



## **SOLUTIONS FOR DRIVE TECHNOLOGY**

ENCODERS AND BEARINGLESS ENCODERS  
MOTOR FEEDBACK SYSTEMS  
LINEAR MEASURING SYSTEMS

## Kübler encoders and motors – a perfect pairing.

Kübler is strongly rooted in drive technology and has been developing appropriate sensor solutions for speed and position detection for different electric drives for decades. Renowned drive manufacturers trust our encoders, bearingless encoders and motor feedback systems. All of them are based on the highest quality, robustness and sustainable technologies.

Combined with the large and flexible selection of mounting and installation solutions, Kübler encoders are the ideal solution for any conceivable task in drive technology. We are also happy to take on individual challenges and implement modifications and special solutions quickly and easily.

When will you choose Kübler?



Further information  
on drive technology



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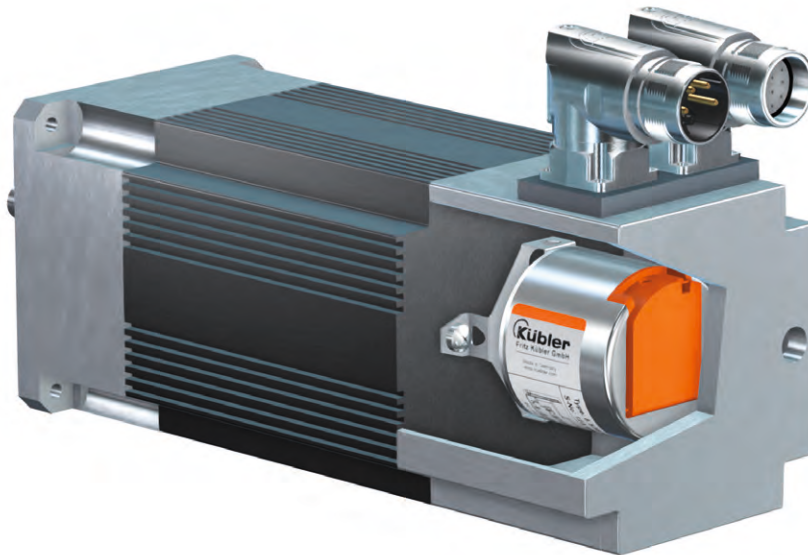
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## Motor Feedback Systems for servo motors

Synchronous servo motors are predestined for all applications requiring accuracy and dynamics. They thus suit optimally for converter operation.

Motor Feedback Systems are essential components in drive systems to ensure optimal control characteristics - in particular for dynamic axes, smooth speed controls and for positioning accuracy. They thus make a significant contribution to the performance of the whole plant.



### Application specific requirements

<b>Installation</b>	The small size of the motors means every millimeter counts. It is therefore essential to use compact yet powerful sensors.
<b>Commutation</b>	To ensure effective control of the servo motors, it is important to have precise information on the position of the rotor. This can be provided via single or multiturn information.
<b>Temperature range</b>	Above all, the intrinsic heating of the powerful synchronous motors entails high ambient temperatures. As the sensors are highly integrated in these drives, encoders are more directly exposed to high temperatures than is the case with other motors.
<b>Accuracy</b>	To ensure good control, especially for large numbers of poles, the encoders must have a high degree of accuracy.

## Motor Feedback Systems for servo motors

Servo motors are characterized by their high dynamics and performance. These features are only reached if the servo converter can control the motor optimally. This requires high-performance sensors such as Kübler's Motor Feedback Systems.



	<b>Sendix S3674 singleturn</b>	<b>Sendix S3684 multiturn</b>
General information	Motor Feedback System for the medium and high performance range	Motor Feedback System for the medium and high performance range
Mechanical interface	Hub shaft $\varnothing$ 8 mm Tapered shaft $\varnothing$ 8 mm	Hub shaft $\varnothing$ 8 mm Tapered shaft $\varnothing$ 8 mm
Electrical interface	RS485 + SinCos (Hiperface <sup>®</sup> <sup>1)</sup> compatible) BiSS + SinCos BiSS fully digital	RS485 + SinCos (Hiperface <sup>®</sup> <sup>1)</sup> compatible) BiSS + SinCos BiSS fully digital
Size	$\varnothing$ 36 mm	$\varnothing$ 36 mm
Resolution SinCos	1024 or 2048 ppr	1024 or 2048 ppr
Resolution max.	23 bit singleturn	23 bit singleturn + 12 bit multiturn
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>
Temperature range	-30 °C ... +120 °C	-30 °C ... +120 °C
Power supply	5 V DC 7 ... 30 V DC	5 V DC 7 ... 30 V DC

<sup>1)</sup> Hiperface<sup>®</sup> is a registered trademark of Sick Stegmann GmbH.



with stator coupling  $\varnothing$  38 mm



with stator coupling  $\varnothing$  60 mm

## Internal encoders for asynchronous motors

Asynchronous motors are increasingly used in applications where the available space is limited. In response to this requirement, drives are becoming ever more compact.

To reduce the length, Kübler provides magnetic, bearingless encoders, which can also be integrated customer specifically in the motor. A scope of delivery tailored to customer requirements and comprising sensor head, magnetic ring and shielding (against magnetic effects from the brake) is provided for such purpose.

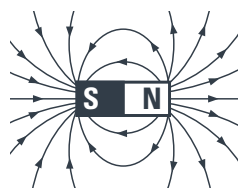
This modular system consisting of optimally coordinated components allows Kübler to provide solutions for all motor sizes with minimum variance.



### + Your benefit

- 100% integration in the motor
- Slim motor design
- High assembly tolerance
- Accurate control
- Ready for Smart Motor

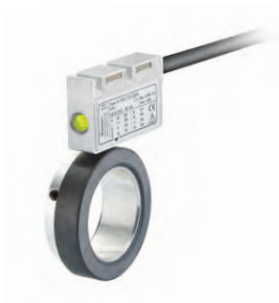
### Interference fields – no problem. Kübler shielding technology.



Electromagnetically actuated brakes generate strong magnetic fields, which make the operation of a bearingless magnetic encoder in their immediate proximity impossible. A shielding method calculated by FEM manages to shield the interference field of the brake at 100 % in the area of the sensor.

## Bearingless encoders as 100 % integration in asynchronous motors

Kübler offers an innovative solution here. It has made the asynchronous motor – the world's most common electrical drive – even smarter and more compact. Thanks to the individually integrated magnetic sensor solution, the dimensions of an asynchronous motor are now significantly reduced – this saving space and costs above all. Smart technology will also make these motors fit for the future. Evaluated data for condition monitoring and predictive maintenance are available.

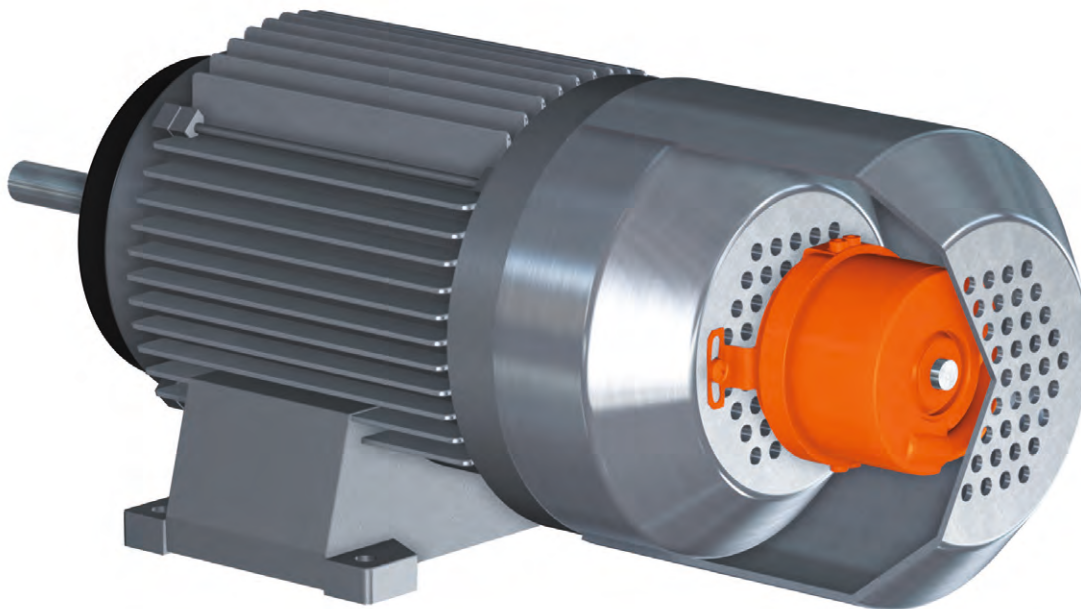


	<b>RL120, RL150</b>	<b>RIL201, RIL501</b>
Electrical interface	Push-pull, RS422 SinCos	Push-pull, RS422 SinCos
Sensor head	Size 40 x 25 mm	Adapted to customer application
Magnetic ring	Ring diameter depends on pulse rates	Adapted to customer application
Resolution max.	On request (resolution depends on ring diameter)	On request (resolution depends on ring diameter)
Speed max.	12000 min <sup>-1</sup>	On request (customer-specific up to max. 12000 min <sup>-1</sup> )
Temperature range	-20 °C ... +80 °C	typ. -30 °C ... +85 °C
Power supply	4.8 ... 26 V DC (RS422) 4.8 ... 30 V DC (push-pull)	5 V DC (RS422) 5... 30 V DC (push-pull) (or customer-specific)

## External encoders for asynchronous motors

Asynchronous motors are the all-rounders amongst electrical drives.

