

Solutions for the Heavy Industry

- Incremental Encoders
- Absolute Encoders
- Transmission Technology
- Counters and Process Indicators



Kübler pulses for the heavy industry. Reliable and sturdy.

On oil platforms and offshore plants, in open-cast or underground mining machines, in crane installations and in steel plants – Kübler encoders operate reliably in heavy machinery in the harshest environmental conditions with dust, moisture and extreme temperatures and mechanical stress. Usually, in these unfriendly environments, high-accuracy sensors reach their limits.

This is not the case with Kübler – With its wide-ranging products portfolio, the Company boasts more than 50 years of experience in mechanical engineering and automation technology.

Heavy Duty encoders and rugged compact encoders equipped with particularly robust bearings, with the most modern housing technologies and many various communication interfaces (from analogue up to the real-time Profinet interface) are part of our wide heavy industry-specific products range.

Encoders for functional safety and optical fibre modules for the secure optical transmission of encoder signals over long distances complete the Kübler product range for these application fields.





Kübler Headquarters, Villingen-Schwenningen, Germany



Applications

- Speed measurement and positioning of rollers and drives in the steel industry P. 4
- Positioning and speed measurement for heavy cranes: Availability 24 hours a day P. 6



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Kübler Service

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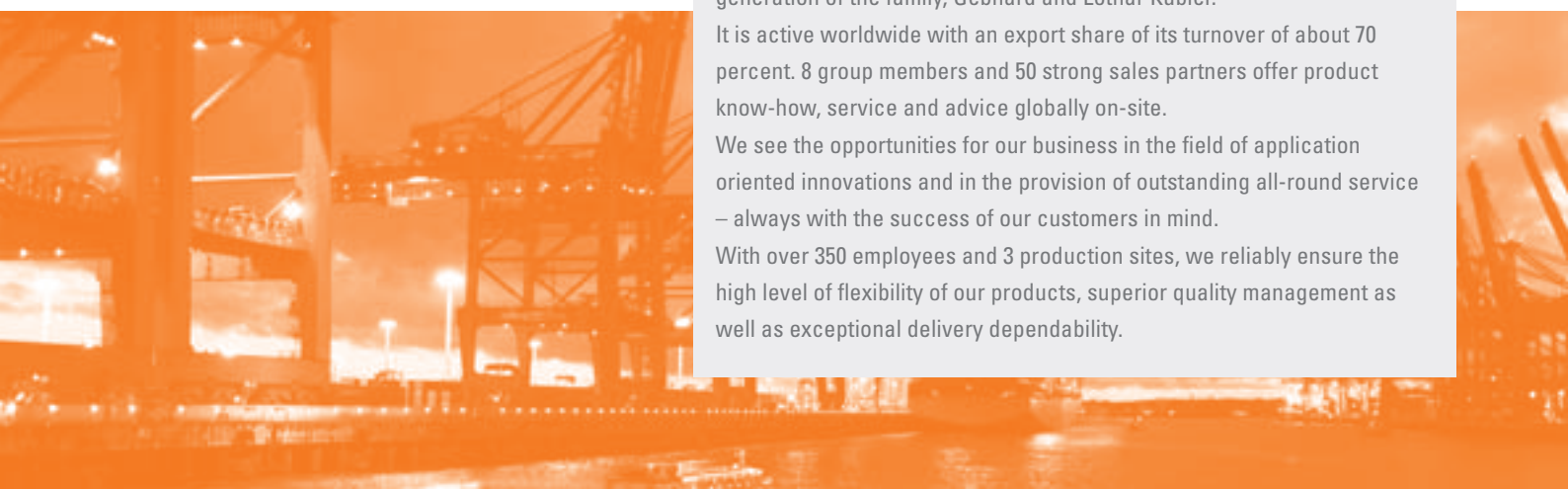
The core business of the Kübler Group is the development, manufacture and marketing of leading-edge position and motion sensors, innovative display and counting technology as well as connection and transmission technology.

Founded in the year 1960, the family business is now led by the next generation of the family, Gebhard and Lothar Kübler.

It is active worldwide with an export share of its turnover of about 70 percent. 8 group members and 50 strong sales partners offer product know-how, service and advice globally on-site.

We see the opportunities for our business in the field of application oriented innovations and in the provision of outstanding all-round service – always with the success of our customers in mind.

With over 350 employees and 3 production sites, we reliably ensure the high level of flexibility of our products, superior quality management as well as exceptional delivery dependability.



Speed measurement and positioning of rollers and drives in the steel industry

Position and movement 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 work steadily for many years in steel plants all over the world. Reliability is the main feature, especially for plants with very high operating costs.

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 moist environments. Rolling mill-suitable encoders, shock-tested and with centrifugal switches to prevent from 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 hoisting gear regulation of cranes.

