



# SOLUTIONS FOR HEAVY INDUSTRY

INCREMENTAL AND ABSOLUTE ENCODERS  
DRAW-WIRE ENCODERS, SIGNAL CONVERTERS  
SAFETY TECHNOLOGY

## High system availability with Kübler sensor solutions.

The heavy industry is particularly challenging for sensors. External influences, such as extreme temperatures, shocks and vibrations, dust and moisture, make it difficult for highly-accurate sensors to operate reliably. Many sensors reach their limits here. Kübler has risen to this challenge and developed suitable sensor solutions that stand for sturdiness, performance and durability. A broad portfolio of encoders, draw-wire encoder as well as signal converters and speed monitors is available.



Further information  
Heavy Industry



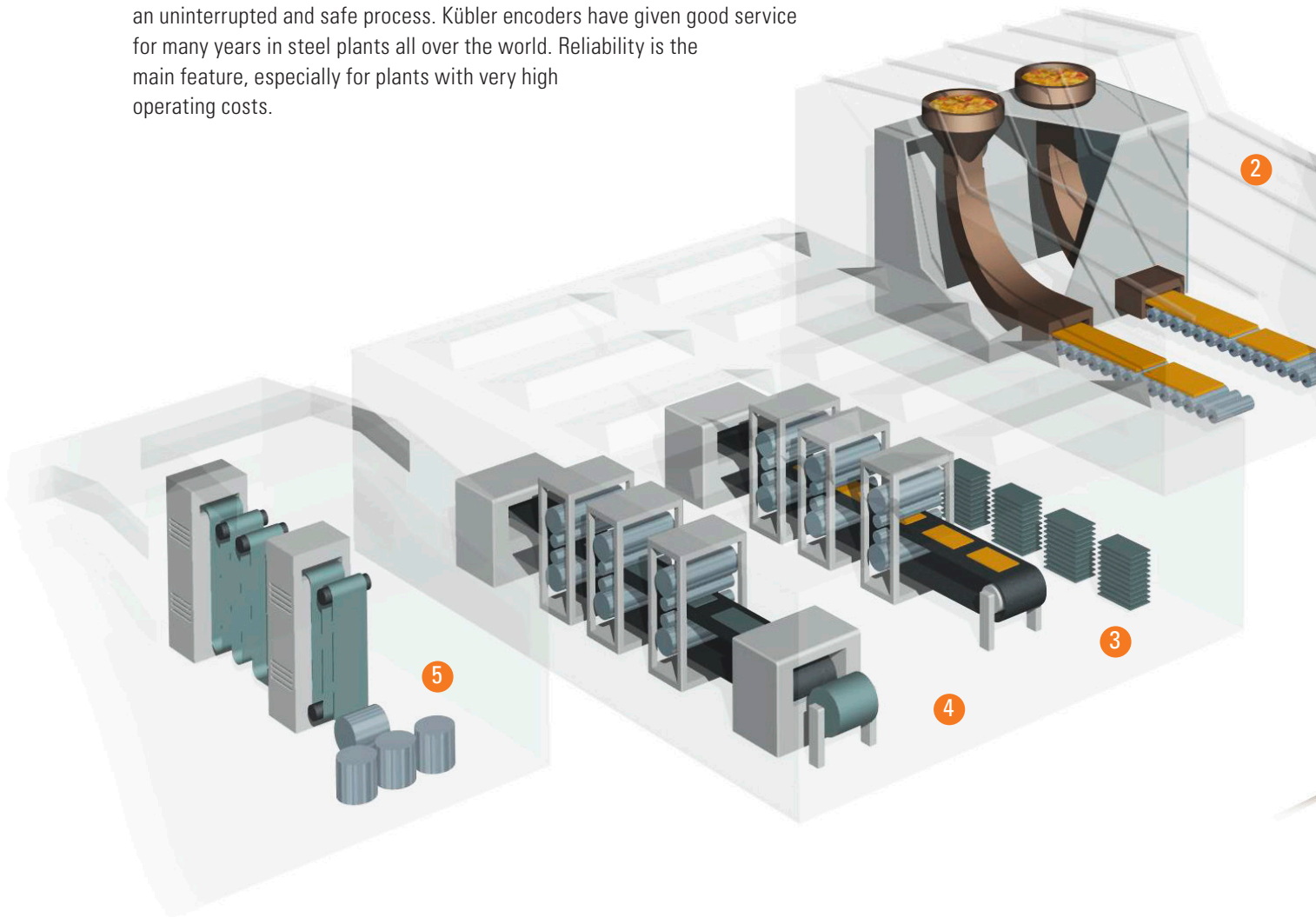
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## Speed measurement and positioning of rollers and drives

Position and motion sensors play an important role in steel plants. Even though they are exposed to harsh environmental conditions, the encoders must ensure an uninterrupted and safe process. Kübler encoders have given good service for many years in steel plants all over the world. Reliability is the main feature, especially for plants with very high operating costs.



### Sendix Heavy Duty H120 (hollow shaft)

- Bearing isolation up to 2.5 kV
- Extremely high resilience (IP66/67), high shock and vibration resistance
- Fastening arm on the flange or cover (flexible installation)
- Cable, plug-in connector, terminal box or optical fibre connection
- Up to 5000 ppr



### A02H (hollow shaft)

- Extremely robust with compact design at the same time
- Locked bearings, balanced stainless steel clamping ring
- Max. 42 mm hollow shaft, through
- 5000 ppr incremental
- Optional insulation insert and tapered shaft mounting



