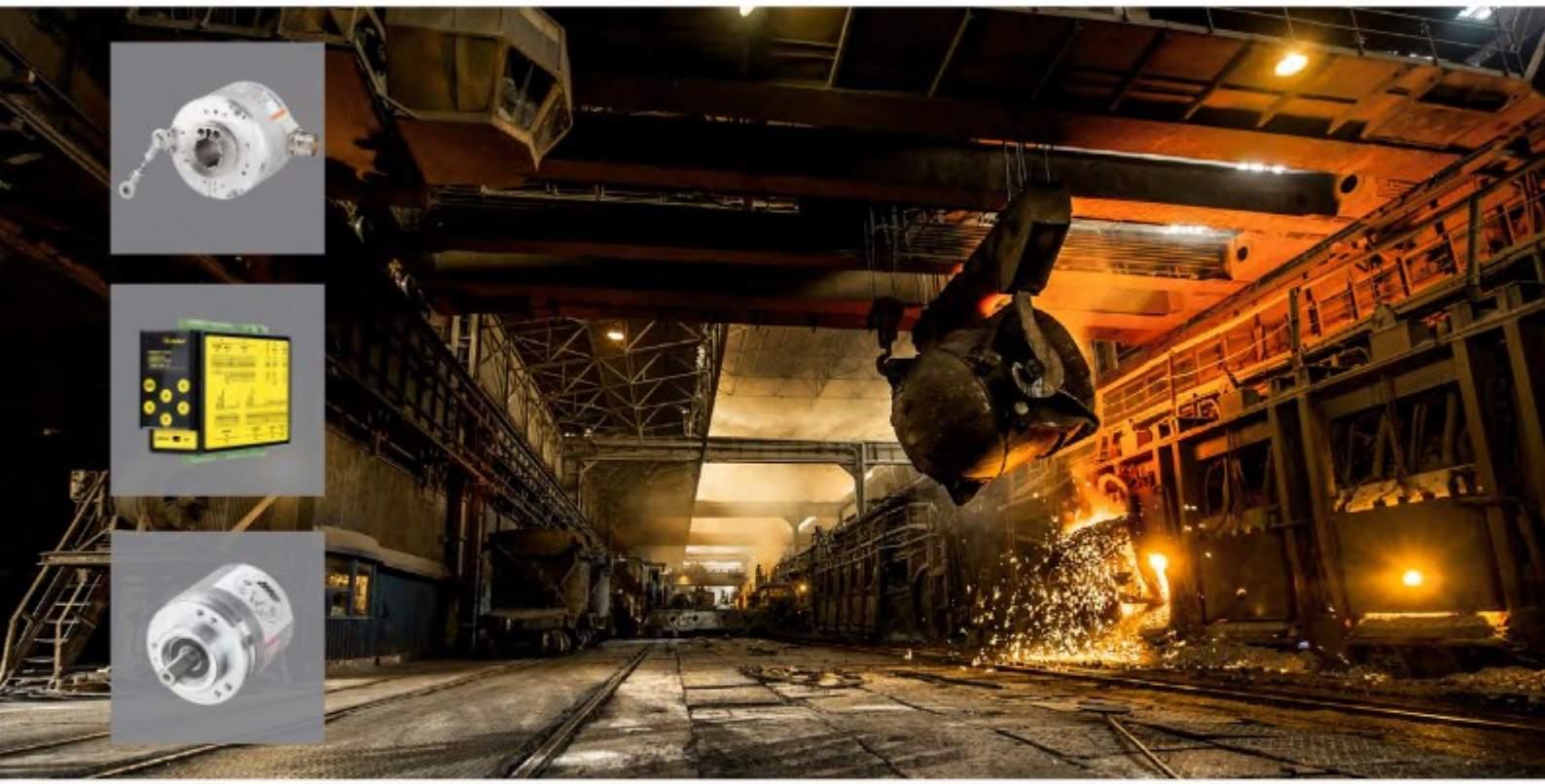
SOLUTIONS FOR HEAVY INDUSTRY

Kübler



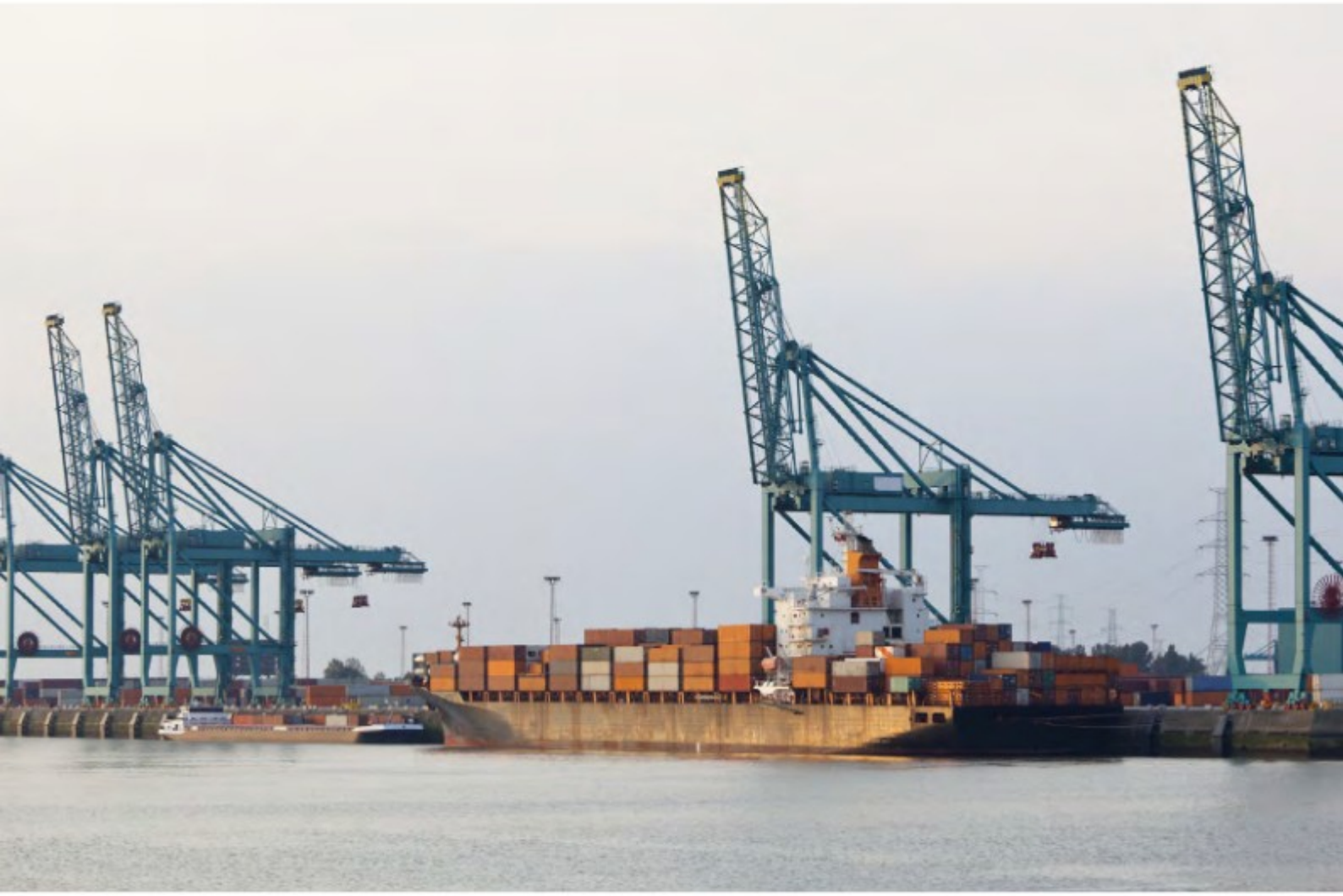
- Incremental Encoders
- Absolute Encoders
- Safety Technology
- Draw-wire Encoders
- Signal Converters

pulses for automation

Solutions for Heavy Industry

High system availability with Kübler sensor solutions.