5 Further processing

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





Sendix Heavy Duty H100

- HD-Safety-Lock™ bearing construction for an extremely high bearing load capacity
- Seawater-resistant material
- Feather key fitting ensures positive fitting to the application
- Safe overspeed protection by means of mechanical speed switch
- Guaranteed availability thanks to the optional double encoder (twin encoder)



Sendix SIL

- Singleturn and multiturn absolute encoders and incremental encoders for functional safety with SIL3 certification
- Interlocked bearings for high robustness, accuracy and long lifetime
- IP67 protection level
- Insensitive to magnetic fields thanks to optical scanning



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
- Rugged Safety Lock™ bearings construction
- Safe operation with moisture and dirt (IP67, -40°C ... +90°C)



5803/5823

High-temperature versions

- Incremental encoder with up to 5000 pulses
- Can be used from -40°C up to +110°C
- Insensitive to magnetic fields thanks to optical scanning
- Various connection possibilities for different application purposes



Incremental encoders - Special solutions

- Sendix 5000 with rugged bearing unit to increase the maximum allowable bearing load to above 300 N
- Standard mounting with EURO flange
- Sensor unit mechanically decoupled from the bearing load ensures additional protection in harsh environments
- Up to 10 times longer lifetime, even in case of high loads



A02H Hollow shaft encoder

- Incremental encoder with large hollow shaft up to 42 mm
- With protective cover for applications with a high degree of pollution
- Many various mounting and connection accessories
- Plastic isolation inserts protect the encoder from shaft currents and prevent from damages to the encoder bearings.
- Simple and accurate mounting, axial fastening for conical and cylindrical shafts



Optical fibre emitters, receivers and cables

- For the transmission of incremental, SSI and Ethercat signals
- No cable-related interference in the optical fibre cables, e.g. due to generators or inverters
- Safe transmission over distances up to 1.5 km

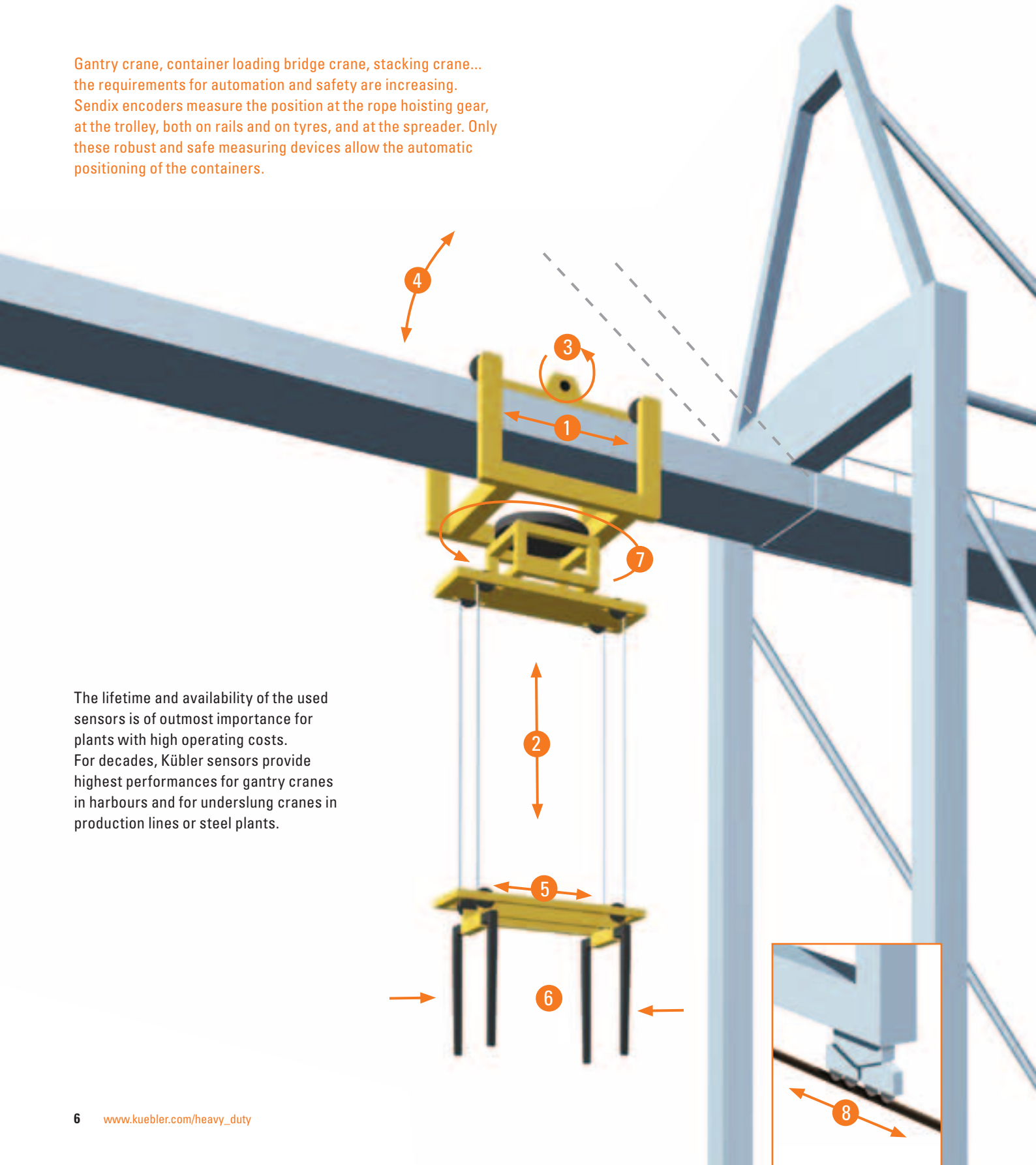


Preset counters Codix 923 and 924

- Multifunctional: pulse counter, timer and tachometer in one device
- Up to 6 presets with relay or optocoupler outputs
- User-friendly: simultaneous display of the actual value and of the presets, batch count or total count
- Easy programming
- With accessories for top-hat rail mounting in cabinets