### Sendix 5000 with Euro flange

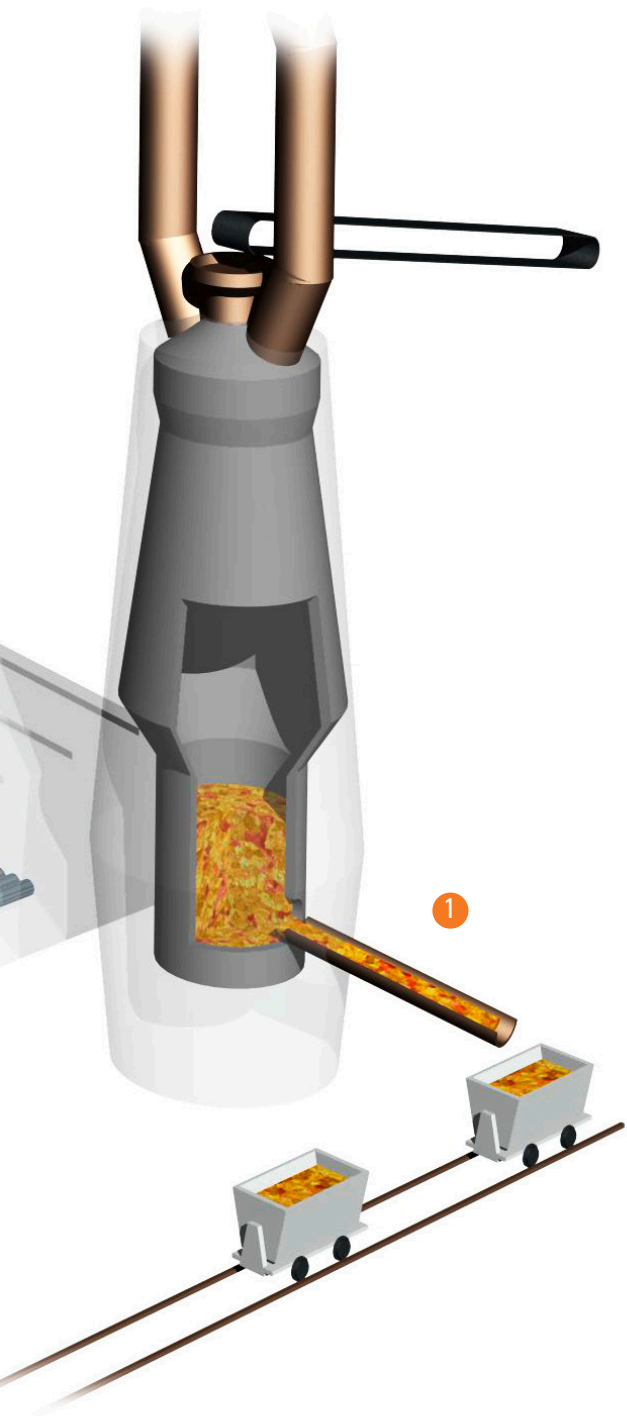
- Compact and rugged incremental encoder
- Mounting compatible with the usual Heavy Duty encoders on the market thanks to the EURO flange
- Safety-Lock™ bearings construction
- Safe operation with humidity and dirt (IP67, -40 °C ... +85 °C)



### Draw-wire encoders

- Length measuring up to 42.5 m
- Four performance classes for different requirements
- Large selection of wire fastenings and wire types





## 1 Steel production

Positioning and speed regulation of cranes and trucks. Rugged sensors in very dusty environments with high mechanical requirements regarding shock and vibration resistance.

## 2 Steel casting

Rolling and cutting to length of the continuous strand. Use of encoders in extreme temperatures.

## 3 Hot rolling

Rugged speed regulation and accurate positioning of the rollers. Encoders in very hot and humid environments. Encoders suitable for rolling mills, shocktested and with centrifugal switches to protect against overspeed.

## 4 Cold rolling

Highly dynamic speed regulation and accurate roller positioning. High speeds and strong vibration and shock stress. Positioning, as well as speed and hoist regulation of cranes.

## 5 Further processing

High-accuracy speed regulation in galvanizing plants. The encoders are exposed to humidity and many chemicals. Positioning, as well as speed and hoisting gear regulation of cranes.

### Sendix F58 PROFINET IO encoders

- Up to 19 bits singleturn and 24 bits multiturn resolution
- Safe operation with humidity and dirt
- High accuracy, insensitive to magnetic fields thanks to optical scanning
- Optional: seawater-resistant
- Industry 4.0 / IIoT ready



### Sendix S58xxFS3 PROFIsafe encoders

- 15 bit (safe) or 24 bit (non-safe) singleturn and 12 bit multiturn resolution
- Redundant multiturn gearbox
- Integrated web server
- SIL 3, Performance Level PLe, Safety Category Cat. 3.



### Sendix FS encoders

- Absolute singleturn and multi-turn encoders and incremental encoders for safety technology with SIL3 certification
- Interlocked bearings for a high degree of ruggedness, accuracy and a long service-life
- Insensitive to magnetic fields thanks to optical scanning



### Safe speed monitors

- Connection of incremental encoders (HTL differential, HTL proximity switches, RS422)
- Integrated signal splitter
- 1 analog output 4 ... 20 mA
- Up to 2 incremental interfaces, 8/4 control inputs, 4/2 safe relay outputs, 8/4 electronic switching outputs 500 mA



### Optical fibre transmitter, receivers and cables

- For the transmission of incremental and SSI signals
- No cable-related interference in the optical fibre cables, e.g. due to generators or inverters
- Safe transmission over distances up to 2000 m



## Positioning and speed measurement

Availability around the clock.

Gantry cranes, container loading bridge cranes, stacking cranes ... the requirements for automation and safety are increasing.

Sendix encoders measure the position at the cable hoist, at the trolley, both on rails and on tyres, and at the spreader. Only these robust and safe measuring devices allow the automatic positioning of the containers.

The lifetime and availability of the sensors used is of the utmost importance for plants with high operating costs. For decades, Kübler sensors have been delivering the highest performance for gantry cranes, in harbours and for underslung cranes on production lines or in steel plants.