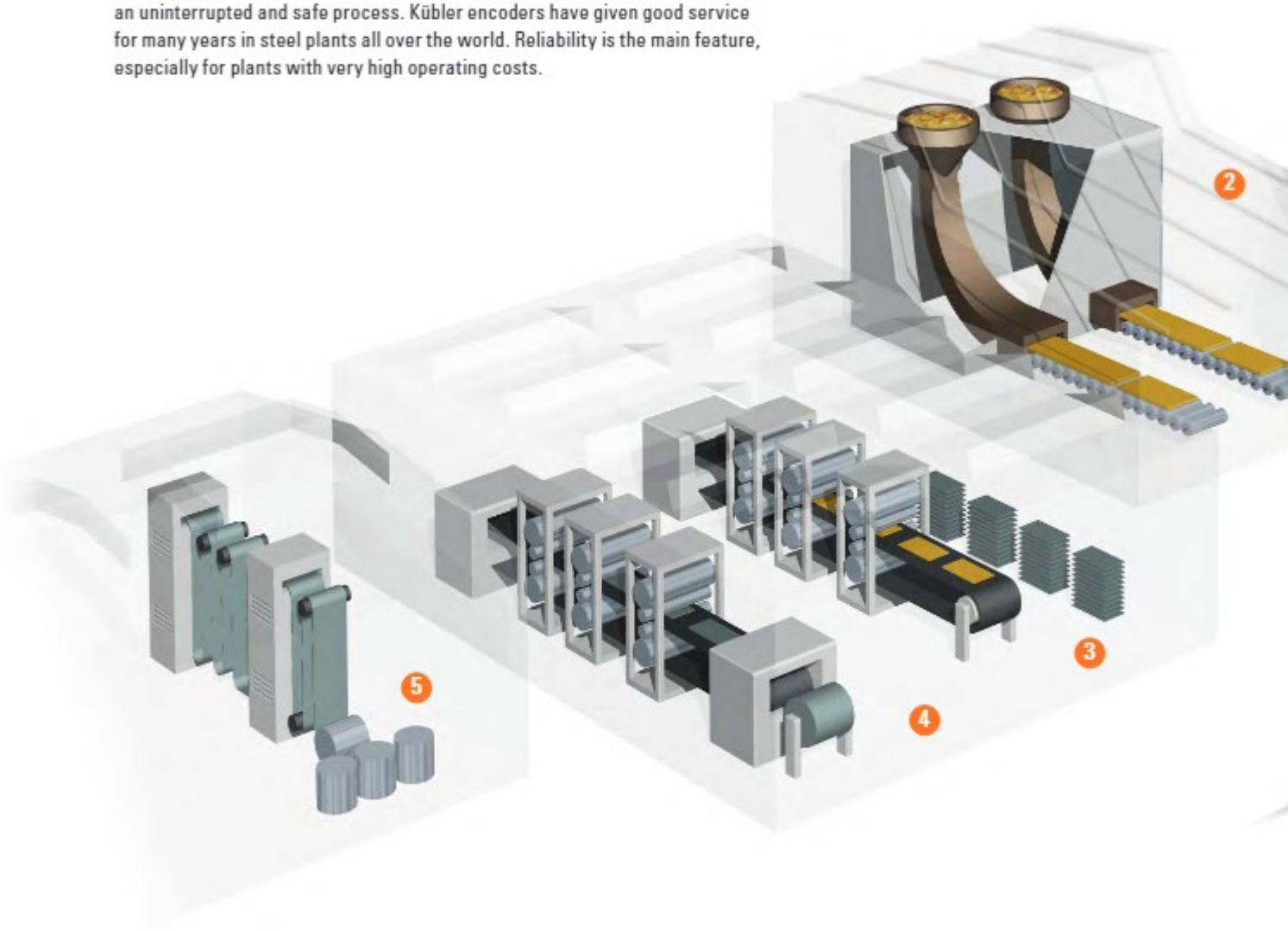
The heavy industry is particularly challenging for sensors. External influences, such as extreme temperatures, shocks and vibrations, dust and moisture, make it difficult for highly-accurate sensors to operate reliably. Many sensors reach their limits here. Kübler has risen to this challenge and developed 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.