Positioning and speed measurement for heavy cranes: Availability 24 hours a day

Gantry crane, container loading bridge crane, stacking crane... the requirements for automation and safety are increasing. Sendix encoders measure the position at the rope hoisting gear, 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 used sensors is of utmost importance for plants with high operating costs. For decades, Kübler sensors provide highest performances for gantry cranes in harbours and for underslung cranes in production lines or steel plants.



1 Lifting gear position



Sendix F36XX CANopen

- Safety Lock – Rugged bearings construction in a compact shape, 36 mm
- Highly accurate optical encoder without gear, insensitive to magnetic fields
- 17 bit singleturn + 24 bit multiturn = 41 bit total resolution
- Interfaces: SSI, CANopen, BiSS, additional incremental outputs RS422 and Sin/Cos
- Optional: seawater-resistant

2 Load handling position



Sendix SIL

- Singleturn and multiturn absolute encoders and incremental encoders for functional safety with SIL3 certification
- Interlocked bearings for high ruggedness, accuracy and long lifetime
- IP67 protection level
- Insensitive to magnetic fields thanks to optical scanning

3 Winch speed



Sendix Heavy Duty H100

- HD-Safety-Lock™ bearing construction for an extremely high bearing load capacity
- Seawater-resistant material
- Feather key fitting ensures positive fitting to the application
- Safe overspeed protection by means of mechanical speed switch
- Guaranteed availability thanks to the optional double encoder (twin encoder)

4 Boom angle / end position



Sendix M3658 CANopen

- Compact singleturn encoder, diameter 36mm
- Fully encapsulated electronics for outdoor applications in moist environments (-40°C, IP 69k)
- Magnetic scanning for a high shock and vibration resistance
- Status display
- Optional: seawater-resistant

5 Accurate spreader positioning

6 Spreader opening / closing, rotation angle

7 Spreader rotation angle



Sendix 58XX CANopen

- Up to 16 bit singleturn and 12 bit multiturn resolution
- Safe operation with moisture and dirt (-40°C ... +90°C, IP 67)
- High accuracy, insensitive to magnetic fields thanks to optical scanning
- Status display and reset button in the cover
- Optional: seawater-resistant

8 Travel speed



Sendix 5000/5020 Incremental

- Compact and rugged incremental encoder
- Rugged Safety Lock™ bearing construction
- Safe operation with moisture and dirt (IP67, -40°C ... +90°C)

Sendix Heavy Duty H100 – Technology for the heavy industry

Thanks to the special HD-Safety-Lock™ construction, the Sendix Heavy Duty H100 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.

i 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
- + Mechanically decoupled sensor unit ensures constant signal quality with large temperature fluctuations and other adverse environmental influences
- + 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

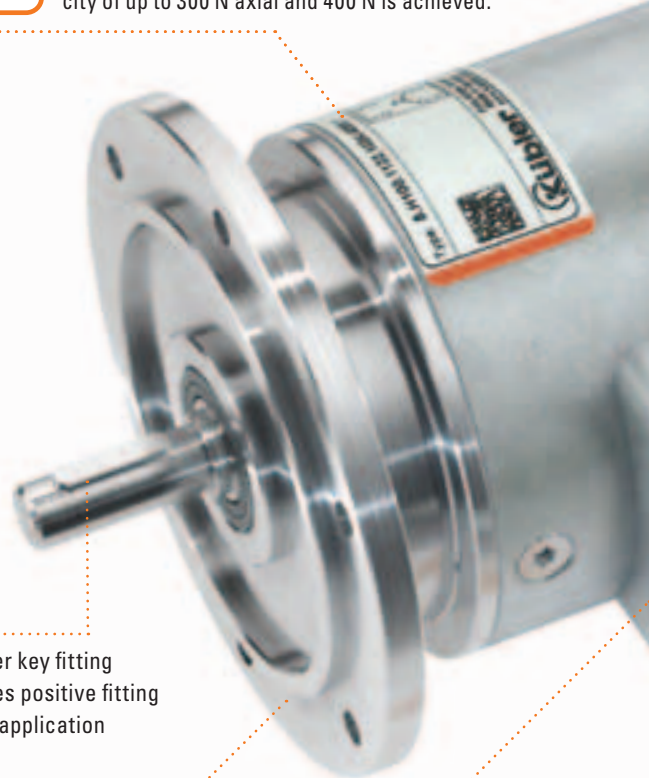
Benefits:

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
Axiale load	40 N	300 N
Elimination of internal stresses	0	++
Constant signal quality with extended temperatures	+	++
Mechanical protection of the seal	0	++



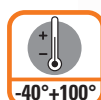
Thanks to the special HD-Safety-Lock™ bearing construction, an extremely high bearing load capacity of up to 300 N axial and 400 N is achieved.



