



- Incremental Encoders
- Absolute Encoders
- Bearingless Encoders
- Slip Rings
- Transmission Technology
- Functional Safety

## More efficiency and high plant availability with Kübler solutions

Renewable energies make a significant contribution to climate and environmental protection. The use of wind turbines is becoming increasingly important - worldwide. Whether as onshore or offshore wind farms - the decisive factor is above all a high efficiency of the plants, in order to achieve the highest possible energy yield.

Sensor technology plays an essential role in this. This is why major wind turbine manufacturers, as well as control system manufacturers, have been relying on solutions from Kübler for years. In addition to suitable encoders, bearingless encoders, slip rings and solutions for functional safety, Kübler also offers in-depth knowledge of the wind industry, first-class service and a global presence. The range is rounded off by customer-specific solutions that can be implemented quickly and easily.

**You too can decide for Kübler.**



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# The comprehensive portfolio for control and monitoring

Whether blade angle measurement, wind direction tracking, position and rotary speed control or signal and load transmission – Kübler has the right product. His many years of experience in this sector ensure the customers reliable products and the best consultation.

Besides encoders and sensors for turbine control, Kübler offers a comprehensive portfolio of safety encoders and slip rings. These can be ideally combined and, together, offer many advantages.

**1 Position and speed measurement of the rotor shaft**

Incremental or absolute sensor head with magnetic band



**2 Position and speed measurement of the generator shaft**

Incremental and absolute bearingless encoders with magnetic ring



**3 Speed measurement of generator shaft**

Incremental Sendix Heavy Duty H120 encoders



**4 Rotary speed monitoring**

Safety-M compact safety modules



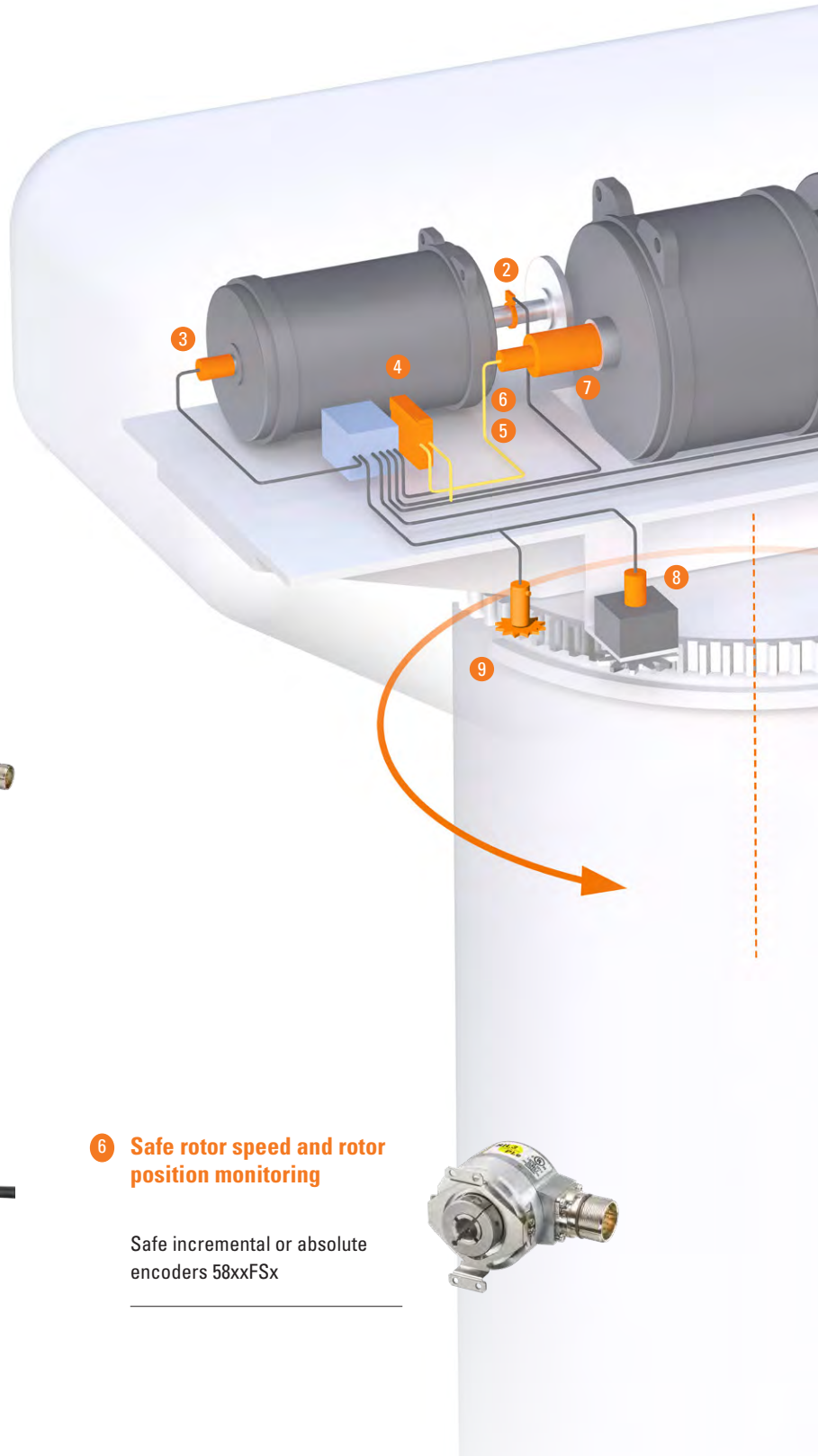
**5 Rotor shaft speed measurement on slip ring**