Contents

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 H100 (shaft)

- Extremely high bearing load capacity thanks to HD-Safety-Lock™
- Seawater-resistant material
- Feather key fitting of the shaft to the application
- Overspeed protection by means of mechanical speed switch

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 multiturn 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

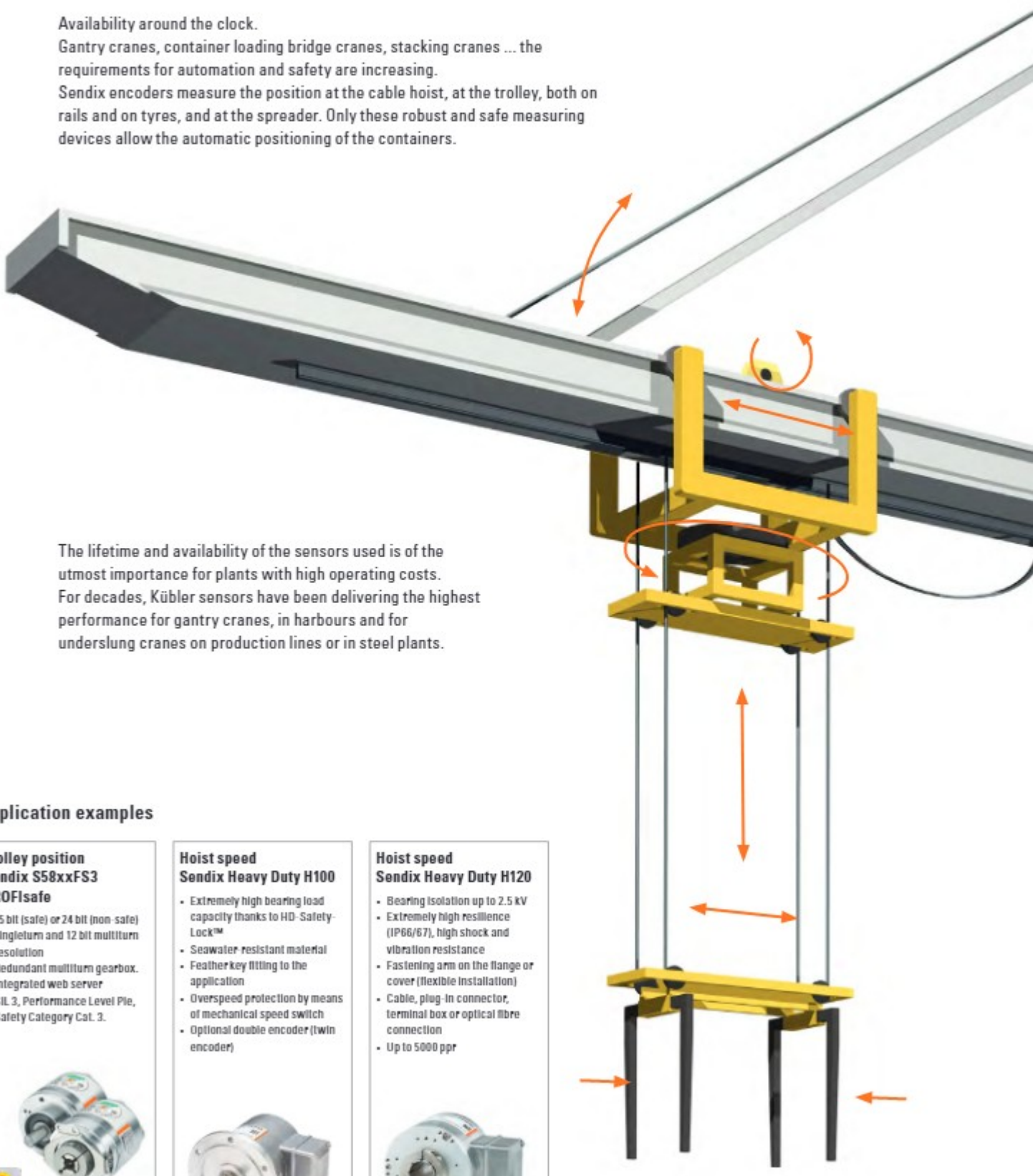
- Connection of incremental encoders (HTL differential, HTL proximity switches, RS422)
- Integrated signal splitter
- 1 analog output 4 ... 20 mA
- Up to 2 incremental interfaces, 8/4 control inputs, 4/2 safe relay outputs, 8/4 electronic switching outputs 500 mA