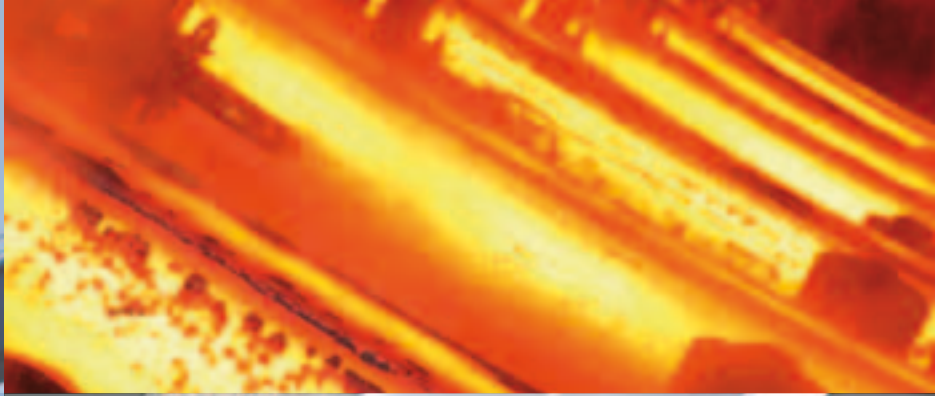
Feather key fitting ensures positive fitting to the application



Dual sealing and seawater-resistant materials, the encoder is resistant to harsh environmental conditions.



Temperature range from -40°C up to +100°C, IP66 protection



Safe overspeed protection by means of mechanical speed switch



Accurate and reliable optical sensor technology



Various connection possibilities thanks to terminal box being rotatable through 180°



Plug-in spring terminal connectors – no need for tools



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 with 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)	++	+

Sendix Heavy Duty H100 – The product family

The Sendix Heavy Duty H100 are an extremely rugged incremental encoders family available in 3 versions. Encoders with or without speed switch, and double encoder.



Incremental encoder

- Euro RE0444 flange
- Shaft \varnothing 11 x 30 mm, with feather key fitting
- Output circuit / Power supply:
 - RS422 (with inverted signal) / 5 ... 30 V DC
 - Puch Pull (with inverted signal) / 10 ... 30 V DC
- Pulse rate up to 3600



Encoder with mechanical speed switch

Additional features of the speed switch:

- Switching speed 750, 1000, 2000, 3000, 4000 (Other switching speeds on request)
- Switching accuracy \pm 4% at 100 rad/s²



Incremental double encoder

Two encoders in the same device to increase the functional safety in case of failure of an encoder.



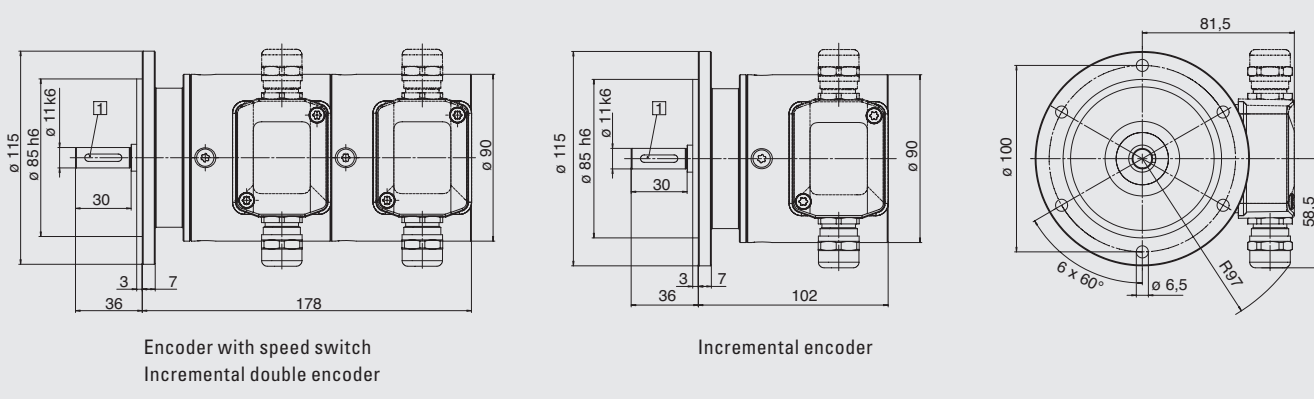
Technical data encoder

Speed		max. 6000 min ⁻¹
Load capacity of shaft	radial	400 N
	axial	300 N
EX approval for hazardous areas		II 3G 3D Eex nA T4
Working temperature range		-40°C ... +100°C
Materials	shaft	stainless steel
	housing	die-cast aluminium (EN AC-44300), seawaterresistant coating
	flange	seawater resistant aluminium, Type Al Si Mg Mn (EN AW-6082)
Shock resistance	acc. EN 60068-2-27	< 300 g ~ 3000 m/s ² (1 ms)
Vibration resistance	acc. EN 60068-2-27	< 10 g ~ 100 m/s ²
		for switching speed
		750 or 1000: < 5 g ~ 50 m/s ²
Short circuit proof outputs		yes
Reverse connection of the supply voltage		yes

