (CaSO_4) is a by-product created by the oxidation of the CaSO_3 solution that arises during the desulfurization process. It is sold to the construction industry or re-used directly in cement plants. Sensors are used to assist with product fill in the gypsum tankers. Sensors are used to fill the gypsum tankers with the

product. The LMS511 is used to position the loading spouts correctly for filling the gypsum into the tanker or truck. The DFS60 incremental encoder accurately controls the speed of the metering unit and enables dust-free filling.

Recommended products

DFS60

Monitoring conveyor belt operation during material handling



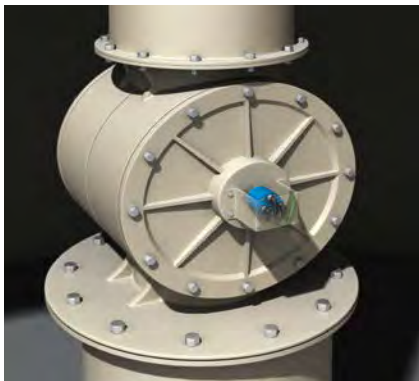
Conveyor belts transport raw material deliveries to interim storage facilities and then take steel products and slag to storage areas and to the dispatch points. A conveyor belt malfunction can cause significant delays in production and involve major costs. It is therefore necessary to monitor the operation of

all conveyor belts, as well as the proper loading, unloading, and positioning of products. The Bulkscan[®] LMS511 laser volume flowmeter performs these tasks in combination with a DFS60 incremental encoder, which provides the speed information. Zero Contact, Zero Wear – the Smart Solution for Conveyor Belts.

Recommended products

DFS60

Monitoring rotary valve operation during material discharge



Rotary valves are small parts used for material flow in cement plants, and they play an important role in the material flow process, which is vital for an uninterrupted cement production. Typical locations for rotary valves include discharging systems for raw meal, additives, dust or ash from silos, bunkers and hoppers as well as transfer points

in conveying systems. So that all system parts function without error, the rotation axis of rotary valves are monitored using absolute encoders, such as the AFS60 PROFINET. An alternative solution to determine the valve position is the use of inductive proximity sensors such as the IMB.

Recommended products

AFS60 PROFINET

Monitoring the bucket conveyor at the clinker cooler outlet



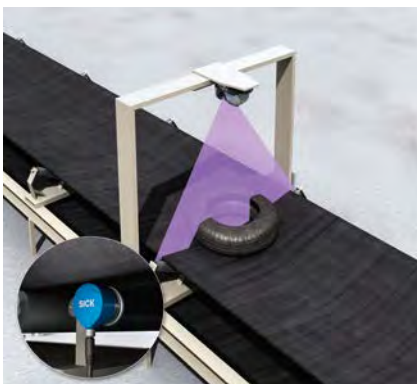
After the burning process, a bucket conveyor transports the hot clinker to the interim storage area. Belt malfunctions can cause significant delays in production and involve major costs. It is therefore necessary to monitor the operation of all conveyor belts, as well as the proper loading, unloading, and position-

ing of products. The Bulkscan® LMS511 laser volume flowmeter performs these tasks in combination with a DFS60 incremental encoder, which provides the speed information. Zero Contact, Zero Wear – the Smart Solution for Bucket Conveyor Belts.

Recommended products

DFS60

Monitoring the conveyor belt for secondary fuels



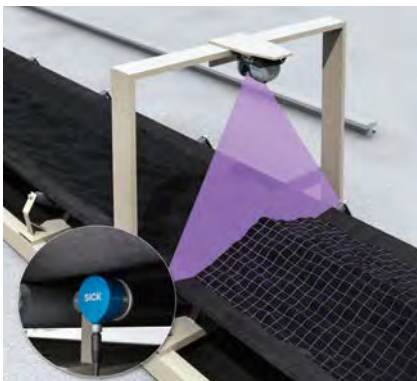
Secondary fuels such as used tires are often transported on conveyor belts to the rotary kiln. A conveyor belt malfunction can cause significant delays in production and involve major costs. Therefore it is necessary to monitor the operation of all conveyor belts, as well as the proper loading, unloading, and posi-

tioning of fuels. The Bulkscan® LMS511 laser volume flowmeter performs these tasks in combination with a DFS60 incremental encoder, which provides the speed information. Zero Contact, Zero Wear – the Smart Solution for Conveyor Belts.

Recommended products

DFS60

Monitoring the coal conveyor belt operation



Conveyor belts convey materials throughout all areas of cement plants. They transport raw material and fuels to interim storage facilities and then take steel products and slag to storage areas and to the dispatch points. A conveyor belt malfunction can cause significant delays in production and involve major costs. Therefore it is necessary to monitor the

operation of all conveyor belts, as well as the proper loading, unloading, and positioning of fuels. The Bulkscan® LMS511 laser volume flowmeter performs these tasks in combination with a DFS60 incremental encoder, which provides the speed information. Zero Contact, Zero Wear – the Smart Solution for Conveyor Belts.

Recommended products

DFS60

Monitoring the fan speed



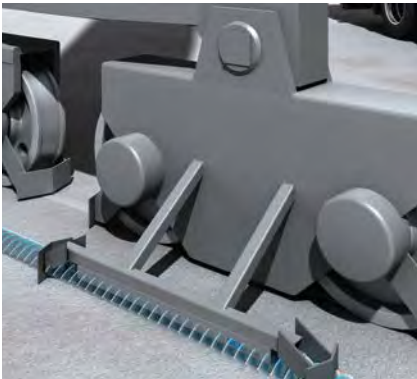
The hot clinker falls out of the rotary kiln onto an air-permeable moving grate and is cooled with air. Speed-regulated fans are used in order to adjust the amount of cool air according to the requirements. The DFS60 incremental encoder measures the speed of the fans with high precision and thus helps to ensure

efficient heat exchange between the hot clinker and the cooling air. This guarantees uninterrupted and high quality clinker production. The encoder can either be configured via a PC or a separate programming tool. The DFS60 therefore provides comprehensive programming flexibility for all industrial requirements.

Recommended products

DFS60

Positioning outdoor overhead traveling cranes



The crane's position must be determined automatically. Outdoor use across long distances and under sometimes difficult measurement conditions, such as uneven measuring distances like railways, poses a great challenge to the measuring system. The KH53 linear encoder measures distances of up to 1,700 m, even under poor environmental

conditions. With a resolution of 0.1 mm and a reproducibility of up to 0.3 mm, the KH53 is suitable for exact positioning tasks on overhead traveling cranes. Due to its absolute positioning functionality, the sensor provides the correct position immediately after being switched on, so a reference run of the crane is not necessary.

Recommended products

KH53

Positioning the stacker



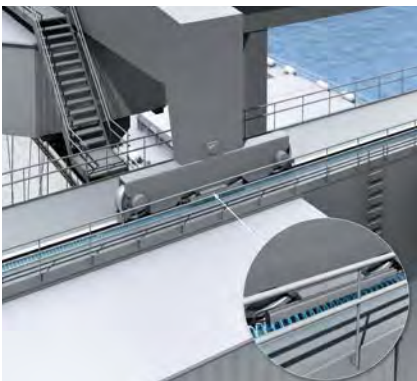
The position of the stacker must be determined automatically. Outdoor use across long distances and under sometimes difficult measurement conditions, such as uneven measuring distances like railways, poses a great challenge to the measuring system. The KH53 linear encoder measures a distance of up to 1,700 m, even under poor environmen-

tal conditions. Thanks to the magnetic measurement principle, dirt and dust do not affect the performance. Even salt water or extreme weather conditions, such as mist, do not limit the functionality of the encoder. This avoids downtime, and ensures high productivity in these applications.

Recommended products

KH53

Positioning the trolley



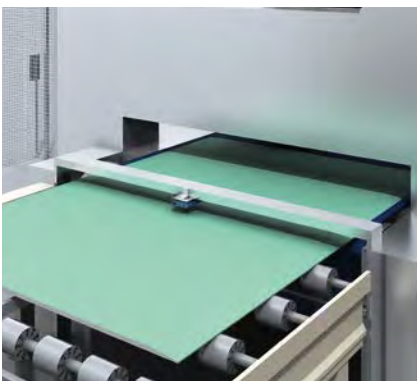
The KH53 is perfectly suited for positioning the traveling trolley on a crane. It provides good repeatability of up to 0.3 mm, and long reading distances of up to 55 mm. It is extremely rugged in the event of shocks and vibrations, and stands up to the affects of severe weather. With the position data of the traveling crane, it is

possible to very precisely load BigBags (flexible intermediate bulk containers) with little deviation. Due to its wear-free measurement design, the positioning systems can be reliably used for many years and enable high productivity of the crane with low maintenance costs.

Recommended products

KH53

Speed and length measurement of plasterboard



The production of plasterboard requires a very high level of quality. The fast production processes involved demand a reliable speed and length measurement

to ensure adherence to the standard dimensions of the plasterboard. SPEETEC solves this task reliably without any contact with the product.

Recommended products

SPEETEC 1D

| Cement | | | | |
|---|-------------------|-----------|----------------------|-------|
| | Absolute encoders | | Incremental encoders | |
| | AHS/AHM36 | AFS/AFM60 | DFS60 | DUS60 |
| Detection of the number of windings on the stretch banding machine | ■ | ■ | | |
| Speed measurement of the roller conveyor for palletizing cement sacks | | | ■ | ■ |

Detection of the number of windings on the stretch banding machine



After the pallet has reached its position, the stretch film is secured to the pallet and wrapped using upward and downward movements of the film. The number

of windings is determined via a gear wheel on the sprocket with an AFM60 absolute encoder.

Recommended products

AFM60

AHM36

Speed measurement of the roller conveyor for palletizing cement sacks



Automatic palletizers stack the filled cement bags onto pallets. The DFS60 incremental encoder monitors the trans-

port speed of the pallets on the roller conveyor.

Recommended products

DFS60

DUS60

| Consumer care | | | | | |
|--|--------------------------|-----------------------|----------------------|-----------------|------------|
| | Absolute encoders | | Incremental encoders | Safety encoders | |
| | AFS/AFM60 EtherNet/IP | AFS/AFM60 PROFINET | DFS60 | AFS/AFM60S Pro | DFS60S Pro |
| Safe speed monitoring on automated guided vehicles (AGV) | | | | ■ | ■ |
| Speed detection for correct labeling | | | ■ | | |
| Speed monitoring of winding head | ■ | | | | |
| Synchronization of infeed systems | | ■ | | | |

Safe speed monitoring on automated guided vehicles (AGV)



The DFS60S Pro incremental safety encoder is used on the main drive axle of an AGV to determine a safe speed, while the AFS/AFM60S absolute encoder detects the safe steering angle. The

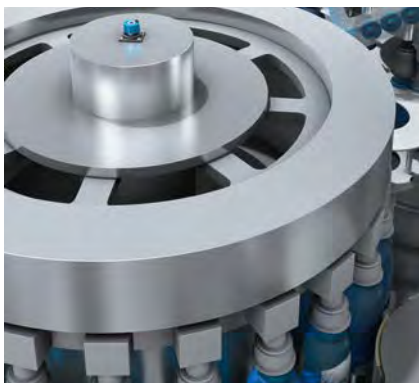
encoders provide data relating to the steering angle and path. The FX3-MOC motion control modules allow this data to be evaluated in the Flexi Soft safety controller.

Recommended products

AFS/AFM60S Pro

DFS60S Pro

Speed detection for correct labeling



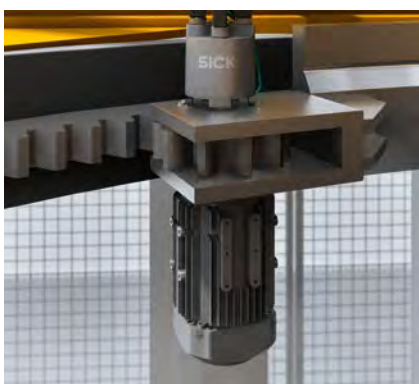
The process of dispensing labels is synchronized with bottle transport, to ensure the label is attached smoothly and in the right place. The labeling module needs to have exact measured values relating

to the movement so it can deal with machine startup and variable production speeds. The DFS60 incremental encoder is easy to mount and generates high-precision speed and position values.

Recommended products

DFS60

Speed monitoring of winding head



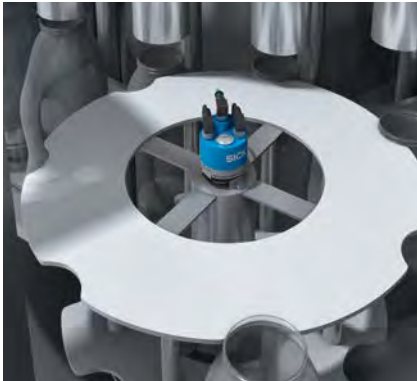
In order to optimally control the wrapping process, it is necessary to monitor the speed of the winding head and the number of windings. The high-resolution AFM60 absolute encoder is used here.

With the EtherNet/IP™ fieldbus interface, the encoder can be integrated into the machine controller easily and cost-effectively.

Recommended products

AFS/AFM60 EtherNet/IP

Synchronization of infeed systems



If bottling systems are to deliver high availability, they require a continuous supply of bottles. The infeed is therefore synchronized with the rotation of the ring tank. Several AFM60 PROFINET absolute

encoders on the carousel and the conveying line control the infeed speed and product position, thus avoiding collisions.

Recommended products

AFM60 PROFINET

| Courier, express, parcel and postal | | | | | | | |
|--|-----------------------|----------------------|-------|-------|--------------------|-------|--------|
| | Absolute encoders | Incremental encoders | | | Wire draw encoders | | |
| | AFS/AFM60 PROFINET | DBS60 Core | DFS60 | DUS60 | DFV60 | DUV60 | MWS120 |
| Speed measurement on conveying systems using encoders | ■ | | ■ | | ■ | ■ | ■ |
| Speed measurement on the belt for ensuring equal object distances in a postal sorting system | | ■ | | ■ | | | |
| Speed measurement on the belt for speed control of the system | | | | | ■ | ■ | |

Speed measurement on conveying systems using encoders



The measured values from programmable encoders can be used to control the conveying speed. They fulfill require-

ments such as high resolution, maximum repeatability, and support for all mechanical and electrical interfaces.

Recommended products

| | | | | |
|-----------------------|-------|-------|-------|--------|
| AFS/AFM60 PROFINET | DFS60 | DFV60 | DUV60 | MWS120 |
|-----------------------|-------|-------|-------|--------|

Speed measurement on the belt for ensuring equal object distances in a postal sorting system



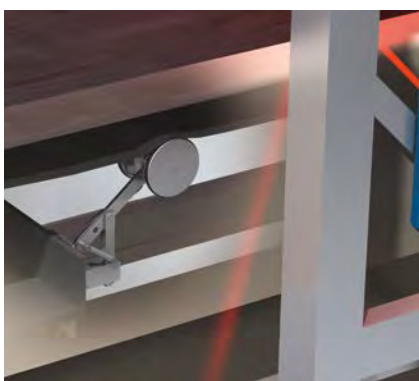
The leading edge detection serves to convey objects at a specified distance from the belts to the main sorter. The combination of high-resolution light grids and high-resolution encoders allows leading edge detection and the detection of additional object profile information such as the length. The duration of the

light grid interruption and the speed of the belt that is measured by the encoder provide information about the length of the objects. This information is required in order to accelerate or slow down individual belt segments so that the objects can be placed properly on the sorter.

Recommended products

| | |
|------------|-------|
| DBS60 Core | DUS60 |
|------------|-------|

Speed measurement on the belt for speed control of the system



The actual speed is a significant parameter for the precise control of a driven system such as a conveyor belt. Incremental measuring wheel encoders with

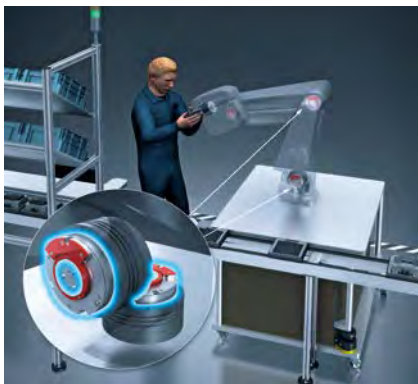
a high resolution of up to 65,536 pulses per rotation supply the controller with precise signals for the speed.

Recommended products

| | |
|-------|-------|
| DFV60 | DUV60 |
|-------|-------|

| Drives and controls | Absolut encoders | | Incremental encoders | | Linear encoders | | Measuring wheel encoders | | | Safety encoders | Motor feedback systems rotary HIPERFACE® | |
|--|---------------------|-----------|----------------------|-------|-----------------|-------|--------------------------|-------|--------|-----------------|--|-----------|
| | AFS/AFM60 EtherCAT® | AFS/AFM60 | DBS36 Core | DLS40 | MAX® | TTK70 | DBV50 | DUV60 | MWS120 | DFS60S Pro | SES/SEM70 | SES/SEM90 |
| Collaborating robots | | | | | | | | | | | ■ | ■ |
| Determining position in modular transfer systems | | | ■ | ■ | | | | | | | | |
| Efficient set-up of roller drives | | | | | | | | | | ■ | | |
| Monitoring of direction of travel and speed for automated guided carts | | | | | | | | | | ■ | | |
| Position determination of a SCARA robot | | | | | | ■ | | | | | | |
| Positioning of hydraulic cylinders | | | | | ■ | | | | | | | |
| Positioning of the pallet shuttle | | | ■ | ■ | | | ■ | ■ | ■ | | | |
| Reliable control of a driving unit | ■ | | | | | | | | | | | |
| Safe speed in automated production | | | | | | | | | | ■ | | |
| Stroke positioning on the crane | ■ | ■ | | | | | | | | | | |

Collaborating robots



Collaborating robots, called cobots, are built compactly and require a high degree of repeatable positioning accuracy. The SES/SEM70 and SES/SEM90 rugged motor feedback systems for direct and mechanically rigid mounting on hollow shaft motors or motor-gear com-

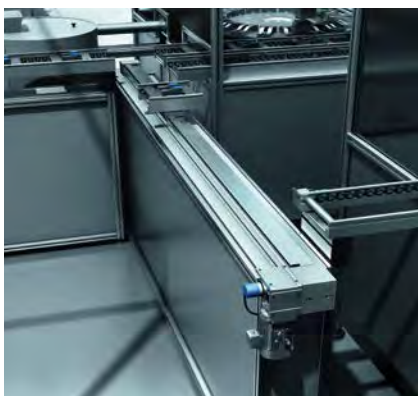
binations are the space-saving solution for modern cobots and are well-suited for the safe operation of cobots when combined with other sensors. The motor feedback systems are maintenance- and wear-free thanks to the bearing-free technology.

Recommended products

SES/SEM70

SES/SEM90

Determining position in modular transfer systems



For the flexible adaptation of modular transfer systems to different assembly systems, these transfer systems incorporate the use of what are known as right angle transfers, cross transfer belts or shuttle units. These elements make it possible to rotate the workpiece carriers 90 or 180 degrees. This repositioning of the carriers is typically carried out

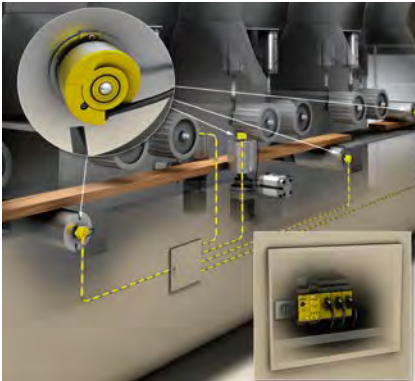
using electric DC or stepper motors or with pneumatic lifting cylinders. DBS36 Core incremental encoders determine the position of the electric axes. These encoders are available in models featuring a blind hollow shaft or a face mount flange with a solid shaft. In pneumatic lifting cylinders on the other hand, MZT8 magnetic cylinder sensors are the optimal choice for precise position sensing.

Recommended products

DBS36 Core

DLS40

Efficient set-up of roller drives



With the FX3-MOC motion control module, the Flexi Soft safety controller monitors the speed of the machine roller easily, flexibly and at low cost. If the machine comes to a standstill, a DFS60S

Pro safety encoder monitors the stopping machine rollers together with the safety functions specified for this application which fulfill the requirements up to SIL 2 / Pl d.

Recommended products

DFS60S Pro

Monitoring of direction of travel and speed for automated guided carts



The direction of travel and speed of the transport cars must be recorded to ensure that automated guided carts manage curves quickly and safely. The DFS60S Pro safety encoder and the Flexi Soft safety controller with the FX3-

MOC motion control module from SICK are ideal for this application. This safe system solution can also be integrated into automated guided carts using very little space.

Recommended products

DFS60S Pro

Position determination of a SCARA robot



A linear motor moves the SCARA robot synchronously to the conveyor belt so that the robot can pick up workpieces with precision. Without making contact, the TTK70 linear encoder determines the absolute position of the robot. The compact read head of the encoder measures the position on coded magnetic tape reference material without causing

wear. Using a unique code pattern, the encoder gathers information about the absolute position of the robot along the reference scale and transmits this data directly to the evaluation electronics. Once it has been installed, the TTK70 is immediately available and completely maintenance-free. This saves time and money.

Recommended products

TTK70

Positioning of hydraulic cylinders



Positioning the individual hydraulic cylinders of the excavator arm enables partial automation of work processes. This makes it possible to strip a slope, for example. Rugged MAX[®] linear encoders

- integrated into the hydraulic cylinder of the excavator arm - first detect the actual position. The target position is then approached by the hydraulic control.

