MOBILE AUTOMATION

ENCODERS, DRAW-WIRE ENCODERS, INCLINOMETERS, SLIP RINGS, COUNTERS AND PROCESS DEVICES

pulses for automation
Solutions for mobile automation

Mobile automation is more diverse than any other industry. There are various requirements for the sensors due to the numerous applications. For many years, Kübler has offered a broad portfolio of encoders, draw-wire encoders, inclinometers as well as slip rings suitable for transmitting loads, signals and data. Every product stands for premium quality, robustness and a long service life. We are also happy to take on individual challenges and implement modifications and special solutions quickly and easily. With us, you will find the right solution for your application.
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Developed for increasingly tough requirements: Kübler encoders, draw-wire systems, slip rings and inclinometers measure and control positions and angles reliably and accurately. Thanks to their robust bearing structure, the sensors withstand also severe „knocks“ in harsh and inaccurate installation conditions. The high IP67 protection ensures tightness in case of intensive outdoor applications. Sensors with IP69k protection can also be steam-jet-cleaned with the machine.

APPLICATION EXAMPLES

Fire trucks / Ladder trucks / Rescue platforms

Ladder rotation / Ladder length

For an outdoor use with humidity and dirt, high positioning accuracy, fieldbus control

Sendix 5868 encoder
- CANopen multiturn
- Safety-Lock™
- High protection level IP67
- Status display + reset button
- Mechanical adaptations + gear
For an outdoor use with humidity for absolute angle measurement with fieldbus control, robust encoder requiring little space

Sendix M36 encoders
- ø 36 mm size
- CANopen interface
- Magnetic scanning
- Safety-Lockplus™
- High protection level IP69k
- Status display

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Data / load transmission
Transmission of load, signal and fieldbus communication from the undercarriage to the rotary platform, additionally with media lead-through in air or hydraulic variant

Ladder elevation angle
Dynamic measurement for the correction of the horizontal operator basket position, inclinometer with high IP protection level and stable measuring value throughout time and temperature

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 1-dimensional

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 1-dimensional

Horizontal basket position
Dynamic measurement for the correction of the horizontal operator basket position, inclinometer with high IP protection level and stable measuring value throughout time and temperature

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 1-dimensional

Inclinometer IN88
- CANopen interface
- High protection level IP69k
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Leg position
Linear measurement of the stroke up to 2 m, accurate speed and position with a compact size

Miniature draw-wire system A40 / A41
- Analog output
- Measuring length 2 m

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- Analog output
- Measuring length 2 m

Slip ring SR160
- Robust: aluminum or stainless steel housing
- Transmission of up to 30 channels (load, data, signal, fieldbus or Ethernet)
- Max. load current 50 A
- High protection level IP65, high-quality seals

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- Robust: aluminum or stainless steel housing
- Transmission of up to 30 channels (load, data, signal, fieldbus or Ethernet)
- Max. load current 50 A
- High protection level IP65, high-quality seals
Compact encoders and draw-wire systems of Kübler are used to determine the speed, the steering angle of the vehicles and the exact position of the load-carrying devices. Their accurate rotary speed and position signals ensure the reliable operation of the intelligent systems - even when only very little space is available. BUS systems ensure the safe signal transmission and simplify notably the cabling work.
**Linear measurement up to 3 or 6 m, absolute value acquisition via fieldbus, high accuracy**

**Draw-wire encoder A41**
- Measuring length 2 m
- CANopen interface
- Robust housing
- High dynamic up to 1 m/s

**Draw-wire encoder B75**
- Measuring length 3 m
- Fieldbus interface
- With optical multiturn encoder
- Robust housing
- Linearity up to ±0.35 % of the measuring range

**Draw-wire encoder B80**
- Measuring length 3 m
- Fieldbus interface
- Interchangeable installation
- With optical multiturn encoder
- Robust housing
- Linearity up to ±0.02 % of the measuring range

**Draw-wire encoder C120**
- Measuring length 6 m
- Fieldbus interface
- Interchangeable installation
- With optical multiturn encoder
- Robust housing
- Linearity up to ±0.02 % of the measuring range
Driving speed