Compact and economical Sendix KI40 incremental encoders

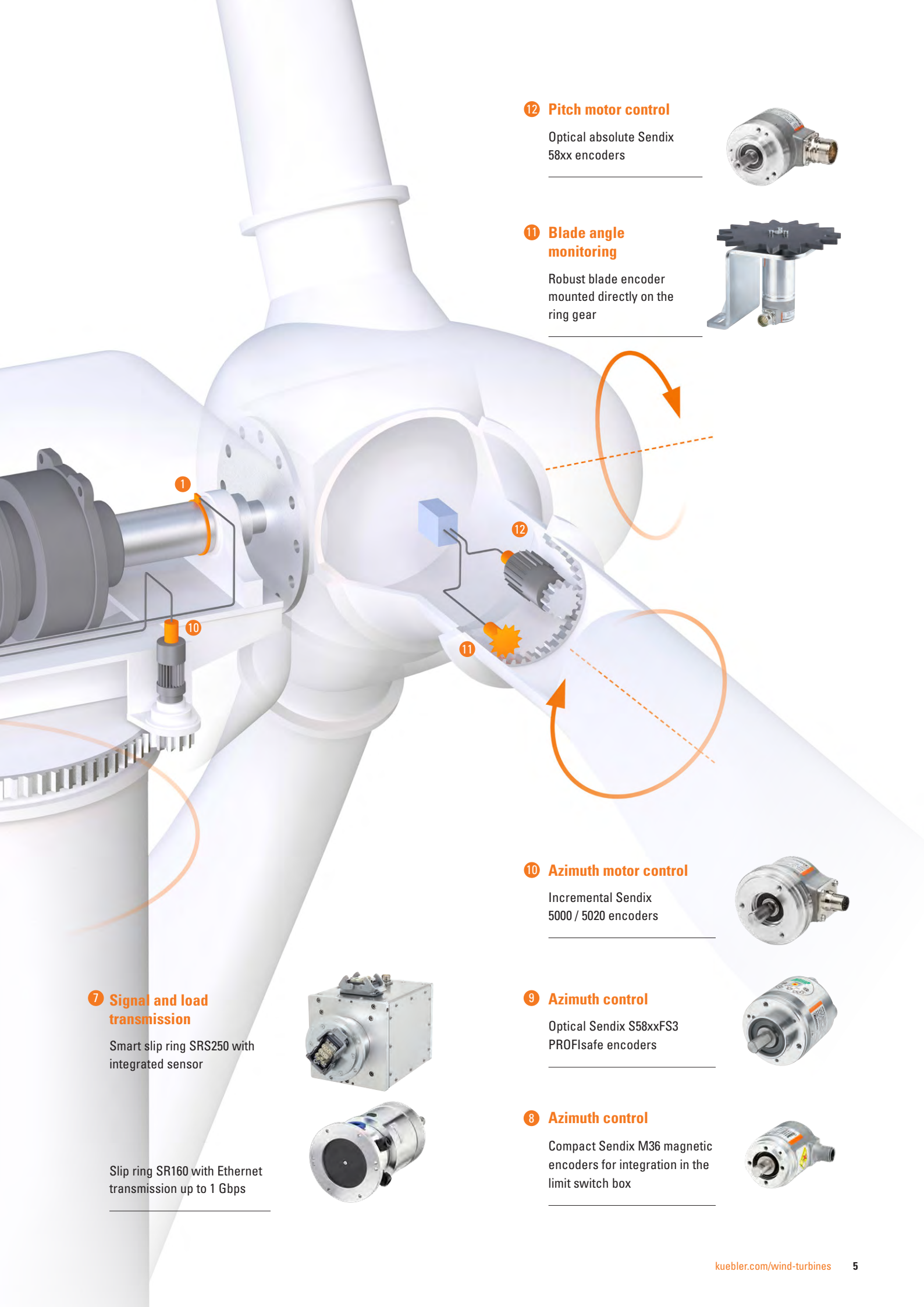


**6 Safe rotor speed and rotor position monitoring**

Safe incremental or absolute encoders 58xxFSx







**12 Pitch motor control**

Optical absolute Sendix 58xx encoders



**11 Blade angle monitoring**

Robust blade encoder mounted directly on the ring gear



**7 Signal and load transmission**

Smart slip ring SRS250 with integrated sensor



Slip ring SR160 with Ethernet transmission up to 1 Gbps



**10 Azimuth motor control**

Incremental Sendix 5000 / 5020 encoders



**9 Azimuth control**

Optical Sendix S58xxFS3 PROFI-safe encoders



**8 Azimuth control**

Compact Sendix M36 magnetic encoders for integration in the limit switch box



## Pitch and azimuth control

Safety first! Measuring systems form an integral part of the safe control of pitch and azimuth and need to offer reliable, precise availability at all times. No matter when nor where, Kübler Sendix series encoders set standards here when it comes to safety, accuracy and ruggedness – whether in the drive or as a stand-alone measuring system in wind turbines.

The flexible and wide-ranging options offered by the Kübler Sendix encoders create the ideal solution for every eventuality when it comes to the construction of wind turbines and ensure a long service life and optimal costs.



	11 Complete system	12 Sendix 58 encoders	8 Sendix M36 encoders	9 Sendix S58 PROFIsafe encoders
Description	Sendix 5863 multiturn encoder combined with robust bearing unit, mounting bracket and pinion	Multiturn encoders, shaft and hollow shaft versions, highly accurate scanning, 100% magnetic field resistant  5863/5883, 5868/5888	Compact multiturn encoders, shaft and hollow shaft versions, high IP protection level, easy installation in tight mounting spaces, extremely robust variant available  M3661/M3681, M3663/M3683, M3668/M3688	Optical multiturn encoders, with redundant multiturn gearbox  S5868FS3 / S5888FS3
