

## HEIDENHAIN Now Offers Rotary Encoders from Sister Companies

We are pleased to announce as of January 1, 2009, HEIDENHAIN CORPORATION has become responsible for the sales and marketing in North America for rotary encoders from the following companies: HEIDENHAIN, RENCO, Leine & Linde, SUMTAK and LTN.

HEIDENHAIN has consolidated the sales and marketing functions from these sister companies while leaving all production and engineering functions in the existing factories. This group will be managed by Bill Anderson, National Sales Manager, Automation Division reporting to Rick Korte, President and Managing Director of HEIDENHAIN Holding.

Under this structure, customers in North America will have direct access to the world's most respected



LTN Servotechnik GmbH



encoder development companies, all through a single source.

This consolidation promises to make searching for the best rotary encoder solution simpler than ever. Within these five lines, customers can now capitalize on many new encoder technologies in order to maximize their machine performance and value. To enable this, HEIDENHAIN has compiled a dedicated and diverse sales force, backed by an expanded team of application experts. This structure has been assembled to represent the industry's leading array of rotary motion products in the most direct way possible.

The portfolio of rotary products offered through HEIDENHAIN Holding is

## Did You Know...

...that HEIDENHAIN angle encoders are vital components in much of the largest array of telescopes of its type in the world, serving as the basis of a large astronomy research and training ground in the upper mountains of eastern California? Known as **CARMA** (the Combined Array for Research in Millimeter-wave Astronomy) this university-based (five universities) millimeter array consists of 23 telescopes and is operated daily with students and young scientists ([www.mmarray.org](http://www.mmarray.org)). The science with CARMA centers around the study of the cold universe through imaging of radio emissions from molecules, dust, and relic emission from the very early universe. Funding is provided from the National Science Foundation and member institutions.

Of the 23 telescope antennas on site, HEIDENHAIN's RCN 729 angle encoders have been retrofitted into the six 10.4 meter antennas (the largest telescopes on the site), as well as chosen for the eight newer 3.5 meter antennas. All the antennas are Altitude - Azimuth mount telescopes, having two axes each, and are used in combination to image the astronomical universe at millimeter wavelengths. "These HEIDENHAIN encoders allow us to accurately point on the sky," explained David Woody, Director of Instrumentation at CARMA. "The accuracy we achieve is 1 to 2 arc seconds."

Because of its high static and dynamic accuracy, HEIDENHAIN's **RCN 729 angle encoders** with large hollow shaft diameters are often the preferred units for rotary and angle measuring tables, indexing fixtures, measuring setups and image scanners. The stainless steel version is particularly useful in antenna applications.

"We chose the HEIDENHAIN encoder because we knew it could do the job we needed, and be reliable as well as very economical" said Woody. "They have proven to work out very well for us."



CARMA telescopes

For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■

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## Leine & Linde Encoders are Vital Components in Iron Ore Production at Kiruna Mine

*In the tough environment at the Kiruna mine in Sweden, it is essential for the pulse encoders providing speed and feedback on location to live up to expectations for problem-free production processes. Leine & Linde has been supplying customized models for the international high-tech mineral group LKAB and its production of highly-refined iron ore for around 20 years.*



*View of Kiirunavaara. LKAB has been mining iron ore for more than 100 years. In the beginning, the mining was open cast, above ground; it wasn't until the 1960s that the mining went underground.*

In the land of the midnight sun, among vast mountainous areas, lie the ore deposits that provide the whole of Norrbotten in Sweden with an important industry. Iron ore, known as magnetite, dominates and is of excellent quality there, thanks to its high iron content.

LKAB has been mining ore in Kiruna since the company was founded in 1890. Today, the company is a leading international producer of refined iron ore products for steel making and is expanding its operations for supplying mineral products to other industrial sectors. The principle operations include iron ore mines and processing plants in Kiruna, Malmberget and Svapavaara, and ore harbors in Sweden and Norway.

The main level of Kiirunavaara is currently at a depth of 1045 meters. Approximately 25 million tons of crude ore is mined annually from the ore body, and, to date, over one billion tons has been extracted from the Kiruna mine.