Recommended products

MAX[®]

Positioning of the pallet shuttle



The shuttle is positioned with maximum accuracy by means of a DBS36 Core incremental encoder mounted on the drive axis. Designs featuring a blind hollow

shaft or a face mount flange with a solid shaft ensure flexible adaptation to the drive. They can even be used in cases where there is very little space available.

Recommended products

DBS36 Core DLS40 DBV50 DUV60 MWS120

Reliable control of a driving unit



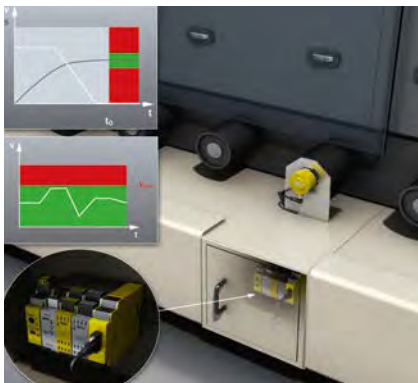
An AFM60 EtherCAT® absolute encoder delivers the actual values for control of position speeds, for example on storage and retrieval systems. With its high resolution and repeatability, the encoder

ensures that the positioning commands can be executed with precision. The integrated fieldbus interface of the encoder quickly and reliably transmits the respective process data to the control.

Recommended products

AFM60 EtherCAT®

Safe speed in automated production



In automated production, plant availability and the safety of operators must be ensured. That is why the Flexi Soft modular safety controller monitors the axis speeds with the FX3-MOC motion

control module and the DFS60S Pro safety encoder. This reliably protects operators and prevents unplanned system downtimes.

Recommended products

DFS60S Pro

Stroke positioning on the crane



Several combined encoders enable the correct positioning of the crane harness. Linear encoders are used for precise control of the horizontal axis movements, a rugged multiturn absolute encoder is employed to position the lifting axis: Any

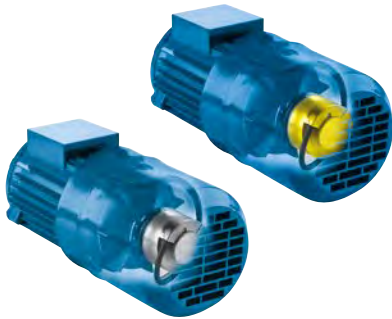
AFS/AFM60 variant is suitable here. Such an absolute encoder detects the position on the overhead crane drive and therefore the lifting position of the crane harness.

Recommended products

AFS/AFM60

| Electrical data | | | | |
|--|----------------------|-------|------------|-----------------|
| | Incremental encoders | | | Safety encoders |
| | DBS36 Core | DLS40 | DBS60 Core | DFS60S Pro |
| Speed measurement of asynchronous motors | ■ | ■ | ■ | ■ |

Speed measurement of asynchronous motors



With asynchronous motors, the speed is measured with an incremental encoder. The DBS36 Core and DBS60 Core incremental encoders offer all the necessary features for this application at a competitive price. With speed information from

the encoder, the speed of the motor is regulated by the controller, which means in many cases that the efficiency can be increased. If safe speed monitoring is required, the DFS60S Pro safety encoder can be used for functional safety.

Recommended products

DBS36 Core

DLS40

DBS60 Core

DFS60S Pro

| Electronic and solar | Absolute encoders | | Incremental encoders | | Linear encoders | Safety encoders | Wire draw encoders |
|---|-------------------|------------------------|----------------------|-------|-----------------|-----------------|--------------------|
| | AHS/AHM36 | AFS/AFM60 EtherCAT® | DBS60 Core | DFS60 | TTK70 | DFS60S Pro | EcoLine |
| Automated removal from the workpiece carrier | | | | | ■ | | |
| Height positioning of gripper for load-port feeding | | | | | | | ■ |
| Monitoring and control of the saw-wire | | ■ | | | | | |
| Printing screen positioning in soldering paste printers | | | | | ■ | | |
| Positioning a wire bonder | | | | | ■ | | |
| Positioning of circuit boards under screen printing stencils | | | | | ■ | | |
| Positioning of semiconductor chips in a bonding machine | | | | | ■ | | |
| Precise height monitoring of printed circuit board devices | | | ■ | | | | |
| Safety solutions allowing automated guided carts to travel at high speeds | | | | | | ■ | |

Automated removal from the workpiece carrier



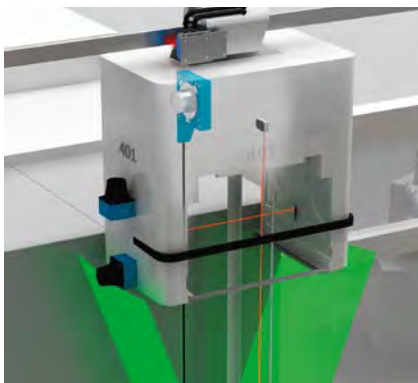
A handling system can be controlled safely and precisely by using the MPA analog positioning sensor. Depending on the drive concept, a compact, high-reso-

lution TTK70 linear encoder or a motor feedback system, ideally with HIPERFACE DSL®, are also suited to this task.

Recommended products

TTK70

Height positioning of gripper for load-port feeding



The risk of material breaks in expensive semiconductor wafers must be kept as small as possible. Therefore, the wafer box is monitored with sensors. The EcoLine product family of wire draw en-

coders – lightweights at just 180 grams – provide the exact position of the FOUPs (wafer box) during lowering.

Recommended products

EcoLine

Monitoring and control of the saw-wire



Wire saws are only as accurate as their encoders. With multiturn absolute encoders, precise control of position minimizes wafer damage by supplying data at the

resolution required for the process. This series can reproduce the characteristics of different encoders, simplifying maintenance and stocking requirements.

Recommended products

AFM60 EtherCAT®

Printing screen positioning in soldering paste printers



Solder paste printers can process circuit boards of all sizes; however for this, they need precise position data ($\pm 10 \mu\text{m}$). The TTK70 linear absolute encoder supplies this data and does not require a new initialization process when the size of the printed circuit boards changes. Two Inspector P30 vision sensors with

dome light detect the alignment marks on the printed circuit boards and check that they are correctly aligned with respect to the printing template. This ensures flexible and high-performance SMD placement of printed circuit boards.

Recommended products

TTK70

Positioning a wire bonder



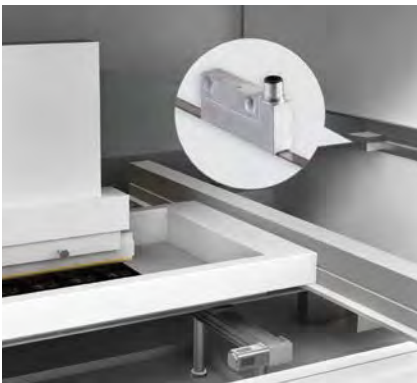
Temperatures are very high in the area around the bonding head, making fiber-optic cable systems the most effective for this application. With its 16 μs response time, the WLL180T works together with the LL3-TH fibers to supply the control unit with a precise signal for edge detection. The grippers of the wire

bonder move the thin substrate carrier at a high speed. This is a process that requires maximum precision. The two read heads of the TTK70 linear encoder work with a precision in the μm range at a speed of up to 10 m/s, thus contributing to the increasing of machine throughput.

Recommended products

TTK70

Positioning of circuit boards under screen printing stencils

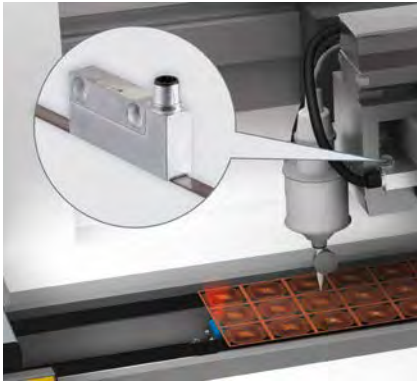


Screen printing machines can process circuit boards of all sizes; however for this, they need precise position data

($\pm 10 \mu\text{m}$). The TTK70 linear absolute encoder performs this task.

Recommended products

TTK70

Positioning of semiconductor chips in a bonding machine

Semiconductor chips are placed in bonding machines at high speed, which assumes the greatest precision. The non-contact TTK70 linear encoder works

with a precision in the μm range, thus enabling the precise positioning on the lead frames.

Recommended products

TTK70

Precise height monitoring of printed circuit board devices

Minimizing soldering faults is a constant aim in PCB production. Selectively checking the height of critical components before and after the soldering process minimizes many faults. With the OD

Mini displacement measurement sensor and DBS60 Core encoder, this can be achieved in a quick, flexible, and above all cost-effective manner.

Recommended products

DBS60 Core

Safety solutions allowing automated guided carts to travel at high speeds

Automated guided carts (AGC) manage high speeds even when going around curves thanks to the switching of protective fields. Reliable detection of speed

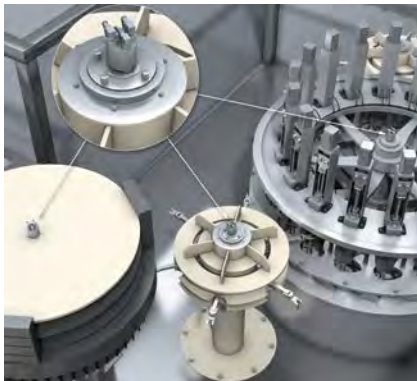
and direction of travel with safety solutions from SICK also reduces the number of components and thereby the required installation space in AGCs.

Recommended products

DFS60S Pro

| Food and beverage | | | | | | | | | |
|---|-------------------|---------------------|--------------------|----------------------|------------|------------|--------------------------|--------|------------------------------|
| | Absolute encoders | | | Incremental encoders | | | Measuring wheel encoders | | Laser surface motion sensors |
| | AHS/AHM36 | AFS/AFM60 EtherCAT® | AFS/AFM60 PROFINET | DFS60 | DFS60 Inox | DBS60 Inox | DBV50 Core | MWS120 | SPEETEC 1D |
| Detection of carousel position | | ■ | | | | | | | |
| Determination of the rolling velocity of packaging material | | | | | | | ■ | ■ | |
| Determination of the speed of a belt | | | | ■ | ■ | ■ | | | |
| Length measurement of packaging film | ■ | | | | | ■ | | | |
| Position and speed measurement of the carousel of a bottle filling system | | | ■ | | | | | | |
| Precise non-contact speed measurement | | | | | | | | | ■ |
| Precise position value identification | | ■ | | | | | | | |
| Precise position value identification | | | | | ■ | ■ | | | |
| Precise speed measurement on conveyor belts | | | | | ■ | ■ | | | |

Detection of carousel position



The carousel angle of rotation serves to control the transport of bottles through the blow stretching machine. A high-precision AFM60 EtherCAT® absolute encoder, which precisely synchronizes the rotations electronically, supplies the

absolute angle. Its optimized mechanical system makes it easy to mount in a central position. Linear and rotative movements are coupled together via electronic cams.

Recommended products

AFM60 EtherCAT®

Determination of the rolling velocity of packaging material



The actual speed is a significant parameter for the precise control of a system such as a code printer. The DBV50 Core measuring wheel encoder measures the exact speed of the

packaging film. With its high resolution of up to 2,500 pulses per rotation, it supplies the system with precise speed signals.

Recommended products

DBV50 Core

MWS120

Determination of the speed of a belt



The conveyor belt speed needs to be determined for accurate control of the transport distance between packages. This is necessary in a variety of machines. Potato chips are fed into the machine from above. The packing film is removed from a roll, shaped, and sealed. A conveyor belt then transports the packaged product to the following process step. The

transport speed determines the distance between the packages and, therefore, the process clock. A DFS60 incremental encoder, which is fitted directly to one of the conveyor belt shafts, records the speed of the belt in order to control the distance between products. The encoder is available with the TTL and HTL interfaces and as a programmable variant.

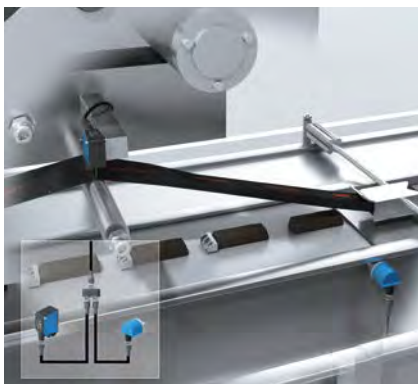
Recommended products

DFS60

DFS60 Inox

DBS60 Inox

Length measurement of packaging film



The AHS/AHM36 IO-Link Advanced absolute encoder, in combination with a print mark sensor, measures the exact length of packaging film. With the help of the integrated A30 Smart Task, after a set length value passes through, a trig-

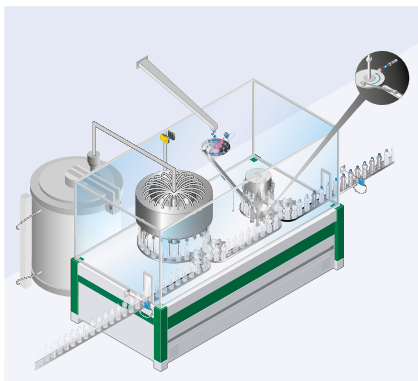
ger signal can be output with which the downstream cutting system is controlled for singulation of packaging films. Direct length measurement in the encoder also works precisely and reliably when conveying speeds change.

Recommended products

AHS/AHM36

DBS60 Inox

Position and speed measurement of the carousel of a bottle filling system



The precise position and speed monitoring is handled by an A3M60 absolute encoder. The encoder is connected directly to the carousel wheel via gear stages. The resolution per rotation depends on the number of filling stations. The number of encoder rotations

depends on the gear translation. Thanks to the endless operating functionality of the encoder, individual resolutions can be configured quickly and safely. (Full scalability for binary, non-binary, as well as for nonwhole-number rotations such as, e.g. 12.4 rotations).

Recommended products

AFM60 PROFINET

Precise non-contact speed measurement



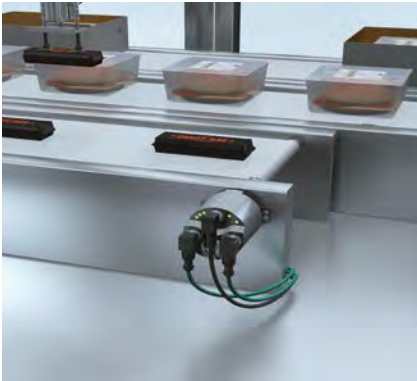
In vertical molding, filling and sealing machines, packaging film is extracted by a roller before being formed and sealed. The SPEETEC 1D non-contact motion sensor reliably detects the speed of the packaging film to ensure the feed has

the required length. The SPEETEC 1D overcomes challenges such as filling tube wear, damage to the packaging film or productivity losses. The sensor also minimizes waste in start-stop and continuous operation.

Recommended products

SPEETEC 1D

Precise position value identification



The 3-axis gantry robot removes a carton from the conveyor belt and supplies it to the next process. Here, it is critical that the movements necessary for positioning within the process are carried out

with a high degree of accuracy. The high-resolution AFS/AFM60 EtherCAT® absolute encoder takes high-precision measurements of the absolute position and speed of the conveyor belt.

Recommended products

AFM60 EtherCAT®

Precise position value identification



The 3-axis gantry robot removes a carton from the conveyor belt and supplies it to the next process. Here, it is critical that the movements necessary for positioning within the process are carried out

with a high degree of accuracy. The high-resolution AFS/AFM60 EtherCAT® absolute encoder takes high-precision measurements of the absolute position and speed of the conveyor belt.

Recommended products

DBS60 Inox

DFS60 Inox

Precise speed measurement on conveyor belts



An essential part of process control involves synchronizing the conveyor belt speed at the cheese slicer outlet with downstream machines. The DFS60 Inox incremental encoder continuously measures the actual value signal for

the speed in order to reliably control the downstream process. Thanks to its IP67 enclosure rating, it is particularly suitable for use on machines in hygienic areas and wet zones.

Recommended products

DFS60 Inox

DBS60 Inox

| Handling and assembly technology | Absolute encoders | | Incremental encoders | | | Measuring wheel encoders | Linear encoders |
|--|-------------------|--------------------|----------------------|-------|-------|--------------------------|-----------------|
| | AHS/AHM36 | AFS/AFM60 PROFINET | DBS60 Core | DFS60 | DUS60 | DUV60 | TTK70 |
| Measuring the conveying speed of a belt conveyor | | | | ■ | | | |
| Measuring the conveying speed of a roller conveyor | | | ■ | | ■ | ■ | |
| Motorized mold height adjustment | | ■ | | | | | |
| Positioning the SCARA robot at the conveyor belt | | | | | | | ■ |
| Quality and position monitoring on conveyor belts | | | | ■ | ■ | | |
| Screw gun guidance and monitoring screw-in depth | ■ | | | | | | |
| Speed measurement on the slat conveyor | | | ■ | | ■ | | |

Measuring the conveying speed of a belt conveyor



SICK developed an incremental encoder with measuring wheel system specifically to provide slip-free speed measurements on the belt conveyor or dual belt transport system. This makes controlling the assembly line a breeze. Because the

pulse value, electrical interface, and other functions can be freely programmed, the DFS60 incremental encoder in combination with the measuring wheel system can be used in a large number of applications.

Recommended products

DFS60

Measuring the conveying speed of a roller conveyor



The conveying speed of a roller conveyor is controlled with the help of the position detection feature of a DBS60 programmable incremental encoder. With its high 16-bit resolution, the encoder ensures maximum reproducibility. The encoder

can be easily mounted to the roller conveyor via a belt drive. SICK offers a large number of encoder variants to accommodate virtually any mechanical and electrical interface.

Recommended products

DBS60 Core

DUS60

DUV60

Motorized mold height adjustment



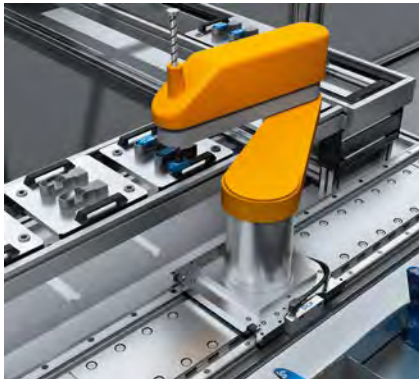
In order to produce the locking force necessary for a closed mold, the closing stroke of the machine must be matched to the current mold height, which can differ for each individual mold. To achieve this, it must be possible to move the entire mold-closing unit lengthwise. This typically occurs by means of a mold height adjuster that is powered by a

hydraulic motor and acts on all four columns of the machine. The AFS/AFM60 PROFINET encoder is used to provide the accompanying path measurement system for controlling the mold closing unit. This absolute encoder delivers high-precision detection of the position and status of the closing axis at a resolution of up to 30 bits.

Recommended products

AFM60 PROFINET

Positioning the SCARA robot at the conveyor belt



The SCARA robot must move in sync with the conveyor speed so that it can remove the workpieces from the belt. The TTK70 linear encoder determines the absolute position of the SCARA robot. This encoder consists of a compact read head and a piece of magnetic tape that serves as a reference scale. The non-contact principle of operation means that the position is determined without causing

any wear. Using a unique code pattern, the encoder gathers information about the absolute position along the reference scale and transmits this data directly to the evaluation electronics. Once it has been installed, the system is immediately available and completely maintenance-free, which saves time and reduces costs.

Recommended products

TTK70

Quality and position monitoring on conveyor belts



In order to grip objects on moving conveyor belts, a pick-and-place robot requires an image processing system that gives it the ability to “see.” The programmable TriSpectorP1000 3D vision sensor is the reliable solution under these difficult conditions. The sensor supplies every piece of object information needed by the robot to securely grip the objects, including their height, position and alignment

on the belt. The robot uses the transport speed, which is precisely determined by an incremental encoder, together with this information to perform its gripping tasks quickly and with accuracy down to the millimeter. The WLL180T fiber-optic sensor serves as a trigger photoelectric sensor and is directly connected to the TriSpectorP1000.

Recommended products

DFS60

DUS60

Screw gun guidance and monitoring screw-in depth



To guide screw guns at precise angles, the carrying arms for the horizontal projection and the rotation axis are each equipped with an AHM36 absolute

encoder. This ensures that components are screwed together in the accurate position.

Recommended products

AHM36

Speed measurement on the slat conveyor



In order to synchronize the product transport with subsequent processing steps, an encoder mounted directly on the drive shaft must measure the conveyor speed. The rugged DBS60 Core incremental

encoder is the ideal product for this task. With its wide range of flange and shaft designs, this encoder can be perfectly integrated into various different belt types.