For every requirement there is a drive and for every drive there is a suitable Kübler encoder for mounting outside the motor. Whether as a fan motor in a small 63 size, or as a geared motor in a 225 size, asynchronous motors place special demands on encoders, above all when it comes to mechanical and electrical ruggedness. Because of their robust technology Sendix encoders prove themselves, especially in harsh environmental conditions.



### Application specific requirements

- |                          |  |
|--------------------------|--|
| <b>Mounting</b>          | Especially during the mounting of encoders the mechanics can be overloaded. This can lead to the encoder being prematurely damaged, so that the average service life is not reached. |
| <b>Motor options</b>     | If a motor next to the encoder is to be equipped with further sensors, then the motor shaft must be fed through the encoder.   |
| <b>Temperature range</b> | When using asynchronous motors extremely high temperature ranges can occur, which place increased demands on the sensors and on the way they are mounted.                            |
| <b>Magnetic fields</b>   | Both the motor and the electromagnetic brakes create stray magnetic fields, which can affect the sensors.  |



## Incremental encoders for mounting on asynchronous motors

The incremental Sendix encoders are available in many versions, with the suitable connection variant for almost every field of application, or as economically optimized versions. Both approaches have one in common – their compact construction.



	<b>Sendix Base KIS40 / KIH40</b>	<b>Sendix 5000 / 5020</b>	<b>Sendix 5814 / 5834</b>
Mechanical interface	Shaft max. 8 mm Hollow shaft max. 8 mm	Shaft max. 12 mm Blind hollow shaft max. 15 mm	Shaft 10 mm Blind hollow shaft max. 15 mm
Electrical interface	Open collector, push-pull, RS422	Open collector, push-pull, RS422	SinCos
Size	ø 40 mm	ø 58 mm	ø 58 mm
Resolution max.	2500 ppr	5000 ppr	2048 ppr
Speed max.	4500 min <sup>-1</sup>	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>
Temperature range	-20 °C ... +70 °C	-40 °C ... +85 °C	-40 °C ... +90 °C
Power supply	5 V DC 5 ... 30 V DC 10 ... 30 V DC	5 V DC 5 ... 30 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

### Absolute encoders for mounting on asynchronous motors



The absolute Sendix encoders – available both as singleturn and multiturn versions - are first of all robust and highly accurate. The multiturn gear uses a purely optical sampling technology and is totally insensitive to magnetic fields. Moreover, the first stage is mounted on two ball bearings and underlines the robust construction of these encoders.



	<b>Sendix 5853 / 5873</b>	<b>Sendix 5863 / 5883</b>	<b>Sendix 5863FS2 / 5883FS2</b>	<b>Sendix 5863FS3 / 5883FS3</b>
Mechanical interface	Shaft max. 10 mm Hollow shaft max. 15 mm	Shaft max. 10 mm Blind hollow shaft max. 15 mm Hollow shaft max. 14 mm	Shaft 10 mm Hollow shaft max. 14 mm	Shaft 10 mm Hollow shaft max. 14 mm
Electrical interface	SSI or BiSS	SSI or BiSS	SSI or BiSS	SSI or BiSS
Size	ø 58 mm	ø 58 mm	ø 58 mm	ø 58 mm
Resolution max.	21 bit	17 bit singleturn + 12 bit multiturn	17 bit singleturn + 12 bit multiturn	17 bit singleturn + 12 bit multiturn
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	9000 / 12000 min <sup>-1</sup>	9000 / 12000 min <sup>-1</sup>
Temperature range	-40 °C ... +90 °C	-40 °C ... +90 °C	-40 °C ... +90 °C	-40 °C ... +90 °C
Power supply	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

## Absolute encoders for mounting on asynchronous motors without mechanical gear



The patented Intelligent Scan Technology™, which won several awards, is the core of these absolute Sendix encoders.

These optical encoders include all singleturn and multiturn functions on an OptoASIC, therefore ensuring in the same time a very high reliability and a high resolution.

The multiturn version reaches a 24 bit resolution. Its outstanding feature is its wear-free functionality thanks to the optical sensor without mechanical gear.



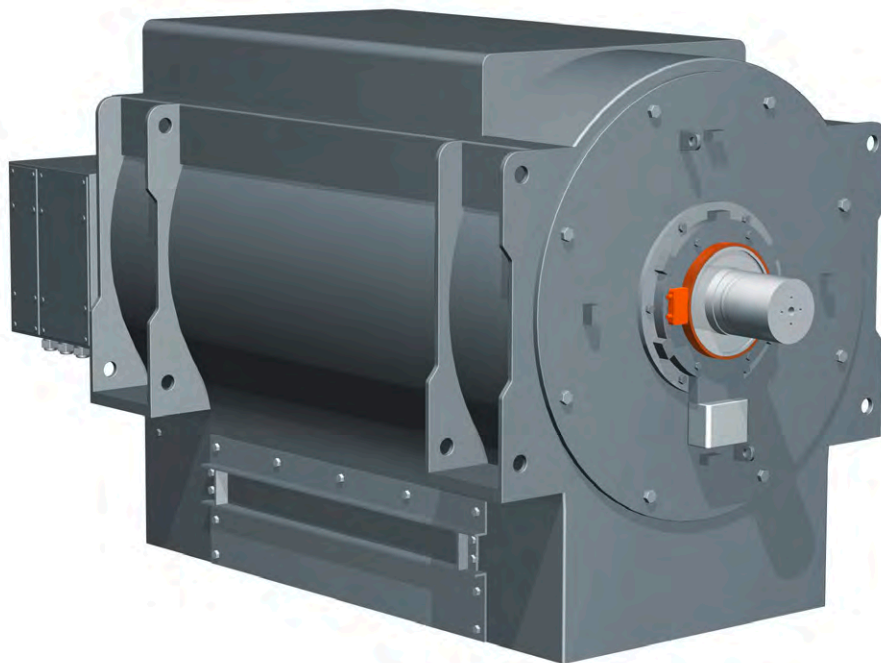
	<b>Sendix F3653 / F3673</b>	<b>Sendix F3663 / F3683</b>	<b>Sendix F5863 / F5883</b>	<b>Sendix F5883M / F5888M</b>
Mechanical interface	Shaft max. 10 mm Blind hollow shaft max. 10 mm Hollow shaft max. 8 mm	Shaft max. 10 mm Blind hollow shaft max. 10 mm Hollow shaft max. 8 mm	Shaft max. 10 mm Hollow shaft max. 15 mm	Hollow shaft max. 15 mm
Electrical interface	SSI or BiSS	SSI or BiSS	SSI or BiSS	SSI or BiSS incremental outputs SinCos and RS422, CANopen
Size	ø 36 mm	ø 36 mm	ø 58 mm	ø 58 mm
Resolution max.	17 bit singleturn	17 bit singleturn + 24 bit multiturn	17 bit singleturn + 24 bit multiturn	17 bit singleturn + 24 bit multiturn
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	12000 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 ... +85 °C
Power supply	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

## External encoders for large motors / generators

A tough nut. Accurate speed information is an important measurement for the control loop of a plant. Measuring systems that supply this information are often subjected to harsh environmental conditions but must not suffer any loss of reliability.

Kübler incremental encoders can handle strong vibration or extreme variations in temperature without any problem. Here, their wide-ranging mounting options guarantee easy, safe installation.

Kübler offers the complete range of solutions, from the extremely rugged Sendix Heavy Duty encoders through to the compact, bearingless encoders.



### Application specific requirements

<b>Ruggedness</b>	The ruggedness of the sensor technology plays a crucial role with large motors and generators. Shocks and vibrations encountered in this class of drives are higher than elsewhere.
<b>Service life / Maintenance</b>	In applications where large motors or generators are used, downtimes are very expensive. For this reason maintenance and any replacement of a component must be very simple.
<b>Weather / environmental conditions</b>	Large motors are employed primarily in harsh environments. The protection class of the sensors is thus correspondingly important, so that breakdowns can be avoided.
<b>High currents</b>	Despite well-earthed machine housings, large motors and generators carry a certain shaft current on the rotor. The equipotential bonding from the rotor to the stator via the encoder bearings can damage the encoder.

## Incremental encoders for large motors / generators

Many different Kübler encoders have been designed for use in large motors and generators.

Compact versions, Sendix Heavy Duty encoders for extreme bearing loads or bearingless versions for long service life – Kübler encoders are exactly adapted to the application-specific requirements.