### **Tough field of application**

Bernt Sundbris is an electricity equipment planner at the Kiruna mine. He is responsible for servicing and maintenance of the mining locomotives, among other things, and can explain the function and purpose of Leine & Linde's pulse encoders in the production process:

"A somewhat customized version of the small, reliable incremental 861 model is used to gauge the location and speed of the ore trains, but you can also find Leine & Linde products elsewhere in the mine. The pulse encoders also determine the speed of the elevators, and are in the mountain winches too, as well as parts of the conveyor tracks. Both incremental and absolute pulse encoders are used. The environment is tough, in terms of vibration, dirt and dust," explains Bernt.

"Other makes were used previously, but failed to satisfy our quality requirements," continues Andreas Karlsson, service

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## Heavy Duty 800 Series Encoders from Leine & Linde Hold Tough in Rough Environments



*Leine & Linde model 862, a robust incremental encoder solution and a top choice for harsh environments.*

With the introduction of the Leine & Linde 800 Series rotary encoders, HEIDENHAIN Corporation, Automation Division now offers a line of encoders that are regarded among the most robust, maintenance-free and cost effective encoder solutions on the market today. In addition, this series can optionally be offered with ADS™ (Advanced Diagnostics System), a built-in system used for condition-based or preventative maintenance, guaranteeing the reliability of the intended application.

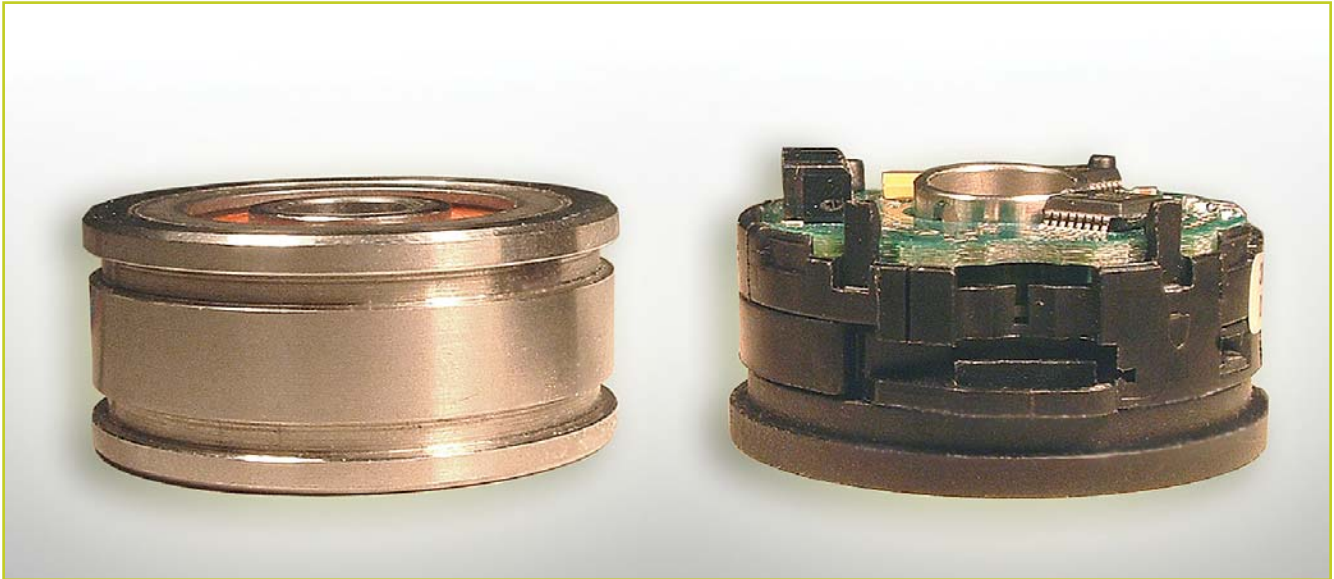
The Leine & Linde 800 Series encoders are widely used for motor feedback in the paper and pulp, steel and mining industries worldwide. They have also become the market's leading choice for generator feedback in wind turbines.

The 800 Series comes in shafted and hollow-shafted versions, with the ceramic bearing option maximizing encoder lifetime. The series is characterized by a dynamic and flexible range of pulse rates and electrical output combinations including a dual encoder solution. For hazardous applications, explosion-proof ATEX-certified encoder options are offered.