### Application examples

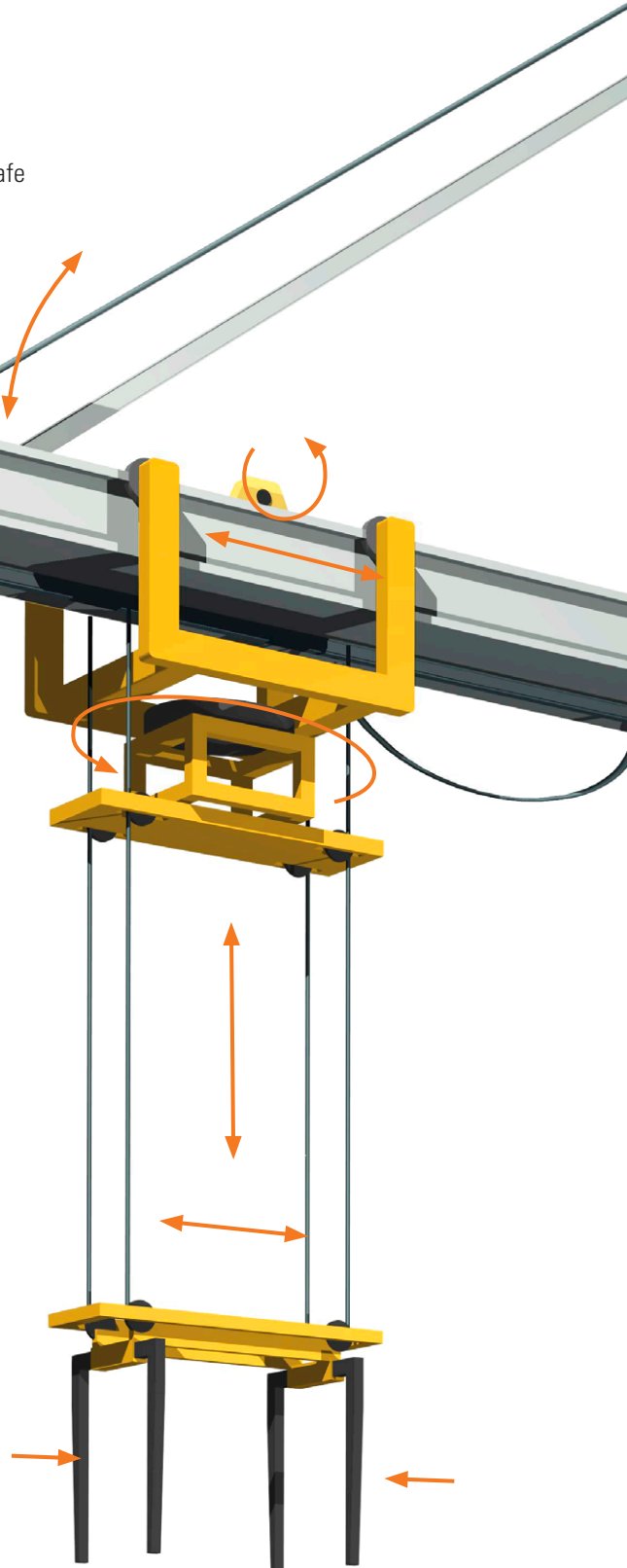
#### Trolley position Sendix S58xxFS3 PROFIsafe

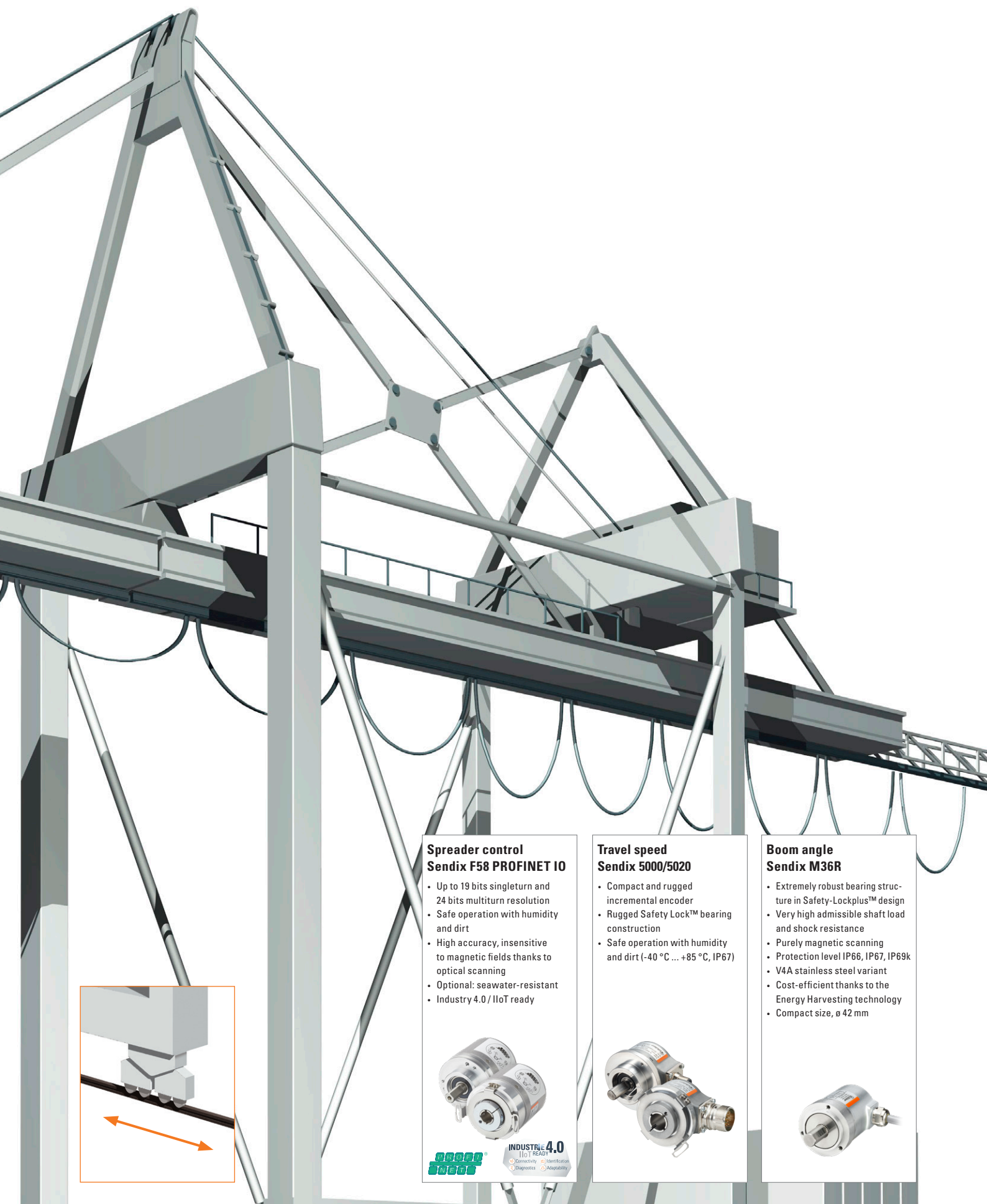
- 15 bit (safe) or 24 bit (non-safe) singleturn and 12 bit multiturn resolution
- Redundant multiturn gearbox.
- Integrated web server
- SIL 3, Performance Level PLe, Safety Category Cat. 3.



