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The Encoder Experts

Cranes and Work Platforms

Reliable control of swivelling and telescopic outriggers

DEVELOPED AND
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5 YEARS WARRANTY

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Safety through redundant signals
Speed, incline and angle of rotation monitoring
Reliable communication with CANopen
EnDra® multiturn technology: maintenance-free and non-wearing

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Industrie ROBUST

Stable lateral position

The use of SPS technology and sensors has considerably increased the range of use for cranes. In Böcker Maschinenwerke GmbH systems, WDGA absolute encoders with EnDra® multiturn technology from Wachendorff ensure boom stability.

Truck-mounted cranes have become an indispensable tool, especially in the roofing trade. Their compact dimensions allow them to be simply driven to the building site and put into position. Although they appear small on the truck, once the support system and telescopic mast are extended, they become an impressive and powerful piece of transport machinery. Previously the operating range of the boom was considerably restricted, but now PLC controls and sophisticated sensor technology ensure that the boom can literally be pushed to its limits. This is also necessary as parked cars, trees or slopes often mean that the crane cannot be ideally positioned and not all of the outriggers can be completely extended. “The crane has to be set up in the space available on site,” explains Dirk Seiger, who is responsible for electronic and control technology at Böcker. Sometimes every centimetre counts.

Sensors for increased safety

Infinitely adjustable swivelling and telescopic outriggers make positioning much easier than before. However, all of these variables are a great challenge for the control technology and safety system. It would be unthinkable for a machine to tip over and fall onto a house or even onto people. Measurement values from different sensors are therefore continuously recorded and the current overturning torque and allowable, non-critical operating range calculated at all times. Thanks to the variable support system, the range is not necessarily circular. It can also be pear-shaped or elliptical, depending on how far each outrigger is extended. Before the system reaches critical limits, it locks automatically and will not allow any further movement or any additional load to be lifted. To do this, values such as the incline and rotation angle of the boom are recorded - each one twice and separately from each other. “All safety mechanisms have redundant monitoring,” explains Dirk Seiger. “Many of our cranes can be converted for use as work platforms in just a few steps. Even stricter safety rules apply then, as people are being carried.”

Sturdy, maintenance-free encoder

The protocol used here is CAN, which is also used in automotive technology. “This allows priorities to be defined particularly easily, and the system is extremely stable,” says Dirk Seiger. The standards that Böcker expect from their suppliers are just as high as their own stability and safety requirements. “Although we have a very high output ratio and produce most of the components for our solutions ourselves, we do purchase control technology components,” explains Dirk Seiger. The company uses Wachendorff absolute multiturn encoders to reliably determine the boom’s angle of rotation at all times. “We have been using products from the Rheingau for several years and are very happy with the high quality and excellent value for money.”

New battery-free technology

As changes in position must also be recorded even if the boom is moved by hand, Böcker now almost exclusively uses absolute encoders with the new EnDra® multiturn technology developed by Wachendorff. Instead of a gear mechanism, they calculate the rotary movement completely electronically via a magnetic field that is built up and discharged during the rotation. The benefit of this is that there are no wearing parts or a battery that must be replaced. “In the extreme

temperatures that our cranes are subjected to, battery life suffers quite considerably," says Dirk Seiger, speaking from experience. EnDra technology makes these concerns a thing of the past. The encoders are even unaffected by wind and weather: the precision turned encoder housing is tightly sealed and also cemented into place, achieving protection class IP67 or 69K.

Fast and convenient start-up

Böcker's favourable experience with Wachendorff products is now bearing more fruit; in future, another device from the Wachendorff group will be found in Böcker cranes. As a start-up tool, the new Wachendorff OPUSA6 allows the many individual parameters to be conveniently set. A total of 8000 variables must be transmitted to the control unit during start-up, which can be carried out conveniently using the OPUSA6. It also allows fault analysis. The crane's graphic display, which shows the position of supports and booms, helps to immediately detect discrepancies and localise faults.