The 800 Series is one of the cornerstones in the Leine & Linde product portfolio where high quality flexible encoder solutions that make use of state-of-the-art technology are the essence of the business.

*For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■*

## Improve Motor Performance by Upgrading Size 15 Resolver to RENCO R35i Encoder



*The RENCO R35i greatly improves motor system performance in size 15 resolver pilots.*

RENCO Encoders offers an R35i modular encoder as a drop-in replacement for size 15 resolvers, greatly improving motor system performance when complete. The R35i encoder comes with a servo-groove mounting option which allows direct fit into existing size 15 resolver pilots.

Now offered through HEIDENHAIN Corporation, Automation Division, RENCO's R35i has resolution up to 13 bits (8192 CPR) and eliminates conversion circuitry, thus reducing complexity. The R35i uses a metal code disk for rugged environments, and its patented mounting process simplifies installation into any application.

To cover various applications, the new R35i is now being offered with TTL output and resolution up to 8192 cycles per revolution, (32768 counts per revolution with quadrature).

Maximum resolution combined with extremely high output frequency capability of 500kHz allows this encoder to be used with motors running at over 3500 rpm. It is important to note that the R35i is able to achieve this high level of performance while also maintaining its user friendly mounting tolerances, allowing up to  $\pm 0.010$ " [250 microns] of shaft axial motion and operating temperatures from  $-30\text{ }^{\circ}\text{C}$  to  $110\text{ }^{\circ}\text{C}$ . The R35i can also be ordered with commutation signals for 4, 6, 8 and 10 pole brushless motors.

The R35i features RENCO's patented slide/gap mechanism for ease of installation and maximum performance, with  $\pm 20^{\circ}$  rotation of the encoder to align the commutation signals with the motor poles.

*For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■*

## Dear Abbe...

### Q: "How do you improve the IP rating on a scale?"

**A:** A few issues back we discussed the definition of IP rating and what the various values mean. To ensure and even increase the IP rating, specifically for sealed linear scales, there are a number of measures you can take.

- 1 Always install the scales with the sealing lips facing down.
- 2 Install a guard above the scale to direct contaminants away from the scale.
- 3 Never use an air hose to clean the area below the scale sealing lips.
- 4 To increase the IP rating, add an air purge system.

Most HEIDENHAIN scales now use the single field scanning principle, which by virtue of the technology is very robust against contamination but not completely immune. An air purge system introduces clean, dry air into the scale thus pressurizing it and preventing the ingress of contaminants. Sealed scales from HEIDENHAIN

feature inlets on either end of the scale and on the scanning unit for this purpose.

The DA 300 air purge system from HEIDENHAIN features particulate filtration system down to 0.1µm and an activated carbon filter for oil vapor up to 0.003 mg/m³. It also has adjustable air pressure with new visual gage and can supply up to 10 measuring systems.

The DA 300 system raises the ratings for LS/LC scales from IP 53 to IP 64.

Remember, contaminated scales are not accurate and if the air you are putting into the scale is not clean and dry, you are introducing contamination; no air purge is better than a bad air purge!

Sincerely,  
Abbe

*If you have a question for Abbe, please send it to us at [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■*

## Leine & Linde Encoders are Vital Components in Iron Ore Production

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engineer in the department. He is responsible for maintenance of the locomotives, and says that the service life and function of Leine & Linde's encoders, on the other hand, is more than satisfactory. "We are very satisfied with the quality and the partnership with Leine & Linde."

Service personnel had previously encountered problems when installing the encoders due to the confined spaces, but with the help of a specially-designed solution, the problem was solved.

### Major focus on development

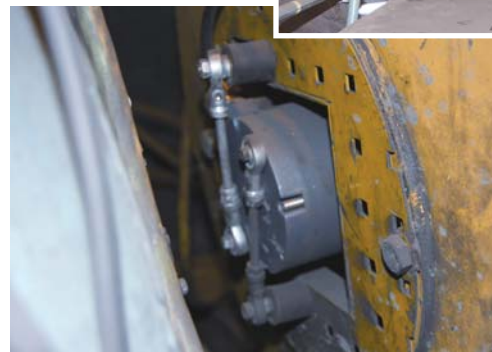
From an early stage, LKAB has focused on advanced technology, and has always been at the forefront of development. Modern IT solutions mean that boring, loading and transporting can all be remotely controlled, which provides better process control. This creates very efficient logistics from crude ore to pellets and from mine to harbor.