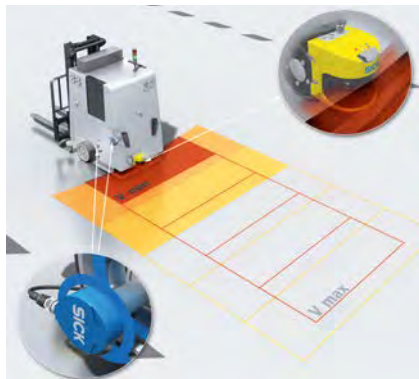
Recommended products

DBS60 Core

DUS60

| Industrial vehicles | Absolute encoders | Incremental encoders | | | | Linear encoders | Measuring wheel encoders | | Wire draw encoders | | | Safety encoders | | Inertial sensors | |
|---|-------------------|----------------------|-------|------------|-------|-----------------|--------------------------|-------|--------------------|----------|---------|-----------------|------------|------------------|-------------------|
| | AHS/AHM36 | DBS36 Core | DLS40 | DBS60 Core | DFS60 | MAX® | DFV60 | DUV60 | EcoLine | HighLine | Compact | AFS/AFM60S Pro | DFS60S Pro | TMS/TMM61 | TMS/TMM88 Dynamic |
| Adaptive protective field adjustment of the safety laser scanner by means of speed monitoring | | | | | ■ | | | | | | | ■ | | | |
| Measuring vertical and horizontal fork movements of a forklift | | | | | | | | | ■ | | ■ | | | | |
| Pallet handling with narrow aisle forklifts at great heights | | | | | | | | | ■ | ■ | | | | | |
| Position measurements in the hydraulic cylinder – extremely durable and compact | | | | | | ■ | | | | | | | | | |
| Quickly and precisely leveling the fork horizontally – for increased safety and productivity | | | | | | | | | | | | | ■ | ■ | |
| Reliably detecting the steering angle for protective field switching | | | | | | | | | | | | ■ | | | |
| Retrofittable speed measurement on narrow aisle forklifts | | | | | | | ■ | ■ | | | | | | | |
| Safe speed for automated guided vehicle systems | | | | | | | | | | | | ■ | | | |
| Speed detection of an automated guided vehicle (AGV) | | ■ | ■ | | | | | | | | | | | | |
| Steering angle detection of automated guided vehicles | ■ | | | | | | | | | | | | | | |

Adaptive protective field adjustment of the safety laser scanner by means of speed monitoring



The transport performance depends heavily on the speed of the automated guided vehicle (AGV). Encoders transmit the actual speed to the S3000 Expert safety laser scanner via special inputs.

The right protective field for the speed and current braking distance is activated in this way. Unnecessary stops are avoided.

Recommended products

DFS60

DFS60S Pro

Measuring vertical and horizontal fork movements of a forklift



The EcoLine wire draw encoder, which can be compactly integrated into the lifting gear, allows accurate, quick, and reliable measurement of the fork height.

The sensor makes it possible to monitor lateral fork movements for automated pre-setting to various pallet sizes.

Recommended products

EcoLine

Compact

Pallet handling with narrow aisle forklifts at great heights



Storing and removing at great heights is often confusing for drivers of narrow aisle forklifts with fixed driver's platforms. Driver assistance systems show the driver the fork position and loading state. The position of the lifting fork is determined precisely with an EcoLine wire draw encoder whose highly-flexible

steel wire ensures permanent maintenance-free operation. The laser photoelectric proximity sensor of the Power-Prox series attached to the back of the fork uses two switching points to report whether the load is positioned securely on the fork.

Recommended products

EcoLine

HighLine

Position measurements in the hydraulic cylinder – extremely durable and compact



Ideally, movements should be measured where they occur. The linear encoders of the MAX® product family are installed directly in the hydraulic cylinder. The sensor therefore does not need any additional installation space and is extremely well-protected in the cylinder interior. The

magnetostriction measurement principle enables accuracy of up to 1/10 mm and does not cause any wear. With measuring ranges of up to 2,500 mm, different movements such as fork lift height, fork width and lift mast tilt can be determined with precision.

Recommended products

MAX®

Quickly and precisely leveling the fork horizontally – for increased safety and productivity



Regardless of the position of a manned forklift truck, inclination sensors can precisely detect the tilt angle of a lifting fork. The acceleration-compensated TMS88 Dynamic inclination sensor supports the driver in quickly aligning the

fork. The sensor measures the tilt of the fork during the loading and unloading process and during driving, therefore ensuring increased stability of the vehicle at all times.

Recommended products

TMS/TMM61

TMS/TMM88 Dynamic

Reliably detecting the steering angle for protective field switching



In order to adapt the automated guided vehicle's protective fields to its exact driving scenario, the steering angle must also be captured by the drive and steering drives. When the MOC1 Flexi

Soft motion control module and the AFS/AFM60S Pro safety encoder interact, the steering angle is recorded in the Flexi Soft CPU for further processing.

Recommended products

AFS/AFM60S Pro

Retrofittable speed measurement on narrow aisle forklifts

When equipping narrow aisle forklifts with safety and driver assistance systems, it is often necessary to provide additional signals for safe detection of driver speed. Regardless of the manu-

facturer, speed measurement on narrow aisle forklifts is possible with the DFV60 measuring wheel encoder, which can be attached to nearly any vehicle.

Recommended products

DFV60

DUV60

Safe speed for automated guided vehicle systems

With automated guided systems, the SSM (safe speed monitor) or SLS (safely-limited speed) function monitors the speed on the wheels using the DFS60S Pro encoder and reduces it via the

controller if necessary. In addition, the Flexi Soft safety controller can be used to switch over the protective fields of the safety laser scanner depending on the speed.

Recommended products

DFS60S Pro

Speed detection of an automated guided vehicle (AGV)

The drive unit of an automated guided vehicle is equipped with an incremental encoder from the DBS36 product family.

In addition to the detected speed, it also provides the direction of travel for the vehicle control.

Recommended products

DBS36 Core

DLS40

Steering angle detection of automated guided vehicles

The steering angle drive features an AHS/AHM36 CANopen absolute encoder that records the current steering angle. It delivers data for determining the

steering angle, which, in addition to other parameters such as speed, lift height, load lifting position and load weight, can be used to monitor vehicle safety.

Recommended products

AHS/AHM36

| Maritime | Absolute encoders | | Linear encoders | Dynamic inclination sensors |
|---|-------------------|-------------------|-----------------|-----------------------------|
| | AFS/AFM60 | AFS/AFM60 Inox | MAX® | TMS/TMM88 Dynamic |
| Aligning keels | | | ■ | |
| Checking anchor winches | | ■ | | |
| Measuring ship inclination | | | | ■ |
| Measuring the admission of liquid fuel to engines | ■ | | | |
| Monitoring sail tension | | | ■ | |
| Optimizing controllable pitch propellers | | | ■ | |
| Positioning rudders | | | ■ | |

Aligning keels



Alignment of the keel is automated on modern sailing yachts. Depending on the water depth e.g. near the coast or in waters with varying sandbanks, the keel can be damaged or the ship may even run aground. Exact position determina-

tion with the MAX® linear encoder in the hydraulic cylinder means that the keel is only retracted as far as necessary so as not to jeopardize the stability of the sailing yacht.

Recommended products

MAX®

Checking anchor winches



The AFM60 Inox absolute encoder reliably measures the length of the unrolling or cast-out anchor chain. This information is used to brake the anchor winch in good time before reaching the end of the chain. This measurement prevents

the anchor winch from being damaged by sudden impact or chain links shattering. The encoder is integrated in the anchor chain control and boasts an IP67 enclosure rating and shock resistance, resulting in high reliability.

Recommended products

AFS/AFM60 Inox

Measuring ship inclination



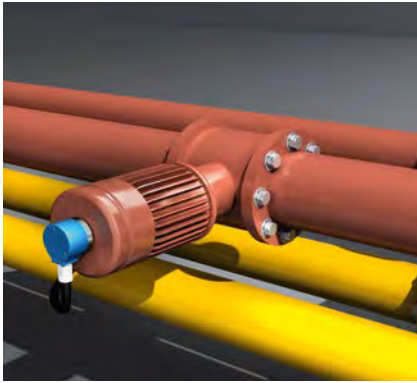
It is possible to mostly compensate for swells using stabilizers. The TMS inclination sensor registers the ship inclination to optimally align the stabilizers. This ensures that the yacht lies as still as possible in the water. This has several

positive effects: A ship position optimally adapted to the driving resistance, meaning a reduction in fuel, and fewer seasick passengers too. SICK's precise and reliable inclination sensors take care of this.

Recommended products

TMM88 Dynamic

Measuring the admission of liquid fuel to engines



Each kWh of engine drive power requires around 200 g of diesel. This equates to around three tons of fuel per hour for an engine with 15 MW drive power. The

AFM60 absolute encoder can precisely detect the aperture angle of the engine's inlet valve for fuel. The payback for this investment is just a few days.

Recommended products

AFM60

Monitoring sail tension



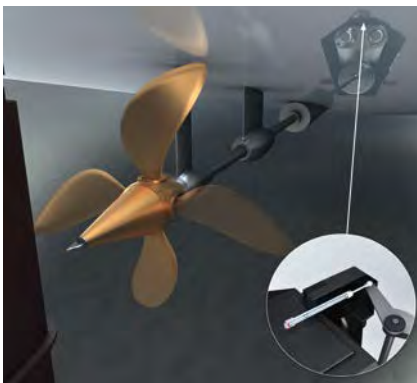
Setting all of the sails and monitoring the sail tension is now almost always fully automated on modern sailing boats. SICK linear encoders integrated

in winches and hydraulic cylinders give direct feedback about sail tension and alignment.

Recommended products

MAX®

Optimizing controllable pitch propellers



Controllable pitch propellers are used when good maneuverability, generator operation and/or varying continuous speeds are required. The propeller blades are fixed to the hub and can rotate. Linear encoders are placed in hydraulic cylinders that act on the shaft for

controlling the rotor blades. The encoder displays the angle of inclination of the propeller blades. The rotor blades can be moved to the desired position, down to the μm . This allows for highly efficient maneuvering or propulsion of the ship.

Recommended products

MAX®

Positioning rudders



If a new course is to be taken, then the rudder position must be changed to the new direction. The rudder blade is moved by hydraulic cylinders. Linear encoders integrated in the hydraulic cylinders give μm -exact feedback on the position change and therefore the position of the

rudder blade. This allows large yachts to be maneuvered more exactly and steered more efficiently. Thanks to the direct feedback from the linear encoders in the cylinders, part-automated control using GPS data can be used.

Recommended products

MAX®

| Machine tools | Absolute encoders | | Incremental encoders | | | | Wire draw encoders | | | Safety encoders |
|--|-------------------|---------------|----------------------|-------|------------|-------|--------------------|----------|---------|-----------------|
| | AHS/AHM36 | AFS/AFM60 SSI | DBS36 Core | DLS40 | DBS60 Core | DFS60 | EcoLine | HighLine | Compact | DFS60S Pro |
| Adjustment of press stroke after tool change | ■ | ■ | | | | | | | | |
| Height monitoring at the scissor lift table | | | | | | | ■ | | | |
| Height positioning in sheet metal storage | | | | | | | | ■ | | |
| Measurement of press stroke with absolute encoder | | ■ | | | | | | | | |
| Measurement of press stroke with wire draw encoder | | | | | | | | | ■ | |
| Saw-blade positioning | | | ■ | ■ | | | | | | |
| Speed measurement for access protection of the saw line | | | | | | | | | | ■ |
| Speed measurement for safety gate securing of the drilling machine | | | | | | | | | | ■ |
| Speed measurement of sheet coil during decoiling process | | | | | ■ | ■ | | | | ■ |
| Weld detection and measurement of the sheet removal speed | | | | | | ■ | | | | |

Adjustment of press stroke after tool change



Once the tools have been replaced, the press stroke must be adapted using a primarily mechanical adjustment mechanism. The procedure for adjusting the height of the press stroke can be done

automatically with the help of an electric drive and the AFM60 absolute encoder, which determines the precise measurement of the revolution at the gear.

Recommended products

AFM60 SSI

AHM36

Height monitoring at the scissor lift table



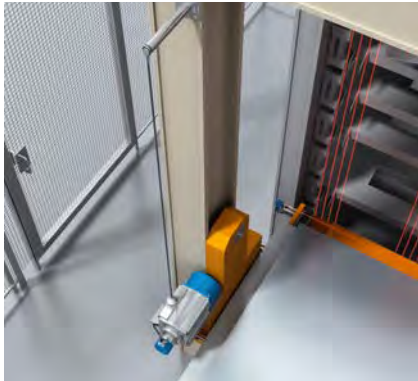
Following machining, residual grids are placed on a scissor lift table. To ensure a smooth transfer, the height of the stack must be aligned with that of the machining table. The analog signal values of the

EcoLine wire draw encoder are used to determine the lifting height. When the maximum load has been reached, the worker removes the stack of residual grids.

Recommended products

EcoLine

Height positioning in sheet metal storage



The material lift is used to move stacks of sheets from a transfer carriage or residual sheets from a vacuum nozzle to an interim shelf for storage. The BTF13 wire draw encoder signals the absolute

height position of the material lift to the control. The bottom and top final positions of the material lift are monitored by inductive proximity sensors.

Recommended products

HighLine

Measurement of press stroke with absolute encoder



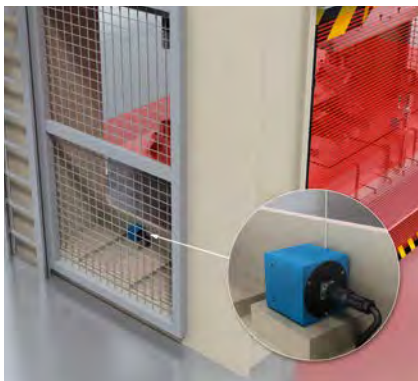
An AFS60 absolute encoder is mounted to the eccentric shaft on mechanical presses for the purpose of determining the position of the press stroke. It reli-

ably supplies signals for establishing the top dead center (TDC) and bottom dead center (BDC).

Recommended products

AFM60 SSI

Measurement of press stroke with wire draw encoder



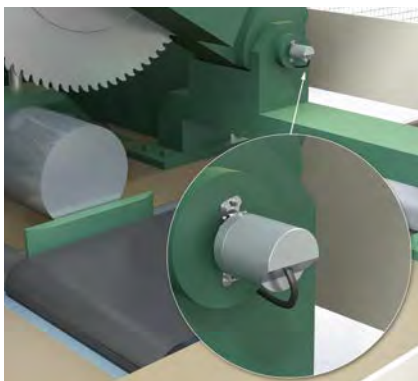
To determine the position of the press stroke, a BKS wire draw encoder is used. It reliably supplies signals for estab-

lishing the top dead center (TDC) and bottom dead center (BDC).

Recommended products

Compact

Saw-blade positioning



The height of the saw blade is automatically positioned for optimum control of the sawing process. The DBS36 incremental encoder supplies precise measurement values for this purpose. It

can be easily and directly mounted using the supported flange joint or the hollow shaft and its universal cable outlet. Its compact size saves space.

Recommended products

DBS36 Core

DLS40

Speed measurement for access protection of the saw line



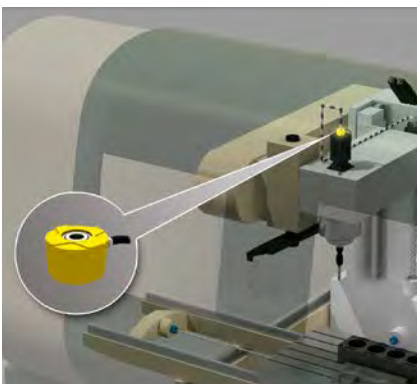
On the saw line, the operator is kept away from the hazardous point by a safety fence. In order to eliminate faults on the line, a safe standstill detection is necessary or for the maintenance and

service mode, a safely-limited speed. The DFS60S Pro safety encoders assist reliably with the realization of safety functions.

Recommended products

DFS60S Pro

Speed measurement for safety gate securing of the drilling machine



For stand-alone machines such as a drilling machine, the user is protected from the hazardous point by a safety door or hood. For set-up operation, the speed of the drilling arm and of the tool table

must be monitored safely at reduced speed. Here, the DFS60S Pro safety encoders assist reliably with the realization of the safety function.

Recommended products

DFS60S Pro

Speed measurement of sheet coil during decoiling process



To ensure a constant feed of material, the uncoiling speed of the sheet coil must be regulated. The distance sensor continuously measures the radius of the sheet coil throughout the entire unwinding process. The DBS60 Core incremental encoder uses a friction roller

to measure the retraction speed of the sheet. If there is a safe stop of the upstream machine, this can cause a hazard due to the overrun of the sheet. Here, the DFS60S Pro safety encoders assist with the realization of the safety function.

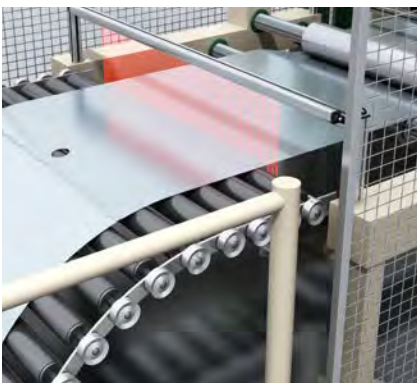
Recommended products

DBS60 Core

DFS60

DFS60S Pro

Weld detection and measurement of the sheet removal speed



The MLG-2 Prime automation light grid detects a hole less than 15 mm in size that marks the weld of the coil. The DFS60 incremental encoder determines

the speed of the sheet. The information from both sensors signals the position of the weld and helps control the downstream system/guillotine machine.

Recommended products

DFS60

| Material transport vehicals, Factory and logistics automation | | | | | | | | |
|--|-------------------|-----------|----------------------|-------|--------------------|----------|---------|-----------------|
| | Absolute encoders | | Incremental encoders | | Wire draw encoders | | | Safety encoders |
| | AHS/AHM36 | AFS/AFM60 | DBS60 Core | DFS60 | EcoLine | HighLine | Compact | DFS60S Pro |
| Detection of the steering angle of an automated guided system | ■ | ■ | | | | | | |
| Height positioning of a storage and retrieval system | | | | | | ■ | | |
| Height positioning of the forks of an automated guided system | | | | | ■ | | | |
| Height positioning of the forks of a narrow aisle truck | | | | | | | ■ | |
| Safe speed measurement of an automated guided system | | | | ■ | | | | ■ |
| Speed measurement of an automated guided system for switching the characteristic diagram of a safety laser scanner | | | ■ | | | | | ■ |

Detection of the steering angle of an automated guided system



The motion direction of the AGS is measured with a Singleturn absolute encoder. The driving direction informa-

tion serves to control the engine safety characteristics.

Recommended products

AFS60

AHS36

Height positioning of the forks of an automated guided system



Positioning of the forks of the AGS is handled by constantly-measuring wire

draw encoders. This way, the bays are approached at the correct height.

Recommended products

EcoLine

Height positioning of the forks of a narrow aisle truck



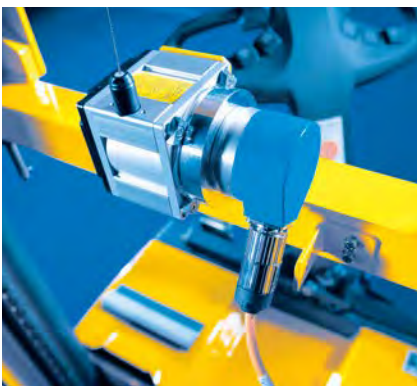
Using a BKS09 wire draw encoder enables the narrow aisle truck to accurately determine the position of the fork. The highly flexible steel wire is fixed to the

fork's 'shoulder'. The driver sees the position of the fork on a display. This provides support when the height of the fork cannot be seen (man-below system).

Recommended products

Compact

Height positioning of a storage and retrieval system



Wire draw encoders fulfill the requirements for the high-precision positioning of storage and retrieval systems. These

products are available in a wide variety of wire lengths and with different interfaces.

Recommended products

HighLine

Safe speed measurement of an automated guided system



With automated guided systems (AGS), the SSM (safety speed monitor) or SLS (safety-limited speed) function monitors the speed on the wheels using the DFS60S Pro encoder and reduces it via the controller if necessary. Thanks to a

central drive unit, with the DFS60S Pro and the Flexi Soft safety controller, it is possible to realize safe motion monitoring or warning field monitoring of the safety laser scanner.

Recommended products

DFS60

DFS60S Pro

Speed measurement of an automated guided system for switching the characteristic diagram of a safety laser scanner



For personal protection and collision prevention with other vehicles or materials on the floor, automated guided systems AGS are equipped on the fork side and on the back wide with safety laser scanners. The AGS is equipped with two drive units with one DBS60

Core incremental encoder apiece and determines the speed of the AGS. The encoder signals are compared to one another with a cross-comparison. The laser scanners use this information for switching depending on the speed of the protection and warning fields.