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

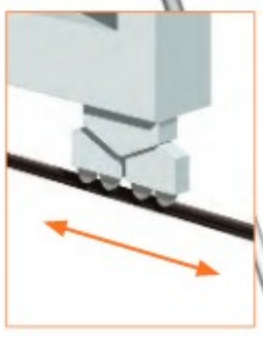
- 15 bit (safe) or 24 bit (non-safe) singleturn and 12 bit multiturn resolution
- Redundant multiturn gearbox.
- Integrated web server
- SIL 3, Performance Level Ple, Safety Category Cat. 3.

Hoist speed
Sendix Heavy Duty H100

- Extremely high bearing load capacity thanks to HD-Safety-Lock™
- Seawater resistant material
- Feather key fitting to the application
- Overspeed protection by means of mechanical speed switch
- Optional double encoder (twin encoder)

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.

SIL3 PLe

SIL3 PLe

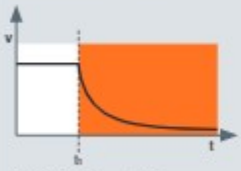
Reliable and safe speed monitoring

- 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

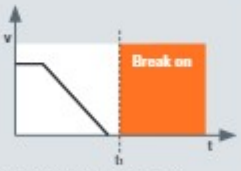
- Support of the latest PROFINET features
- 100 % future-proof due to integrated web server
- High resolution: Singleturn 16 bit (safe) or 24 bit (non safe) / Multiturn 12 bit (safe)
- Redundant multiturn gear
- Ideal for highly synchronous applications, e.g. axis synchronization

Safe Switch-Off



STO – Safe Torque OFF

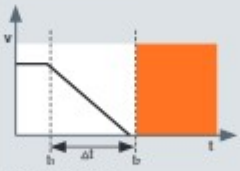
Safe disabling of the torque on the drive by means of an immediate switching off of the energy supply.



SBC – Safe Break Control

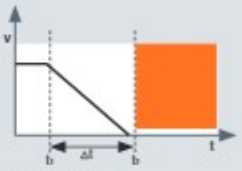
Safe de-energizing of the brake. This allows generating a braking torque.

Safe Standstill



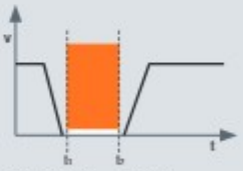
SS1 – Safe Stop 1

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.

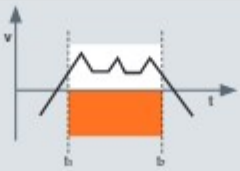
Safe Motion

SLS – Safely-Limited Speed

Safe monitoring of a reduced drive speed.

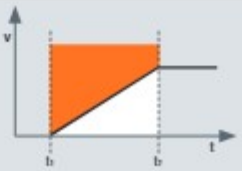
SSR – Safe Speed Range

The safely monitored speed must be within a corridor.



SDI – Safe Direction

Safe monitoring of the direction of movement of the drive.