Dynamic rotary speed measurement with reduced space requirements in hollow shaft version

Sendix S3674 Motor Feedback System
- Singleturn encoder ø 36 mm
- SIL2/PLd
- Operating temperature -30°C ... +120°C
- Accurate optical scanning
- Tapered shaft ø 8 mm

Sendix Base KIH40 encoder
- Incremental encoder ø 40 mm
- Optical scanning
- Safety Lock™
- Resolution max. 2500 ppr

RLI20 bearingless encoder
- Magnetic scanning
- Resolution max. 3600 ppr
- High protection level up to IP69k

Sendix 5834FS encoder
- Incremental encoder ø 58 mm
- Accurate optical scanning
- SIL2/PLd, SIL3/PLc
- Resolution max. 2048 ppr
Steering angle monitoring

Absolute angle measurement with fieldbus control, robust encoder with reduced space requirements

**Sendix M36 encoders**
- Ø 36 mm size
- CANopen interface
- Magnetic scanning
- Safety-Lockplus™
- High protection level IP69k
- Status display

**Sendix F5888 encoder**
- Ø 58 mm size
- CANopen interface
- Optical scanning

For safety applications – Sendix S58 PROFIsafe encoders

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- High resolution: Singleturn 15 bit (safe) or 24 bit (non safe), Multiturn 12 bit (safe).
- SIL3, Performance Level Ple, Safety Category Cat. 3.
- Fully redundant multiturn information due to redundant multiturn gearbox.
- Transmission via safety telegrams 36/37, according to BP and XP.
- Implement features and adaptations quickly and easily.
Agricultural and forestry machinery

The Kübler encoders and inclinometers can cope with the demanding requirements of the agricultural and forestry branch. They ensure a safe and accurate operation of the machines. Inclinometers monitor the horizontal position of the vehicle and warn in case of an excessive inclination. Encoders measure the setting angle and the speed and feed of the work equipment. Compact miniature encoders can be integrated in an existing device, if the customer wishes so, and make the big difference thanks to their intelligent extra features.
Transmission of load, data and signals from the boom to the endless rotating harvester head

Slip ring SR075
- Individual slip ring solution
- Compact and robust
- Transmission of load, data and signals

Inclinometer IN81
- Analog output
- SAE J1939 interface
- High protection level IP69k
- 1-dimensional

Vehicle balance control
- Dynamic balance display via an analog value with high protection against humidity

Endless rotating harvester head
- Transmission of load, data and signals from the boom to the endless rotating harvester head

Feedrate and position
- Trunk length measurement at the feed wheel, dynamic rotational speed measurement requiring little space

Sendix 5000 encoder
- Incremental encoder ø 50 mm
- Safety-Lock™
- Operating temperature: -40°C ... +85°C
- High shaft load: 50 N axial and 100 N radial

Sendix M36 encoders
- ø 36 mm size
- SAE J1939 interface
- Magnetic scanning
- Safety-Lockplus™
- High protection level IP69k
- Status display

For an outdoor use with humidity, absolute angle measurement with fieldbus control, robust encoder requiring little space

Saw blade setting angle
Construction machinery / Concrete pumps

BUS systems are a standard in passenger cars for years. They are now increasingly used also in mobile machines. Rough positioning using analog values is replaced with accurate angular sensors with CAN bus. Encoders and draw-wire systems mounted in construction machines cope with the most demanding requirements, both on the work site and underground.
Dynamic measurement of the elevation angle of the mast, inclinometer with high IP protection level and stable measuring value throughout time and temperature

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 1-dimensional

Angle of rotation of the concrete distribution mast
- Outdoor use with humidity and dirt, high positioning accuracy, fieldbus control

Sendix M3668R encoder
- CANopen multiturn
- Safety-Lockplus™
- High protection level IP69k
- Status display + reset button
- Measuring pinion on the encoder shaft