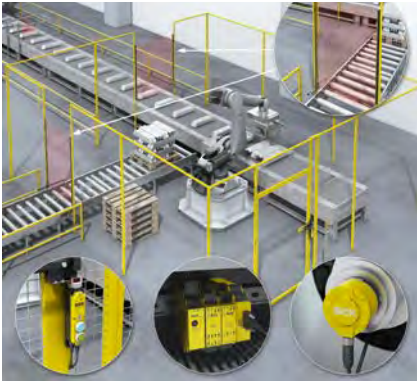
Recommended products

DBS60 Core

DFS60S Pro

| Metal and steel | | | | | | | | | | | | | |
|--|-------------------|---------------|----------------|---------------------|--------------------|----------------------|-------|------------|-------|-----------------|--------------------|-----------------|---------------------|
| | Absolute encoders | | | | | Incremental encoders | | | | Linear encoders | Wire draw encoders | Safety encoders | Inclination sensors |
| | AHS/AHM36 | AFS/AFM60 SSI | AFS/AFM60 Inox | AFS/AFM60 EtherCAT® | AFS/AFM60 PROFINET | DBS36 Core | DLS40 | DBS60 Core | DFS60 | KH53 | HighLine | DFS60S Pro | TMS/TMM88 |
| Access monitoring and protection of casting system | | | | | | | | | | | | ■ | |
| Controlling the speed of an object and conveyor during the rolling process | | | | | | | | | ■ | | | | |
| Conveyor belt operation on dust conveying system | | | | | | | | | ■ | | | | |
| Damper positioning at duct system | | ■ | | | | | | | ■ | | | | |
| Fan operation (RPM) at impeller axis in the off-gas system | | | | | | | | | ■ | | | | |
| Inlet and outlet damper position at main fans | ■ | ■ | | | | | | | | | | | |
| Ladle car position at ladle furnace during secondary metallurgy | | | | | | | | | | ■ | | | |
| Monitoring belt operation in carbon and sinter supply | | | | | | ■ | ■ | | ■ | | | | |
| Monitoring of conveyor speed of anode transport track | | | | | | | | | | | | ■ | |
| Monitoring of damper position during alumina distribution | | | | | | | | | ■ | | | | |
| Monitoring of tilting position on basic oxygen furnace | | | | | | | | | ■ | | | | |
| Monitoring rotary valve operation | | | | | | | | | ■ | | | | |
| Monitoring the operation of the sinter conveyor in the sinter plant | | | | | | | | | ■ | | | | |
| Movement and position control of internal machine parts | | | | | | | | | ■ | ■ | | | |
| Movement and position control of oxygen and carbon lances | | ■ | | | | | | | | | | | |
| Overhead crane gear position | | | | ■ | | | | | | | | | |
| Overhead crane trolley positioning | | ■ | | ■ | ■ | | | | | ■ | | | |
| Position detection of furnace door in collection and holding furnaces | | | | | ■ | | | | | | | | |
| Position of electrode arms and electrodes at ladle furnace | | | | | | | | | | | ■ | | |
| Position of ladle furnace roof during second metallurgy process | | ■ | | | | | | | | | ■ | | |
| Positioning of outdoor cranes | | | | | | | | | | ■ | | | |
| Positioning of rail-mounted shuttles during the material handling process | | | | | | | | | | ■ | | | |
| Positioning of the oxygen cutting torch during continuous casting | | | | | | | | | ■ | | | | |
| Protection of mills | | | | | | | | | | | | ■ | |
| Protection of slag preparation machine | | | | | | | | | | | | ■ | |
| Reactor vessel position detection at Ruhrstahl-Heraeus degasser | | ■ | | | | | | | | | | | |
| Roof position detection at vacuum degasser during secondary metallurgy | ■ | ■ | | | | | | | | | | | |
| Rotary valve operation for carbon and sinter supply | | ■ | | ■ | ■ | | | | | | | | |
| Safe rotary kiln standstill | | | | | | | | | | | | ■ | |
| Speed measurement of casting wheel for casting process monitoring | | | ■ | | | | | | | | | | |
| Speed measurement of ingot casting belt | | | | | | ■ | ■ | | | | | | |
| Speed measurement of rotary drum furnace | | | ■ | | | | | | | | | | |
| Synchronization of drive motors in the hot rolling process | ■ | ■ | | | | | | | ■ | | | | |
| Tilt angle detection on injection molding machine | | | | | | | | | | | | | ■ |
| Tilt measurement at rotary drum furnace | | | | | | | | | | | | | ■ |
| Width and diameter control of coils during winding | | | | | | | | ■ | ■ | | | | |

Access monitoring and protection of casting system



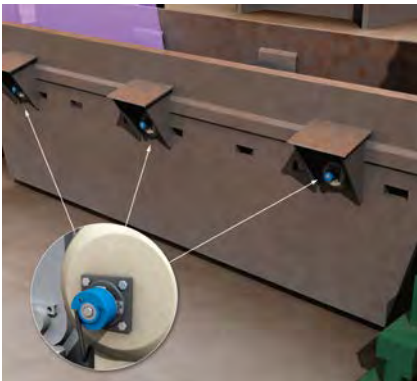
A casting system for aluminum ingots has various dangerous parts, such as the rotating casting wheel, conveyor belts, as well as automated grippers or robots. The molten metal and hot surfaces also pose a hazard. A combination of several safety sensors and MOC Motion Safety Drive Monitor ensure safe machine

standstills. The DFS60S Pro safety encoder safely monitors the machine speed. One and more TR110 Lock safety locking devices ensure that no personnel can enter the hazardous areas while the machine is running. The conveyor belts are also protected by safety light curtains.

Recommended products

DFS60S Pro

Controlling the speed of an object and conveyor during the rolling process



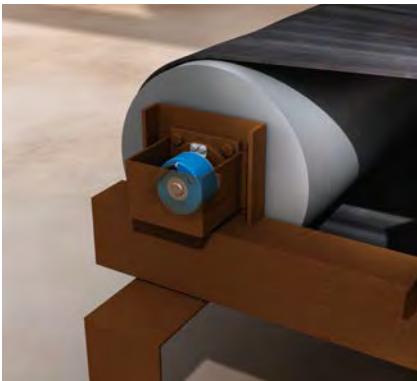
Incremental encoders can control the motor of the hot roller table and therefore also the speed at which steel bars move within the rolling mill train. Controlling the train's speed helps to ensure product quality and to optimize the rolling process. The advantages and

success factors of an incremental encoder include robustness, compactness and programmability. The high enclosure rating, wide temperature range and large ball bearing distance make the DFS60 the ideal encoder for the rolling mill's harsh environment.

Recommended products

DFS60

Conveyor belt operation on dust conveying system



In a baghouse, conveyor systems are used for discharging dust from hoppers or silos, load trucks or train cars and much more. They can be of different types: drag chain, screw, vibration or belt, but they are almost always pneumatically operated. All mechanical types

have drive and non-drive ends, and the supervision of the non-drive end offers reliable feedback to ensure the conveyor system is working properly. Either an inductive speed monitor or an incremental encoder can help aid in this conveyor monitoring process.

Recommended products

DFS60

Damper positioning at duct system



A steel plant's off-gas system can be quite complicated, especially if different exhaust points are combined. Every exhaust point has its own related process and by combining exhaust points, the exhaust rate changes. This means the performance of the entire off-gas system must be controlled to allocate and direct

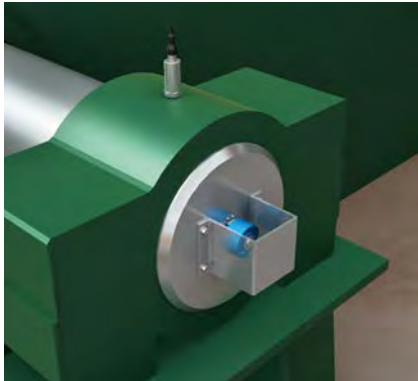
suction where it is required. This is done via dampers in the ductwork. Therefore, monitoring the actual position of the dampers is essential for optimally controlling of the off-gas system. Rugged inductive proximity sensors and encoders simplify this damper control task.

Recommended products

AFS60 SSI

DFS60

Fan operation (RPM) at impeller axis in the off-gas system



The steel making process depends on proper functioning of the furnace and melt shop's exhaust system. Fans, equipped with three megawatt rating motors, dissipate gases. Efficient flow control, customized to exact process requirements, results in optimized consumption figures. To achieve this

adaption, flow control by variable motor fan speeds is an economical tool. For this optimization, the motor or fan impeller RPM measurement is required and a combined solution that includes an inductive proximity sensor and an incremental rotary encoder perfectly solves this control task.

Recommended products

DFS60

Inlet and outlet damper position at main fans



Fans exceeding a certain size cannot be started simply by switching on the motor. When starting large fans that are common in steel mills, the motor's current can exceed defined amp tolerances. If this occurs, significant damage may result. Consequently, the fans are started

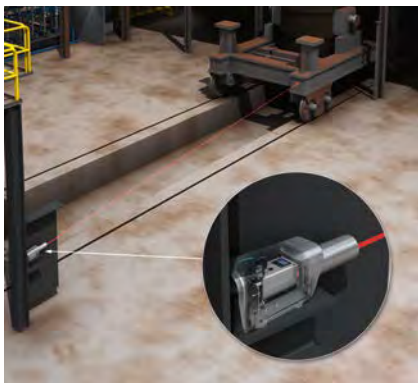
while isolated from the off-gas system ductwork. Once the fans have achieved normal speed, the dampers are opened. In order to achieve full control of the process setup, the dampers' end positions are precisely monitored via a complete absolute multiturn encoder solution.

Recommended products

AFM60 SSI

AHM36 SSI

Ladle car position at ladle furnace during secondary metallurgy



Ladle cars transport ladles to different locations within the steel plant. The plant's central control room must know where individual ladle cars are and if they are correctly positioned at each location. Missing or improperly positioned ladle cars can lead to inefficiency and even catastrophic consequences. Track-

ing and exact positioning of the cars can be achieved with a combined solution of linear encoder and long range distance measuring device. Both sensors' rugged designs allow the solution to withstand the plant's high temperatures and harsh environment.

Recommended products

KH53

Monitoring belt operation in carbon and sinter supply



The conveyor belt used to supply and transport carbon and sinter must be monitored and maintained in order to avoid spillage, down time and material waste. An inductive sensor's robustness in very harsh environments and its high

availability easily detects rotating levers on the sinter band indicating its movement. Meanwhile, encoders control the belt's speed and its positioning in order to ensure proper and ideal usage.

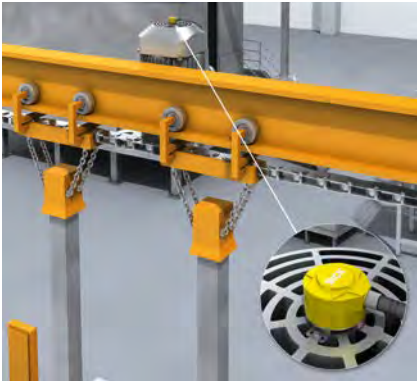
Recommended products

DFS60

DBS36 Core

DLS40

Monitoring of conveyor speed of anode transport track



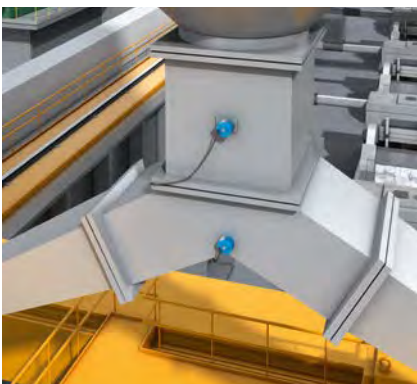
In anode production, the transport carriages of an overhead conveyor system move from one station to another in succession. To avoid banked or empty transport carriages, the conveying speed needs to be monitored. Personnel may also need to carry out work on the

system in the area of the overhead conveyor or during downtimes. The certified DFS60S Pro safety encoder is therefore used to precisely monitor the conveyor speed and standstills of the overhead conveyor.

Recommended products

DFS60S Pro

Monitoring of damper position during alumina distribution



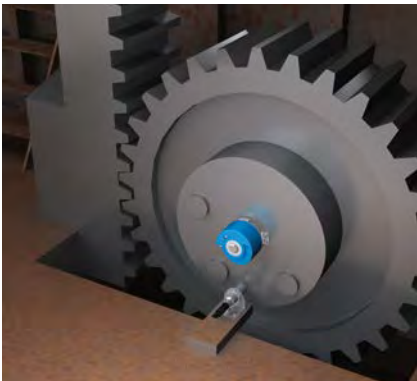
A conveyor pipe distributes the enriched aluminum oxide into various supply bins. The charging cranes in turn take material out of these bins to fill their own bins. The electrolysis cells are supplied by means of the cranes. A mechanical flap determines which storage container the main conveyor pipe will fill. To ensure this

process runs smoothly and reliably, the flap positions need to be precisely monitored. The DFS60 incremental encoder is ideally suited for this task. The flap positions can be accurately determined even in the event of a power outage – without having to reset them.

Recommended products

DFS60

Monitoring of tilting position on basic oxygen furnace



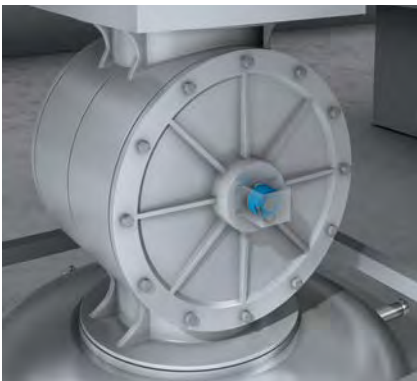
The vessel or shell of a basic oxygen furnace is mounted in a way that allows tilting movements. Depending on the process step during heating (e.g. tapping, de-slagging, charging), the shell must be tilted in different positions by means of hydraulic cylinders. To control the tilting process, measurement equipment pre-

cisely controls the tilting maneuver. The tilting must be measured accurately and the maximum tilting positions must be defined and secured. A rugged inductive proximity sensor and an incremental encoder can together accurately provide the shell's tilting position.

Recommended products

DFS60

Monitoring rotary valve operation



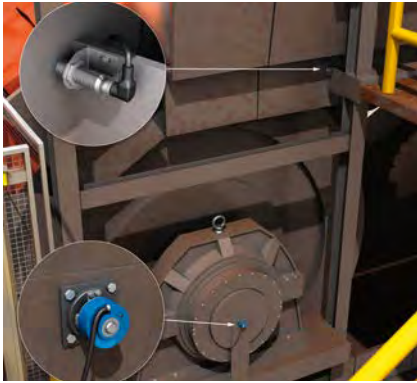
Rotary valves are small components in an aluminum plant but they play an important role in the flow of materials and in guaranteeing uninterrupted production. Typical applications for rotary valves include discharging dust from si-

los, bunkers, hopper gates, and transfer points in conveying systems. The axial movement of the rotary valves can be monitored using the DFS60 incremental encoder.

Recommended products

DFS60

Monitoring the operation of the sinter conveyor in the sinter plant



In general usage, sinter belt must withstand high and changing temperatures, a dusty environment, vibrations and mechanical stress. The same is valid for the motors and drives of the sinter belt structure. If mishaps are not detected immediately, failures in the operation may lead to severe equipment damage

and process delay implications with a high cost potential. Hence, sinter belt operation as well as the integrity of the conveying system should be closely monitored. A combination of encoders, inductive sensors and other sensing solutions achieve the monitoring goal.

Recommended products

DFS60

Movement and position control of internal machine parts



Lances and manipulators for injection, sampling and temperature measurement move in several directions. The entire apparatus moves both up and down, as well as swivels around the vertical axis. The arm carrying the head bearing lance and sampling probe maneuvers up and down, left and right. Such

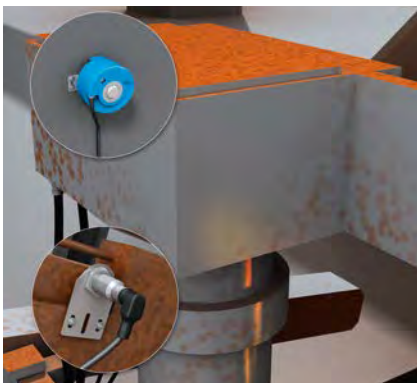
probes can be inserted or retracted. Therefore accurate control and precise monitoring of both actual and end positions are necessary to efficiently operate the lance. Encoders and inductive proximity sensors can help the operator determine the exact positioning of the injection manipulator.

Recommended products

DFS60

KH53

Movement and position control of oxygen and carbon lances



Lance manipulators are used for oxygen and carbon injection into the furnace as well as for sample taking and temperature measuring in the electric arc furnace by entering and exiting the furnace through the furnace door. The actual penetration depth of the lances in the steel bath, as well as the maxi-

mum insertion and retraction positions, ensure proper execution of the position measuring task. A combination of an absolute encoder and inductive proximity sensor correctly identify the lances' actual positions in the furnace - even with the surrounding harsh conditions in the steel plant.

Recommended products

AFM60 SSI

Overhead crane gear position



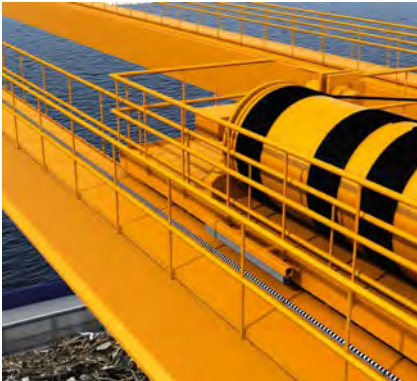
Positioning overhead cranes can be accomplished using a combination of encoders. While precise positioning of the crane's x- and y-axes can be managed with linear encoders, the z-axis positioning is solved using an absolute multiturn encoder. The AFS/AFM60 encoder is a

rugged solution that determines the absolute position of the overhead crane's gears. The absolute encoder measures infinite lengths by counting rotations and is used in the harshest environmental conditions, which are often present in outdoor areas of steel plants.

Recommended products

AFM60 EtherCAT®

Overhead crane trolley positioning



Proper overhead crane positioning in a warehouse or outdoor area is easily solved using a combination of encoders. While precise positioning of the crane's x- and y-axes can be managed with linear encoders, the z-axis positioning is solved using an absolute multiturn encoder. The KH53 non-contact linear encoder is

a rugged solution that determines the absolute position of an overhead crane. It can measure lengths of up to 1.7 kilometers and be used in the harshest environmental conditions, often present in steel warehouses. Additionally, KH53 linear encoders tolerate speeds up to 6.6 m/s.

Recommended products

AFM60

KH53

Position detection of furnace door in collection and holding furnaces



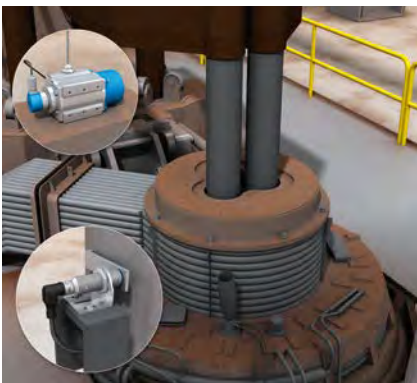
For optimal operation of the collection and holding furnaces, it is also necessary to reduce the cost of heating the furnaces. The position of the furnace door should therefore be monitored to determine whether it is open or closed. If continuous values of the door position are required, the A3M60 PROFIBUS or AFS/

AFM60 PROFINET absolute encoder, distance measurement devices, or optical methods - as offered by laser scanners - are suitable choices. If only limit values specifying whether the door is open or closed are required, presence sensors, displacement measurement sensors, or inductive sensors are sufficient.

Recommended products

AFS/AFM60 PROFINET

Position of electrode arms and electrodes at ladle furnace



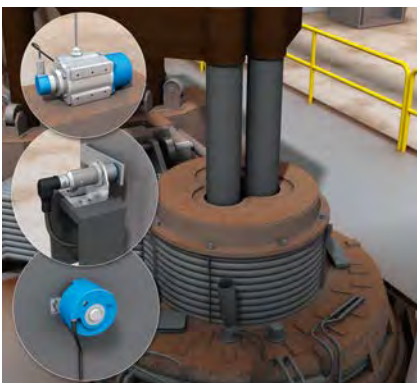
A ladle furnace's electrodes are hoisted and lowered by electrode arms. In some cases, the electrodes' position determines other movements or timing of subsequent steps, such as moving the ladle. Therefore, knowledge of the electrodes' exact position is imperative for safe and

efficient process optimization. A solution consisting of an inductive proximity sensor and wire draw encoder can detect the correct position of the electrodes and their arms and relay the information for optimum task performance.

Recommended products

HighLine

Position of ladle furnace roof during second metallurgy process



The ladle furnace roof is lifted and lowered, depending on the process step. These mechanical movements are executed by cylinders and drives. Some processes can only be safely executed when the roof is in a defined position. An absolute or wire draw encoder together with a proximity inductive switch care-

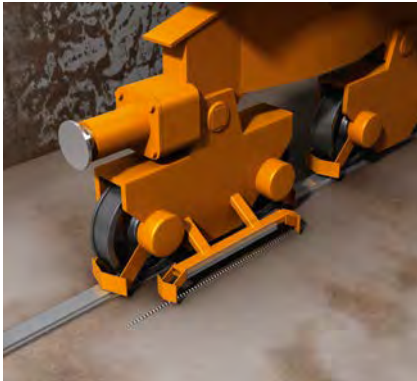
fully monitor the roof's movements and positioning. These sensors are precise enough to accurately detect the roof's position, yet robust, which is important considering the inhospitable temperatures, vibration and mechanical shock present at the ladle furnace.

Recommended products

AFM60 SSI

HighLine

Positioning of outdoor cranes



Precise crane positioning can be achieved by using the rugged KH53 linear encoder. To properly determine the crane's x-axis, this non-contact, virtually maintenance-free linear measuring system mounted on the crane's column. This encoder determines the crane's absolute position by sensing the integrat-

ed magnets buried parallel to the rails on which the crane runs. This accurate linear encoder can measure up to 1,700 m at speeds up to 6.6 m/s. The KH53 is an ideal solution in harsh environments with superior background suppression and immunity to cross talk from other sensors.

Recommended products

KH53

Positioning of rail-mounted shuttles during the material handling process



Proper positioning of outdoor rail-mounted transfer cars and product shuttles during the material handling process is simple with the help of a linear encoder. The encoder's several magnetic heads are buried in concrete between the shuttles' rails while the encoder is mounted underneath the moving shuttle. The

non-contact, accurate measuring system identifies each shuttle's position on the track. Since the vehicles' track isn't necessarily straight, the linear encoder is able to reliably manage the track's curves. Outdoor vehicle positioning could not be easier.