#### Hoist speed Sendix Heavy Duty H120

- Bearing isolation up to 2.5 kV
- Extremely high resilience (IP66/67), high shock and vibration resistance
- Fastening arm on the flange or cover (flexible installation)
- Cable, plug-in connector, terminal box or optical fibre connection
- Up to 5000 ppr





#### Spreader control Sendix F58 PROFINET IO

- Up to 19 bits singleturn and 24 bits multiturn resolution
- Safe operation with humidity and dirt
- High accuracy, insensitive to magnetic fields thanks to optical scanning
- Optional: seawater-resistant
- Industry 4.0 / IIoT ready



#### Travel speed Sendix 5000/5020

- Compact and rugged incremental encoder
- Rugged Safety Lock™ bearing construction
- Safe operation with humidity and dirt (-40 °C ... +85 °C, IP67)



#### Boom angle Sendix M36R

- Extremely robust bearing structure in Safety-Lockplus™ design
- Very high admissible shaft load and shock resistance
- Purely magnetic scanning
- Protection level IP66, IP67, IP69k
- V4A stainless steel variant
- Cost-efficient thanks to the Energy Harvesting technology
- Compact size, ø 42 mm

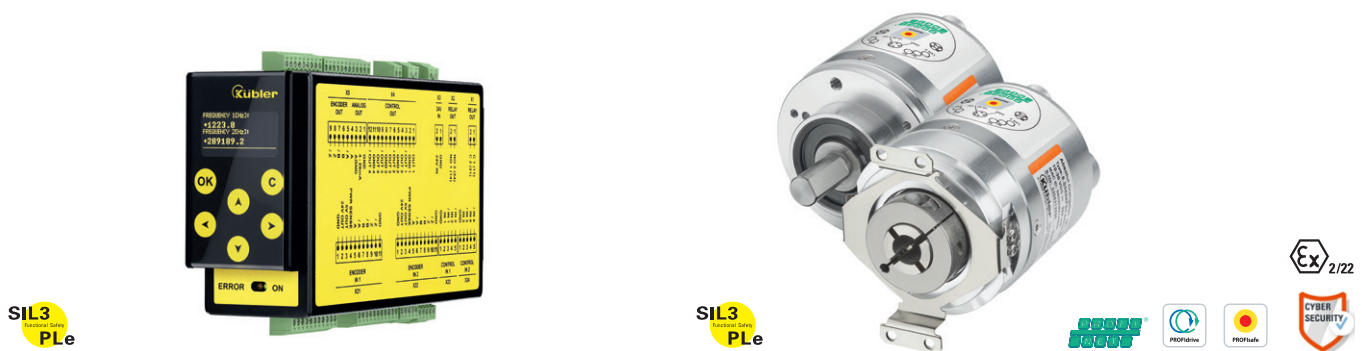




## Kübler safety technology for crane facilities

Crane facilities become increasingly large and efficient. Higher loads and working speeds lead to ever more demanding safety requirements.

The time slots for loading and unloading are small and working pressure is high-increasing the risk of making errors or overlooking dangers. Without suitable protective equipment, cranes may collide, loads may swing or people in safe working areas may be overlooked.



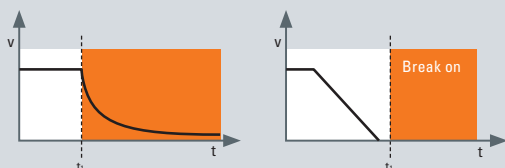
### Reliable and safe speed monitoring

- Safe speed monitoring of up to 2 incremental encoders (HTL, TTL or SinCos) or HTL speed signals on the drive train of e.g. motor, generator, gearbox or rotor
- Integrated signal splitters to forward the encoder signals (HTL or RS422 and analog) to a converter, CMS or control
- 4/2 safe digital inputs; 8/4 safe digital outputs; 2 safe relay outputs
- Easy parameterizing by means of touch display or free PC software "SafeConfig OSxx"

### Sendix S58xxFS3 PROFIsafe encoder for safety applications

- Support of the latest PROFINET features
- 100 % future-proof due to integrated web server
- High resolution: Singleturn 16 bit (safe) or 24 bit (non safe) / Multiturn 12 bit (safe)
- Redundant multiturn gear
- Ideal for highly synchronous applications, e.g. axis synchronization

### Safe Switch-Off



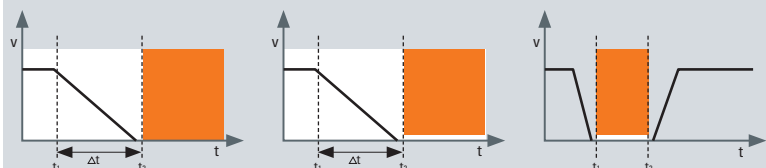
**ST0 – Safe Torque Off**

Safe disabling of the torque on the drive by means of an immediate switching off of the energy supply.