Elevation angle
- Dynamic measurement of the elevation angle of the mast, inclinometer with high IP protection level and stable measuring value throughout time and temperature

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 1-dimensional

Vehicle balance control
- Dynamic and exact balance display via CANopen, high protection against humidity and dirt

Draw-wire encoder C100
- CANopen interface
- High protection level IP67
- Redundant sensors
- Measuring length 1 m ... 5 m
- Easy mounting
- Operating temperature -40°C ... +85°C

Leg position
- Position measurement of the telescopic leg, linear measurement of the stroke up to 5 m, speed and position control via BUS

Inclinometer IN88
- CANopen interface
- High protection level IP69k
- 2-dimensional
Flexibility, speed and safety are the main features of working platforms. The requirements for fast installation and access, as well as absolute stability whatever the inclination or the nature of the ground call for tailor-made sensors both for monitoring and automation purposes. Only highest safety standards can be sufficient were people are at work. Kübler sensors monitor the position of the operator basket and the levelling of the chassis – both for self-propelled and for trailer or truck-mounted working platforms.
Angle of rotation of the mast

Outdoor use with humidity and dirt, high positioning accuracy, fieldbus control

Sendix M3661 encoder
- Analog multiturn encoder
- Safety-Lock™
- High protection level IP67
- Status display + reset button
- Measuring pinion on the encoder shaft

Mast elevation angle

Dynamic measurement of the elevation angle of the mast, inclinometer with high IP protection level and stable measuring value throughout time and temperature

Inclinometer IN81
- Analog output
- High protection level IP69k
- 1-dimensional

Chassis balance control

Dynamic balance display via an analog value for self-levelling of the chassis, high protection against humidity

Inclinometer IN81
- Analog output
- High protection level IP69k
- 2-dimensional

Telescopic mast length

Linear measurement of the stroke up to 2 m, accurate speed and position with a compact construction

Miniature draw-wire encoder A40 / A41
- Analog output
- Measuring length 2 m
Mobile cranes

Mobile cranes are used whenever heavy loads must be handled – on public roads or on difficult terrain. High reliability and safety are the requirements for mobile boom cranes. Sensors play a major role here. Kübler offers the suitable solution for any imaginable task based on robustness, premium quality and long service life. Our encoders, draw-wire systems and inclinometers measure reliably every movement and ensure the faultless operation of your mobile cranes. Take advantage of countless ordering options and of the wide range of suitable interfaces, from analog up to CANopen.
Turret rotation

Outdoor use with dirt, high positioning accuracy, fieldbus control

**Sendix M5868 encoders**
- Magnetic scanning
- Electronic, multiturn gearless encoder
- CANopen interface

Boom elevation + vehicle levelling

Dynamic and accurate measurement of the vehicle leveling and of the mast elevation angle via BUS interface

**Inclinometer IN88**
- CANopen interface
- High protection level IP69k
- 2-dimensional

Outriggers

Position measurement of the telescopic outriggers, linear measurement up to 5 m, speed and position control via BUS interface

**Draw-wire encoder A41 / C100**
- A41 compact size with CANopen interface
- C100 redundant sensors with integrated inclinometer

Boom length and elevation

Dynamic and accurate measurement of the mast elevation angle and extension length in one device

**Draw-wire encoder D125**
- Redundant sensors
- Integrated inclinometer
- Measuring length up to 10 m
Encoders are used everywhere lengths, positions, rotary speeds and angles are to be measured. They convert mechanical movements into electrical signals. Incremental encoders deliver signal periods whose number can be a measure for the rotary speed, the length or the position. In absolute encoders, a unique code pattern is assigned to every position. Even after power failure, the current position is immediately available after re-powering.