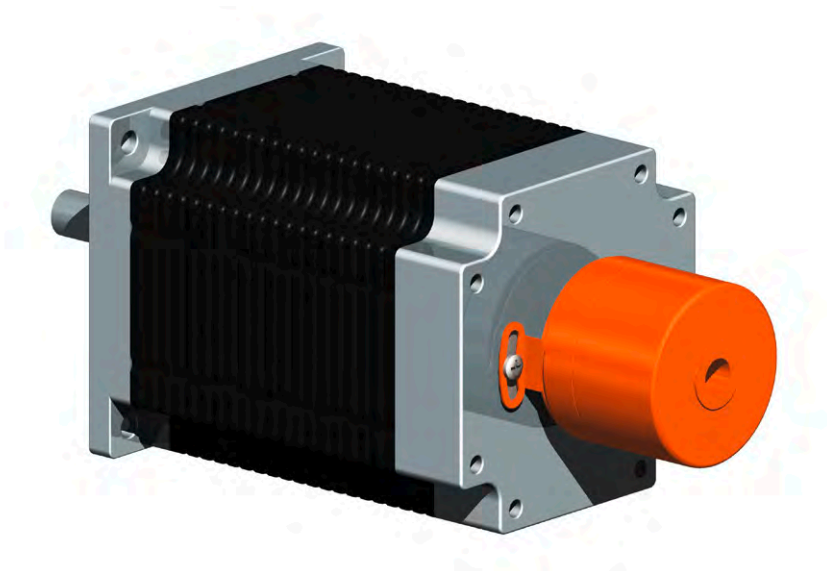
In the end, it is the application that will decide which encoder will be used.



	<b>HDRI500, HDRI5000</b>	<b>A020, A02H</b>	<b>Sendix Heavy Duty H120</b>
General information	For mounting on large shaft diameters	Tight mounting conditions and applications with high bearing forces	Applications with high bearing loads and very high shaft currents
Mechanical interface	Mounting on shafts up to $\varnothing$ 740 mm	Hollow shaft max. 42 mm	Hollow shaft max. 28 mm
Electrical interface	Push-pull, RS422, SinCos (opt. SSI, BiSS, analog)	Push-pull, RS422, SinCos	Push-pull, RS422
Size	100 x 60 x 25 mm	$\varnothing$ 100 mm	$\varnothing$ 100 mm
Resolution max.	On request (resolution depends on magnetic ring diameter)	5000 ppr	5000 ppr
Speed max.	max. 12000 min <sup>-1</sup> (depends on magnetic ring diameter)	6000 min <sup>-1</sup>	6000 min <sup>-1</sup>
Temperature range	-20 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +100 °C
Power supply	5 V DC 5 ... 30 V DC 10 ... 30 V DC	5 V DC 5 ... 30 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

## External encoders for stepper motors

Every millimeter counts with stepper motors. Usually only limited installation space is provided for the sensors. We offer you the right solutions for speed measuring. High resolution with simultaneously compact design – these are the miniature and compact encoders from Kübler. The robustness, quality and reliability speak for themselves.



### Application specific requirements

<b>Mounting</b>	The small dimensions make these motors an ideal solution when space is limited. That means compact sensors are essential.
<b>Resolution</b>	Stepper motors provide high torque at low speeds. This calls for high resolution sensors.
<b>Accuracy</b>	Stepper motors equipped with highly accurate optical sensors are used for precision in positioning tasks.

## External encoders for stepper motors

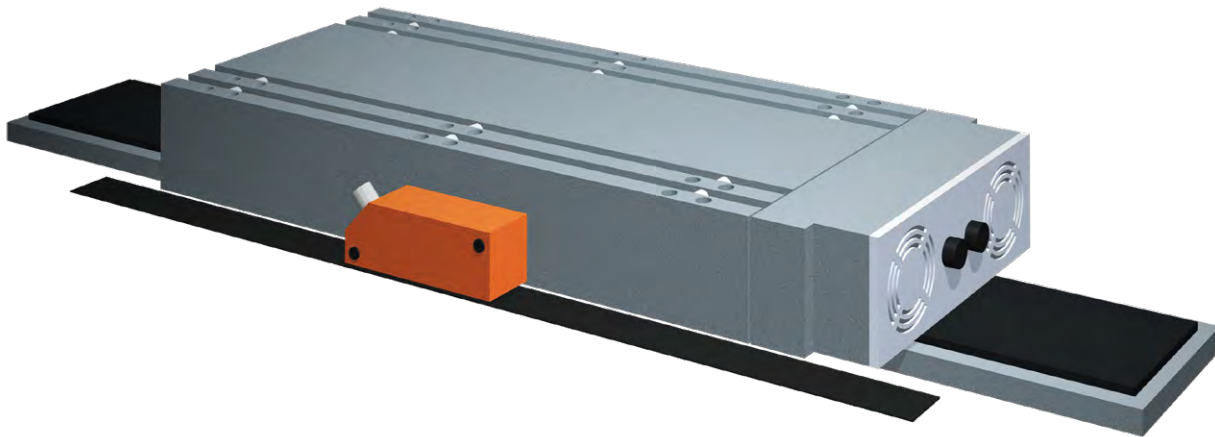
The incremental miniature and compact encoders from Kübler are ideal for speed measuring in tight installation spaces or spatial conditions. Numerous ordering options are available to you. We are also happy to implement modifications and special solutions.



	<b>2400 / 2420</b>	<b>2430 / 2440</b>	<b>3610 / 3620</b>	<b>Sendix Base KIS40 / KIH40</b>
General information	Incremental miniature encoder with optical sensor	Incremental miniature encoder with magnetic sensor	Incremental compact encoder with optical sensor	Incremental compact encoder with optical sensor
Mechanical interface	Shaft max. 6 mm Blind hollow shaft max. 6 mm	Shaft max. 6 mm Blind hollow shaft max. 6 mm	Shaft max. 6 mm Hollow shaft max. 8 mm	Shaft max. 8 mm Hollow shaft max. 8 mm
Electrical interface	Push-pull	RS422	Push-pull, RS422	Open collector, push-pull, RS422
Size	ø 24 mm	ø 24 mm	ø 36 mm	ø 40 mm
Resolution max.	1024 ppr	256 ppr	2500 ppr	2500 ppr
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>	4500 min <sup>-1</sup>
Temperature range	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +70 °C
Power supply	5 ... 24 V DC 8 ... 30 V DC	5 V DC	5 V DC 5 ... 18 V DC 8 ... 30 V DC	5 V DC 5 ... 30 V DC 10 ... 30 V DC

## Magnetic length measuring systems for linear motors

Linear motors are versatile to use. They are often used in wood processing machines, solar energy systems, glass processing or even in medical technology. Each application thus places different requirements on the entire system. Kübler offers you the right measuring system. This is characterized by robustness, quality and reliability.



### Application specific requirements

<b>Robust</b>	Highly robust sensors are required when using linear motors in rough environments.
<b>Installation</b>	A corresponding measuring system is used for direct, translational motion (linear motion).
<b>Speed</b>	Linear motors are characterized by high travel speeds. A fast measuring system is therefore relevant.



## Magnetic length measuring systems for linear motors

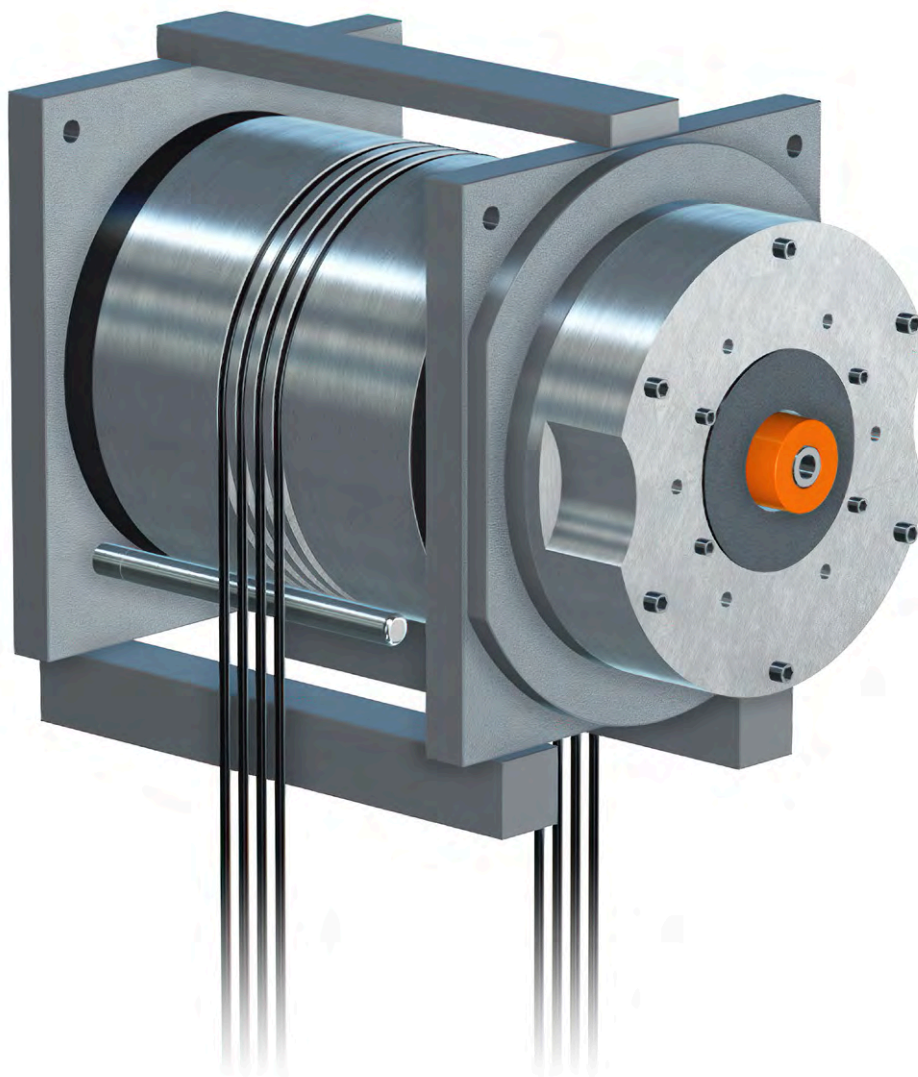
The Limes product family is a very compact solution for non-contact magnetic scanning and represents a cost-effective alternative in applications that do not require the high accuracy of glass scales. This magnetic measuring system shows its strong points especially in the presence of dirt, oils and humidity. Therefore, this measuring system is optimally suited for use in the linear drive technology.