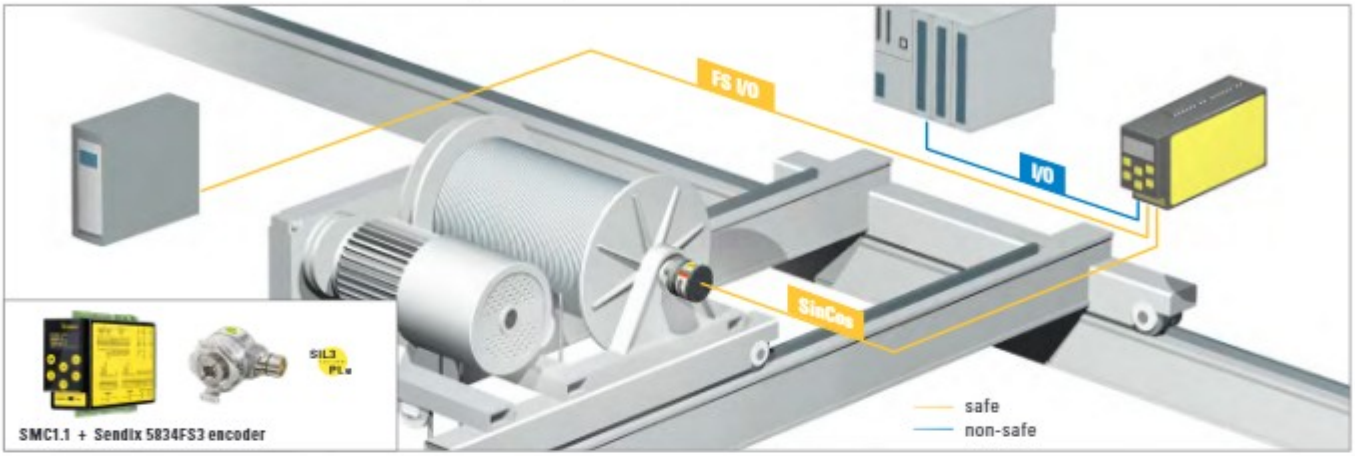
SLA – Safely-Limited Acceleration

Monitoring of the maximum acceleration of the drive.

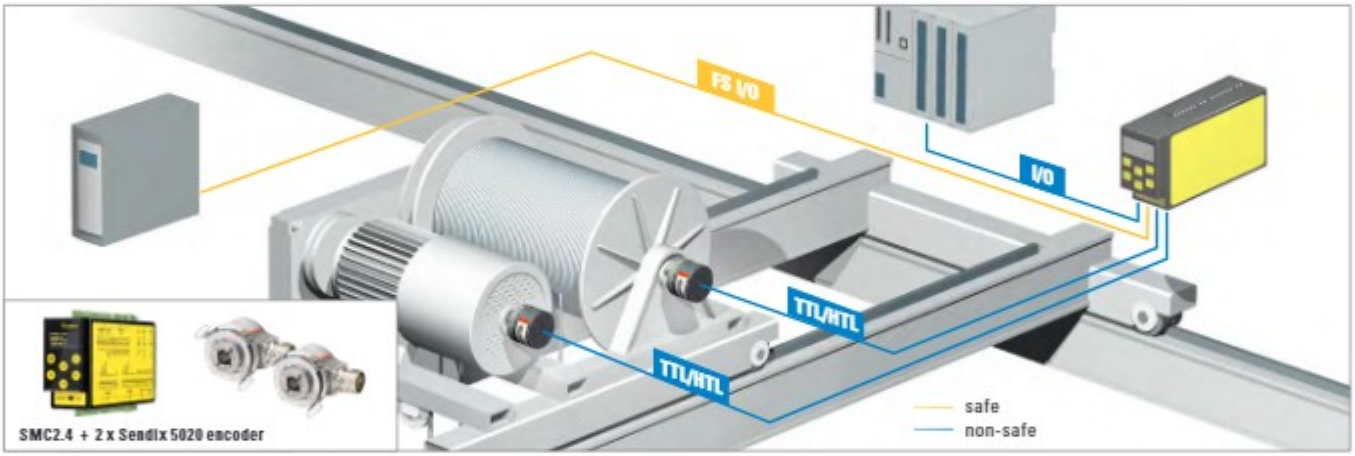
SAR – Safe Acceleration Range

The safely monitored acceleration must be within a corridor.