Leine & Linde 861 heavy-duty encoders, along with other absolute encoders, are used frequently within mining operations.

Leine & Linde has a close partnership with LKAB, and constant technical development takes place in order to maintain their high quality requirements.

*For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■*

*Bernt Sundbris (LKAB), Håkan Karlsson (sales engineer, Leine & Linde) and Andreas Karlsson (LKAB) discuss the installation of a pulse encoder.*



*Leine & Linde heavy-duty encoder is installed on one of the mining locomotives.*

## HEIDENHAIN Now Offers Rotary Encoders from Sister Companies

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truly the best in the industry. Some of the product highlights offered by the Automation group include: incremental and absolute rotary encoders, linear encoders, modular and kit encoders, angular encoders, robust heavy duty encoders, resolvers and slip rings.

Field applications for these products are very diverse. Examples include, but are not limited to: standard duty encoders used on automated doors, high resolution encoders used on stepper motors, modular encoders used on machines for DNA sampling, and heavy duty encoders used in wind generators and pitch control. In addition, HEIDENHAIN's Automation division will continue to sell high accuracy, high resolution encoders for industries such as printing machines, and paper and steel processing equipment, as well as encoders for general machine tool applications such as rotary tables and spindle feedback. Other complimentary products offered include resolvers and slip rings for various applications such as automated agricultural irrigation systems.

As a global industry leader committed to technology, this overall consolidation offers customers many benefits. "By investing in our products, our customers will always be on the forefront of technology," explained Anderson. "The HEIDENHAIN family of companies will continue to lead the industry by continued investment in Research and Development in order to ensure that our customers receive the best products available on the market."

For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■

## HEIDENHAIN's 2009 North American Exhibitions

See what's new and exciting in the precision measurement/motion control industry by visiting HEIDENHAIN on the road this year! ■

### Lab Automation

January 25-27  
Palm Springs Convention Center  
Palm Springs, California



### ATX (Automation Technology Expo)

Feb. 10-12  
Anaheim Convention Center  
Anaheim, California



### Motor, Drive & Automation Systems Conference

March 3-4  
Hilton Hotel at Walt Disney World  
Orlando, Florida



### TECMA

March 10-13  
Expo Bancomer Santa Fe  
Mexico City, Mexico



### WESTEC

March 30 – April 2  
Los Angeles Convention Center  
Los Angeles, California



### EASTEC

May 19-21  
Eastern State Exposition  
Springfield, Massachusetts



### SEMICON

July 14-16  
Moscone Center  
San Francisco, California



### Design & Manufacturing Midwest

September 22-24  
Donald E. Stephens Convention Center  
Rosemont, Illinois



**Technical Tidbit:**  
**Effect of Eccentricity**

When installing an exposed angle encoder, one of the biggest factors affecting accuracy is mounting eccentricity to the center of rotation.

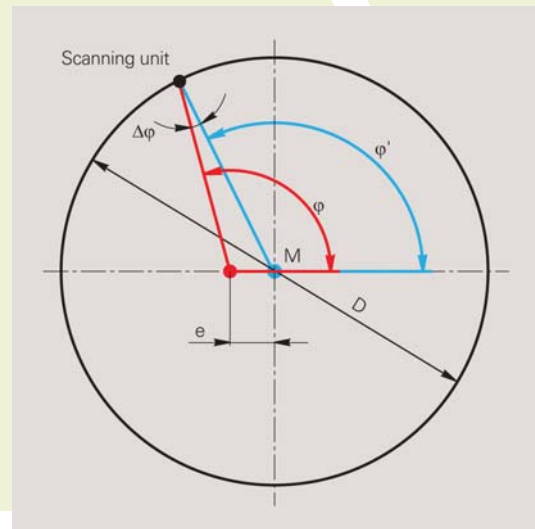
**Error due to eccentricity of the graduation to the bearing**