	<b>Limes LI20 / B1</b>	<b>Limes LI50 / B2</b>	<b>Limes LA10 / BA1</b>	<b>Limes LA50 / BA5</b>
General information	Linear measuring technology for linear motors	Linear measuring technology for linear motors	Linear measuring technology for linear motors	Linear measuring technology for linear motors
Electrical interface	RS422 / push-pull	RS422 / push-pull	Absolute SSI / BiSS incremental SinCos absolute fieldbus	Absolute SSI / BiSS absolute fieldbus
Size	10.2 x 25 x 40 mm	10.2 x 25 x 40 mm	16 x 30 x 70 mm	24 x 26 x 75 mm
Resolution max.	10 µm	5 µm	1 µm	10 µm
Measuring length	max. 70 m	max. 70 m	max. 8 m	max. 20 m
Accuracy	Depends on measuring length 0.06 mm at 1 m	Depends on measuring length 0.08 mm at 1 m	Depends on measuring length 0.03 mm at 1 m	Depends on measuring length 0.17 mm at 1 m
Temperature range	-20 °C ... +80 °C	-20 °C ... +80 °C	-10 °C ... +70 °C	-10 °C ... +70 °C
Type of connection	Cable	Cable	M12 connector	Cable

## Encoders for gearless drives

Permanent magnet excited gearless synchronous drives (gearless drives) are the consistent further development of geared motors. Their benefits are primarily a high torque even at small rotary frequencies, as well as uniform and silent operating properties. Gearless drives are therefore perfectly suited for use in the elevator technology.

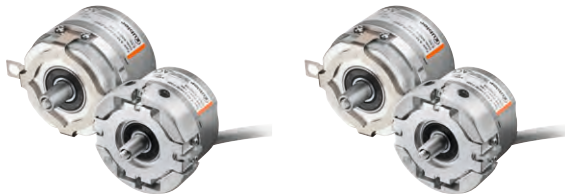


## Encoders for gearless drives

Flexibility is the main characteristic of the encoders for gearless drives.

They provide the suitable encoder technology, the optimal mechanical mounting, but also the electrical interface.

The drive and/or the system determine the choice of the suitable encoder.



	<b>Sendix 5873 Motor-Line</b>	<b>Sendix 5834 Motor-Line</b>
General information	Absolute encoder with tapered shaft and robust bearing structure in Safety-Lock™ design	Incremental encoders with tapered shaft and robust bearing structure in Safety-Lock™ design
Mechanical interface	Tapered shaft 10 mm with stator coupling $\varnothing$ 72 mm or with expanding coupling $\varnothing$ 65 mm	Tapered shaft 10 mm with stator coupling $\varnothing$ 72 mm or with expanding coupling $\varnothing$ 65 mm
Electrical interface	Absolute SSI / BiSS incremental SinCos	Incremental SinCos
Size	$\varnothing$ 58 mm	$\varnothing$ 58 mm
Resolution max.	13 bit or 17 bit + 2048 ppr SinCos optional: 21 bit, fully-digital	1024, 2048 ppr SinCos
Speed max.	12000 min <sup>-1</sup>	12000 min <sup>-1</sup>
Temperature range	-40 °C ... +105 °C	-40 °C ... +90 °C
Power supply	5 V DC 4,5 ... 5,5 V DC 10 ... 30 V DC	5 V DC 10 ... 30 V DC

### **i** PCB connector

The Sendix 5873 and Sendix 5834 encoders in Motor-Line version are also available with a PCB connector instead of the cable connection.



## Encoders for gearless drives

### High-resolution singleturn encoder Sendix 5873 Motor-Line

The Sendix 5873 singleturn encoders with SSI or BiSS interface and optional 2048 ppr SinCos signals are predestined for the elevator technology. Furthermore, the Sendix 5873 in Motor-Line version convince with their plug-and-play commissioning including an electronic data sheet and the possibility of setting the absolute measuring system to a predefined position (electronic zeroing).



### Your benefits at a glance

- High-resolution singleturn encoder for optimal travel comfort
- Predestined for the elevator technology thanks to its design optimized for gearless drives
- Cost-efficient thanks to simple plug-and-play commissioning
- Reduction of life cycle costs due to the optimization of drive efficiency thanks to the high-resolution absolute and analog encoder signals
- Reduction of the energy costs thanks to the electronic switching based on the high-resolution absolute position information of the measuring system

### Characteristics

#### Resolution

- SSI with max. 17 bit singleturn resolution and additional 2048 SinCos signals
- BiSS interface with max. 21 bit singleturn resolution and additional 2048 SinCos signals

#### Electrical interface

- BiSS or SSI interface with additional SinCos signals
- Electronic data sheet
- Possibility of setting the measuring system to a predefined position value (electronic zeroing)
- Optional SET key – to zero the Sendix 5873 Motor-Line at any desired position

#### Mechanical interface

- Tapered shaft with stator coupling,  $\varnothing$  72 mm or tapered shaft with expanding coupling,  $\varnothing$  65 mm
- Tangential cable outlet or PCB connector
- Robust bearing structure in Safety-Lock™ Design

**Order code**  
**Tapered shaft**

**8.5873** . **XKXX** . **XX2X**  
Type      **a** **b** **c** **d**      **e** **f** **g**

**a** Flange

G = with stator coupling, IP65,  $\varnothing$  72 mm [2.83"]  
H = with expanding coupling, IP65,  $\varnothing$  65 mm [2.56"]

**b** Tapered shaft

K =  $\varnothing$  10 mm [0.39"]

**c** Interface / power supply

1 = SSI, BiSS / 5 V DC  
2 = SSI, BiSS / 10 ... 30 V DC  
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC  
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC  
5 = SSI, BiSS / 5 V DC, with sensor output  
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output  
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output  
E = SSI, BiSS + 2048 ppr. SinCos / 4.5 ... 5.5 V DC, with sensor output<sup>1)</sup>

**d** Type of connection

E = tangential cable, 1 m PVC  
F = tangential cable, length PVC see below \*)  
G = tangential cable, with Sub-D connector (male contact, 15-pin, double-row), length PVC s. below \*)<sup>2)</sup>  
H = tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), length PVC s. below \*)<sup>2)</sup>  
L = with PCB connector<sup>3)</sup>  
(without cable, including sealing cap for tangential cable outlet)

\*) Available lengths (connection types F, G, H):  
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 8.5873.GK2E.G323.0030 (for cable length 3 m)

**e** Code

B = SSI, binary  
C = BiSS, binary  
G = SSI, gray

**f** Resolution<sup>4)</sup>

A = 10 bit  
1 = 11 bit  
2 = 12 bit  
3 = 13 bit  
4 = 14 bit  
7 = 17 bit  
C = 21 bit<sup>5)</sup>