Recommended products

KH53

Positioning of the oxygen cutting torch during continuous casting



Positioning the cutting torch during the continuous casting process is an important step in guaranteeing that each object is precisely cut to length. An encoder and presence detection sensor enable accurate positioning of the cutter as the hot steel is being extruded. While the photoelectric switch detects

the object's presence, the encoder can be programmed to accommodate any value to 65,536 pulses per revolution - something no other encoder can do. It includes a revolutionary design and a metal code disc that provides a high temperature tolerance - an undeniable requirement for this task.

Recommended products

DFS60

Protection of mills



One part of aluminum production is the crushing and grinding of bauxite where large machines comminute the material. Operational and personal safety are essential in this area. A combination of several safety sensors and the MOC Motion Safety Drive Monitor

ensure safe machine standstills period: The DFS60S Pro safety encoder safely monitors the machine speed. One or more TR110 Lock safety locking devices ensures that no personnel can enter the hazardous areas while the machine is not yet stationary.

Recommended products

DFS60S Pro

Protection of slag preparation machine



The recycling process for aluminum includes treating any slag, also referred to as dross, produced during the smelting process. This still contains a significant quantity of aluminum that is worthwhile recovering. This slag treatment occurs in rotary kilns that are fed by

conveyor belts. The DFS60S Pro safety encoder safely monitors the machines when they are idle. They ensure that the access points can only be accessed when the machine is stationary.

Recommended products

DFS60S Pro

Safe rotary kiln standstill



The calcination of fresh aluminum oxide takes place in the rotating cylinder of a rotary kiln. Since these units are very large, their moving parts are also extensive. The drives for the kilns are also correspondingly powerful. A combination of several safety sensors and the MOC Motion Safety Drive Monitor

ensure a safe standstill of the rotary kiln. The DFS60S Pro safety encoder safely monitors the machine speed. One or more TR110 Lock safety locking devices ensure that no personnel can enter the hazardous areas while the machine is not yet stationary.

Recommended products

DFS60S Pro

Speed measurement of casting wheel for casting process monitoring



For optimal filling of ingot molds, it is essential to synchronize the speed of the casting wheel with the speed of the ingot casting conveyor. This requires precise measurement of the speed of the casting wheel. The AFS/AFM60

Inox absolute encoder performs this task reliably and, thanks to its high resolution, with maximum accuracy too. Its rugged design enables it to be used in the harsh environment of aluminum casting.

Recommended products

AFS/AFM60 Inx

Speed measurement of ingot casting belt



To ensure the empty ingot molds arrive at the casting wheel at the right time and can be filled, it is essential to synchronize the speed of the ingot casting conveyor with the speed of the casting

wheel. This requires precise measurement of the speed of the ingot casting conveyor. The DBS36 Core incremental encoder performs this task reliably in the harsh environment of aluminum casting.

Recommended products

DBS36 Core

DLS40

Speed measurement of rotary drum furnace



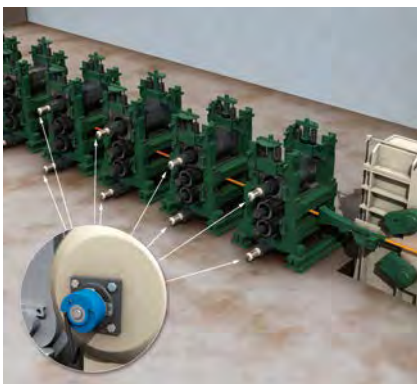
The aluminum recovered from recycling of aluminum waste is first placed in a furnace, usually a rotary drum furnace. The rotation of the furnace chamber ensures a perfect mixing of the input materials and accelerates the smelting process.

For optimal process control, the speed of rotation and rotational position of the rotary drum furnace needs to be monitored and measured. The AFS/AFM60 Inox absolute encoder performs this task even under harsh conditions.

Recommended products

AFS/AFM60 Inox

Synchronization of drive motors in the hot rolling process



Synchronization of rollers and their stands during the rolling process is an important goal to ensure consistent product quality. Production optimization is also attained via proper rolling equipment control. Absolute and incremental encoders regulate the rolling stands motor drives during the rolling process

thereby controlling the speed at which the objects pass through the rollers and stands. Benefits of these encoders include permanent and safe operation of the equipment due to a high enclosure rating, extreme temperature resistance and a long bearing lifetime.

Recommended products

AFS/AFM60 SSI

DFS60

AHS/AHM36

Reactor vessel position detection at Ruhrstahl-Heraeus degasser



The vacuum vessel of a Ruhrstahl-Heraeus reactor is lowered and lifted to different positions, depending on the process step and level in the ladle. The lower part of the vacuum vessel is dipped and submerged into the liquid steel. During this process step, it is important to carefully

monitor and control the vessel's position. A solution of a high-resolution absolute encoder and robust proximity inductive sensor using ASIC technology combine to offer a unique remedy to determine the vessel's exact positioning.

Recommended products

AFM60 SSI

Roof position detection at vacuum degasser during secondary metallurgy



The roofs of vacuum degasser and vacuum oxygen degasser furnaces are lifted and lowered, depending on the process step. These mechanical movements are executed by cylinders and drives. Some secondary metallurgy processes can only be safely performed if the degasser roof is in a specific position. Therefore, it

is important to carefully and accurately monitor and control the roof's position. Robust - yet precise - sensors are required to accomplish this monitoring this task since the conditions are challenging: high temperature, vibration and mechanical shock.

Recommended products

AFM60 SSI

AHM36 SSI

Rotary valve operation for carbon and sinter supply



Rotary valves control the carbon and sinter supply for the subsequent processing steps. Encoders control the rotary valve motor and therefore the amount and speed at which carbon and sinter material is supplied to the subsequent processes. The fact that the encoders

are so easy to program reduces storage costs and downtime of the dosing system. Their magnetic scanning system makes them ideal for use in harsh environments. What's more, condensation has no influence on the encoders' measurement results.

Recommended products

AFM60

Tilt angle detection on injection molding machine



When connecting the anode block and support, liquid cast iron is used as an "adhesive." The cast iron is poured from a pot into the space between the support and the anode block using a tilting device. In order to properly pour the liquid iron, it is necessary to know the precise position of the tilting device. The TMS/TMM88 inclination sensor

exactly measures the tilt angle of the device. Measurement is done in one or two dimensions. This enables the sensor to also detect deviations in inclination transverse to the tilting axis. Thanks to its aluminum housing with fully-encapsulated electronics, the sensor is insensitive to the harsh ambient conditions.

Recommended products

TMS/TMM88

Tilt measurement at rotary drum furnace



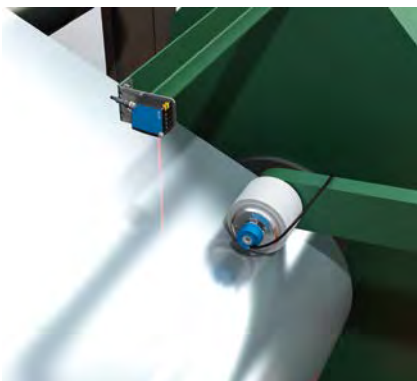
Rotary drum furnaces are often used as smelting units when recycling aluminum waste. The furnace drum can rotate, the door opens and closes, and the entire unit tilts. The latter mentioned movement is necessary in order to tilt the

furnace to the correct angle and in the correct direction for loading the waste and tapping the molten aluminum. The TMS/TMM88 inclination sensor precisely measures this tilt in two axes.

Recommended products

TMS/TMM88

Width and diameter control of coils during winding



During the finishing process, steel is wound into coils. These are monitored and measured to ensure that the length and width are correct before leaving the winding area. A combination of SICK solutions allows this task to be performed with ease. A LiDAR sensor monitors the width of the coil on the winding

machine while an incremental encoder monitors the speed and motion of the winding machine. A distance sensor determines the diameter of the wound coils, while a pressure switch monitors the coolant pressure and liquid level of the wrapping machine.

Recommended products

DBS60 Core

DFS60

| Mining | Incremental encoders | Linear encoders | Safety encoders | Inclination sensors |
|---|----------------------|-----------------|-----------------|---------------------|
| | DFS60 | KH53 | DFS60S Pro | TMS/TMM88 |
| Calculation of belt speed and running direction | ■ | | | |
| Detection of the crane position | | ■ | | |
| Monitoring conveyor belt operation | | | ■ | |
| Monitoring train loading and unloading operations | ■ | | | |
| Monitoring unloading operations via a wagon tippler mechanism | | | | ■ |

Calculation of belt speed and running direction



The belt speed at which excavation materials are conveyed to stockpiles, ship loaders, and railroad loading facilities is of paramount importance. The DFS60 incremental encoder calculates the speed and running direction of the belt. The

DFS60 encoder can be configured either via a PC or with a separate programming tool, thus offering comprehensive programming flexibility for all mining requirements.

Recommended products

DFS60

Detection of the crane position



The non-contact KH53 linear encoder for measuring length makes it possible to detect the position of the crane portal precisely over a distance of up to 1,700 m. Thanks to the absolute position de-

tection, a reference run is not required. Furthermore, the linear encoder also works under difficult ambient conditions without displaying signs of wear.

Recommended products

KH53

Monitoring conveyor belt operation



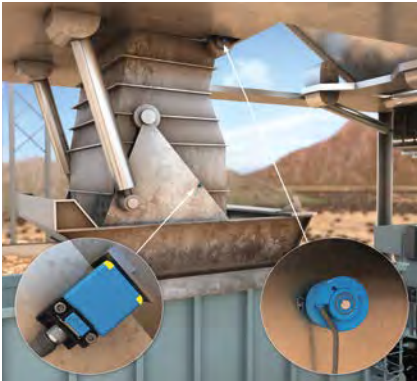
When the actual speed of a conveyor belt differs from the required speed, production yield changes and production steps can be misaligned. Maintaining the proper speed and taking periodic measurements to prevent interruptions or failures

are therefore essential for maintaining production throughput. A safety encoder continuously monitors conveyor belt operations to maximize performance, while an encoder for functional safety furthermore supports safety functions.

Recommended products

DFS60S Pro

Monitoring train loading and unloading operations



Filling each wagon with coal or metal ore requires precise loading. Too much material results in spillage and waste, while too little is not efficient. The clam shell dispenses the load into the wagon based on its location under the chute. A rugged inductive proximity sensor determines the wagon's exact position while a dura-

ble high-resolution incremental encoder regulates the opening and closing of the clam shell's chute for accurate and optimal loading. Additionally, the Visionary-T AG can monitor the filling process by measuring the volume of material filling each wagon.

Recommended products

DFS60

Monitoring unloading operations via a wagon tippler mechanism



Efficient, fast unloading of filled wagons via a tippler mechanism is required for maximum productivity. Determining the wagon's precise position for the tippler mechanism to properly function is essential. An interlinking system of rugged

inductive proximity switches to establish the wagon's exact position, and a dynamic inclination sensor to determine the tipping angle, combine to expedite the offloading process and maximize output for the operating entity.

Recommended products

TMS/TMM88

| Mobile automation | | | | | | | |
|--|------------------|-----------------|--------------------|----------|---------------------|-----------|-----------|
| | Absolut encoders | Linear encoders | Wire draw encoders | | Inclination sensors | | |
| | AHS/AHM36 | MAX® | EcoLine | HighLine | TMS/TMM22 | TMS/TMM61 | TMS/TMM88 |
| Aerial ladder positioning on aerial rescue trucks | | | ■ | ■ | | | |
| Detection of slewing ring position | ■ | | | | | | |
| Determining the inclination of the basket | | | | | | ■ | |
| Determining the length of square bales | ■ | | | | | | |
| Encoder for angle detection at the aerial ladder | ■ | | | | | | |
| Encoder for angle detection on the boom | ■ | | | | | | |
| Inclination sensors for positioning tasks on the mobile crane | | | | | | | ■ |
| Leveling of the excavator arm in limited working ranges | | ■ | | | | | |
| Leveling the excavator arm | ■ | | | | | | ■ |
| Leveling the spray boom | | | | | ■ | | |
| Measuring the incline of the driver's cab and chassis | | | | | | | ■ |
| Measuring tree trunks on the harvester | ■ | | | | | | |
| Monitoring of the drill feed and drill speed | ■ | | | ■ | | | |
| Monitoring the drilling angle | | | | | | | ■ |
| Position detection in aircraft tractors | ■ | | | | | | |
| Position detection of the steering cylinder | | ■ | | | | | |
| Positioning of the gripper arm on garbage trucks | ■ | | | ■ | | | |
| Positioning of the supports on a mobile crane | | ■ | | | | | |
| Positioning the hydraulic cylinder in semi-automated work processes | | ■ | | | | | |
| Positioning the water/foam monitor | ■ | | | | | | |
| Steering angle detection on heavy trucks | ■ | | | | | | |
| Tilt detection on heavy trucks | | | | | | | ■ |
| Wire draw encoder for support and boom positioning on the mobile crane | | | ■ | ■ | | | |

Aerial ladder positioning on aerial rescue trucks



Sensor solutions for position recording are used to realize reproducible motion sequences of the aerial ladder. Wire draw encoders from the HighLine product family detect the length of the extended ladder. Thanks to robust mechan-

ics and very precise sensor technology, high repeatability is achieved. The wire draw encoders from the EcoLine product family are perfect for the support positioning thanks to their narrow shape.

Recommended products

HighLine

EcoLine

Detection of slewing ring position



In order to realize semi-automated machine processes it is necessary to measure the position of the upper to the lower carriage with an absolute encoder at the slewing ring. With its very compact size and the rugged design, the AHS/

AHM36 absolute encoder is perfect for this task. Thanks to the absolute position detection, high resolution and high repeatability, it can also realize repeating work processes.

Recommended products

AHS/AHM36

Determining the inclination of the basket



In order to be able to transport people steadily and horizontally, the two-dimensional TMM61 inclination sensor detects the inclination of the basket and forwards this regulation information to

the superior control unit. Thanks to the compensating cross sensitivity and the configurable vibration suppression, the TMM61 enables precise and reliable positioning.

Recommended products

TMM61

Determining the length of square bales



The compact AHS/AHM36 absolute encoder can determine bale length on square balers. By detecting the absolute position of the measuring wheel, the encoder determines the feed rate, and,

thereby, the bale length. Thanks to its dust resistance and reliable, fully magnetic sensor, it is particularly well suited to this task.

Recommended products

AHS/AHM36

Encoder for angle detection at the aerial ladder



The angle and the position of the aerial ladder relative to the lower carriage must be known in order to realize repeating motion sequences. The AHS/AHM36

absolute encoder is the perfect sensor solution thanks to its compact and rugged design and the high repeatability.

Recommended products

AHS/AHM36

Encoder for angle detection on the boom



The angle and the position of the boom relative to the lower carriage must be known for a stable load torque restriction. The absolute encoder

AHS/AHM36 is suitable for this task thanks to its compact and robust design and the CANopen or SAE J1939 interface.

Recommended products

AHS/AHM36

Inclination sensors for positioning tasks on the mobile crane



To avoid damage due to overload and overturning, sensor solutions for load torque restrictions are used on the mobile crane. The 2 dimensionally functioning inclination sensor TMM88 suited for the support during the automated leveling of the mobile crane has a compensated cross sensitivity and

configurable vibration suppression. The one-dimensional functioning inclination sensor TMM88 records the position of the boom. Its measuring range of 360° and the freely adjustable zero point allow flexible application in various installation situations.

Recommended products

TMS/TMM88

Leveling of the excavator arm in limited working ranges



When space is limited, precise control of the excavator arm is important to prevent damage to the surrounding infrastructure and pipelines in the ground. With the MAX® linear encoders - integrated in the four hydraulic cylinders of the excavator - indirect measurement of the position of

the hydraulic cylinders and therefore leveling of the excavator arm are possible. Maximum height and depth positions can be taught in by integrating the rugged sensors. This prevents collisions and supports the operator in his/her work.

Recommended products

MAX®

Leveling the excavator arm



To optimize the work routine of an excavator, the absolute position of the moving parts to each other must be known. Inclination sensors TMS/TMM88 reliably record this position by measuring the in-

clination of the upper and lower carriage and the excavator arm. Absolute encoder AHS/AHM36 on the respective arm joints can support the measurement.

Recommended products

AHS/AHM36

TMS/TMM88

Leveling the spray boom



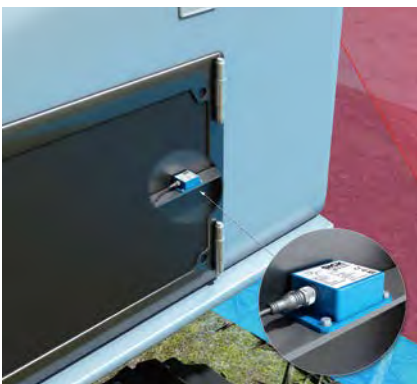
The compact TMS/TMM22 inclination sensor is used to level the rod. Thanks to the sensor, the rod level can be adjusted for different terrains, for example. The TMS/TMM22 is suitable for this precise

leveling task as it offers high accuracy across the entire measuring range, outstanding temperature stability, compensated cross sensitivity, and optimal vibration suppression.

Recommended products

TMS/TMM22

Measuring the incline of the driver's cab and chassis



The AHS/AHM36 absolute encoders record the joint position in order to realize automatic swivel movements of the foam monitor, such as the approach into attack position or automatic oscillation

movements. Thanks to the high resolution, the design intended for harsh ambient conditions and the compact construction, these encoders are particularly well-suited for such tasks.

Recommended products

TMS/TMM88

Measuring tree trunks on the harvester



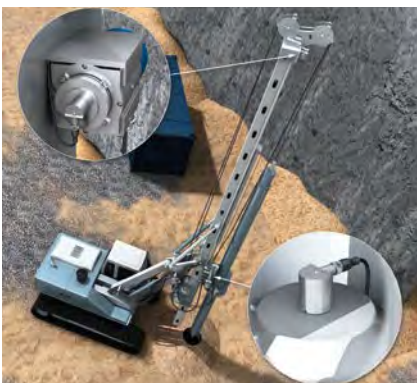
The rugged and highly compact AHS/AHM36 absolute encoders determine the gripper position to measure the

tree-trunk diameter. A further encoder detects the feed rate, thereby measuring the length of the trunk.

Recommended products

AHS/AHM36

Monitoring of the drill feed and drill speed



For precise drilling, it is important to know the exact drill speed and the position of the drill feed. The AHS/AHM36 absolute encoder is the optimal choice for this purpose due to the absolute position detection, dust-proof perfor-

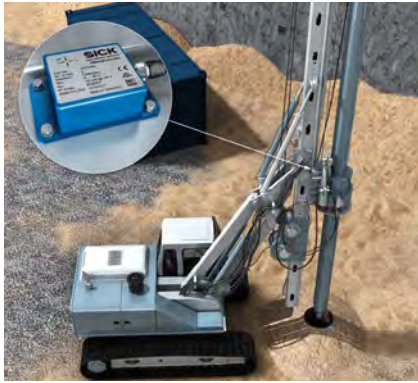
mance as well as reliable fully-magnetic sensors. In addition, it can be used for position detection in combination with a wire draw mechanism, the BTF wire draw encoder.

Recommended products

AHS/AHM36

HighLine

Monitoring the drilling angle



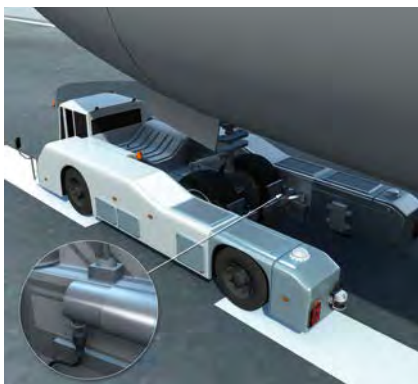
The foundation for successful drilling is accurate positioning and adjustment of the drilling machine. To do so, the TMM88 inclination sensor determines the x- and y-coordinates. High accuracy over the entire measuring range,

excellent temperature stability as well as compensated cross sensitivity and configurable vibration suppression make the TMM88 the perfect solution for this challenging task.

Recommended products

TMM88

Position detection in aircraft tractors



It is important to check the exact position of the nose wheel receptacle flap in the nose wheel receptacle. The singleturn type of the AHS/AHM36 absolute encoder is used for this purpose. It can also be used in harsh ambient conditions thanks to its rugged and reliable fully magnetic

sensor technology. Thanks to its small size, the encoder fits into even restricted installation spaces. Depending on the control architecture used, the devices are available with CANopen, IO-Link SSI or SAE J1939 interface.

Recommended products

AHS/AHM36

Position detection of the steering cylinder



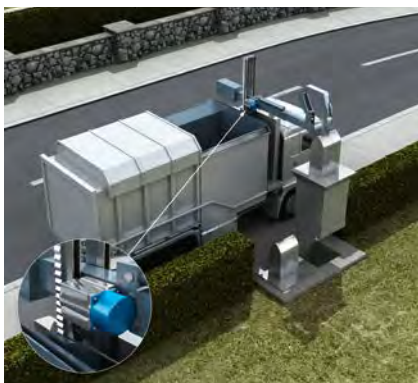
Precise positioning of the control for steering is a basic prerequisite for autonomous driving of mobile machines. The MAX[®] linear encoder - integrated in the steering cylinder of the tractor - detects

its position. In combination with the WGS driver assistance system, the steering cylinder can be positioned and the steering controlled.