### Absolute singleturn / multiturn encoders

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Sendix M36</th>
<th>Sendix M36R</th>
<th>Sendix F5868 / F5888</th>
<th>Sendix 5868 / 5888</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>Ø 36 mm</td>
<td>Ø 36 mm</td>
<td>Ø 58 mm</td>
<td>Ø 58 mm</td>
</tr>
<tr>
<td><strong>Measuring principle</strong></td>
<td>Magnetic, absolute</td>
<td>Magnetic, absolute</td>
<td>Optical, absolute</td>
<td>Optical, absolute</td>
</tr>
<tr>
<td><strong>Electrical interface</strong></td>
<td>Analog SSI CANopen SAE J1939</td>
<td>Analog SSI CANopen SAE J1939</td>
<td>CANopen EtherNet/IP PROFINET IO</td>
<td>CANopen PROFINET DP PROFINET IO EtherCAT</td>
</tr>
<tr>
<td><strong>Resolution max.</strong></td>
<td>14 bit singleturn</td>
<td>13 bit singleturn (max. 14 bit) 12 bit multiturn (max. 24 bit)</td>
<td>13 bit singleturn (max. 16 bit) 12 bit multiturn (max. 16 bit)</td>
<td>13 bit singleturn (max. 16 bit) 12 bit multiturn</td>
</tr>
<tr>
<td><strong>Protection level</strong></td>
<td>IP67, IP69k</td>
<td>IP67, IP69k</td>
<td>IP65, IP67</td>
<td>IP65, IP67</td>
</tr>
<tr>
<td><strong>Type of connection</strong></td>
<td>Cable M12 connector</td>
<td>Cable M12 connector</td>
<td>Cable M12 connector</td>
<td>Cable M12 connector M23 connector Fieldbus hood</td>
</tr>
</tbody>
</table>
### Incremental encoders

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>2400 / 2420</th>
<th>Sendix 5000 / 5020</th>
<th>R150 / Limes LI50</th>
<th>RLI Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-resolution miniature encoder</strong></td>
<td>• High-resolution miniature encoder</td>
<td>• Robust and versatile incremental encoder</td>
<td>• Bearingless and extremely slim incremental encoder</td>
<td>• Smart bearingless encoders</td>
</tr>
<tr>
<td><strong>Ideal for use in restricted spaces or for integration in gear limit switches</strong></td>
<td></td>
<td></td>
<td>• Rings flexibly adaptable to the shaft diameter</td>
<td>• Freely adjustable line count with reference signal(s)</td>
</tr>
<tr>
<td><strong>Robust and versatile incremental encoder</strong></td>
<td></td>
<td></td>
<td></td>
<td>• Status LED, Status output</td>
</tr>
<tr>
<td><strong>Bearingless and extremely slim incremental encoder</strong></td>
<td></td>
<td></td>
<td></td>
<td>• Optional integrated vibration sensor (possibility for condition monitoring and predictive maintenance)</td>
</tr>
<tr>
<td><strong>Rings flexibly adaptable to the shaft diameter</strong></td>
<td></td>
<td></td>
<td></td>
<td>• Integrated digital signal filters and electronic type label with user memory</td>
</tr>
<tr>
<td><strong>Smart bearingless encoders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Freely adjustable line count with reference signal(s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Status LED, Status output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Optional integrated vibration sensor (possibility for condition monitoring and predictive maintenance)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated digital signal filters and electronic type label with user memory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>Ø 24 mm</td>
<td>Ø 50 mm</td>
<td>16 mm mounting depth</td>
<td>Sensor head 100 x 60 x 25 mm</td>
</tr>
<tr>
<td><strong>Optical, incremental</strong></td>
<td>Optical, incremental</td>
<td>Optical, incremental</td>
<td>Magnetic, incremental</td>
<td>Magnetic ring</td>
</tr>
<tr>
<td><strong>Push-pull</strong></td>
<td>RS422</td>
<td>RS422</td>
<td>Push-pull</td>
<td>RS422</td>
</tr>
<tr>
<td><strong>Push-pull</strong></td>
<td>Push-pull</td>
<td>Push-pull</td>
<td></td>
<td>Push-pull</td>
</tr>
<tr>
<td><strong>Open collector</strong></td>
<td>Open collector</td>
<td></td>
<td></td>
<td>SSI, BiSS</td>
</tr>
<tr>
<td><strong>Magnetic, incremental</strong></td>
<td></td>
<td></td>
<td></td>
<td>Analog</td>
</tr>
<tr>
<td><strong>Resolution max.</strong></td>
<td>1.024 ppr</td>
<td>5.000 ppr</td>
<td>3.600 ppr</td>
<td>Resolution freely programmable (in the factory or by the customer)</td>
</tr>
<tr>
<td><strong>IP50, IP64 (housing IP65)</strong></td>
<td>IP65, IP67</td>
<td>IP67, IP68/IP69k</td>
<td></td>
<td>IP67</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>Cable</td>
<td>Cable</td>
<td>Cable</td>
<td>M12 connector</td>
</tr>
<tr>
<td><strong>Type of connection</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>M12 connector</strong></td>
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<tr>
<td><strong>M23 connector</strong></td>
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<tr>
<td><strong>MIL connector</strong></td>
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</tr>
</tbody>
</table>