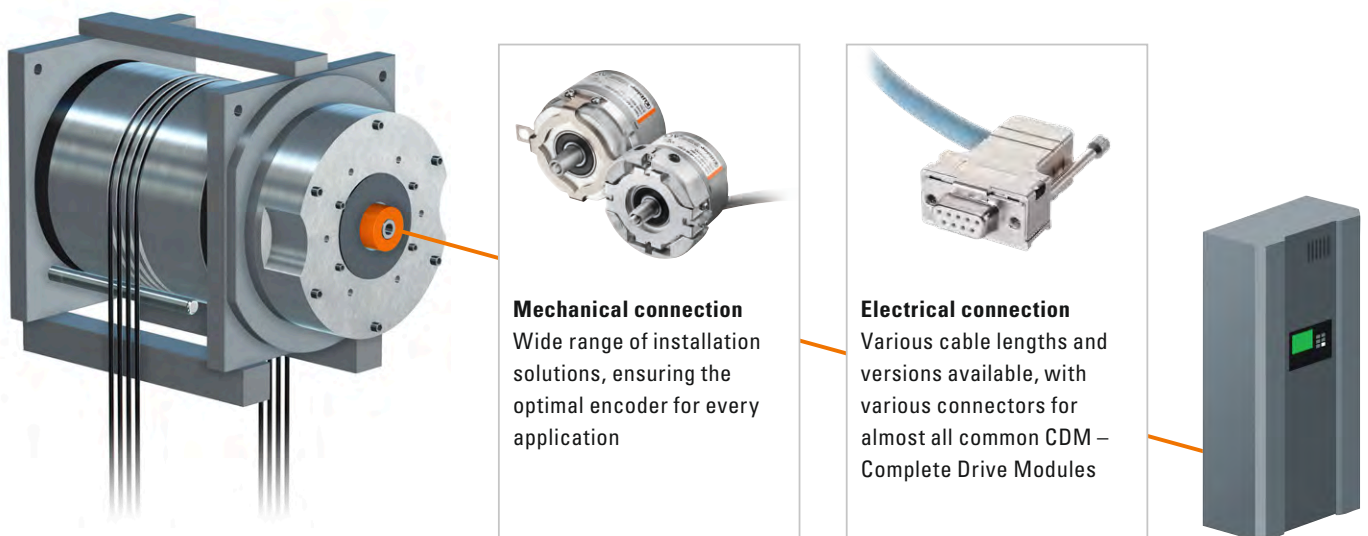
**g** Options (service)

1 = no option  
2 = status LED  
3 = SET button and status LED

- 1) Without reverse polarity protection.  
2) Can be combined as a standard only with interface E (other variants on request).  
3) IP40, only available without SET button and status LED, not available with interface 9, see the Accessories for the suitable connection cable.  
4) Resolution, preset value and counting direction factory-programmable.  
5) Only in conjunction with interface 1 or 2 and code C.

## Solutions for the ideal connection of motor, encoder and CDM – Complete Drive Module

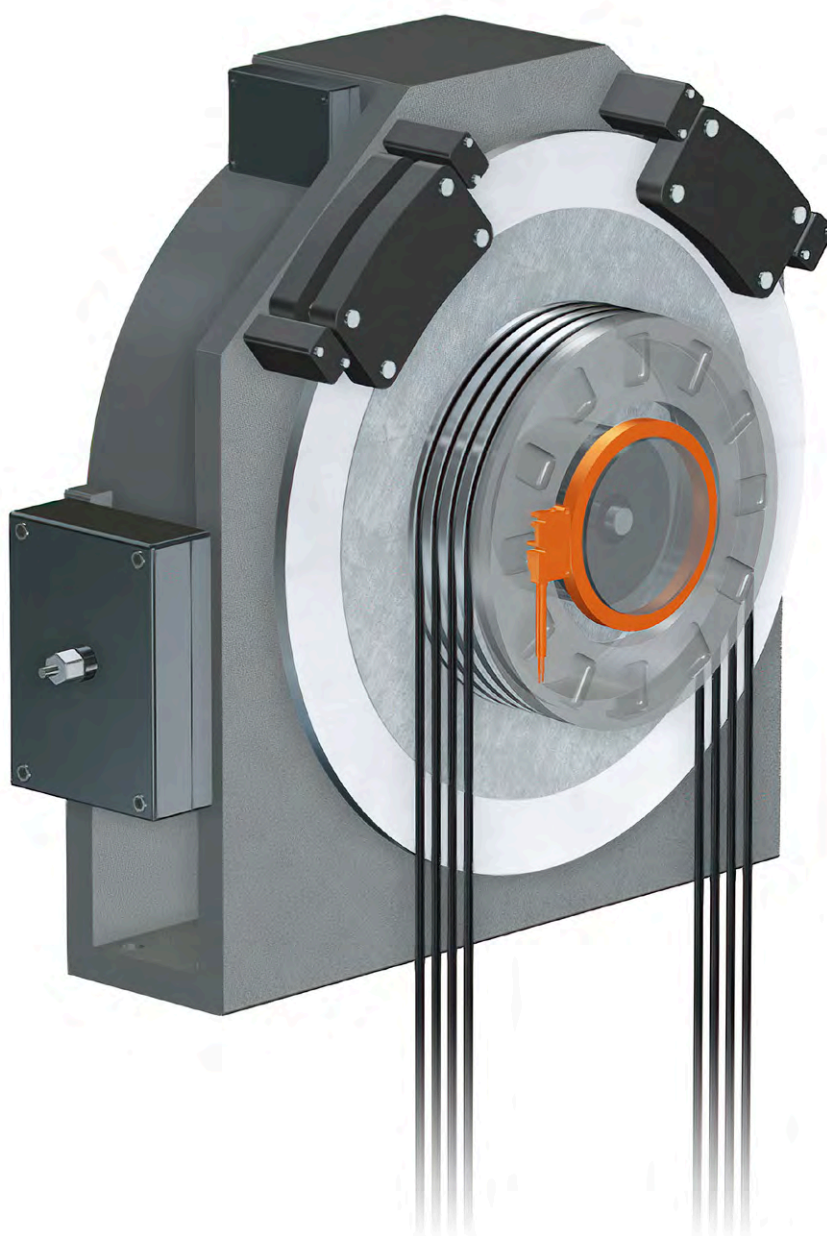
The Sendix 5873 singleturn encoders in Motor-Line version provide above all high flexibility. This means that focus is set on the solution itself in order to achieve an ideal connection between the motor, the encoder and the CDM – Complete Drive Module. This ensures maximum customer benefit and highest flexibility.



## Bearingless encoders for pancake drives

Axial flux synchronous drives or pancake drives are characterized in various versions by a compact and particularly flat construction.

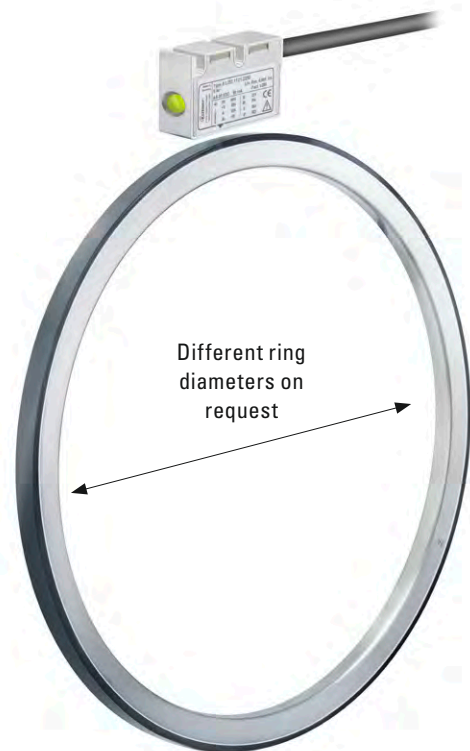
Generally, these drives do not require an additional machinery room and are installed directly in the elevator shaft.



## Bearingless encoders for pancake drives

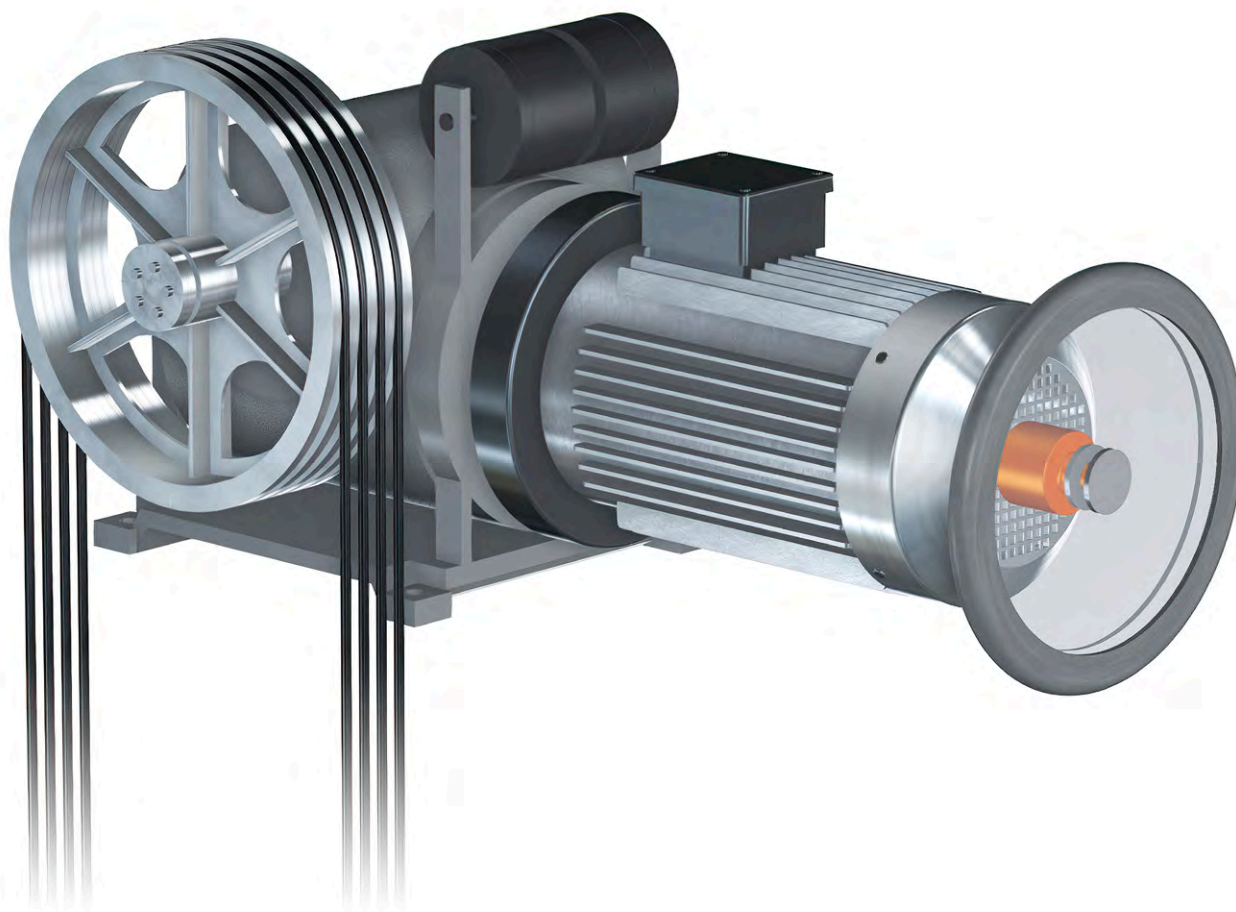
The bearingless encoders are made of a magnetic ring and a sensor head. They are ideal for compact and flat external rotor motors. The non-contact measuring principle, with its reduced mounting depth and various magnetic ring diameters, is perfectly suited for tight installation possibilities. Individual adaptation of the measuring system to the dimensions of the drive are here one of the most important prerequisites.