Technical data speed switch

Switching speed (ns)	750 ... 4000 min ⁻¹
max. rotational speed (mechanical)	1,25 x ns
Switching accuracy	+/- 4% of ns
	with acceleration $\alpha = 100 \text{ rad/s}^2$ (corresponds $\Delta n = 955 \text{ min}^{-1}/\text{s}$)
Switching difference CW/CCW rotation	~ 3 %
Switching hysteresis	~ 40% up to 65% of ns
Switching capacity	3 A / 230 V AC
	1 A / 125 V DC

Dimensions



Encoders for Functional Safety

Safety is – not least since the EU Machinery Directive 2006/42/EG – an “integral part of the construction of drives”. When choosing the right encoder for functional safety the principle applies that safety is achieved through the intelligent combination of encoder, controller and actuator.

Sendix SSI absolute encoders, with an additional Sin/Cos incremental output, and Sin/Cos versions of incremental encoders are available with certification.

But safety goes further than this: safe components are characterised by a robust reliable interface and by the ability to cope with high mechanical and electronic loads.



i Multitalented device

Absolute encoder with incremental sine/cosine signals, multiturn stage and integrated functional safety

Drive control using incremental sine and cosine signals is a tried-and-tested technology with a number of advantages. The high interpolatability of the analogue sine and cosine signals, with more than 1 million steps per revolution, allows for precise control of both slow turning as well as highly dynamic drives.

Combined with the high resolution and very accurate position information provided by the absolute encoder, all the data necessary for a precisely controlled motor start-up with an encoder is available. Furthermore, the multiturn sensor technology permits position control over a wide range. And finally, the high information content of the signals – all independent of one another – forms the basis for a sensor with high functional safety.



Compliance with Safety Standards

According to DIN EN 13849-1 and DIN EN 61800-5-2 up to SIL3/PLe/Kat.4 the following safety functions can be implemented with the encoder:

SS1:	Safe Stop 1	controlled braking, STO after time or standstill
SS2:	Safe Stop 2	controlled braking until SOS
SOS:	Safe Operating Stop	safe operating stop in position control
SLS:	Safe Limited Speed	
SLI:	Limited Increment of Position	
SLP:	Safe Limited Position	
SSR:	Safe Speed Range	
SDI:	Safe Direction	
SSM:	Safe Speed Monitoring	

Safe Incremental Encoder Function

In order to achieve safe incremental information with the encoder, the controller must monitor the validity of the analogue, 90° phase-shifted sine/cosine signals with the help of the function: $\sin^2 + \cos^2 = 1$

Safe Absolute Encoder Function

In order to obtain safe information with the encoder regarding the absolute position, the controller counts the incremental pulses and compares the result with the absolute positions also provided by the encoder.

Safe mechanical connection

A 100% reliable mechanical connection is required for a safe function in the applications. Suitably sturdy fixing elements can help eliminate the risk of faults.

i MTTFd Values

With regard to the requirements of the Machinery Directive 2006/42/EC the MTTFd values for the most important standard encoders from Kübler are also provided. This thus enables the user to carry out his own calculations according to DIN EN 61800-5-2 and DIN EN ISO 13849.

Sendix 5814SIL / 5834SIL

Incremental encoders with Sin/Cos outputs

The incremental position of the encoder family 58x4SIL is provided in the form of an analogue sine/cosine signal; here the resolution per revolution is 1024 or 2048 sine/cosine periods.

Additional features:

- With protected Safety Lock™ Technology: interlocked bearings for a high degree of ruggedness, accuracy and long service life.
- Protection rating IP65 or IP67
- Magnetically insensitive due to optical scanning.

Sendix 5853SIL / 5873SIL, Sendix 5863SIL / 5883SIL

Absolute encoders single and multiturn with SSI and Sin/Cos outputs

The absolute position of the encoder family 58x3SIL is transmitted in the form of a digital SSI or BiSS data word. With the singleturn variants 5853SIL and 5873SIL the resolution is between 10 bits and 17 bits, depending on the variant.

In contrast to the singleturn variants 5853SIL / 5873SIL, the multiturn variants 5863SIL / 5883SIL have in addition a gear for detecting positions greater than 360°. The number for detecting the revolutions amounts to 12 bits. This thus gives a total resolution for the multiturn of up to 29 bits.

The incremental position is provided in the form of an analogue sine/cosine signal. The resolution per revolution is 1024 or 2048 sine/cosine periods.

Additional features:

- Interlocked bearings for a high degree of ruggedness, accuracy and long service life.
- Protection rating IP65 or IP67
- Magnetically insensitive due to optical scanning.