Characteristics	ø 58 mm, optical, mechanical multiturn Safety-Lock™ design	ø 58 mm, optical, mechanical multiturn Safety-Lock™ design	ø 36 mm, magnetic, electronic multiturn Energy Harvesting Technology Safety-Lock™ design	ø 58 mm, optical, electronic multiturn Safety-Lock™ Design
Mechanical interface	shaft max. 10 mm	shaft max. 10 mm hollow shaft max. 15 mm blind hollow shaft max. 15 mm	shaft 10 mm blind hollow shaft max. 10 mm	shaft max. 12 mm blind hollow shaft max. 15 mm
Electrical interface	SSI, BiSS + 2048 ppr SinCos or + 2048 ppr RS422	SSI, BiSS + 2048 ppr SinCos or + 2048 ppr RS422, PROFIBUS, CANopen, EtherCAT and PROFINET	analog, SSI, CANopen	PROFINET IO / PROFIsafe
Resolution max.	17 bit singleturn + 12 bit multiturn	17 bit singleturn + 12 bit multiturn	14 bit singleturn + 24 bit multiturn	24 bit singleturn + 12 bit multiturn
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	6000 min <sup>-1</sup>	9000 min <sup>-1</sup>
Temperature range	-40 °C ... +90 °C	-40 °C ... +90 °C	-40 °C ... +85 °C	-40 °C ... +80 °C
Supply voltage	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC	10 ... 30 V DC	10 ... 30 V DC

## Position / speed measurement of rotor and generator shafts

A tough nut. Accurate position and speed informations are important measurement values for the control loop of a wind turbine. Measuring systems that supply this information are often subjected to harsh environmental conditions but must in no way suffer any loss of reliability.

Kübler offers here the complete range of solutions: from the extremely robust Sendix Heavy Duty H120 encoder mounted on the generator, through compact and cost-effective Sendix 5000 or Sendix KIS40 encoders for slip ring integration, up to bearingless encoders with magnetic rings or magnetic tapes, which can be mounted directly on the rotor or generator shaft.