You will find further encoders on our Internet website under kuebler.com/encoders
Inclinometers

Inclinometers are used to measure deviations with respect to a horizontal rotation axis over an angular range that can reach 360°. Kübler inclinometers are based on the MEMS technology (Micro-Electro-Mechanical System).

### Characteristics

- Robust housing
- Flexibly adjustable to the application
- Optional additional adjustable limit switches
- With 1 x M12 connector and practical teach adapter

### Measuring ranges

<table>
<thead>
<tr>
<th>1-dimensional</th>
<th>±0° ... 360°</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-dimensional</td>
<td>±10°, ±45°, ±60°</td>
</tr>
</tbody>
</table>

### Electrical interface

- 4 ... 20 mA
- 0.1 ... 4.9 V
- 0.5 ... 4.5 V
- 0 ... 5 V
- 0 ... 10 V
- CANopen
- Optional limit switch
- SAE J1939
- Optional switching outputs

### Setting

- Zero point setting
- Measuring range setting
- Filter matching
- Filter matching via CANopen

### Accuracy

- ±0.1°
Slip rings

When it comes to transmitting electrical signals, energy, gases or liquid media from a static to a rotating component, Kübler slip rings offer the optimal solution. High current carrying capacity, reliable signal and data transmission with high transmission rates, combined with long service life and easy handling are some of the main requirements met by Kübler slip rings. Kübler slip rings are the result of highest quality awareness and a careful selection of materials – made in Germany. We focus on your application: we realize modifications and special solutions quickly and simply.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>SR075</th>
<th>SR120</th>
<th>SR160</th>
<th>SR250H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact and robust</td>
<td>This compact and robust design is ideal for Mobile Automation applications. Optimal combination of fieldbus communication with load transmission in the on-board network area.</td>
<td>Flexible and fast</td>
<td>Powerful and flexible</td>
<td>High-current transmission</td>
</tr>
<tr>
<td></td>
<td>The slip ring SR120 is ideal for applications requiring high transmission rates. Its specially developed shield concept allows parallel transmission of load currents up to 25 A and of data up to 100 Mbit/s.</td>
<td>The modular construction and variable connection possibilities allow obtaining a customized product. Load currents up to 50 A combinable with signal, fieldbus and Ethernet transmission. The innovative contact technology ensures a long, low-maintenance and reliable operation.</td>
<td>The SR250H transmits simultaneously currents up to 120 A, signals and fieldbus or Ethernet data. Its robust construction and a wide variety of connection possibilities allow adapting it individually to the application. It convinces with its high reliability.</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>75 x 85 mm</td>
<td>ø 120 mm</td>
<td>ø 160 mm</td>
<td>ø 250 mm</td>
</tr>
<tr>
<td>Protection</td>
<td>IP64 (IP65 on request)</td>
<td>Max. IP65</td>
<td>Max. IP65</td>
<td>Max. IP65</td>
</tr>
<tr>
<td>Transmission paths</td>
<td>2 load channels 6 signal channels Fieldbus transmission</td>
<td>Up to 20 load and signal channels Fieldbus transmission Ethernet transmission</td>
<td>Load and signal channels Fieldbus transmission Ethernet transmission</td>
<td>Load and signal channels Fieldbus transmission Ethernet transmission</td>
</tr>
<tr>
<td>Contact materials</td>
<td>Gold/Gold</td>
<td>Copper/Brass Silver/Precious metal</td>
<td>Copper/Brass Silver/Precious metal Gold/Gold Silver/Silver</td>
<td>Copper/Brass Silver/Precious metal Silver/Silver</td>
</tr>
<tr>
<td>Load current</td>
<td>0 ... 20 A 0 ... 48 V</td>
<td>0 ... 25 A 0 ... 400 V</td>
<td>0 ... 50 A 0 ... 400 V</td>
<td>0 ... 120 A 0 ... 480 V</td>
</tr>
</tbody>
</table>