Technologies for the heavy industry

Innovations from tradition. Kübler products benefit from 50 years experience in automation engineering. Over the years they have undergone ongoing development and been optimised for use in the heavy industry.

Small details make a big difference. Our products feature many intelligent, high-quality extras, which offer our customers decisive advantages, whilst at the same time making a significant contribution to the high availability and safety of the machines.



HD Safety-Lock™



Safety-Lock™



High shaft load capacity



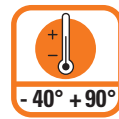
Shock / vibration resistant



Seawaterresistant optional



High IP value



Temperature



Magnetic field proof



Optical sensor

Optical Multiturn Technology

100 percent resistant to magnetic fields – extremely compact design. Even strong magnetic fields, as occur in the vicinity of brakes or drive motors, pose no problems for the sensor technology of optical single- or multiturn devices.

The technology dispenses with any components that may be susceptible to magnetic influences.

As a result of the proven drive, the encoder has no need of a battery to store the number of revolutions.

Insensitive to interference: OptoASICs

The resistant Kübler OptoASIC technology offers a very high integration density of components.

This means that, on the one hand, the reliability in the application can be increased significantly, and on the other hand the technology demonstrates quality EMC characteristics and shock resistance.





Well protected against dust and moisture

The sturdy, thick-walled die-cast housing of the Sendix encoders is press-fit stemmed several times on the encoder flange. The high protection level and the wide temperature range from -40°C to +90°C allow a safe outdoor operation. The die-cast housing is fitted with an extremely resistant base, on which the connector flange is screwed with four screws.

High temperatures

High heat resistance – combined with high rotational speeds – make the Sendix encoders the optimal solution for all applications in a high temperature environment. Also the used seals, cables and connectors withstand extreme temperatures.

Shock and vibration resistant

Kübler encoders avoid serious, expensive failures right from the start – even with increased levels of axial loading, shock and vibration. This can eliminate enormous service costs and expensive downtimes in applications worldwide.

Sea-water resistant versions

Although it has already proved itself in harsh environments, the Sendix family of devices has now been tested and certified to IEC 68-2-11 for resistance to the effects of salt-spray over a period of up to 672 hours – the highest test level. The high certification level for the Sendix encoders attests a high level of corrosion resistance.



Tested
acc. to the
saltspray test
IEC 68-2-11
=> 672 h



Presales

Kübler – the service specialists for every industrial sector and application – supplying complete integrated solutions – globally on your doorstep

Sample Service – Fast delivery of customised versions

Selection tool
Kübler website: Product Finder

Delivery Service: 10 by 10,
48 h Express and Repair Service



Kübler Service for planning dependability

Fast, reliable service and professional advice have top priority at Kübler. We are globally on your doorstep in 6 service and application centres and offer our customers planning dependability.

We deliver from stock within one day. We can manufacture your special orders within 48 hours. Moreover, 10 by 10 is our delivery offensive, which ensures that – for quantities of up to 10 pieces – you will receive all catalogue products so marked within 10 days.

Our processes and services are certified and are constantly being improved.

10 by 10

With our 10 by 10 Service we will manufacture 10 encoders within 10 working days.

The benefits to you: easier to order, the delivery can be calculated, flexibility for small production batches.



Technical Hotline

Our Hotline will answer your technical questions Mon-Fri within normal working hours:



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Kübler Italy	+39 0 26 42 33 45
Kübler China	+86 10 5134 8680
Kübler India	+91 9819 457 872
Kübler Poland	+48 6 18 49 99 02

Sample and Repair Service

The Kübler Service Centre can quickly manufacture special, customised versions within a short space of time. We are happy to help you with the practicalities of using our products – at your location if desired. We can carry out repairs within a maximum of 5 working days.



48 h Express Service

Short delivery times, a high level of on-time delivery, guaranteed quality and enthusiastic, service-oriented employees – these are what our customers can depend on.

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



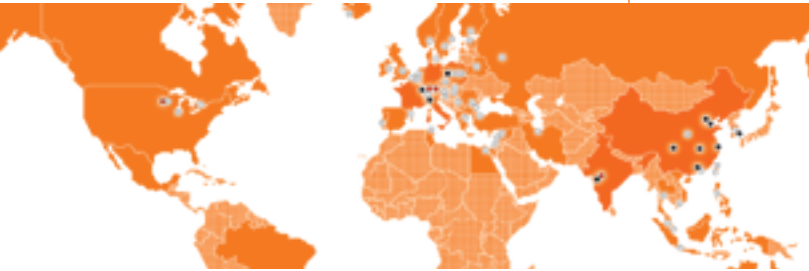


Service Excellence provided by Kübler application specialists for target sectors

Product security – replacement models at the end of the product life-cycle

Aftersales

Service Centres, globally on your doorstep:
Advice, analysis, support during installation in over 50 countries



« We were able to considerably reduce our average delivery time and I can confirm that delivery schedules were always adhered to. Technical support is very professional, efficient and not at all bureaucratic. »