**SBC – Safe Break Control**

Safe de-energizing of the brake. This allows generating a braking torque.

### Safe Standstill



**SS1 – Safe Stop 1**

Safe monitored standstill followed by the disabling of the torque on the drive.

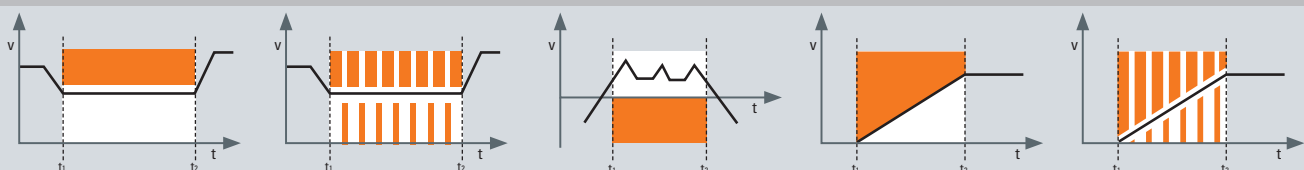
**SS2 – Safe Stop 2**

Safe monitored standstill followed by standstill monitoring, while the torque remains enabled.

**SOS – Safe Operating Stop**

The drive is maintained in its position electrically.

### Safe Motion



**SLS – Safely-Limited Speed**

Safe monitoring of a reduced drive speed.

**SSR – Safe Speed Range**

The safely monitored speed must be within a corridor.

**SDI – Safe Direction**

Safe monitoring of the direction of movement of the drive.

**SLA – Safely-Limited Acceleration**

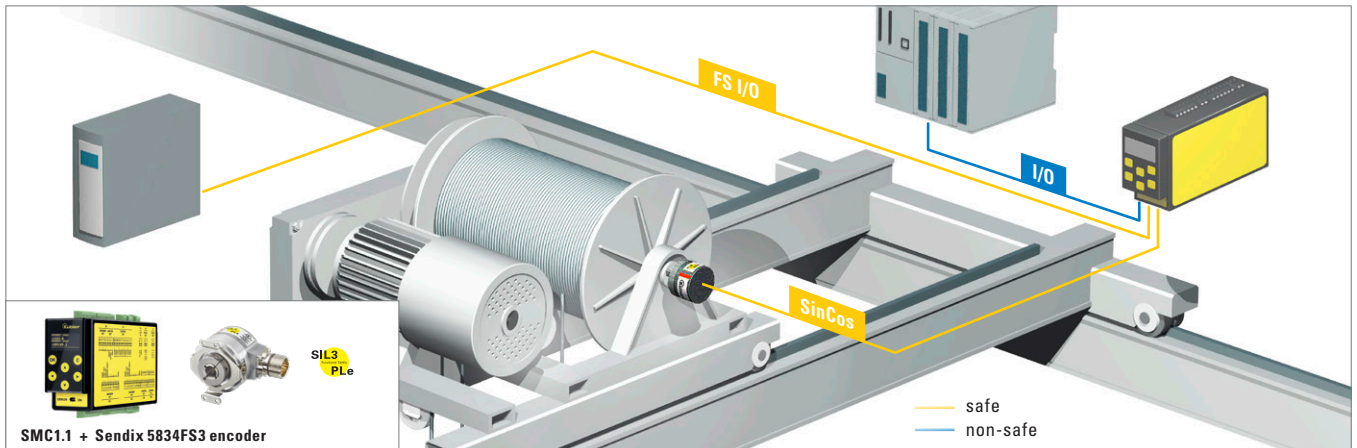
Monitoring of the maximum acceleration of the drive.

**SAR – Safe Acceleration Range**

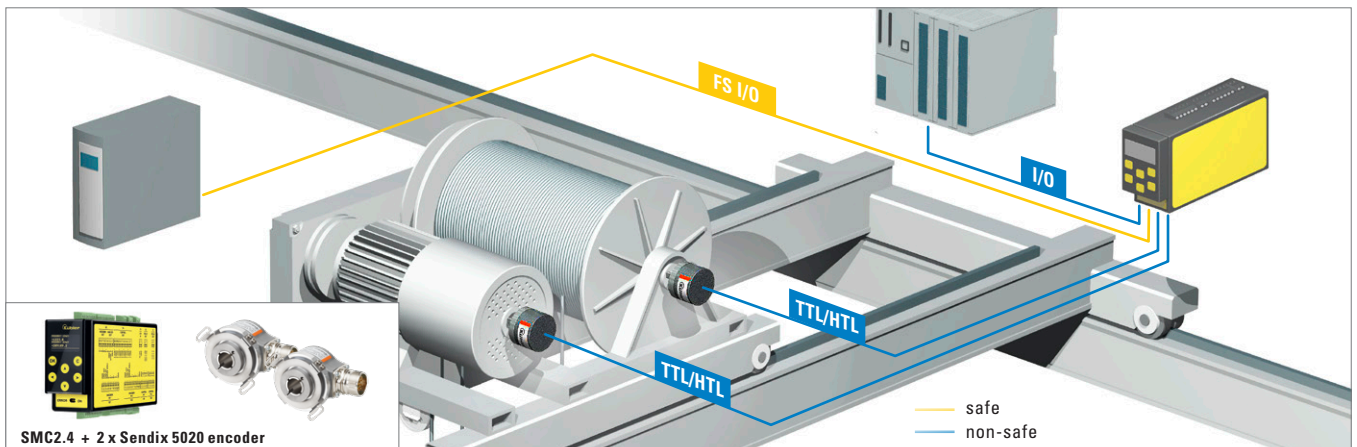
The safely monitored acceleration must be within a corridor.