Under normal circumstances, the graduation will have a certain amount of eccentricity to the bearing after the disk/hub assembly (ERP), circumferential-scale drum (ERA 4000) or scale tape (ERA 78x C and ERA 88x C) is mounted. In addition, dimensional and form deviations of the mating shaft caused by the positioning of the centering collar can result in added eccentricity. The following relationship exists between the eccentricity  $e$ , the mean graduation diameter  $D$  and the measuring error  $\Delta\phi$ .

$$\Delta\phi = \pm 412 e / D$$

- $\Delta\phi$  = Measuring error in " (angular seconds)
- $e$  = Eccentricity of the radial grating to the bearing in  $\mu\text{m}$
- $D$  = Mean graduation diameter (ERP) or drum outside diameter (ERA 4000) and scale-tape carrier diameter (ERA 78x C/ERA 88x C) in mm
- $M$  = Center of graduation
- $\phi$  = "True" angle
- $\phi'$  = Scanned angle

*Eccentricity of the graduation to the bearing*

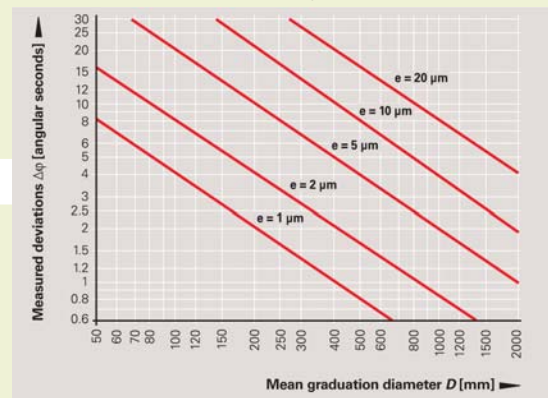


If we take the example of an ERA 42XX with an OD of 127.64 mm and a line count of 20,000, the specified accuracy of the graduation is 3.7". If we installed this device with 2 $\mu$  (0.002 mm) of eccentricity, the following additional error would be added.

$$\begin{aligned} \Delta\phi &= \pm 412 \cdot e / D \\ &= \pm 412 \cdot 2 / 127.64 \\ &= \pm 6.45'' \end{aligned}$$

The chart to the right can be used as a quick reference to calculate the effect of eccentricity at various ODs with various deviations. ■

*Resultant measured deviations  $\Delta\phi$  for various eccentricity values  $e$  as a function of mean graduation diameter  $D$*





## HEIDENHAIN Thinks Green

By Tom Wyatt  
Product Manager, Automation

HEIDENHAIN evolves right along with the many industries it currently serves since, fortunately, measurement and feedback of motion improves over time. As the energy industry seems to be moving to a new state, HEIDENHAIN is right there with the correct, accurate feedback solutions to assist in the processes.

For example, with regard to wind energy, HEIDENHAIN and its sister companies, like RENCO, Leine & Linde and LTN to name a few, are enjoying business by providing the necessary feedback devices for the wind turbines. You can imagine that these turbines are in tough environments: lightning, excessively high winds during storms, humidity, large temperature swings, etc. HEIDENHAIN's families of encoders are tested internally to those same specifications and more, thereby providing long lifetime in these harsh conditions.

On the renewable energy source of light from the sun, photovoltaic production and solar tracking are also popular applications for HEIDENHAIN currently. Solar concentrators and tracking photovoltaic cells need to follow the sun to obtain maximum efficiency. The motion control systems involved also often use HEIDENHAIN family rotary feedback products to provide speed and position control.

Also, in the photovoltaic production processes, which is similar to the well established flat panel production



schemes, HEIDENHAIN linear encoders are used from coarse resolution applications such as shuttling axes for the panels, as well as in high-end scribes outputting several hundreds of

panels per hour, to deposition techniques requiring resolved constant motion. Even third generation photovoltaics

that are basically printed like a newspaper use HEIDENHAIN feedback devices on the production machines.

Constantly involved in R&D, HEIDENHAIN and its family of sister companies with its leading edge technologies are proud to continue to be a part of evolving industries. Fortunately for us, our

reputation of quality in the field has brought us into the energy industry and allowed us to learn a few things along the way!

For more information, go to [www.heidenhain.us/au1](http://www.heidenhain.us/au1) ■



**HEIDENHAIN**  
The Measure of Excellence

### HEIDENHAIN CORPORATION

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