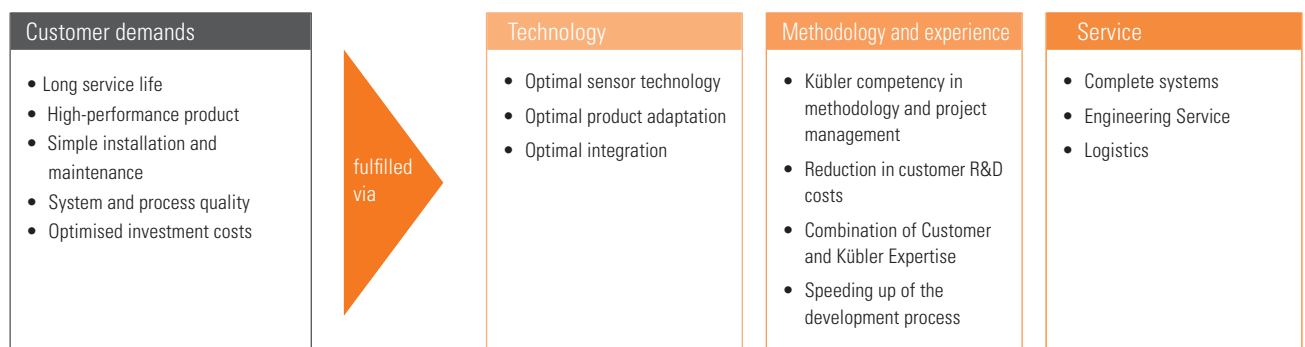
Purchasing Manager, German Producer of Geared Motors

Tailor-made solutions – Kübler Design System

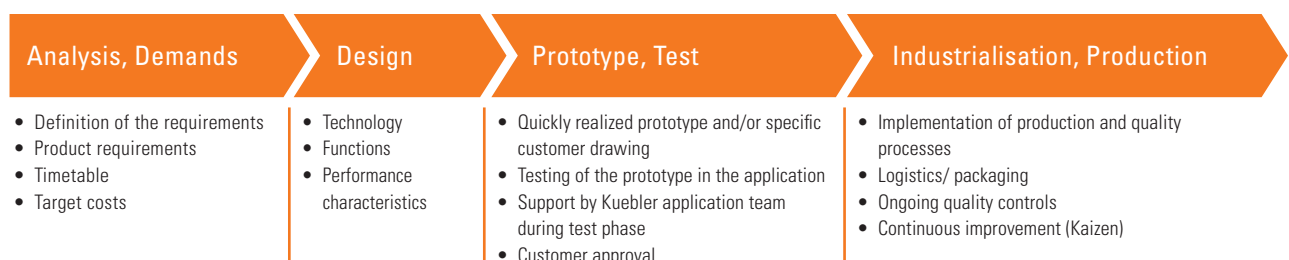
« With the KDS method our customers receive a lasting solution to lowering costs, reducing the number of models available or eliminating quality deficiencies. With KDS we develop product and engineering solutions together. The method stands out because of its structured process; this delivers innovation through experience and cooperation with the customer. »

Gebhard and Lothar Kübler, Managing Directors Kübler GmbH

The Kübler Design System – satisfying customer demands



The 4 phases of the Kübler Design System



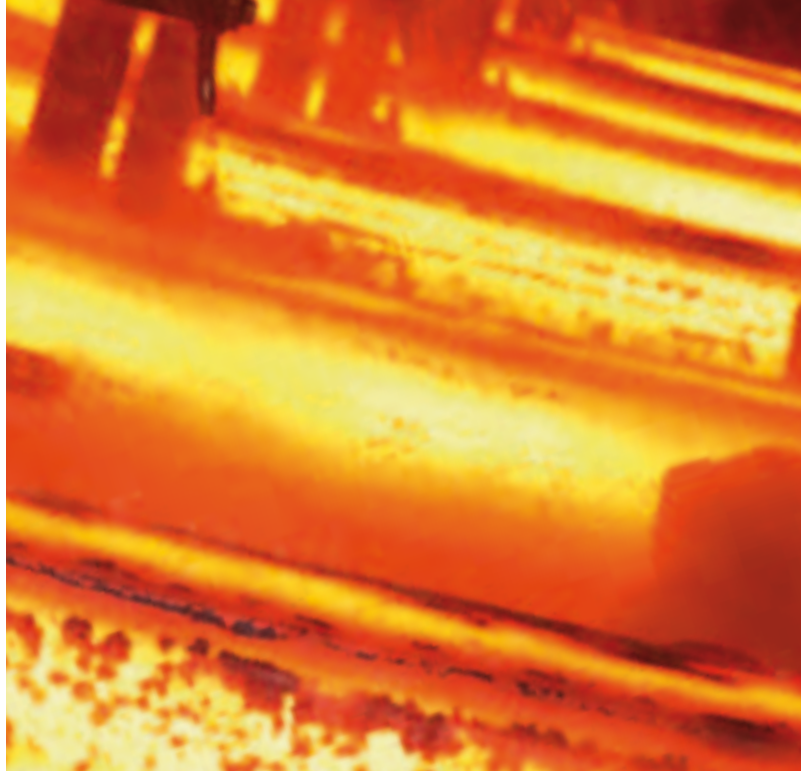
References

What is crucial is how products withstand the endurance test in practice!