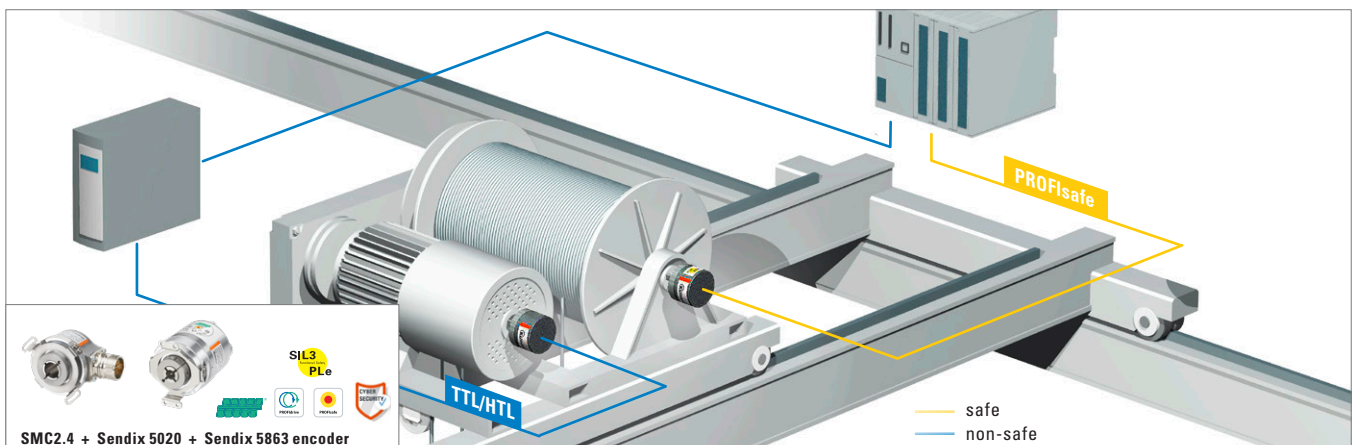
- 1 - Safe detection of overspeed** using an SMC1.1 module with a safe incremental encoder such as the Sendix 5834FS3 with SinCos signals, which is mounted on the motor or wire drum, for example.



- 2 - Safe detection of overspeed** by an SMC2.4 module with two diversitary incremental encoders, e.g. Sendix 5020. By detecting the speed at the motor and at the wire drum, the drive train can additionally be monitored for mechanical damage such as slip or gear breakage. The safe digital outputs of the SMC module activate the STO function (Safe Torque Off) of the inverter.

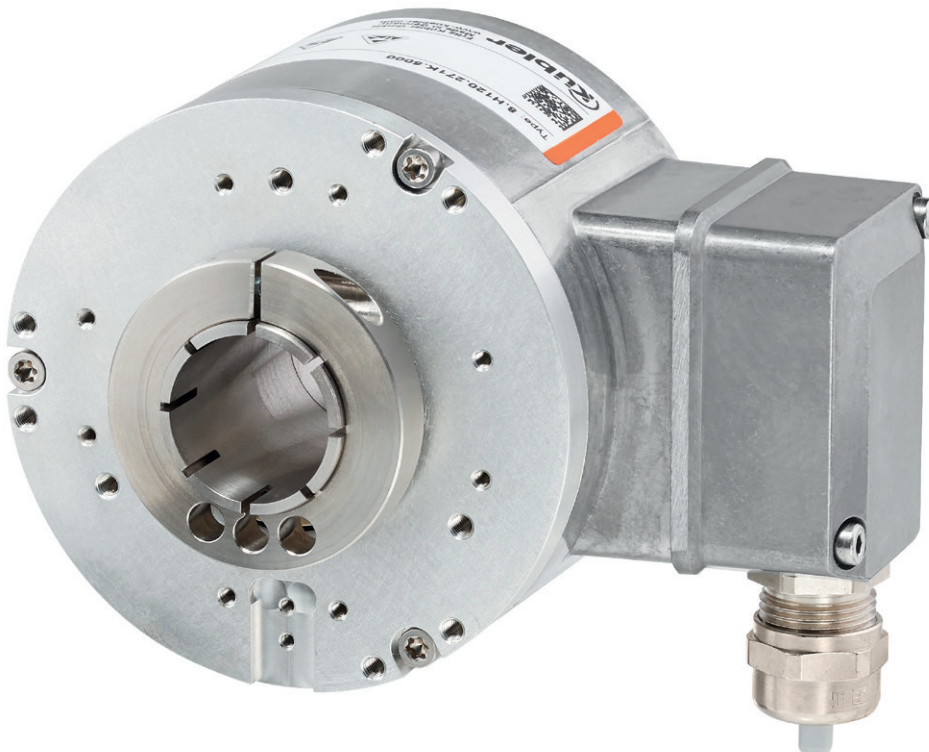


- 3 - Safe hoist position and winch speed** thanks to the certified Profisafe Sendix S58FS3 encoder. The encoder transmits the position of the load and the speed of the winch directly to the safety controller. An incremental encoder, e.g. Sendix 5020, measures the motor speed and transmits it to the inverter. By measuring the speed at the motor and at the rope drum, the drive train can additionally be monitored for mechanical damage such as slippage or gear breakage.