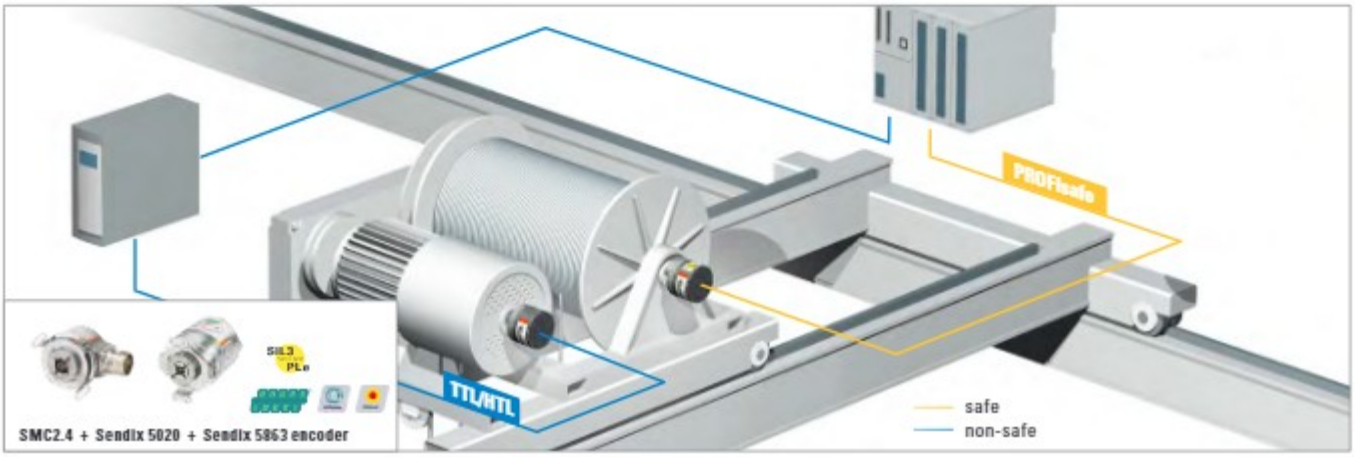
1 - **Safe detection of overspeed** using an SMC1.1 module with a safe incremental encoder such as the Sendix 5834FS3 with SinCos signals, which is mounted on the motor or wire drum, for example.



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 – encoders for heavy industry

Thanks to the special HD-Safety-Lock™ construction, the Sendix Heavy Duty 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.

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:
+ Floating bearing on the cover-side eliminates internal stress [1]
+ Mechanically decoupled sensor unit ensures constant signal quality with large temperature fluctuations and other adverse environmental influences [1]
+ 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. [2]

Benefits:

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

	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	++ [2]

1) for Sendix Heavy Duty H100 2) for Sendix Heavy Duty H120

Sendix Heavy Duty H120

Thanks to the special HD-Safety-Lock™ hollow shaft bearing construction, an extremely high radial bearing load capacity is achieved (Sendix Heavy Duty H120)

Integrated bearing isolation up to 2.5 kV (Sendix Heavy Duty H120)

Through hollow shaft up to ø 28 mm (Sendix Heavy Duty H120)

High level of protection against dust and humidity as a result of dual protection of the shaft (Sendix Heavy Duty H120)

Sendix Heavy Duty H100

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 new 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)	++	+

Thanks to the special HD-Safety-Lock™ shaft bearing construction, an extremely high bearing load capacity is achieved (Sendix Heavy Duty H100)

Feather key fitting ensures positive fitting to the application (Sendix Heavy Duty H100)

High pulse rates up to 5000 ppr

High shock (2000 m/s², 6 ms) and vibration resistance (150 m/s², 10 ... 2000 Hz)