Here, every day, Kübler encoders demonstrate their high quality standards - and this applies to every area of application.

Many international companies have confidence in our solutions for heavy industry.

These companies include the following:



SMS Meer GmbH - Germany



Sendix 5868 Profibus absolute encoders for format setting in long-product and semi-product rolling mills

Demag Cranes and Components - Germany



Sendix 5000 Incremental encoders for motor speed measurement

AG der Dillinger Hüttenwerke - Germany



A02H incremental encoder and LWL optical modules for roller speed measurement

BAO Steel - China



Sendix 5020 Incremental encoder for motor speed and Sendix 5888 Profibus encoder for roller position in cold rolling mills

TATA Steel - India

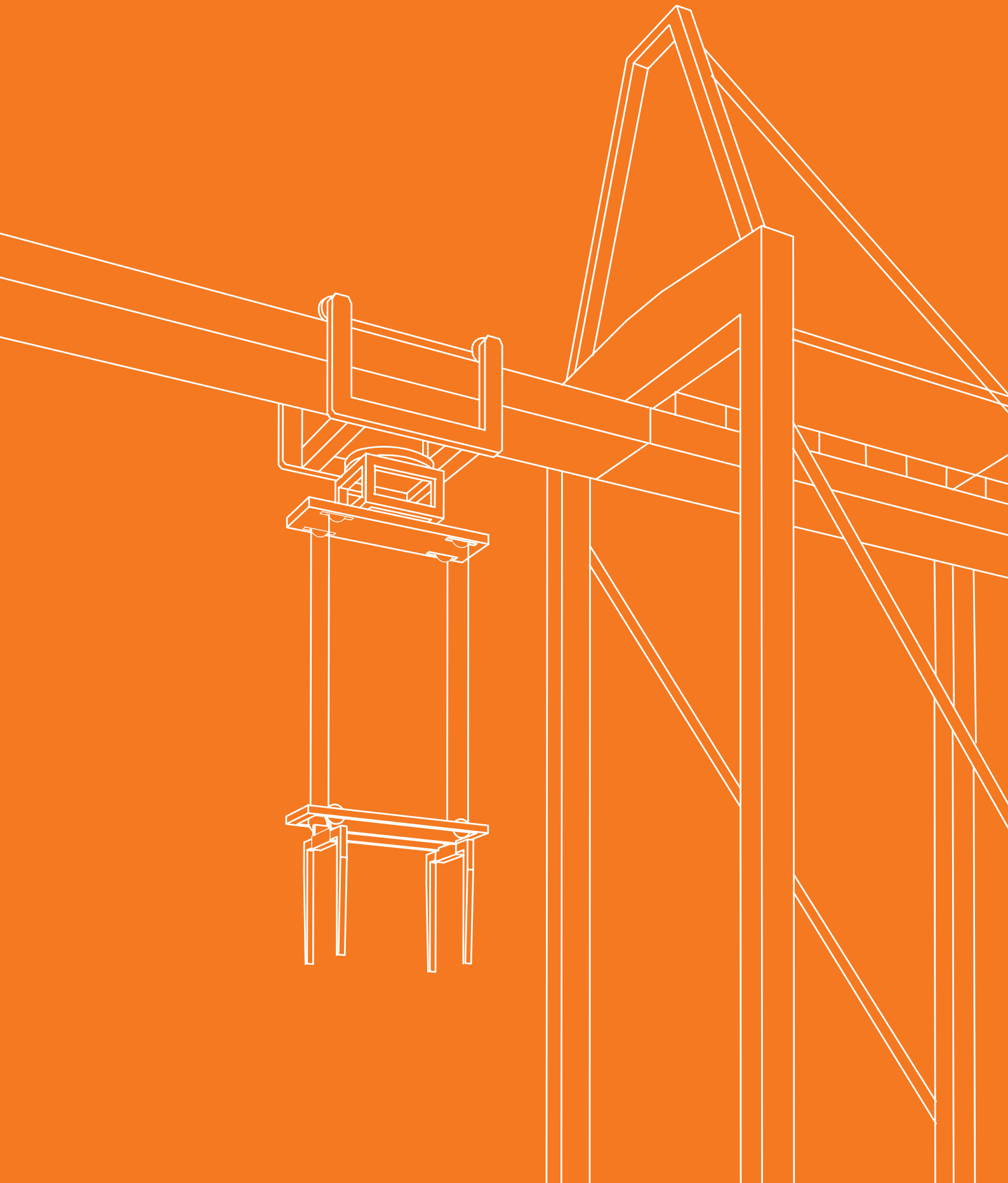


A02H Heavy Duty incremental encoders for vessel tilt drive

Wuhan Iron and Steel Corp. – China



Kuebler Sendix 5020 incremental encoder user for motor speed measurement in steel melting shop



Heavy Duty

www.kuebler.com



www.kuebler.com/heavy_duty

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■■■ *pulses for automation*