## Sendix Heavy Duty H120 – encoders for heavy industry

Thanks to the special HD-Safety-Lock™ construction, the Sendix Heavy Duty H120 encoders are ideally suited for applications in heavy industry, such as steel works and cranes. Resistant materials, wide temperature ranges and a high protection level ensure they remain unaffected by the harshest environmental conditions. Their innovative connection technology enables simple quick installation.



Thanks to the special HD-Safety-Lock™ hollow shaft bearing construction, an extremely high radial bearing load capacity is achieved



High level of protection against dust and humidity as a result of dual protection of the shaft



Seawater-resistant materials



Integrated bearing isolation up to 2.5 kV



High pulse rates up to 5000 ppr



-40° ... +100°C



IP66/67

Suitable for outdoor use



Through hollow shaft up to ø 28 mm



High shock (2000 m/s<sup>2</sup>, 6 ms) and vibration resistance (150 m/s<sup>2</sup>, 10 ... 2000 Hz)



Accurate and reliable optical sensor technology

## Suitable for your Heavy Duty application

### Safety-Lock™

- Mechanically interlocked bearings
- Large, extra-strong outer bearings
- Larger bearing span

#### Benefits:

Avoids premature damage or even encoder failure in the field.

### Safety-Lock™ becomes HD-Safety-Lock™

HD-Safety-Lock™ = Safety-Lock™ + additional engineering:

- + Dual seals on the shaft-side – friction seal against humidity, labyrinth seal against dust and water jet ingress
- + Very large, highly-robust flange bearings
- + Even greater bearing clearance
- + Extremely robust flange mounting due to screw-on housing
- + Bearing design incorporates integrated isolation (isolating inserts not required), tested up to 2.5 kV for high running accuracy; metal to metal connection for slip free mounting.

#### Benefits:

**The resistance against adverse environmental conditions is greatly increased – especially against high bearing loads and high temperatures.**

| Comparison                                         | Safety-Lock™ | HD-Safety-Lock™ |
|----------------------------------------------------|--------------|-----------------|
| Stability with vibration                           | +            | +               |
| Robustness against installation errors             | ++           | ++              |
| Radial load                                        | 80 N         | 400 N           |
| Axial load                                         | 40 N         | 300 N           |
| Elimination of internal stresses                   | 0            | ++              |
| Constant signal quality with extended temperatures | +            | ++              |
| Mechanical protection of the seal                  | 0            | ++              |
| Bearing isolation                                  | 0            | ++              |

### i Simple quick installation

Maximum safety thanks to innovative connection technology with plug-in spring terminals in the terminal box, which is rotatable through 180°.




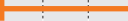





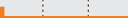









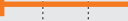






**Sendix Heavy Duty terminal box connection technology**

**Standard terminal box connection technology**

|                                                                                                         |    |              |
|---------------------------------------------------------------------------------------------------------|----|--------------|
| Simple, safe and fast installation                                                                      | ++ | 0            |
| Quick connection of the cable to the spring terminal without the need for tools                         | ++ | not possible |
| Mounting of the encoder and electrical installation can be carried out separately                       | ++ | 0            |
| Preparation of the connection cable can be done in the workshop → facilitates installation in the field | ++ | not possible |
| Simplified installation where access is tight or difficult (no kinks in the cable)                      | ++ | +            |

## Portfolio overview draw-wire encoders

|                  | Characteristics |             |                    | Draw-wire encoders                                                                  |      |            |             |                | Measuring length                                                                     |   |   |           |   |   |   |    |            |    |           |  |  |
|------------------|-----------------|-------------|--------------------|-------------------------------------------------------------------------------------|------|------------|-------------|----------------|--------------------------------------------------------------------------------------|---|---|-----------|---|---|---|----|------------|----|-----------|--|--|
|                  | Linearity max.  | Speed [m/s] | Wire diameter [mm] | Measuring length [m]                                                                |      |            |             | Short range    |                                                                                      |   |   | Mid range |   |   |   |    | Long range |    |           |  |  |
|                  |                 |             |                    |                                                                                     |      |            |             | 0              | 1                                                                                    | 2 | 3 | 4         | 5 | 6 | 8 | 10 | 12         | 15 | max. 42.5 |  |  |
| Performance-Line | ±0.02 %         | 10          | 0.5                |    | A50  | INC<br>ABS | U<br>I<br>R |                |     |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |   | B80  | INC<br>ABS | U<br>I<br>R |                |    |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | C120 | INC<br>ABS | U<br>I<br>R |                |  |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | D135 | INC<br>ABS | U<br>I<br>R |                |  |   |   |           |   |   |   |    |            |    |           |  |  |
| Robust-Line      | ±0.1 %          | 3           | 1.0                |  | C60  | ABS        | U<br>I<br>R | RED            |  |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             | 1.5                |  | D120 | ABS        | U<br>I<br>R | RED            |  |   |   |           |   |   |   |    |            |    |           |  |  |
| Compact-Line     | ±0.3 %          | 3           | 0.9                |  | A30  |            | U<br>I<br>R |                |   |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | A40  | INC        | U<br>I<br>R |                |   |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | A41  | ABS        | U<br>I<br>R |                |   |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | B75  | INC<br>ABS | U<br>I<br>R | RED            |  |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | C105 | INC<br>ABS | U<br>I      | RED            |  |   |   |           |   |   |   |    |            |    |           |  |  |
| Base-Line        | ±0.5 %          | 1           | 0.9                |  | C100 | INC<br>ABS | U           | N<br>RS<br>RED |  |   |   |           |   |   |   |    |            |    |           |  |  |
|                  |                 |             |                    |  | D125 | ABS        | U           | N<br>RED       |  |   |   |           |   |   |   |    |            |    |           |  |  |