	<b>RLI500, RLI200, RLI50, RLI20</b>
General information	Bearingless encoder for tightest mounting situations (only 10 mm deep)
Ring diameter	On request (customer-specific)
Electrical interface	Push-pull, RS422 SinCos
Size	40 x 25 mm (sensor head)
Resolution max.	On request (resolution depends on ring diameter)
Speed max.	12000 min <sup>-1</sup>
Temperature range	-20 °C ... +80 °C
Power supply	4.8 ... 26 V DC (RS422) 4.8 ... 30 V DC (Push-Pull)



## Encoders for geared motors

Geared motors are used for the new construction, but mainly for the modernization of elevator systems. Their main features are the reduction gear and a handwheel at the end of the motor shaft. On these drives, an incremental encoder mounted between the motor and the handwheel measures the rotary speed for speed control and transmits it to the CDM – Complete Drive Module.





## Encoders for geared motors

The encoders for geared motors are characterized in particular by their large hollow shaft and their compact size intended for tight mounting spaces. In addition, high encoder resolution is necessary in order to ensure optimum speed regulation.



	<b>5821</b>	<b>A020 / A02H</b>
General information	Compact encoder for large smoothly-operating drives and tight mounting space	Tight mounting conditions and applications with high bearing forces
Mechanical interface	Hollow shaft max. 28 mm	Hollow shaft max. 42 mm
Electrical interface	Push-pull, RS422	Push-pull, RS422, SinCos
Size	ø 58 mm	ø 100 mm
Resolution max.	5000 ppr	5000 ppr
Speed max.	2500 min <sup>-1</sup>	6000 min <sup>-1</sup>
Temperature range	-20 °C ... +70 °C	-40 °C ... +80 °C
Power supply	5 V DC 8 ... 30 V DC	5 V DC 5 ... 30 V DC 10 ... 30 V DC

## Explosion protection – ATEX / IECEx

In hazardous areas encoders must comply with special protective regulations, as even the smallest spark can have very serious consequences.

Positioning tasks occur in many hazardous environments – whether in mining, in the chemical industry or also in oil production.

Especially for those applications that require absolute position values, Kübler offers the Sendix absolute encoders with ATEX / IECEx approval. The singleturn and multturn ATEX encoders with “flameproof-enclosure” housings are approved for zones 1, 2, 21 and 22 and certified according to the ATEX guidelines and IECEx standards.





## Sendix ATEX / IECEx encoders

The shock and vibration resistant ATEX / IECEx encoders operate flexibly with a resolution of up to 17 bits (singleturn) and 29 bits (multiturn).

In addition the incremental version supplies a push-pull, RS422 or SinCos signal. With their IP67 protection level and wide temperature range of -40 °C up to +60 °C, the ATEX / IECEx encoders remain sealed even under the rigours of tough everyday use and offer good security against failures in the field. Thanks to the housing and flange made of seawater durable aluminum they are ideal for use in offshore and coastal applications. The compact design with an installation depth of only 145 mm, a diameter of 70 mm and a space saving cable outlet round off the diverse, flexible options for use in hazardous EX areas.

### **Standard ATEX encoders**

Incremental:	Sendix 7000 / Sendix 7020 (shaft / hollow shaft)
Singleturn:	Sendix 7053 / Sendix 7073 (shaft / hollow shaft) Sendix 7058 / Sendix 7078 (shaft / hollow shaft)
Multiturn:	Sendix 7063 / Sendix 7083 (shaft / hollow shaft) Sendix 7068 / Sendix 7088 (shaft / hollow shaft)

## Functional Safety

Safety is – not least since the EU Machinery Directive 2006/42/EC – 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.

But safety goes further than this: safe components are characterized by a robust reliable interface and by the ability to cope with high mechanical and electronic loads. Both Sendix encoders with SSI absolute and additional SinCos interface and also the SinCos version of the incremental encoders have been certified up to SIL3 by TÜV Rheinland.





## Encoders for Functional Safety

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

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 position also provided by the encoder. 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.

### **Incremental SinCos encoders**

Sendix 5814FS2 / FS3 (shaft)  
Sendix 5834FS2 / FS3 (hollow shaft)

### **Absolute singleturn SSI / SinCos encoders**

Sendix 5853FS2 / FS3 (shaft)  
Sendix 5873FS2 / FS3 (hollow shaft)

### **Absolute multiturn SSI / SinCos encoders**

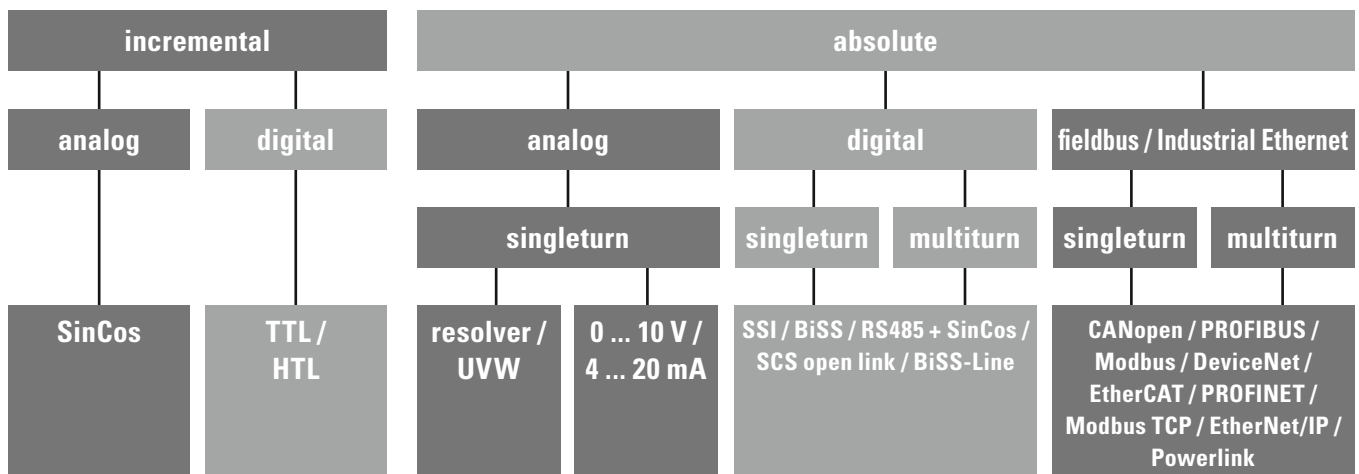
Sendix 5863FS2 / FS3 (shaft)  
Sendix 5883FS2 / FS3 (hollow shaft)

## Overview electrical interfaces

Encoders have various tasks to fulfil in elevator engineering.

One of the most frequent tasks is to supply information concerning speed, for better control of the motor using a CDM – Complete Drive Module. For this type of speed control motor feedback is necessary, which is suitable for improving the speed quality and the control response. As a rule a SinCos or TTL / HTL signal is used for this purpose.

A further task is the positioning of the drive. This can occur both incrementally and absolutely. The dynamic control of synchronous servo motors requires the feedback of the rotor position within a revolution. This is achieved using singleturn absolute encoders with a BiSS or SSI interface.



### Single Cable Solutions

The Single Cable Solutions combines the motor power supply line and the data communication in one single cable. Requiring less cables and connectors, this technology simplifies installation and thus reduces in the same time the error sources.