You will find further slip rings on our Internet website under kuebler.com/sliprings
**Draw-wire encoders**

The core of a draw-wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device. An encoder measures the number of revolutions. If the circumference of the drum is known, length can be calculated.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Draw-wire encoder C100</th>
<th>Draw-wire encoder D125</th>
<th>Draw-wire encoder A40 / A41</th>
<th>Draw-wire encoder B75</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobile-Robust and cost-effective</strong></td>
<td>0.9 mm thick measuring wire</td>
<td>0.8 mm thick measuring wire</td>
<td>Most compact draw-wire encoder with 2 m measuring length</td>
<td>Compact and cost-effective</td>
</tr>
<tr>
<td></td>
<td>Protection level IP67</td>
<td>Sensor with protection level IP67</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature range</td>
<td>All interfaces, also redundant with double sensor electronics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40°C ... +85°C</td>
<td>Optionally with integrated inclinometer for measuring the mast elevation angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>108 x 98 x 68.4 mm</td>
<td>approx. 124 x 124 x 94 mm</td>
<td>approx. 50 x 50 x 77 mm</td>
<td>78 x 78 x 55 mm</td>
</tr>
<tr>
<td><strong>Measuring lengths</strong></td>
<td>1 m ... 5 m</td>
<td>6 m ... 10 m</td>
<td>1 m, 2 m</td>
<td>3 m</td>
</tr>
<tr>
<td><strong>Electrical interface</strong></td>
<td>Analog sensor</td>
<td>Analog sensor</td>
<td>Analog sensor</td>
<td>Analog sensor</td>
</tr>
<tr>
<td></td>
<td>Incremental output</td>
<td>CANopen</td>
<td>CANopen</td>
<td>SSI</td>
</tr>
<tr>
<td></td>
<td>Relay output</td>
<td>Inclinometer</td>
<td>(also with redundant outputs)</td>
<td>CANopen</td>
</tr>
<tr>
<td></td>
<td>Switch output</td>
<td></td>
<td>(also with redundant outputs)</td>
<td></td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>Analog 12 bit</td>
<td>Analog 12 bit</td>
<td>Analog approx. ±0.8 %</td>
<td>Analog approx. ±0.5 %</td>
</tr>
<tr>
<td></td>
<td>CANopen ≤ 0.3 mm</td>
<td>CANopen ≤ 0.6 mm</td>
<td>CANopen approx. ±0.8 %</td>
<td>CANopen approx. ±0.5 %</td>
</tr>
<tr>
<td><strong>Accuracy / Linearity</strong></td>
<td>Approx. ±0.8 %</td>
<td>Approx. ±0.8 %</td>
<td>Approx. ±0.35 %</td>
<td>Approx. ±0.35 %</td>
</tr>
</tbody>
</table>
Draw-wire encoder C60

Robust and versatile
- Protection level up to IP69k
- Wide temperature range -40°C ... +85°C
- Titanium-anodized aluminum housing
- Various constructions: open, closed housing or housing with perforated sheet steel cover
- Stable measuring wire (stainless steel, V4A) wire diameter up to ø 1 mm - ideal for outdoor applications