INC Incremental

ABS Absolute, digital

U Voltage

I Current

R Potentiometer











N Inclinator

RS Relais / switch output

RED Redundant sensors



## Portfolio overview signal converters

|                                    | Signal converter                                                                    |               | Input signal |        |                   |               |          |     | Output signal |        |                   |               |          |     | Software |
|------------------------------------|-------------------------------------------------------------------------------------|---------------|--------------|--------|-------------------|---------------|----------|-----|---------------|--------|-------------------|---------------|----------|-----|----------|
|                                    |                                                                                     |               | Analog       | SinCos | HTL / TTL / RS422 | RS232 / RS485 | Parallel | SSI | Analog        | SinCos | HTL / TTL / RS422 | RS232 / RS485 | Parallel | SSI | OSxx     |
| Level converter                    |    | PW 1D-1D      |              |        | ■                 |               |          |     |               |        | ■                 |               |          |     |          |
| Signal splitters                   |   | SP 1SC-2SC2D  |              | ■      |                   |               |          |     |               | ■      | ■                 |               |          |     |          |
|                                    |  | SP 2D-2D      |              |        | ■                 |               |          |     |               |        | ■                 |               |          |     |          |
| Signal converters                  |  | SK 1A-1S1D2RS | ■            |        |                   |               |          |     |               |        | ■                 | ■             |          | ■   | ■        |
|                                    |  | SK 1SC-1D     |              | ■      |                   |               |          |     |               |        | ■                 |               |          |     |          |
|                                    |  | SK 1S-1P      |              |        |                   |               |          | ■   |               |        |                   |               | ■        |     |          |
|                                    |  | SK 1S1D-1A2RS |              |        | ■                 |               |          | ■   | ■             |        |                   | ■             |          |     | ■        |
| Frequency divider                  |  | FT 1D-1D      |              |        | ■                 |               |          |     |               |        | ■                 |               |          |     |          |
| Optical fiber transmission modules |  | LWLS/LWLE     |              |        | ■                 |               |          |     |               |        | ■                 |               |          |     |          |
|                                    |  | LWLA          |              |        |                   |               |          | ■   |               |        |                   |               |          | ■   |          |

## Product portfolio – Made in Germany



### MEASUREMENT

Rotary speed and position detection, linear position, and speed measurement as well as inclination angle detection.

- Encoders
- Bearingless encoders
- Motor Feedback Systems
- Linear measuring systems
- Shaft copying systems
- Inclinometers

### TRANSMISSION

Reliable and interference-free transmission of power, signals, and data. Communication between control system and sensors.

- Slip rings
- Slip rings, customized solutions
- Signal converters and optical fiber modules
- Cables and connectors

### EVALUATION

Recording of quantities, counting of units of any kind, and reliable speed and position recording for functional safety.

- Displays and counters
- Process devices
- Safe speed monitors up to SIL3/PLe

We offer solutions for the following industries:



The **high performance level and reliability** of the Kübler products are based on our long experience in these demanding application sectors. Learn more about our application-specific solutions under:

[kuebler.com/industries](https://kuebler.com/industries)

# Kübler Service for worldwide planning reliability

24**ONE**

## 24one delivery promise

Manufacturing in 24 hours. For orders placed on working days before 9 AM, the product will be ready for dispatch on that same day. 24one is limited to 20 pieces per delivery.



## 10 by 10

We will manufacture and deliver 10 encoders within 10 working days (365 days a year - with the exception of 24th Dec. until 2nd Jan.)



## 48 h Express-Service

We can process your order within 48 hours; we can ship stock items the same day.



## Technical Support

Kübler' applications team is present on site all over the world for advice, analysis and support.

Kübler France ..... +33 3 89 53 45 45  
Kübler Italy ..... +39 026 423 345  
Kübler Poland ..... +48 61 84 99 902  
Kübler Austria ..... +43 3322 43723 12  
Kübler Turkey ..... +90 216 999 9791

International (English speaking)

Kübler Germany ..... +49 7720 3903 849  
E-mail ..... support@kuebler.com



## Sample Service

We manufacture samples of special designs or according to customer specification within shortest time.



## Safety Services

Individual customer solutions.



## Tailor-made Solutions – Kübler Design System (KDS) OEM Products and Systems (OPS)

We develop jointly with our customers product and engineering solutions for customer-specific products, integrated drive solutions, up to complete systems.



# KÜBLER WORLDWIDE

500 EMPLOYEES · 4 PRODUCTION SITES · PRESENCE IN OVER 50 COUNTRIES

**EUROPE** AUSTRIA · BELGIUM · BULGARIA · CROATIA · CZECH REPUBLIC · DENMARK · ESTONIA · FINLAND · FRANCE · GERMANY · GREAT BRITAIN · GREECE · HUNGARY · ICELAND · IRELAND · LITHUANIA · ITALY · NETHERLANDS · NORWAY · POLAND · PORTUGAL · SLOVAKIA · SLOVENIA · SPAIN · SWEDEN · SWITZERLAND · TURKEY · UKRAINE  
**AFRICA** ÄGYPT · MOROCCO · SOUTH AFRICA · TUNISIA    **NORTH AND SOUTH AMERICA** ARGENTINA · BRAZIL · CANADA · MEXICO · PERU · U.S.A.  
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-  FRITZ KÜBLER SARL
-  KÜBLER ITALIA S.R.L.
-  KÜBLER ÖSTERREICH
-  KÜBLER SP. Z.O.O.
-  KÜBLER TURKEY OTOMASYON TICARET LTD. STI.
-  KÜBLER INC.
-  KÜBLER AUTOMATION INDIA PVT. LTD.
-  KUEBLER (BEIJING) AUTOMATION TRADING CO. LTD.
-  KUEBLER KOREA (BY F&B)
-  KÜBLER AUTOMATION SOUTH EAST ASIA SDN. BHD.
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