Not all protocols are suitable. They must be specially tailored to this application, such as for example SCS open link or BiSS Line.

Safety is not simply a trend, but it is establishing itself as a standard in the drive technology. It is therefore important to pay attention to safety-relevant characteristics when choosing the interface.

Field buses or industrial Ethernet interfaces are principally used in the application and are not directly involved in speed regulation. The position control can operate with these encoders.



## Incremental interface (SinCos, TTL / HTL)

The SinCos interface provides a sine wave-shaped voltage signal. High-quality encoders allow very high interpolation of this signal, which benefits the speed control. This means that the SinCos signals can be processed in many various ways in the subsequent electronics. The steady signal evolution makes sure that signal information is available at any time. This is an advantage in drives for speed control, even for very slow motions.

The cosine precedes the sine by 90° so that one of the signals emits a valid value also when passing the zero point. This is also the great difference with digital incremental signals such as HTL or TTL. These have signal states in which both channels A and B can have simultaneously the value zero or one, which does not allow detecting errors.

By contrast, even though the encoders with incremental interface (TTL / HTL) also generate a sine wave shaped scanning signal, this signal is then digitized in the encoder and provided to the subsequent electronics as a rectangular pulse. Various output types are available for transmission.

## SSI interface

The synchronous serial interface (SSI) is a digital interface for absolute encoders. This means that the SSI interface allows digital and absolute transmission of motion or angular information. It is therefore particularly well suited for applications requiring reliability and signal robustness in industrial environments. Another advantage is the fact that transmission requires significantly less lines than parallel interfaces. It also allows much longer cable lengths.

At rest, the clock and data lines are at a high level. With the first falling clock-pulse edge, the current encoder data are stored in the buffer ready to be sent. With the next rising clock-pulse edge, the data are transmitted bit by bit, starting with the MSB.

The transfer of a complete data word requires  $n+1$  rising clockpulse edges ( $n$ =resolution in bit), e.g. 14 clock signals for a complete readout of a 13 bit encoder.

After the last positive going clock-pulse edge the data line will remain for the duration of the monoflop time  $t_3$  at a low level, until the encoder is ready for a new data word. The clock line must stay high for at least as long, and then can begin a new readout sequence again with the next falling edge.



## BiSS interface

The BiSS interface is a fully-digital bidirectional connection for absolute measuring systems. Therefore, BiSS is perfectly suited for dynamic axes with very high accelerations, constant speed control and best positioning accuracy possible.

## Benefits

The great benefit of the BiSS interface is its open source protocol for sensors, inverters and drives, offering e.g. high speeds (data rate up to 10 MHz) and a delay compensation for the optimal operation of the drive system. The selection of the components is not imposed by a licensed interface, but only by the requirements of the application, which results in more flexibility and higher cost-efficiency.

- BiSS is fully-digital and bidirectional and is perfectly suited as a motor feedback system for both linear and rotary axes.
- As the BiSS interface is not proprietary, it is cost-efficient and flexible. This ensures a much wider choice of available products.
- The inverters equipped with an RS422 and RS485 interface can mostly be used for BiSS thanks to an extension with a firmware update for BiSS, thus opening the possibility of using an open source interface.
- There is nevertheless also the possibility of a quick and simple BiSS Master implementation with free BiSS IPs on processors and FPGAs.
- Benefits for the commissioning of motor and inverter thanks to plug-and-play using the motor data and maintenance information that can be stored in and retrieved from the encoder and to the possibility to set the absolute measuring system to a predefined position value.
- Information and evaluation of the complete system during operation thanks to Condition Monitoring and to the delay compensation for accelerated communication, e.g. to minimize drift effects due to temperature.

Contact persons for advice and support for the implementation of BiSS

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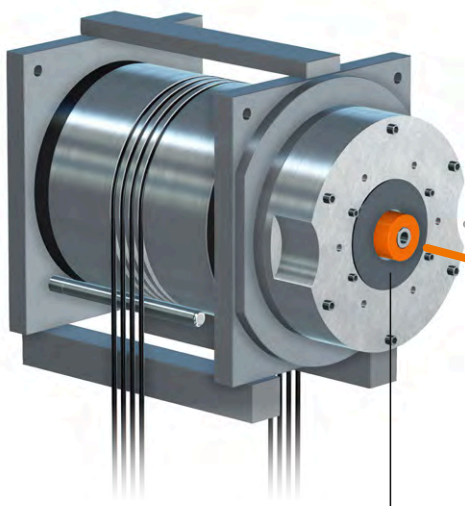




## **i** BiSS Support Tool

The BiSS support tool helps implementing a BiSS interface. The following components are available in a set for this purpose:

- Sendix 5873 Motor-Line (8.5873.HK3E.C323)
- BiSS-to-PC Adapter (USB)
- GUI Software for Windows PC
- Analysis board
- Adapter cables for connecting the components

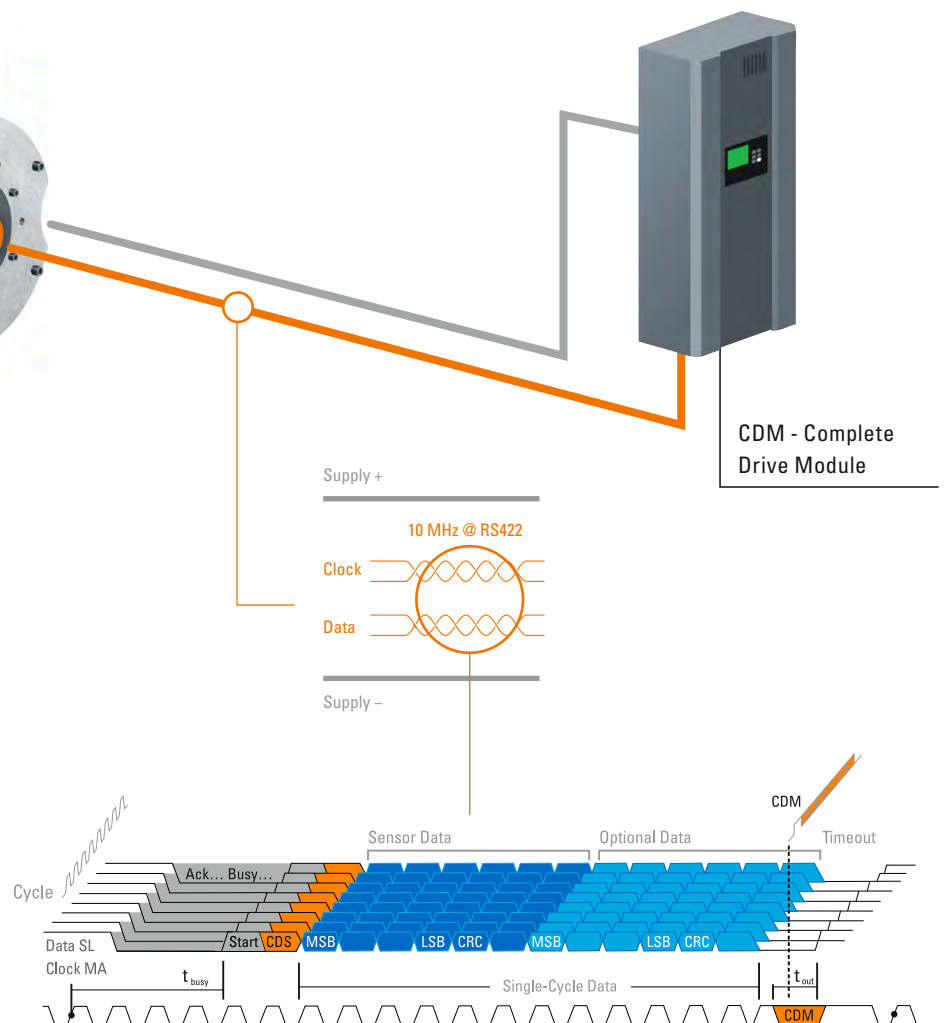


Absolute encoder with

**BiSS**  
INTERFACE (fully-digital)

or

**BiSS**  
INTERFACE + SinCos



## Fixing and connection solutions

Perfect integration into the drive can only be successful if an optimal connection of the encoder to the motor is made.

For the rotating motor shaft and motor housing Kübler offers a wide choice of standard fixing and connection options, with which the desired encoder variants can be combined in a modular design principle. In addition to this individual, customized solutions can be worked out.

### Fixing on the motor housing

#### Torque stop

For applications with axial and radial play with constant rotary movements.



#### Stator coupling

For applications with axial and radial play with high dynamics.



#### Tether arm

For applications with low axial and radial play, flexible in use.



#### Individual fixing solutions

E.g. ez Fan-clip – mounting solution on fan grill.  
For instant easy fixing of the encoder directly onto the fan grill of the gear housing.

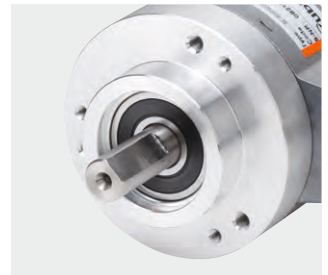


### Fixing to the motor shaft

#### Shaft

Simple mounting on various shaft diameters via suitable couplings.