Characteristics

- Various constructive variants
- Housing made of titanium-anodized aluminum
- IP69K protection level
- Suitable for outdoor use

Size
- 60 x 60 x 125 mm

Measuring lengths
- 4 m

Electrical interface
- Analog sensor CANopen
- Potentiometer (also with redundant outputs)

Resolution
- Depending on the encoder
- Analog 16 bit

Accuracy / Linearity
- Approx. ±0.1 %

You will find further draw-wire systems on our Internet website under kuebler.com/draw-wire_encoders

Draw-wire encoder D120

Extremely robust and dynamic
- Draw-wire encoder for outdoor
- Sensor with protection level IP69k and temperature level -40°C ... +85°C
- Stable measuring wire (stainless steel, V4A), wire diameter up to 1.5 mm
- All interfaces, also redundant with double sensor electronics

Characteristics

- Various constructive variants
- Housing made of titanium-anodized aluminum
- IP69K protection level
- Suitable for outdoor use

Size
- approx. 120 x 125 x 133 mm

Measuring lengths
- 3 m ... 10 m

Electrical interface
- Analog sensor CANopen
- Potentiometer (also with redundant outputs)

Resolution
- Analog 16 bit

Accuracy / Linearity
- Approx. ±0.1 %

Draw-wire encoder C120

Highly accurate and dynamic
- Excellent linearity up to ±0.02% of the measuring range
- Robust housing
- High dynamics up to 10 m/s
- Customer-specific adaptations possible

Characteristics

- Various constructive variants
- Housing made of titanium-anodized aluminum
- IP69K protection level
- Suitable for outdoor use

Size
- approx. 120 x 120 x 120 mm

Measuring lengths
- 6 m

Electrical interface
- Analog sensor CANopen
- Potentiometer (also with redundant outputs)

Resolution
- Analog 16 bit

Accuracy / Linearity
- Approx. ±0.1 %

Draw-wire encoder D135

Highly accurate and dynamic
- Measuring lengths up to 42.5 m
- Can be combined with Kübler Sendix encoders and with analog sensors

Characteristics

- Various constructive variants
- Housing made of titanium-anodized aluminum
- IP69K protection level
- Suitable for outdoor use

Size
- 135 x 135 x 318 mm

Measuring lengths
- 8 m, 10 m, 12 m, 15 m, 20 m, 25 m, 30 m, 35 m, 40 m, 42.5 m

Electrical interface
- Analog sensor CANopen
- SAE J1939
- PROFIBUS DP
- PROFINET IO
- Incremental Push-pull/RS422

Resolution
- Analog approx. ±0.1 %
- CANopen approx. ±0.05 %

Accuracy / Linearity
- Approx. ±0.1 %

You will find further draw-wire systems on our Internet website under kuebler.com/draw-wire_encoders
# Portfolio overview draw-wire encoders

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Draw-wire encoders</th>
<th>Measuring length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity max.</td>
<td>Speed [m/s]</td>
<td>Encoder</td>
</tr>
<tr>
<td>Speed [m/s]</td>
<td>Wire diameter [mm]</td>
<td></td>
</tr>
<tr>
<td>Robust-Line</td>
<td>±0.1 %</td>
<td>A50 INC</td>
</tr>
<tr>
<td>Robust-Line</td>
<td>±0.1 %</td>
<td>B80 INC</td>
</tr>
<tr>
<td>Robust-Line</td>
<td>±0.1 %</td>
<td>C120 INC</td>
</tr>
<tr>
<td>Robust-Line</td>
<td>±0.1 %</td>
<td>D135 INC</td>
</tr>
<tr>
<td>Compact-Line</td>
<td>±0.3 %</td>
<td>A30 INC</td>
</tr>
<tr>
<td>Compact-Line</td>
<td>±0.3 %</td>
<td>A40 INC</td>
</tr>
<tr>
<td>Compact-Line</td>
<td>±0.3 %</td>
<td>A41 INC</td>
</tr>
<tr>
<td>Compact-Line</td>
<td>±0.3 %</td>
<td>B75 INC</td>
</tr>
<tr>
<td>Compact-Line</td>
<td>±0.3 %</td>
<td>C105 INC</td>
</tr>
<tr>
<td>Base-Line</td>
<td>±0.5 %</td>
<td>C100 INC</td>
</tr>
<tr>
<td>Base-Line</td>
<td>±0.5 %</td>
<td>D125 INC</td>
</tr>
</tbody>
</table>