Seawater-resistant materials

-40°...+100°C IP66/67

Suitable for outdoor use

Accurate and reliable optical sensor technology

Portfolio overview draw-wire encoders

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

INC Incremental
ABS Absolute, digital

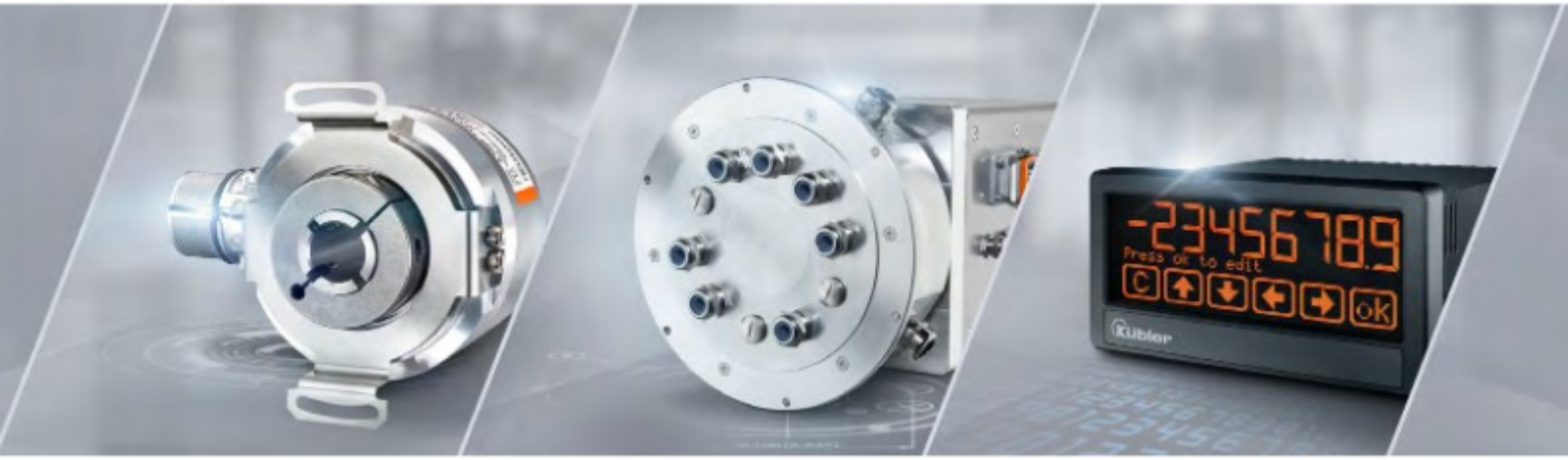
U Voltage
I Current
R Potentiometer

N Inclinometer
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:


DRIVE TECHNOLOGY


ELEVATOR TECHNOLOGY


MOBILE AUTOMATION


HEAVY INDUSTRY


WIND TURBINES


SOLAR INDUSTRY


PACKAGING INDUSTRY


BOTTLING PLANTS

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

Kübler Service for worldwide planning reliability

24one

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

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.)

48h

48 h Express-Service

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

Sample Service

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

FS

Safety Services

Individual customer solutions.

KDS

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.

Technical Support

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

Kübler Germany	+49 7720 3903 952
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
Kübler China	+86 10 8471 0818
Kübler India	+91 2135 618200
Kübler USA	+1 855 583 2537

KÜBLER WORLDWIDE

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

EUROPE AUSTRIA · BELARUS · BELGIUM · BULGARIA · CROATIA · CZECH REPUBLIC · DENMARK · ESTONIA · FINLAND · FRANCE · GERMANY · GREAT BRITAIN · GREECE · HUNGARY · ICELAND · IRELAND · LITHUANIA · ITALY · NETHERLANDS · NORWAY · POLAND · PORTUGAL · RUSSIA · SLOVAKIA · SLOVENIA · SPAIN · SWEDEN · SWITZERLAND · TURKEY · UKRAINE **AFRICA** EGYPT · MOROCCO · SOUTH AFRICA · TUNISIA **NORTH AND SOUTH AMERICA** ARGENTINA · BRAZIL · CANADA · MEXICO · PERU · U.S.A.
OCEANIA AUSTRALIA · NEW ZEALAND **ASIA** CHINA · HONG KONG, CHINA · INDIA · INDONESIA · ISRAEL · LEBANON · MALAYSIA · PHILIPPINES · SINGAPORE · SOUTH KOREA · TAIWAN, CHINA · THAILAND · UNITED ARAB EMIRATES · VIETNAM

KÜBLER GROUP

- FRITZ KÜBLER GMBH
- 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.

Kübler Group
Fritz Kübler GmbH
Schubertstrasse 47
78054 Villingen-Schwenningen
Germany

Phone +49 7720 3903-0
Fax +49 7720 21564
info@kuebler.com

R64042.0002 08 070 22 ES

kuebler.com