Recommended products

MAX[®]

Positioning of the gripper arm on garbage trucks



The exact position of the gripper arm must be recorded to enable automatic emptying of waste containers. Therefore the compact AHS/AHM36 absolute encoder determines the rotational movement on the gripper arm. Thanks to the

high repeatability, the HighLine wire draw encoder reliably measures the extension path of the gripper arm. The gripper arm can now be positioned exactly by means of the recorded sensor values.

Recommended products

AHS/AHM36

HighLine

Positioning of the supports on a mobile crane



Space is often tight in construction sites in cities in particular. MAX® linear encoders are integrated into the hydraulic cylinders of the four crane supports and help to position them precisely. This makes it possible to extend all four supports,

provided there is enough space and if the respective task requires this. Precise load determination is also possible: this prevents the mobile crane from overturning.

Recommended products

MAX®

Positioning the hydraulic cylinder in semi-automated work processes



Positioning the individual hydraulic cylinders of the excavator arm enables partial automation of work processes. This makes it possible to strip a slope, for example. Rugged MAX® linear encoders

- integrated into the hydraulic cylinder of the excavator arm - first detect the actual position. The target position is then approached by the hydraulic control.

Recommended products

MAX®

Positioning the water/foam monitor



The AHS/AHM36 absolute encoders record the joint position in order to realize automatic swivel movements of the foam monitor, such as the approach into attack position or automatic oscillation

movements. Thanks to the high resolution, the design intended for harsh ambient conditions and the compact construction, these encoders are particularly well-suited for such tasks.

Recommended products

AHS/AHM36

Steering angle detection on heavy trucks



For simpler and more reliable maneuvering of heavy trucks carrying large payloads, many of these vehicles have sensors for controlling the steering angles of each individual drive axle. The AHS/AHM36 absolute encoder is ideally suited for this task. With its IP 66/IP 67

enclosure ratings, as well as an operating temperature range of -40 °C to $+85\text{ °C}$, it reliably detects the absolute position of the respective wheels, even in harsh environments. The positioning data obtained in this way enables heavy loads to be positioned precisely.

Recommended products

AHS/AHM36

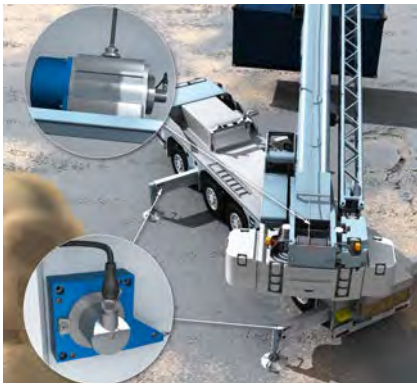
Tilt detection on heavy trucks

When heavy trucks transport goods, dangerous imbalances can occur, which can lead to the goods slipping or even to the vehicles overturning. To prevent this, sensors are increasingly being used for data acquisition and precise control.

The TMM88 two-dimensional inclination sensor accurately measures the vehicle's tilt angle to an accuracy of $\pm 0.02^\circ$, increasing safety and efficiency in the operation of heavy trucks.

Recommended products

TMS/TMM88

Wire draw encoder for support and boom positioning on the mobile crane

A sub-function for the load torque restriction on the mobile crane is the position detection of the extendable support feet and the recording of the boom and crane arm position. The wire draw encoders from the EcoLine product family are per-

fect for the support positioning thanks to their narrow shape. The wire draw encoder from the HighLine product family, with their rugged housing and measurement length up to maximum 50 m, are the right solution for boom positioning.

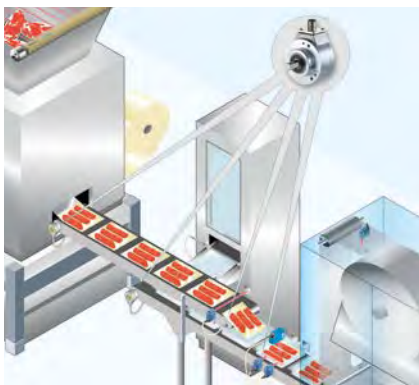
Recommended products

EcoLine

HighLine

| Packaging | | | | | | | | |
|--|-------------------|----------------------|------------|------------|-------|--------------------------|-------|-----------------|
| | Absolute encoders | Incremental encoders | | | | Measuring wheel encoders | | Safety encoders |
| | AFS/AFM60 | DBS50 Core | DBS60 Core | DBS60 Inox | DUS60 | DFV60 | DUV60 | DFS60S Pro |
| Control of the belt speed for primary packaging of meat products | | | ■ | ■ | | | | ■ |
| Feinpositionierung der Verpackungsfolie für Schüttgut | | ■ | | | | ■ | ■ | |
| Positioning of the individual wire axes of the pallet handling robot | ■ | | | | | | | |
| Speed measurement of belt on packaging systems for individual products | | | ■ | | ■ | | | |
| Speed regulation of the conveyor unit for beverage cartons from filling systems for dairy products | | | ■ | | ■ | | | |

Control of the belt speed for primary packaging of meat products



The DBS60 Core incremental encoder is used to regulate the speed of the belt. Both belts must be speed-synchronized

in order to guarantee precise storage of the meat portions in the plastic trays.

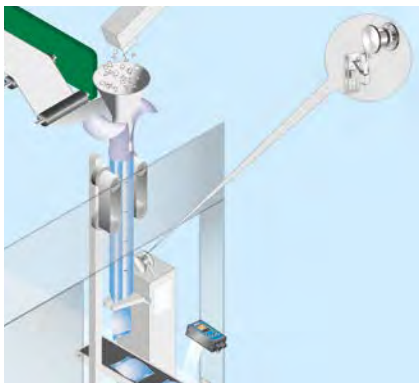
Recommended products

DBS60 Core

DBS60 Inox

DFS60S Pro

Fine positioning of the packaging film for bulk materials



The DBS50 Core incremental encoder monitors the speed of the packaging film on a bag packaging machine. This measurement is required in order to control the fill quantity and cutting process. For

slip-free speed measurement, an alternative is to use the DFV60 incremental measuring wheel encoder.

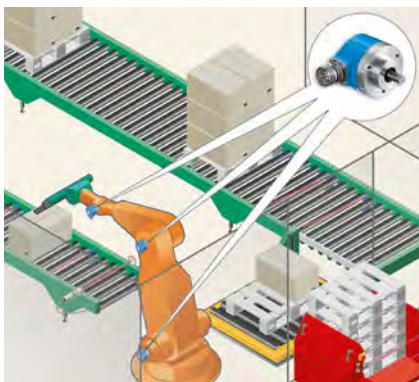
Recommended products

DBS50 Core

DFV60

DUV60

Positioning of the individual wire axes of the pallet handling robot



AFM60 Multiturn absolute encoders transmit the absolute positions of the

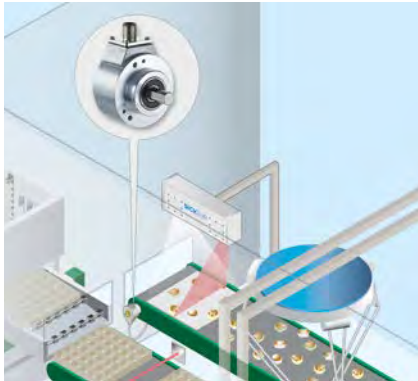
robot's individual axes of rotation to the controller.

Recommended products

AFM60

AHM36

Speed measurement of belt on packaging systems for individual products



The DBS60 Core incremental encoder measures the speed of the belt. Pralines of different types are transported on the belt and sorted into the trays with a Pick

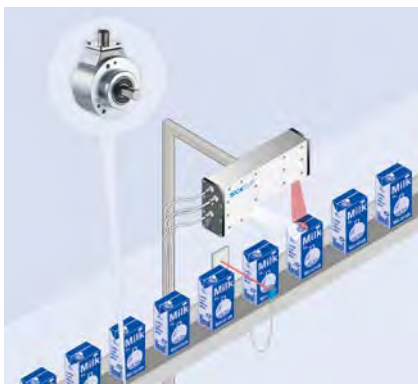
& Place robot. The processes must be synchronized and the encoder provides the required process speed.

Recommended products

DBS60 Core

DUS60

Speed regulation of the conveyor unit for beverage cartons from filling systems for dairy products



The DBS60 Core incremental encoder measures the speed of the belt. This information is required in order to control

the camera for detection of the sealing lids depending on the speed.

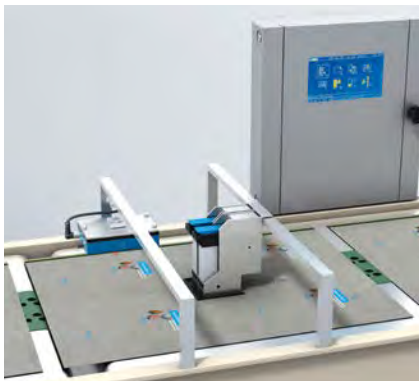
Recommended products

DBS60 Core

DUS60

| Print | Absolute encoders | Incremental encoders | | Measuring wheel encoders | | Wire draw encoders | Laser surface motion sensors |
|--|-------------------|----------------------|-------|--------------------------|--------|--------------------|------------------------------|
| | AFS60/AFM60 SSI | DBS60 Core | DFS60 | DBV50 Core | MWS120 | EcoLine | SPEETEC 1D |
| Control of the print unit when printing sheets | | | | | | | ■ |
| Controlling the print head on ink jet printers | | ■ | ■ | | | | |
| Shelf assignment | ■ | | | | | ■ | |
| Speed measurement for synchronization of machine processes | | | ■ | | | | |
| Speed measurement of paper webs | | | | | | | ■ |

Control of the print unit when printing sheets



After punching and separating the sheets, the print unit must print a 1D code on each sheet. The SPEETEC 1D non-contact motion sensor fulfills two requirements that are important for this. It detects the speed of the sheet to con-

control the print speed and simultaneously determines the correct positioning of the 1D code. This helps overcome challenges such as damage to the sheets that can occur with tactile measurement methods.

Recommended products

SPEETEC 1D

Controlling the print head on ink jet printers



Certain digital printing machines fire individual ink droplets onto the paper per drop-on-demand and with the highest accuracy. The DFS60 incremental encoder uses a measuring wheel to detect the

speed of the paper web. Its resolution of up to 65,536 pulses per revolution provides fast and high-precision control for this process. These encoders also control continuous ink jet printers.

Recommended products

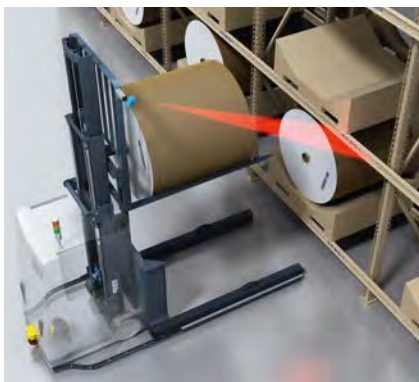
DFS60

DBS60 Core

DBV50 Core

MWS120

Shelf assignment



The CLV650 bar code scanner reads the bar code at the shelf and delivers the data to a central computer. This assigns the corresponding path to the automated guided vehicle (AGV) to incorporate the paper roll into the production process as scheduled. The autofocus function

in real time achieves a greater depth of field. This enhances the scan rate. The EcoLine wire draw encoder measures the lifting height at the AGV, while the AFS/AFM60 SSI absolute encoder takes care of steering control.

Recommended products

AFM60 SSI

EcoLine

Speed measurement for synchronization of machine processes



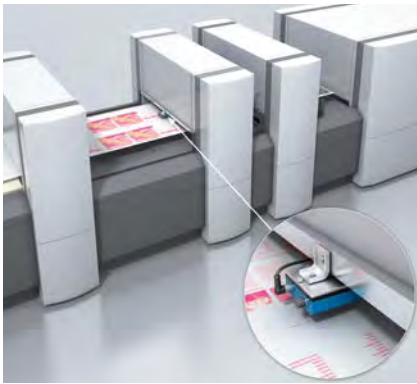
The folding process, the adhesive joints and the paper travel must match exactly. The actual values in the process must also be compared to the positions of the drives. The extremely high resolution

means that the DFS60 incremental encoder satisfies the requirements for accurate synchronization. The easy programming capability enables adaptation to special customer requirements.

Recommended products

DFS60

Speed measurement of paper webs



In the printing industry, paper webs are conveyed at high speed. The SPEETEC 1D non-contact motion sensor reliably detects the web speed and supplies the print unit with high-precision signals.

This controls the print unit with extreme precision and ensures a high-quality print image. The SPEETEC 1D overcomes challenges such as paper web damage and achieves excellent print resolution.

Recommended products

SPEETEC 1D

| Ports and cranes | | | | | | | |
|---|----------------------|-------|-----------------|------|-----------------|------------|---------------------|
| | Incremental encoders | | Linear encoders | | Safety encoders | | Inclination sensors |
| | DBS60 Core | DFS60 | MAX® | KH53 | AFS/AFM60S Pro | DFS60S Pro | TMS/TMM88 |
| Advanced Assistance System | | | ■ | | ■ | | ■ |
| Length measurement on the boom of a reach stacker | | | | | | ■ | |
| Monitoring of the crane winch | | | | | | ■ | |
| Positioning of the traveling crane on a crane | | | | ■ | | | |
| Speed measurement on the crane drive | ■ | | | | | | |

Advanced Assistance System



Intelligent assistant systems prevent hazardous states arising from the load level of a vehicle or the driving behavior of the driver. These modular systems can be used to provide either active or passive assistance. Whereas active assistance systems directly intervene in the motion

of the vehicle, passive systems provide the driver with an acoustic or visual warning. The example shows a modular selection of sensors that are combined and individually adapted to the respective customer requirements as a smart system solution.

Recommended products

AFS/AFM60S Pro

MAX®

TMS/TMM88

Length measurement on the boom of a reach stacker



The BTF wire draw encoder measures how far a reach stacker's boom has been

extended.

Recommended products

HighLine

Monitoring of the crane winch



The information for the safe speed and direction of rotation monitoring of the crane winch is generated by the DFS60S Pro safety encoder. This way, hazards

due to excessive speed or acceleration can be prevented depending on the cargo.

Recommended products

DFS60S Pro

Positioning of the traveling crane on a crane



The KH53 is ideally-suited for positioning the traveling crane on the crane thanks to its good repeatability, large reading distances, and extreme robustness in case of shocks, vibrations, and weather

influences of all kinds. With the position data of the traveling crane, it is possible to stack containers very precisely and with as little offset as possible.

Recommended products

KH53

Speed measurement on the crane drive



The speed of the drive motor of a crane is measured with the DBS60 incremental encoder. This way, the speed can be con-

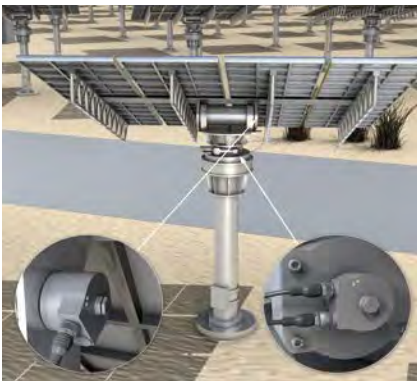
trolled depending on the cargo and the travel path of the crane determined.

Recommended products

DBS60 Core

| Power | Absolute encoders | Incremental encoders | Inclination sensors | |
|---|-------------------|----------------------|---------------------|---------------------------------|
| | AFS/AFM60 SSI | DFS60 | TMS/TMM22 | TMM55 TMS/TMM61 TMS/TMM88 |
| Heliostat – tracking in concentrated solar power plants | ■ | | | |
| Parabolic trough – tracking in CSPs | | | | ■ |
| Solar panel – tracking photovoltaics | | | ■ | |
| Speed of the biomass conveyor belt | | ■ | | |

Heliostat – tracking in concentrated solar power plants



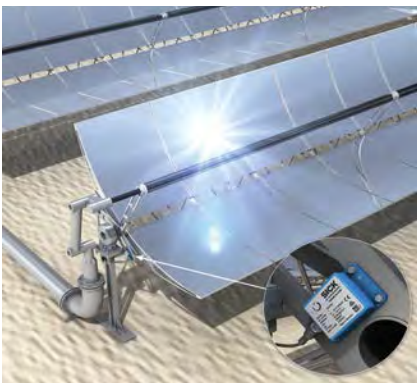
In order to align and adjust the mirrors to best track the sunlight, the heliostat is guided by encoder systems that adjust and identify the exact x and y position of the mirror. SICK manufactures a range of

absolute and incremental encoders, for example the AFS60 absolute singleturn encoder that provides very high accuracy, even at extreme ambient temperatures.

Recommended products

AFS/AFM60 SSI

Parabolic trough – tracking in CSPs



In this system, the sunlight is concentrated by using parabolic mirrors. The sunlight, which enters the mirror parallel to its plane of symmetry, is focused along the focal line and is warming up a heat transfer media like oil. The position of the mirror needs to be guided to follow the sun's daily path in order to achieve

the optimal energy efficiency. Inclination sensors report the actual position of the parabolic mirror to the controller. An inclination sensor which provides very high accuracy even in rough environments can be used to align and adjust the positioning of the parabolic trough.

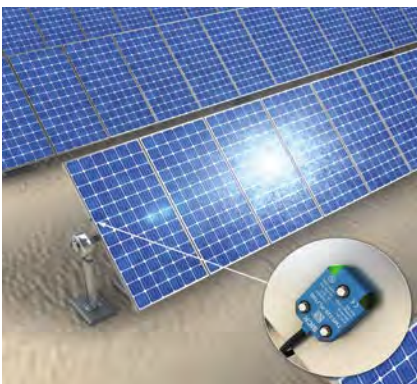
Recommended products

TMM55

TMS/TMM61

TMS/TMM88

Solar panel – tracking photovoltaics



The inclination sensor of a solar panel system is communicating the actual tilt position of the solar modules to the controller. The TMS/TMM22 range of inclination sensors provides non-contact inclination measurement with precision,

even under tough ambient conditions. The sensors are available for one or two-dimensional measurements and offer high availability with fully encapsulated electronics.

Recommended products

TMS/TMM22

Speed of the biomass conveyor belt



The conveyor belt speed at which the biomass is transported to the shredder and then to the storage location is very important when it comes to controlling the material flow. The DFS60 incremental encoder calculates the speed and

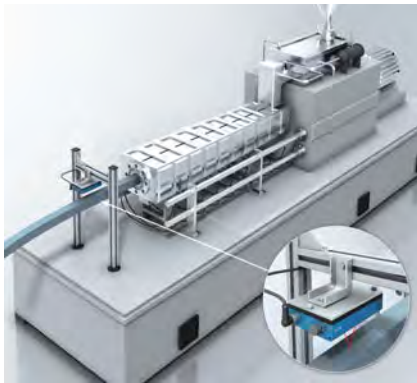
running direction of the conveyor belt. It can either be configured via a PC or a separate programming tool, thus offering comprehensive programming flexibility for all industrial requirements.

Recommended products

DFS60

| Rubber and plastics | | | | | |
|---|----------------------|-------|--------------------------|-------|------------------------------|
| | Incremental encoders | | Measuring wheel encoders | | Laser surface motion sensors |
| | DBS60 Core | DUS60 | DFV60 | DUV60 | SPEETEC 1D |
| Non-contact speed and length measurement of extruded plastic profiles | | | | | ■ |
| Speed measurement of film | ■ | ■ | | | |
| Speed measurement of roller conveyor | | | ■ | ■ | |

Non-contact speed and length measurement of extruded plastic profiles



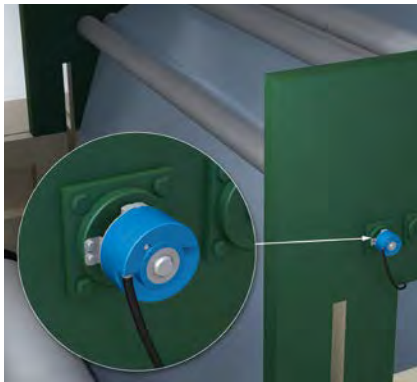
The SPEETEC 1D non-contact linear measurement sensor measures the feed speed and length of the extruded plastic profile exactly and without slippage.

The measured values obtained can be used to control and monitor subsequent system components.

Recommended products

SPEETEC 1D

Speed measurement of film



The DBS60 incremental encoder monitors the speed of the film sheet on a roller. This enables the film sheet to be

wound up onto the coil at a constant rate.

Recommended products

DBS60 Core

DUS60

Speed measuring of roller conveyor



The DFV60 incremental measuring wheel encoder uses a friction wheel to measure the exact feed speed of the

extruded plastic panel. The measured value obtained is used to control the panel sizing saw downstream.