Smart, bearingless encoders offer, if needed, highest resolutions and allow high control accuracy thanks to the digital signal processing with active signal errors correction. The flexible encoder systems are genuine all-rounders. They provide information about position, rotational speed and acceleration, and additional outputs allow their direct integration in the condition monitoring system or in the safety monitoring of the plant.



	<b>3 Sendix Heavy Duty H120 encoders</b>	<b>10 Sendix 5000 / 5020 encoders</b>	<b>6 Sendix 58FS encoders</b>	<b>1 + 2 Bearingless encoders RLI Performance</b>
<b>Description</b>	Extremely resistant incremental encoders. Integrated bearing isolation max. 2.5 kV, IP66 and IP67 thanks to double shaft protection.	Robust incremental shaft or hollow shaft encoders. Unique variants variety, sets new standards in its class.	Certified incremental and absolute encoders for highest safety and reliability. Optimally combinable with Safety-M safety modules.  5814FS2/5834FS2, 5853FS2/5873FS2	<ul style="list-style-type: none"> <li>Smart bearingless encoders</li> <li>Freely adjustable line count with reference signal(s)</li> <li>Status LED, Status output</li> <li>Optional integrated vibration sensor (possibility for condition monitoring and predictive maintenance)</li> <li>Integrated digital signal filters and electronic type label with user memory</li> </ul>
<b>Characteristics</b>	ø 100 mm, optical, incremental, HD-Safety-Lock™ design	ø 50 mm, optical, incremental, Safety-Lock™ design	ø 58 mm, optical, incremental and absolute Safety-Lock™ design	Sensor head for magnetic ring or magnetic tape
<b>Mechanical interface</b>	hollow shaft max. 28 mm	shaft max. 12 mm hollow shaft max. 15 mm	shaft max. 10 mm hollow shaft max. 14 mm	Magnetic ring up to ø 390 mm (larger diameters on request) Magnetic tapes for mounting on very large shafts > ø 500 mm
<b>Electrical interface</b>	RS422, optical fiber, push-pull	RS422, open collector, push-pull	SinCos, SSI, BiSS + SinCos	RS422, push-pull, SSI, BiSS, analog
<b>Resolution max.</b>	5000 ppr	5000 ppr	2048 ppr. SinCos 17 bit singleturn	Resolution freely programmable (in the factory or by the customer)
<b>Speed max.</b>	5000 min <sup>-1</sup>	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	12000 min <sup>-1</sup> (mechanically limited acc. to the magnetic ring diameter)
<b>Temperature range</b>	-40 °C ... +100 °C	-40 °C ... +85 °C	-40 °C ... +90 °C	-20 °C ... +80 °C
<b>Supply voltage</b>	5 V DC 10 ... 30 V DC	5 VDC 5 ... 30 VDC 10 ... 30 VDC	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

# Slip rings and transmission technology

In addition to encoders for speed and position control, a wide range of products for the transmission of signals rounds off the portfolio for plant monitoring. Kübler slip rings provide for all plant types with hydraulic or electrical pitch control a reliable transmission of power, signals and data from the nacelle to the rotating hub. Also the transmission of classical fieldbuses and of Ethernet-based communication is ensured without any problem.

All from one single source: The suitable incremental and absolute Kübler encoders allow of course perfect integration in the slip ring. A comprehensive range of transmission technology, cables, connectors and pre-assembled cordsets ensures reliable transmission for suitable and error-free communication.