Electronics for extreme conditions

For many years, Wachendorff Elektronik has specialised in developing customised and standard operating units for use in mobile work machinery under harsh conditions. These are used in agricultural and construction equipment and in municipal and forestry vehicles. The new A6 product line offers a wide range of options. This allows easily configurable operating units to be used to simply display data or to interactively control machinery. The temperature range of -30°C to +75°C covers a broad field of application, whether on hot summer days or in the bitter cold. If necessary, the equipment can also be used outdoors – it meets protection classes IP65 and IP67, and are therefore suitable for the requirements of outdoor applications. The most stringent endurance tests in a testing laboratory ensure that quality remains the same. Intensive climate and final tests are also carried out on every device after production, before they are delivered to the customer.

This has long made Wachendorff synonymous with extremely hard-wearing electronics – a characteristic that runs through the company's entire product range, from control consoles and encoders to remote maintenance modules.

Sturdy encoders

The Wachendorff group has been developing and manufacturing absolute and incremental encoders for use in all kinds of applications around the world for more than 20 years. Alongside a wide standard range with comprehensive options, the company also works with customers to develop individual solutions or make adjustments on request. This medium sized company's innovative capabilities are evidenced by their own developments, such as the non-wearing, battery-free EnDra technology for absolute multiturn encoders. As development and manufacturing takes place under the same roof at the headquarters in Geisenheim/Rheingau, they are able to react particularly quickly and flexibly to customer requests. Above all, customers value the ruggedness of the components, which Wachendorff guarantees for 5 years worldwide.

New EnDra® technology

Wachendorff Automation, based in Geisenheim in the Rheingau, uses EnDra® multiturn technology for the absolute encoders developed by the company and tested in practical applications. No mechanical gears are required to record the direction and number of rotations here. Instead, these parameters are determined by an electrical conductor. This Wiegand wire consists of a hard magnetic outer shell and a soft magnetic inner core. The absolute position per turn (single turn) is measured with four Hall sensors and a magnet on the rotating shaft. As the magnetic field moves along the Wiegand wire due to the rotation of the shaft, the soft magnetic core attempts to follow the field and is prevented by the hard magnetic shell. An increasingly large field difference is created in the wire, similar to drawing a bow. As soon as the external field matches the field strength of the outer shell, the shell is demagnetised and the voltage in the core jumps dramatically. This speed-independent momentum is generated twice per rotation and converted into electrical signals via a coil. These signals create enough power to operate a low-energy accumulator and also provide information on the number of rotations completed. When external voltage is available again, a microcontroller calculates the correct value from the position and number of rotations, and sends this value to the control unit. The encoders therefore work completely independently and do not require buffer batteries. The absence of mechanical gears also makes them non-wearing.

Image 0
Böcker cranes can be converted into work platforms in just a few steps. Particularly high safety standards apply to these.

Image 1
The support system is variable and can be adjusted to the circumstances onsite. This creates completely asymmetrical operating ranges which are calculated and monitored by sophisticated sensor technology.

Image 2
In the last 50 years, Böcker has grown to become one of the leading international manufacturers of crane and lift technology, ranging from small construction winches to aluminium cranes with a 6 tonne operating load. The headquarters are in Werne, in Westphalia.

Image 3
The outriggers can be extended with infinite variation. This allows the crane to fit even into narrow streets or gaps between buildings.

Image 4
WDGA absolute encoders from Wachendorff record the rotation of the boom on its own axis. For safety reasons, the entire safety system is designed with redundant sensors and controls – this is why there are two encoders side by side, each working completely independently. Thanks to EnDra® multiturn technology, the encoders are non-wearing and work without a battery.

Image 5
Stephan Rump (Wachendorff) and Dirk Seiger (Böcker)

Image 6
The mast is small and compact during transport, but can easily cope with working heights of 40 metres and ranges of 30 metres.

Any Questions? Just call us at +49 (0) 67 22 / 99 65 414, send us an E-Mail to support-wa@wachendorff.de or call your local distributor: **www.wachendorff-automation.com/distri**

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