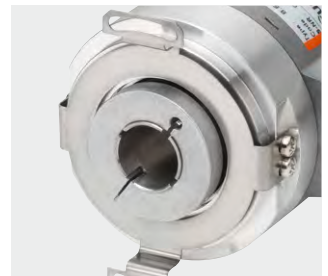
- Easy to centre
- Long service life
- Max. tolerance
- High speed



#### Hollow shaft

Accurate centring and reduced vibration.

- Long service life
- Max. tolerance
- High accuracy



#### Safety-oriented coupling

For applications requiring safe transmission of the rotary movement.





Additional accessories at: [kuebler.com/accessories](http://kuebler.com/accessories)  
 Additional connection technology at: [kuebler.com/connection\\_technology](http://kuebler.com/connection_technology)

## Connection solutions

### Standard connection solutions

- PCB plug-in connectors: M12, M23, MIL
- Cable connection
- Terminal box
- PCB connectors



### Individual connection solutions

Kübler offers space-saving installation options for M12 and M23 connectors under the fan cowl.

- Lead-through M12 straight, IP67
- Male connector with external thread, IP67, central fastening



## Accessories connection technology

### Cables

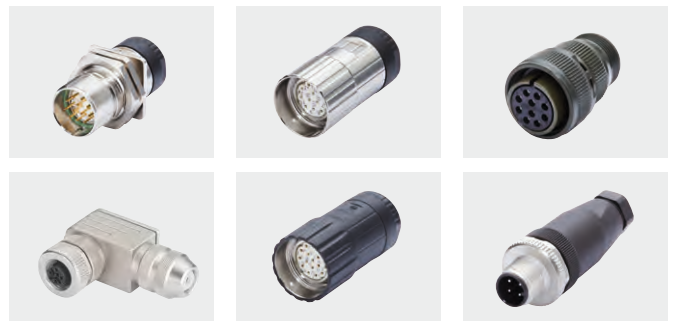
All cables – for incremental, absolute and fieldbus encoders – can also be ordered by the metre as open-ended cable:

- PVC and PUR cables
- Halogen-free cables
- Bus cables



### Connectors

Kübler offers a range of connectors for self-assembly with a protection level of up to IP67, for example as male connector M23 with external thread or as socket with metal union nut.



### Cordsets, pre-assembled

Kübler offers pre-assembled cordsets in a variety of connector versions as well as with a different number of cores (5, 8, 10, 12, 18).



## Optimal solutions thanks to customer-specific development

The ideal sensor for your drive – that is our goal: for simple, fast and error-free mounting – highest reliability of the signals – long service life and minimum costs.

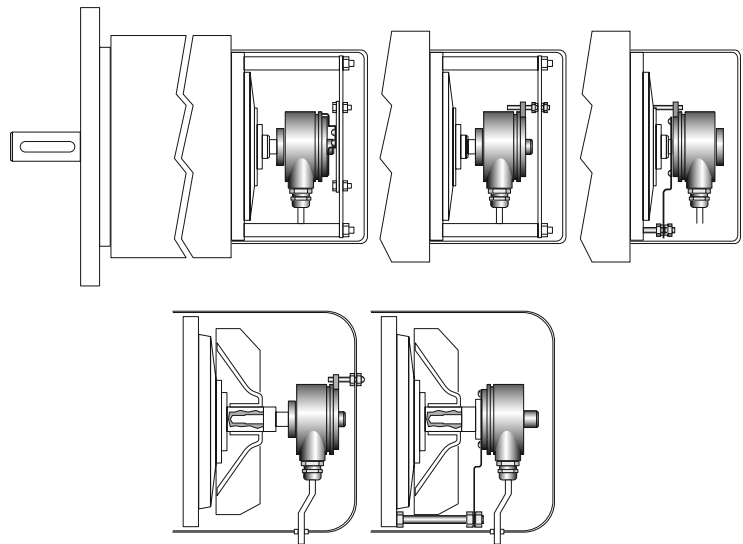
During development of customer-specific solutions Kübler focuses on 3 principles:

- Lean Design (coordinating the materials and functionality to the application)
- Design to Cost (aligning development to target costs)
- Cost of Ownership (fast installation, simple maintenance, long service life)

### Fixing solutions

The correct mounting and fixing solution of an encoder in a drive is crucial for reliable operation and peace of mind. The wide variety of drives and the increasing demands placed on drives (especially in respect of installation space) pose new challenges every day.

By the use of intelligent solutions, closely matched to the drive, great savings can be made when it comes to space, time and costs. Furthermore, specific fixing elements can be developed, which are tailored to the installation space of the housing or the geometry of the flange and shaft; this ensures an optimal connection and the highest degree of accuracy.

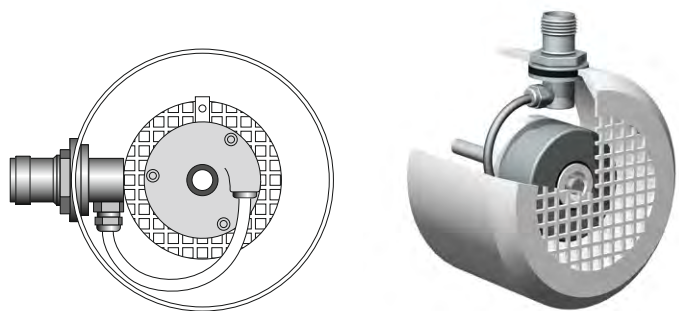


### Connection solutions

The cable and connectors used to connect an encoder with the PLC must be matched to the installation space available as well as being capable of withstanding the prevailing environmental conditions such as humidity, cold or heat.

Here too, the setting-up of special cables or the development of specific connectors can lead to the right solution.

In particular, the cable or connector transition from the motor housing to the outside world requires innovative constructions, in order to guarantee reliability and freedom from errors.



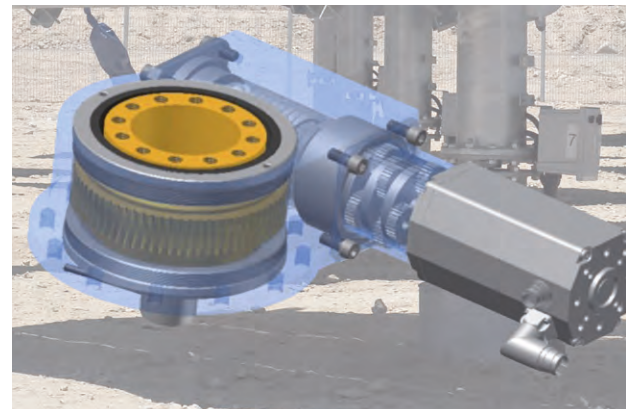
## Protection concepts

Kübler does not leave protection of its sensors to chance. The application areas for drives are very diverse. Kübler has designed appropriate specific protective covers, which take into consideration the design of the encoder, as well as the IP protection level, temperature and operating conditions. With its extensive experience in difficult application areas, such as steel production, wind turbines or in mobile applications, Kübler has developed special housing and seal designs, as well as coating solutions, which also withstand the high demands of outdoor applications in respect of condensation or extreme fluctuations in temperature.



## Advantages of customized integrated drive solutions

- High reliability, as all component parts have been specifically designed for your drive.
- Particular focus on a longer service life when selecting the product.
- Simple, fast mounting thanks to a high degree of integration.
- Development of solutions for simple maintenance.
- Warranty and support from a single source.
- Reduced costs, as the solution is directly tailored to the drive. No "over-engineering".



# 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.

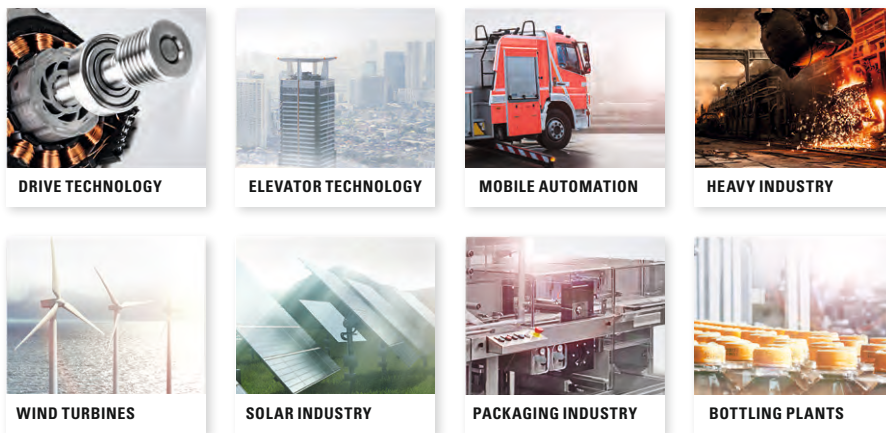
- Slip rings
- Slip rings, customized solutions
- Signal converters and optical fiber modules
- Cables and connectors

## 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**  
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**  
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.

**FS 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.

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