	7 SR160 slip rings	7 SRS250 slip rings	Optical fiber transmission modules (LWL)	Connection technology
Description	<p>Reliable and robust contact technology for transmission of electrical load up to 85 A (higher on request), data and signal, fieldbus, protocol independent Ethernet transmission</p> <ul style="list-style-type: none"> <li>• Very long service life, no maintenance</li> <li>• Integrated incremental or absolute encoder</li> <li>• Up to IP65 protection</li> <li>• Various connection options</li> <li>• Robust design – aluminum or stainless steel housing mission available</li> <li>• High flexibility by modular design options, tailored to customer requirements</li> <li>• Operating temperature -30 °C ... + 60 °C</li> </ul>	<p>Flexible and reliable use thanks to robust, modular design with a wide range of connection options. With integrated sensor technology for the implementation of Industry 4.0 / IIoT concepts.</p> <ul style="list-style-type: none"> <li>• Reliable use in harsh environments.</li> <li>• High protection up to IP67.</li> <li>• Modular design for individual products.</li> <li>• Integrated sensor system for high plant availability through Condition Monitoring, life cycle histograms and Predictive Maintenance.</li> <li>• Simplifies commissioning and asset management through Electronic data sheet.</li> </ul>	<p>Optical fiber transmitter, receiver and cable</p> <ul style="list-style-type: none"> <li>• Available for incremental and SSI signals</li> <li>• Signal transmission through one single glass fiber</li> <li>• Safe signal transmission up to 2000 m</li> <li>• Withstands extremely strong electromagnetic fields</li> <li>• Potential separation</li> <li>• Accessories: Simplex patch cable, ST multimode coupling</li> </ul>	<p>Connectors and cables</p> <ul style="list-style-type: none"> <li>• Connectors, cables and preassembled cordsets</li> <li>• M12, M23, MIL and many others</li> <li>• Fieldbus connection technology</li> </ul>
Use	<p>Transmission of power, signals and data from the nacelle to the rotating hub. Innovative contact technology with a three chamber system for safe and reliable operation in harsh environments.</p>	<p>Parallel transmission of load up to 600 V / 100 A, Industrial Ethernet and analog signals (0 ... 20 mA, 0 ... 10 V, PT100 / 1000 and thermocouples). Innovative contact technology in three-chamber system for low-maintenance and long-life operation in harsh environments.</p>	<p>Optical transmission of the speed signals from the generator or from the rotor to the tower base. No line-conducted interference in the optical fiber cables, e.g. due to generators, inverters or power cables.</p>	<p>For a reliable connection of all electrical components. Sensors and connection cables prequalified from one hand.</p>



## Solutions for Functional Safety

Safe single components alone do not fully ensure a safe global application. Only the optimal interaction between safety sensors and safety monitoring modules offers reliable solutions, which will meet the necessary safety requirements. The optimal combination of Kübler's Safety-M modules and Sendix encoders allows the easy implementation of a safe drive monitoring system.



### 4 Safety-M compact SMCx speed monitor

Description

- Complete speed monitor in smallest construction space
- Integrated signal splitters to forward the encoder signals to a converter, CMS or control
  - Local diagnostics thanks to front-side status LED and removable OLED touch screen with plain text display
  - Easily configurable with parameters
  - 1 or 2 incremental encoder interfaces (HTL/proximity switch, TTL, SinCos)

Use

Speed monitoring of up to 2 incremental encoders or HTL speed signals in the drive train e.g. from a generator or rotor

Supply voltage

24 V DC +5 %

Number of encoder interfaces

2 – to monitor 2 incremental encoders SinCos, RS422, Push-pull

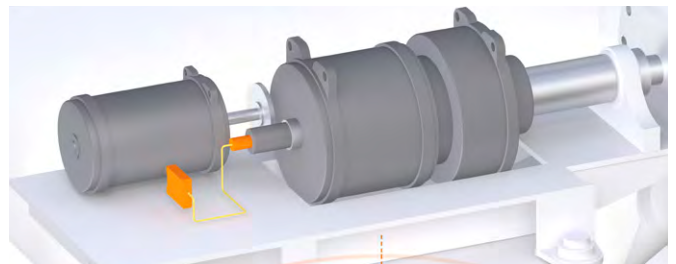
Inputs and outputs

4/2 safe digital inputs  
8/4 safe digital outputs  
2 safe relay outputs

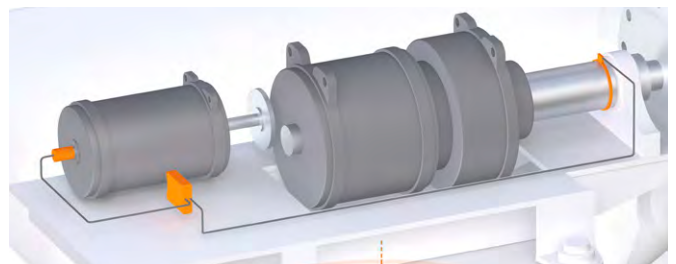
Parameterizing / Programming

Easy parameterizing by means of touch display or free PC software "SafeConfig OSxx"

The Safety-M compact module monitors rotational speed signals directly from the slow-speed rotor shaft or from the high-speed generator shaft. Safe overspeed detection can occur in two ways:



1 – By means of a safe incremental encoder such as the Sendix 5834FS2 with SinCos signals, for example integrated in a slip ring on the rotor shaft.



2 – By means of two incremental encoders at different measuring points in the drive train. In addition, the difference between the rotor and generator shafts allows here monitoring slippage or transmission breakage.

## 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](http://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.)

48 h

## 48 h Express-Service

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

Technical Support

## Technical Support

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

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## 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

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