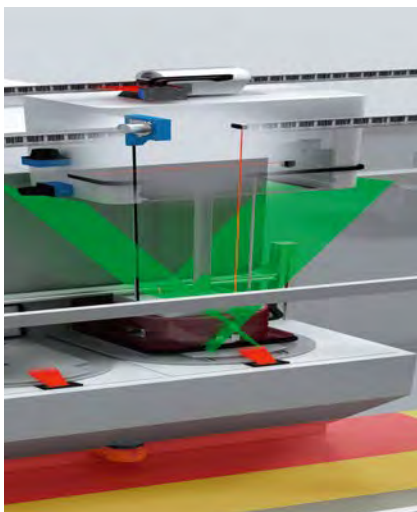
Recommended products

DFV60

DUV60

| Semiconductor | | | | |
|--|--------------------------|----------------------|-----------------|--------------------|
| | Absolute encoders | Incremental encoders | Linear encoders | Wire draw encoders |
| | AFS/AFM60 EtherNet/IP | DFS60 | TTK70 | EcoLine |
| Automated port loading and FOUP identification | | | | ■ |
| Avoid collisions with safety scanning | | ■ | | |
| Detection and positioning solutions in wire bond machines | | | ■ | |
| Inspection and positioning solutions in chip bond machines | | | ■ | |
| Monitoring the positions of wafer carriers | ■ | | | |

Automated port loading and FOUP identification



The risk of material breaks in expensive semiconductor wafers must be kept as small as possible. To ensure this is the case, sensors are used, monitoring, for example, whether a FOUP (Front Opening Unified Pod) is jittering too much when being lowered. The miniature photoelectric sensor WL100L detects these kinds of unwanted movements. As a Class 1 laser sensor, it poses no risk to the operator. The EcoLine wire draw encoder, lightweight at just 180 grams and also

energy-saving (3 W), provides the exact position of the FOUP. Information about the FOUPs, which ultimately provides information about the location of the wafer, is required for effective process control. Regardless of whether a RFID, 1D, or 2D code reader is being used, SICK's 4Dpro concept ensures that all of these have the same connectivity and user interfaces and can be integrated without any problems.

Recommended products

EcoLine

Avoid collisions with safety scanning



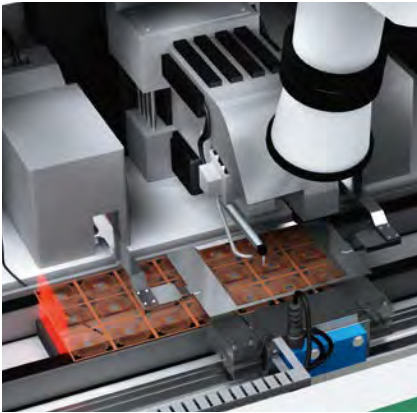
The usable area of cleanrooms represents a significant cost factor. By using flexible equipment in collision zones on automated guided vehicles (AGV) – even at changing speeds – utilization of the workspace can be optimized. SICK's S3000 safety laser scanner adjusts its

collision and protection zones dynamically. The control data for direction and speed is provided by two DFS60 incremental encoders, which are mounted on the AGV. As a result, the S3000 protects workers and other vehicles against collisions with the AGV.

Recommended products

DFS60

Detection and positioning solutions in wire bond machines



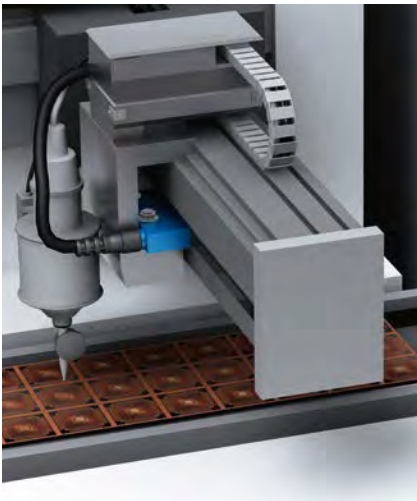
Temperatures are very high in the area around the bonding head, which is why suitably resistant fiber optic systems are advisable in this area. With its mere 16 μ s response time, the WLL180T fiber-optic sensor works together with the LL3 fibers to supply the control unit with a precise signal for edge detection. The grippers move the thin lead frames at an extremely high speed, which means

that maximum precision is a must. The two integrated read heads on the TTK70 linear encoders work with an accuracy in the lower two-digit μ m range at a speed of up to 10 m/s, thereby helping to increase the throughput of the machine. The WT2S photoelectric proximity sensor ensures that lead frames are carried to the next available position.

Recommended products

TTK70

Inspection and positioning solutions in chip bond machines



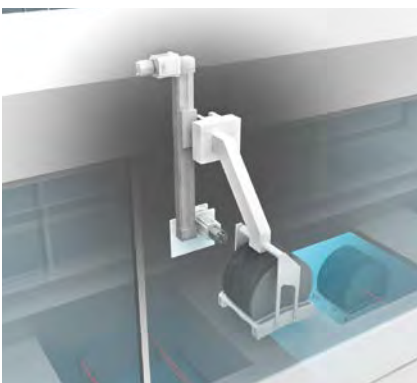
In chip bond machines, defined chips and small rectangular plates from the wafer are bonded to lead frames. If the adhesive is not positioned exactly on the lead frames, the semiconductor chips will be unusable. Incorrectly positioned adhesive points need to be detected before the chip is put in place. The 2D vision sensor Inspector increases the availability of the bond machine. The Inspector can define up to 32 different reference images with up to 16 switch-

ing outputs. Chips are put in place at high speed, which requires the highest level of precision possible. TTK70, the non-contact motor feedback system with integrated HIPERFACE® interface, reports movements with an accuracy in the lower two-digit μ m range – even with large relative movements. The WT2S photoelectric sensor detects the exact point at which the lead frame came into use, utilizing this for the subsequent chip bonding.

Recommended products

TTK70

Monitoring the positions of wafer carriers



The position of the wafer carrier can be determined reliably with absolute encoders: with the AFS60 Singleturn on the vertical and the AFM60 Multiturn on the horizontal axis. Thanks to the field-bus and Industrial Ethernet interface,

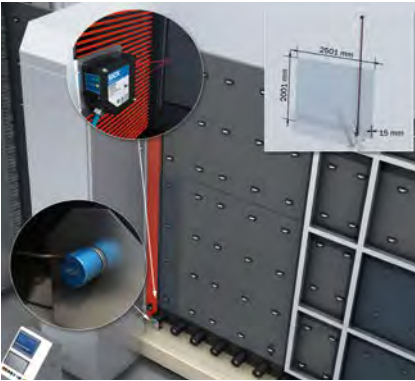
it is possible to integrate the encoders into the machine controller easily and cost-effectively and they can be used even under extreme ambient conditions such as high temperatures.

Recommended products

AFS/AFM60 EtherNet/IP

| Stone, ceramic, glass | | | |
|-------------------------|----------------------|-------|-----------------|
| | Incremental encoders | | Safety encoders |
| | DBS36 Core | DLS40 | DFS60S Pro |
| Glass plate measurement | ■ | ■ | |
| Safe speed monitoring | | | ■ |

Glass plate measurement



A system composed of the MLG-2 Pro automation light grid, the DBS36 Core incremental encoder and the OD5000 displacement measurement sensor measures the glass plates as they are moving. The outer contour is calculated

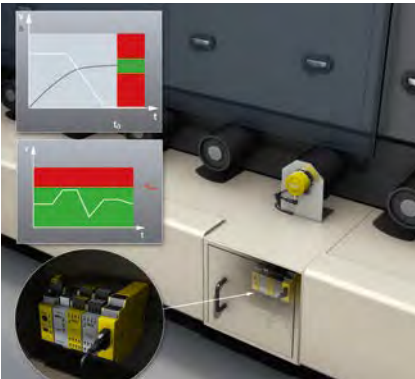
using the height information recorded by the MLG-2 Pro and the speed signal from the DBS36 Core. The thickness of the glass is detected without making contact and with maximum precision with the OD5000.

Recommended products

DBS36 Core

DLS40

Safe speed monitoring



The modular Flexi Soft safety controller is responsible for monitoring all safety functions in the production system. When combined with the Flexi Soft Drive Monitor and the DFS60S Pro safety

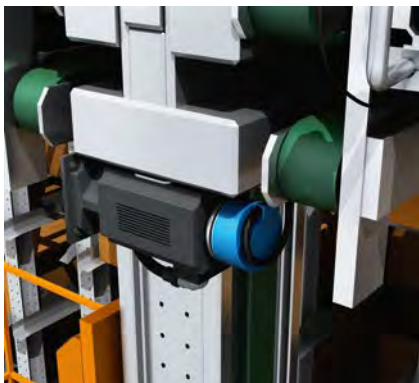
encoder, safe monitoring of the conveyor speed is possible. A system stop is automatically triggered if the speed of the glass plate is too high. This protects the operator.

Recommended products

DFS60S Pro

| Storage and conveyor | | | | | | | | | | | | |
|---|--------------------|-----------|----------------------|-------|-------|--------------------------|-------|-------|--------|--------------------|-----------------|---------------------|
| | Absolute encoders | | Incremental encoders | | | Measuring wheel encoders | | | | Wire draw encoders | Safety encoders | Inclination sensors |
| | AFS/AFM60 PROFINET | AHS/AHM36 | DBS36 Core | DFS60 | DUS60 | DBV50 Core | DFV60 | DUV60 | MWS120 | EcoLine | DFS60S Pro | TMS/TMM22 |
| Height positioning of a storage and retrieval system | ■ | ■ | | | | | | | | | | |
| Height positioning of the scissor lift table | | | | | | | | | | ■ | | |
| Measurement of object lengths and gaps between objects | | ■ | | | | | | | | | | |
| Measurement of tray inclination in vertical storage systems | | | | | | | | | | | | ■ |
| Measuring the conveying speed of a roller conveyor or a roller conveyor | ■ | | | ■ | ■ | | | | | | | |
| Positioning and speed measurement on the shuttle | | | | | | | ■ | ■ | ■ | | | |
| Positioning of storage and retrieval system and transfer cars | ■ | ■ | | | | | | | | | | |
| Speed measurement and positioning at the transfer car | | | | ■ | ■ | | | | | | ■ | |
| Speed measurement and positioning of the x axis on a tote shuttle | | ■ | ■ | | | | | | | | ■ | |
| Speed measurement of the positioning unit on a storage and retrieval system | | | | ■ | ■ | | | | | | ■ | |

Height positioning of a storage and retrieval system



When it comes to the insertion depth, accurate measurements are crucial. A robust absolute encoder on the belt drive with a high resolution and excellent

repeatability ensures precision. The availability of most common communication protocols make integration into the control architecture a breeze.

Recommended products

AFM60

AHM36

Height positioning of the scissor lift table



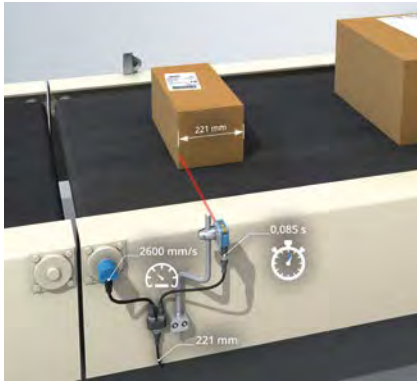
The scissor lift table is positioned using a high-resolution wire draw encoder with a teach-in function. The extremely reliable wire draw encoder does not require

complex linear guidance, and can be integrated with ease both electrically and mechanically.

Recommended products

EcoLine

Measurement of object lengths and gaps between objects



The AHS/AHM36 IO-Link Advanced absolute encoder is suitable for measuring belt speeds. Thanks to the integrated A30 Smart Task, it can be combined with

a photoelectric sensor to also detect the lengths of objects and the gaps between objects. Limit values can be defined for the latter which the encoder monitors.

Recommended products

AHS/AHM36

Measurement of tray inclination in vertical storage systems



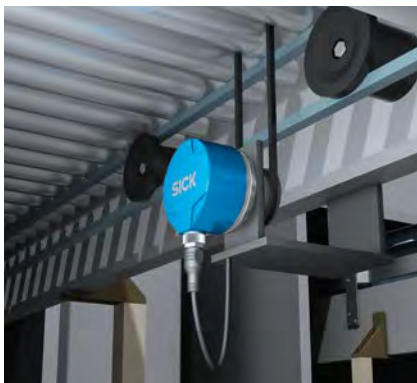
In vertical storage systems, inclination sensors ensure smooth put away and prevent mechanical damage. The sensors measure the inclination of trays and

reliably detect one-sided or uneven loading. An additional advantage: Inclination sensors can be installed optimally even if space is tight.

Recommended products

TMS/TMM22

Measuring the conveying speed of a roller conveyor or a roller conveyor



The conveying speed of a roller conveyor is controlled with the help of the position detection feature of a DBS60 programmable incremental encoder. With its high 16-bit resolution, the encoder ensures maximum reproducibility. The encoder

can be easily mounted to the roller conveyor via a belt drive. SICK offers a large number of encoder variants to accommodate virtually any mechanical and electrical interface.

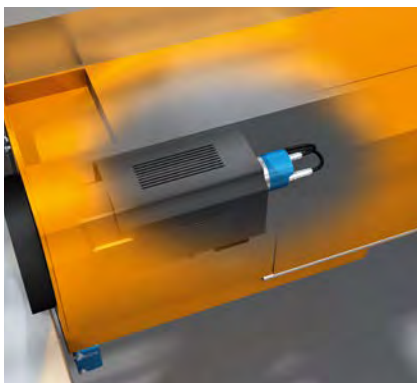
Recommended products

DBS60 Core

DUS60

AFM60 PROFINET

Positioning and speed measurement on the shuttle



The shuttle is positioned by means of an incremental encoder. It supplies the necessary value for controlling the positioning speed, acceleration, and delay.

With its high resolution and repeatability, the encoder ensures that the positioning commands are executed with precision.

Recommended products

DBV50 Core

DFV60

DUV60

MWS120

Positioning of storage and retrieval system and transfer cars



SICK absolute encoders fulfill the requirements for high-precision distance measurement devices for the precise positioning of transport units such as

storage and retrieval systems, transfer carriages, and automated guided systems.

Recommended products

AFM60

AHM36

Speed measurement and positioning at the transfer car



The measured values of the DFS60 programmable incremental encoder control the positioning and speed. With its high resolution, the DFS60 encoder ensures maximum repeatability. There are numer-

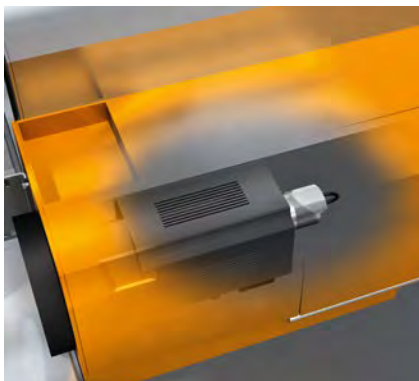
ous versions available to accommodate nearly all mechanical and electrical interfaces. The DFS60S Pro can help to realize safe speed and direction of rotation detection.

Recommended products

DFS60

DFS60S Pro

Speed measurement and positioning of the x axis on a tote shuttle



The DBS36 Core incremental encoder or the AHM36 absolute encoder supplies the value for controlling the positioning, speed, and acceleration. The encoder

ensures that the positioning of the shuttle can be executed with precision. The DFS60S Pro can help to realize these safety functions.

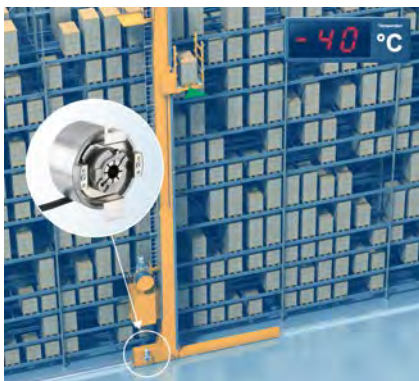
Recommended products

DBS36 Core

AHM36

DFS60S Pro

Speed measurement of the positioning unit on a storage and retrieval system



To avoid an unnecessary increase in enormous cold store energy requirements, it is important to ensure optimal storage and retrieval. Among other things, this depends on accurate positioning of the drive unit for efficient flow. This is realized thanks to the speed

information that the DFS60 incremental encoder provides. With its high resolution and wide temperature range down to $-40\text{ }^{\circ}\text{C}$, the DFS60 works precisely and reliably under even the harshest conditions.

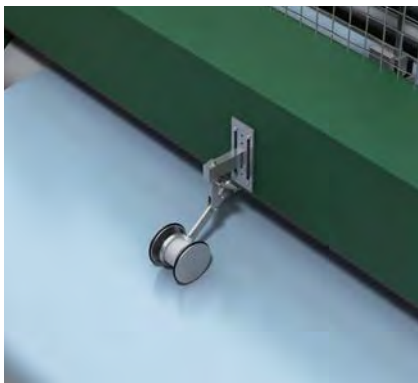
Recommended products

DFS60

DFS60S Pro

| Textile | Measuring wheel encoders | | Safety encoders | Wire draw encoders | Laser surface motion sensors |
|--|--------------------------|-------|-----------------|--------------------|------------------------------|
| | DFV60 | DUV60 | AFS/AFM60S Pro | EcoLine | SPEETEC 1D |
| Length measurement of fabric sheets with measuring wheel encoder | ■ | ■ | | | |
| Non-contact length measurement of fabric sheets | | | | | ■ |
| Safe goods transport with automated guided vehicles (AGV) | | | ■ | ■ | |

Length measurement of fabric sheets with measuring wheel encoder



The DFV60 measuring wheel encoder uses a friction wheel to measure the

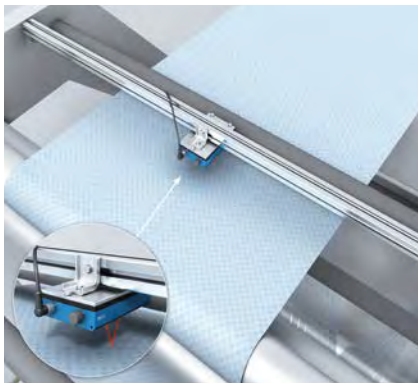
exact speed and length of the woven textile cord.

Recommended products

DFV60

DUV60

Non-contact length measurement of fabric sheets



The SPEETEC® non-contact motion sensor measures the speed and length of fabric sheets optically and without making contact. Inaccuracies caused by

slippage or impairment of the web goods are no longer a problem thanks to the direct contact, which makes high product quality possible.

Recommended products

SPEETEC 1D

Safe goods transport with automated guided vehicles (AGV)



AGVs for automated goods transport are equipped with a wide range of sensors depending on the requirement. A safety system consisting of safety laser scanners, safety controllers and safe en-

coders enables non-contact monitoring of the travel path and adjusts the speed and direction of movement. Inductive proximity sensors or wire draw encoders detect the end positions of lifting forks.

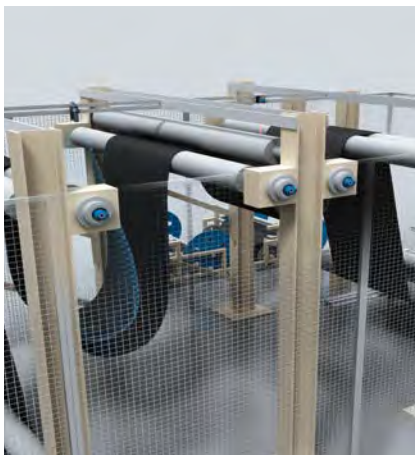
Recommended products

AFS/AFM60S Pro

EcoLine

| Tire | Incremental encoders | | | Laser surface motion sensors |
|---|----------------------|-------|-------|------------------------------|
| | DBS60 Core | DFS60 | DUS60 | SPEETEC 1D |
| Loop control: loop and speed measurement | | ■ | | |
| Non-contact speed measurement during tire rubber transport | | | | ■ |
| Non-contact speed measurement of the tire material during extrusion | | | | ■ |
| Speed measurement of roller conveyor for synchronization of the camera system | ■ | | ■ | |
| Synchronizing the camera system | | ■ | ■ | |

Loop control: loop and speed measurement



Loop control enables the uncoupling of processes such as calendaring and material in-feed and out-feed. The distance sensors installed above the loop are used either for continuous measurement with analog output or with two previously taught-in digital switching points. The loop measurement is performed with only one sensor per loop, which reduces the installation work required. Depending on the properties of the material and

the width of the strip, either Dx35/Dx50 distance sensors or UM30 ultrasonic sensors may be used. DFS60 incremental encoders monitor the speed of the roller. The DFS60 is highly rugged and is available in a variety of mechanical and electrical versions. DFS60 incremental encoders are programmable, thus eliminating the need to have a variety of resolutions and versions in stock.

Recommended products

DFS60

Non-contact speed measurement during tire rubber transport



When extruding tire rubber, the belt speed must be controlled so that the rubber does not stretch. This ensures consistently high product quality. For this purpose, the speed at which the tire material reaches the conveyor belt and the continuous advance of the rubber on the conveyor belt must be precisely synchro-

nized. This is the only way to ensure a smooth transition to the next production step. To prevent damage to the tire tread, the sensor used for speed measurement should also have no contact with the extruded rubber. The SPEETEC 1D non-contact motion sensor is therefore ideally suited for this application.

Recommended products

SPEETEC 1D

Non-contact speed measurement of the tire material during extrusion



When extruding tire rubber, the belt thickness of the tire material must be adhered to exactly in order to ensure product quality of a consistently high standard. This requires precisely synchronizing the release speed of the tire material on the belt to the continuous

forward feed of the extruder press. The SPEETEC® non-contact motion sensor reliably detects the speed directly on the material without slipping, therefore making a significant contribution to the constant optimization of product quality.