### Measuring length

<table>
<thead>
<tr>
<th>Short range</th>
<th>Mid range</th>
<th>Long range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2</td>
<td>4 5 6 8</td>
<td>12 15 max. 42.5</td>
</tr>
</tbody>
</table>

**Features**

- **INC**: Incremental
- **ABS**: Absolute, digital
- **U**: Voltage
- **I**: Current
- **R**: Relais / switch output
- **RED**: Redundant sensors

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[portfolio overview](http://kuebler.com/mobileautomation)
Counters and process devices

The main task of the Kübler counters is the direct or scaled display of electronic pulses - in variants with or without switching outputs, with analog output and electronic or electromechanical display. Process devices are used for displaying, monitoring and scaling standard signals, temperature or strain gauge signals in any desired unit. All functions also with modular, 3-colour touch display.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>HR47, HK07, Codix 13x</th>
<th>HW66M</th>
<th>K07.20, Codix 92x, 57xT</th>
<th>Codix 534, Codix 565</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hour meters for operating time measurement, service intervals, short time measurement</td>
<td>Energy and hour meter</td>
<td>Position acquisition, quantity and piece counting, length counter, rotary speed measurement</td>
<td>Flow measurement, pressure measurement, filling level display, weight monitoring, speed display, temperature monitoring</td>
</tr>
<tr>
<td>Applications</td>
<td>Pumps, vibrators, generators, compressors, small machinery, rollers, power sets, lighting</td>
<td>Dehumidifiers, generators and power sets</td>
<td>Fork lifts, cranes, armorimg machines, pumps, disconnecting devices, saws</td>
<td>Compressors, pumps, motors, weighing devices, tank installations</td>
</tr>
<tr>
<td>Power supply</td>
<td>Battery, DC or AC</td>
<td>115 or 230 V AC</td>
<td>Battery, DC or AC</td>
<td>DC or AC</td>
</tr>
<tr>
<td></td>
<td>IP65</td>
<td>IP65</td>
<td>IP65</td>
<td>IP65</td>
</tr>
<tr>
<td></td>
<td>ø 58, 30 x 20, 48 x 24</td>
<td>48 x 48</td>
<td>30 x 20, 48 x 48, 96 x 48</td>
<td>48 x 24, 96 x 48</td>
</tr>
<tr>
<td>Measuring input</td>
<td>Time ranges: sec, min, h with resolution up to 1 ms</td>
<td>kWh and operating time measurement</td>
<td>Various counting and frequency modes up to max. 1 MHz</td>
<td>Scalable standard signal or strain gauge inputs, temperature inputs</td>
</tr>
<tr>
<td>Features</td>
<td>• High vibration and shock resistance</td>
<td>• High vibration and shock resistance</td>
<td>• High vibration and shock resistance</td>
<td>• High vibration and shock resistance</td>
</tr>
<tr>
<td></td>
<td>• Wide temperature range</td>
<td>• Wide temperature range</td>
<td>• Wide temperature range</td>
<td>• Wide temperature range</td>
</tr>
</tbody>
</table>

You will find further counters and process devices on our Internet website under kuebler.com/counters
Product portfolio – Made in Germany

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

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

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

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

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

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

We offer solutions for the following industries:

- DRIVE TECHNOLOGY
- ELEVATOR TECHNOLOGY
- MOBILE AUTOMATION
- HEAVY INDUSTRY
- WIND TURBINES
- SOLAR INDUSTRY
- PACKAGING INDUSTRY
- BOTTLING PLANTS

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

kuebler.com/industries
Kübler Service for worldwide planning reliability

24one 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.)

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

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

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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