Recommended products

SPEETEC 1D

Speed measurement of roller conveyor for synchronization of the camera system



Image evaluation requires an undistorted image. The imaging technology obtains the information relating to the speed of

the roller conveyor and the tire (which is required for synchronization) from the DBS60 Core incremental encoder.

Recommended products

DBS60 Core

DUS60

Synchronizing the camera system

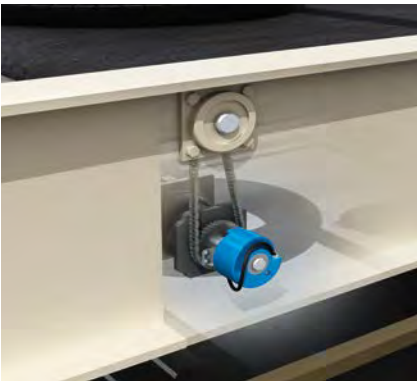


Image evaluation requires an undistorted image. The DFS60 incremental encoder sends the information relating to the speed of the belt and therefore also

the tire (which is required for synchronization) to the ColorRanger E 3D vision sensor.

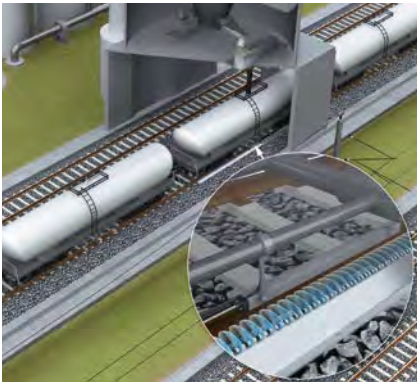
Recommended products

DFS60

DUS60

| Traffic | |
|--------------------------------------|-----------------|
| | Linear encoders |
| | KH53 |
| Freight train positioning | ■ |
| Position determination at lock gates | ■ |
| Position determination of a crane | ■ |

Freight train positioning



So that loading and unloading is done correctly, especially with automatic systems, freight trains must be positioned exactly. With a measurement length of max. 1,700 m, the KH53 linear encoder

is especially well-suited for use on tracks. Due to the non-contact technology, this system works wear-free and precisely – even in case of vibrations of the train, contamination, and precipitation.

Recommended products

KH53

Position determination at lock gates



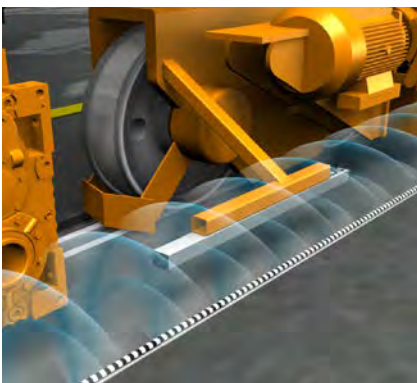
The KH53 linear encoder records the position of the lock gate when closing for optimal control. Non-contact, wear-free

technology ensures accurate system measurements, even in harsh environments.

Recommended products

KH53

Position determination of a crane



The position of the crane must be detected automatically. Outdoor use and long distances present substantial challenges to the measuring system, often charac-

terized by uneven measuring distances such as railways. The KH53 linear encoder operates over a distance of up to 1,700 m even in harsh environments.

Recommended products

KH53

| Waste and recycling | | |
|---|----------------------|-------|
| | Incremental encoders | |
| | DFS60 | DUS60 |
| Conveyor belt speed of the biomass belt in organic waste incineration | ■ | ■ |
| Monitoring conveyor belt operation | ■ | ■ |

Conveyor belt speed of the biomass belt in organic waste incineration



The conveyor belt speed at which the biomass is transported to the shredder and then to the storage location is very important when it comes to managing the material flow. The DFS60 incremental encoder calculates the speed and

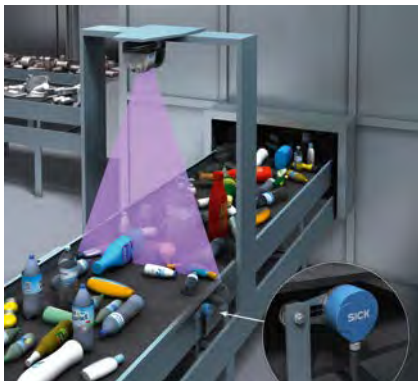
running direction of the belt. The DFS60 can either be configured via a PC or a separate programming tool, thus offering comprehensive programming flexibility for all industrial requirements.

Recommended products

DFS60

DUS60

Monitoring conveyor belt operation



Conveyor belts transport waste in recycling plants. A conveyor belt malfunction can cause significant delays in production and involve major costs. It is therefore necessary to monitor the operation of all conveyor belts, as well as the proper loading, unloading, and positioning of

products. The DFS60 encoder provides the information on conveyor speed, while the Bulkscan® LMS511 laser volume flowmeter determines the volume flow, center of gravity of the load and load height with no contact and no wear.

Recommended products

DFS60

DUS60

| Wind energy | Absolute encoders | | Incremental encoders | Safety encoders |
|--|-------------------|---------------|----------------------|-----------------|
| | AHS/AHM36 | AFS/AFM60 SSI | DFS60 | DFS60S Pro |
| Azimuth motor control | ■ | ■ | | |
| Azimuth system: positioning of the gondola on a wind power plant | ■ | ■ | | |
| Blade angle monitoring | | ■ | | |
| Pitch motor control | | ■ | | |
| Speed measurement of the rotor of a wind power plant | | | ■ | ■ |

Azimuth motor control



Encoders used on azimuth motors should above all be rugged and precise. The AFS/AFM60 absolute encoder is

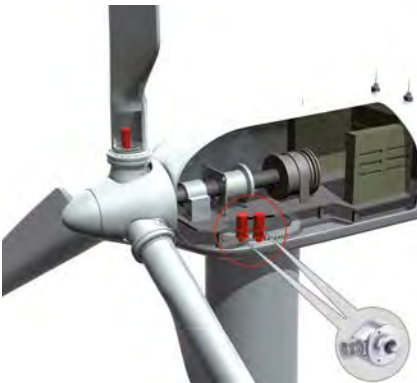
ideally suited for this task. It quickly measures the position and speed of the motor with high precision.

Recommended products

AFS/AFM60 SSI

AHM36

Azimuth system: positioning of the gondola on a wind power plant



Depending on the change of the wind, the gondola must be aligned in the optimal wind direction. Thanks to the absolute encoder, the correct rotation and function of the system is monitored,

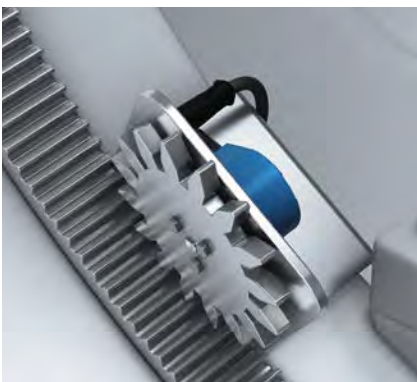
since precisely with strong winds there are very high forces and a malfunction of the gondola controller can result in high costs and downtimes.

Recommended products

AFM60

AHM36

Blade angle monitoring



The redundant blade angle monitoring function makes it possible to check whether the rotor blades actually turn when the pitch motor is rotating. The

AFS/AFM60 absolute encoder does this by measuring the absolute position and speed of the rotor blades.

Recommended products

AFS/AFM60 SSI

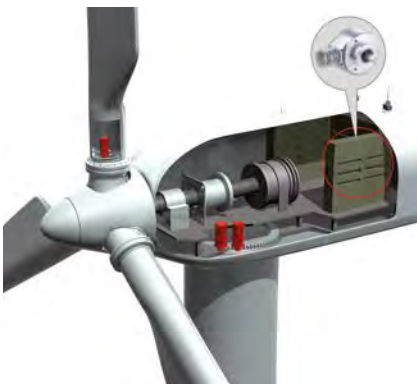
Pitch motor control

Pitch motor controls reduce the structural strain of rotor blades and mechanics at maximum energy consumption. Knowing the current blade angle position is

important for efficient system control. The AFS/AFM60 absolute encoder reliably and precisely measures this position.

Recommended products

AFS/AFM60 SSI

Speed measurement of the rotor of a wind power plant

Generally, incremental encoders are used to monitor the rotor speed. These are normally fastened to the hub of the rotor. The DFS60 incremental encoder is used around the world under the harshest conditions. Its stable construction with enclosure rating up to IP67 makes

it a robust and nevertheless high-resolution incremental encoder. With through hollow shafts up to \varnothing 15,875 mm, the DFS60 family can be used universally. The safe detection of the rotor generator speed can alternatively be handled with the DFS60S Pro safety encoder.

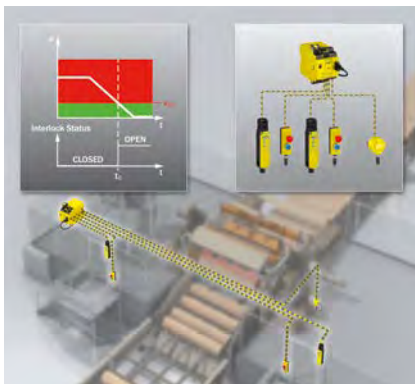
Recommended products

DFS60

DFS60S Pro

| | Absolute encoder | | | | Incremental encoder | | Linear encoder | Measuring wheel encoder | | | Safety encoder | Wire draw encoder | | Inclination sensors |
|--|------------------|---------------|---------------------|--------------------|---------------------|-------|----------------|-------------------------|-------|--------|----------------|-------------------|----------|---------------------|
| | AHS/AHM36 | AFS/AFM60 SSI | AFS/AFM60 EtherCAT® | AFS/AFM60 PROFIBET | DFS60 | DUS60 | KH53 | DBV50 Core | DUV60 | MWS120 | DFS60S Pro | EcoLine | HighLine | TMS/TMM88 |
| Access protection | | | | | | | | | | | ■ | | | |
| Adjustment of the pressing unit height | | | | ■ | | | | | | | | | | |
| Crane positioning | | | | | | | ■ | | | | | | | |
| Detection of the crane position | | | | | | | ■ | | | | | | | |
| Detection of the position height | | | | | | | | | | | | ■ | | |
| Height detection of the crane gripper | | | | | | | | | | | | | ■ | |
| Measurement of the log volume | | | | | ■ | | | | | | | | | |
| Monitoring or conveyed tree trunks | ■ | | | | | | | | | | | | | |
| Monitoring the conveying speed | | | | | | | | ■ | ■ | ■ | | | | |
| Monitoring the conveyor belt speed | | | | | ■ | ■ | | | | | | | | |
| Monitoring the feed speed | | | | | ■ | ■ | | | | | | | | |
| Plausibility check | | | | | ■ | | | | | | | | | |
| Position detection | | ■ | | | | | | | | | | | | |
| Position detection of the hold-down arm | | | | | | | | | | | | | | ■ |
| Positioning of the spraying unit | | | ■ | | | | | | | | | | | |
| Positioning the stacking unit for destacking | | | | ■ | | | | | | | | | | |
| Positioning the stacking unit in the pallet handling machine | | | | ■ | | | | | | | | | | |
| Saw-blade positioning | | | | ■ | | | | | | | | | | |
| Synchronizing the package ejection | | | | | ■ | | | | | | | | | |
| Überwachung von geförderten Baumstämmen | ■ | | | | | | | | | | | | | |

Access protection



Unforeseeable dangers arise in the machining process when stripping the veneer due to the high rotational speed of the rotating unit in which the log is clamped. In order to minimize these risks, the speed of the rotating unit is reduced to a safe tempo when opening

the access door and the system is put into a safe state. In conjunction with the i110 Lock safety locking device and the DFS60S Pro safety encoder, the FX3-MOC motion control modules of the Flexi Soft safety controller monitor the system's electronic drive system.

Recommended products

DFS60S Pro

Adjustment of the pressing unit height



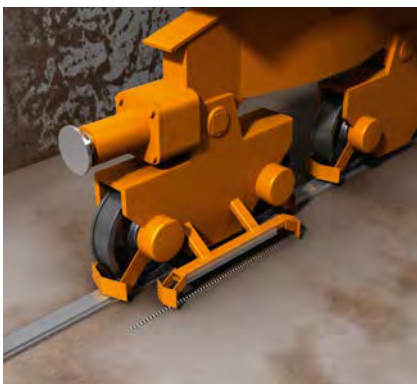
A carriage support and the high-resolution AFM60 PROFINET absolute multiturn encoder ensure that the height of the multi-blade circular saw pressing unit is

aligned with the thickness of the wooden board being machined. The board can therefore be fixed securely and cut precisely during machining.

Recommended products

AFM60 PROFINET

Crane positioning



A non-contact KH53 linear encoder with a resolution of 0.1 mm and optionally for measurement lengths up to 38, 107, 354, and 1700 m is used for detecting

the position of the crane portal. The KH53 is wear-free and is also ideal for harsh ambient conditions.

Recommended products

KH53

Detection of the crane position



The non-contact KH53 linear encoder for measuring length makes it possible to detect the position of the crane portal precisely over a distance of up to 1,700 m. Thanks to the absolute position de-

tection, a reference run is not required. Furthermore, the encoder also works under difficult ambient conditions without displaying signs of wear.

Recommended products

KH53

Detection of the position height



The BCG wire draw encoder supports logistical processes in the large panel warehouse. The encoder detects the exact lift height of the vacuum gripper, which is used for the automated picking

up and setting down of panels. The BCG offers high precision and stability thanks to its integrated spring and adaptation without coupling.

Recommended products

EcoLine

Height detection of the crane gripper



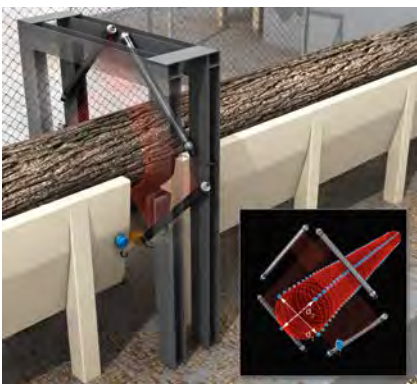
The high-resolution HighLine wire draw encoder measures the height position and speed of the crane gripper. Thanks

to the rugged housing and dirt-repellent brush attachments, the encoder is highly resistant to dirt, shock, and vibrations.

Recommended products

HighLine

Measurement of the log volume



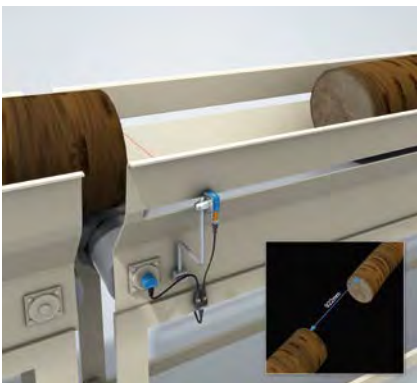
A log measurement system consists of two automation light grids and a DFS60 incremental encoder, and is the ideal solution for determining the log volume – regardless of the surface condition of a tree. The MLG-2 Pro automation light

grids also take reliable measurements in extremely harsh conditions, as they are protected by rugged aluminum housing in combination with the IPG2 protective pipe.

Recommended products

DFS60

Monitoring of conveyed tree trunks



The AHS/AHM36 IO-Link Advanced absolute encoder detects the speed and position of the chain conveyor. The A30 Smart Tasks integrated in the encoder, combined with the W16 photoelectric

retro-reflective sensor, also detects the length of the conveyed tree trunks or the distances between two trunks, even if the conveyor speed is not constant.

Recommended products

AHS/AHM36

Monitoring the conveying speed



With a resolution of up to 5,000 pulses per revolution, the DBV50 Core measuring wheel encoder reliably monitors the conveying speed of the veneer. In

conjunction with an optical photoelectric sensor, it measures the length of the veneer precisely.

Recommended products

DBV50 Core

DUV60

MWS120

Monitoring the conveyor belt speed



The conveyor belt speed is controlled using the measured values of the DFS60 programmable incremental encoder. With its high resolution, the encoder

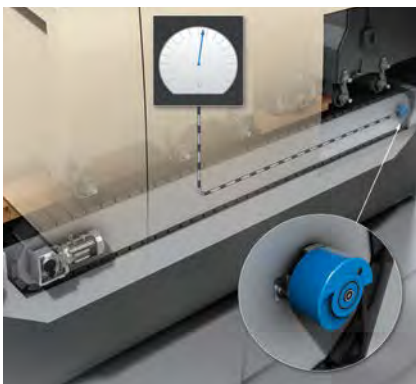
ensures maximum repeatability. There are numerous versions available to accommodate nearly all mechanical and electrical interfaces.

Recommended products

DFS60

DUS60

Monitoring the feed speed



In spite of strong vibrations and shock effects, the DFS60 incremental encoder precisely monitors the feed speed of the conveyor chain. With its high enclosure

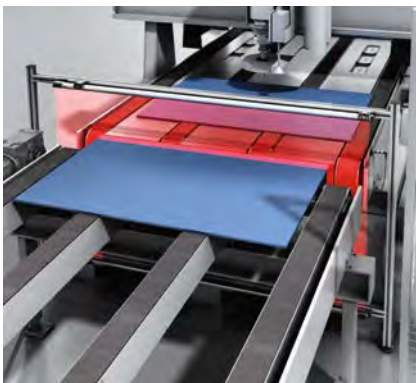
rating and wide-set ball bearings, this encoder is ideal for applications in the harsh environments of the wood industry.

Recommended products

DFS60

DUS60

Plausibility check



In combination with the DFS60 incremental encoder, the MLG-2 Pro measuring automation light grid measures the width, length, and position of the moving

board with millimeter precision. The batch of the board is identified exactly based on this measurement and the holes are drilled in the right place.

Recommended products

DFS60

Position detection



The AFM60 SSI absolute multiturn encoder reliably signals the precise position of the machine to the system control. With magnetic scanning, rugged housing,

and high shock and vibration resistance, the ATM60 SSI is ideal for use in harsh environments.

Recommended products

AFM60 SSI

Position detection of the hold-down arm



The one-dimensional TMS88 inclination sensor measures the inclination angle of the hold-down arm to the transport belt contactlessly. The position of the arm is

thereby detected precisely, the log diameter is calculated, and the log rotation time is determined.

Recommended products

TMS88

Positioning of the spraying unit



The product travel path of the spraying unit is adapted to the dimensions of the corresponding furniture board using the AFM60 EtherCAT® absolute encoder. This

therefore reduces paint consumption, which ensures more economical and ecological production.

Recommended products

AFM60 EtherCAT®

Positioning the stacking unit for destacking



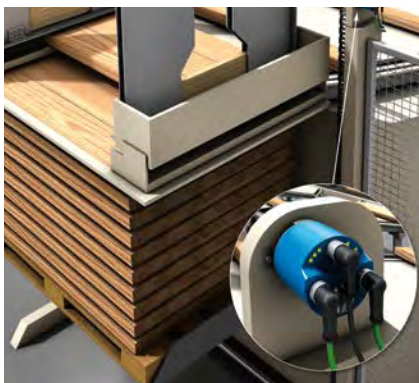
Thanks to its high resolution, the compact AFM60 PROFINET absolute multiturn encoder makes it possible to precisely position the stacking unit for

destacking. In every machining cycle in the system, one layer of wood can therefore be tipped precisely and the system boards can be fed in smoothly.

Recommended products

AFM60 PROFINET

Positioning the stacking unit in the pallet handling machine



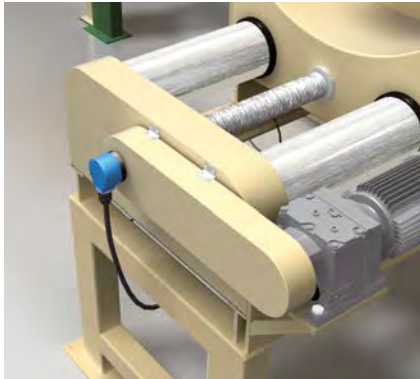
Thanks to its high resolution and IP enclosure rating, the AFM60 PROFINET absolute multiturn encoder determines the position of the stacking unit in the pallet handling machine both reliably and precisely. As a result of its high IP enclosure

rating, the encoder is also resistant to dirt and water. The wooden strips can therefore be fed in smoothly and the machining line is extremely efficient, even in harsh industrial environments.

Recommended products

AFM60 PROFINET

Saw-blade positioning



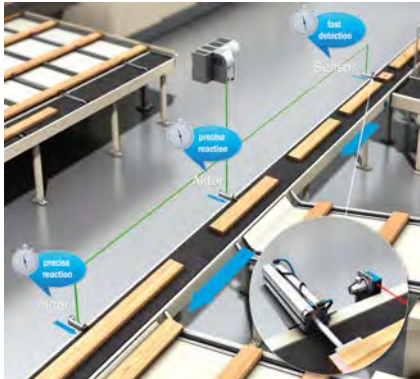
The positioning of saw-blades for setting to the thickness to be sawed is done with the ATM60 absolute encoder. The

AFM60 encoder signals the precise position of the saw-blades to the system control.

Recommended products

AFM60 PROFINET

Synchronizing the package ejection



In conjunction with a DFS60 incremental encoder, the PowerProx Speed MultiTask photoelectric sensor identifies the position and length of the wooden boards when they pass through. Each

board then receives a time stamp and an actuator identification number which facilitates the fully-automated synchronization of the package ejection.

Recommended products

DFS60

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 10,400 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its 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.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

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

That is “Sensor Intelligence.”

Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations → www.sick.com