



## **HEIDENHAIN India – You can count on us!**

- + Next generation Linear Encoders**
- + Rotary Encoders for Elevators**
- + Next generation Angle Encoders**
- + New Features in TNC Controls**
  - **Dynamic Efficiency & Dynamic Precision**
- + Accuracy campaigns**
- + Training schedule**



# HEIDENHAIN

Dear Readers,

India has a new Government and an ambitious plan has been outlined to streamline infrastructure growth and putting the economy on a fast track with business and industry friendly policies with accent on manufacturing growth. Government has pronounced a clear policy that enables setting up of industrial regions aimed at making India a “globally competitive manufacturing hub”.

If high wage, high skill jobs are to be created for 21<sup>st</sup> century manufacturing, Indian manufacturing need to compete globally on value rather than cost. Our manufacturing industry need to draw upon our design, research and innovation skills combined with state of art high quality equipment that can create global quality products for the local and world markets and build competitive advantage.”Competitive”, should not be confused with “cheaper” and what I mean here is the ability under present conditions for Indian products to command world markets. The valuation includes many things such as cutting edge science and technology, innovation, talent, design, engineering and services. India’s contribution of manufacturing to GDP is a poor 16% today and this need to change. If Government intends to increase the manufacturing share to 25%, foreign investment and technologies will have to be factored in and procedural and regulatory hurdles will have to be removed and shop floor productivity and quality improved

Our manufacturing policy will hopefully infuse huge investments to improve India’s poor infrastructure and enhance manufacturing productivity. Despite a few Indian firms being awarded with Deming prize, many strategy studies have shown that the Indian manufacturing industries in general remain somewhat indifferent towards the issues related to competitive priorities. Investing in world class technologies without compromise and producing high quality goods for local consumption and export will only make us competitive.

We believe that HEIDENHAIN and the products that we manufacture in the field of measuring and control technology for demanding positioning tasks on Machine Tools and systems for manufacturing electronic components, and areas like motor control, robotics, conveyor systems, packaging, printing and elevators etc will play a

significant role in redefining India’s manufacturing resurgence.

Apart from the ubiquitous Linear Encoders that are trusted by every Machine builder anywhere in the world, a part of the over a million rotary encoders that we produce at our factory in Traunreut will play efficient roles in the redefined Indian industrial revival. China installs over 600,000 elevators yearly and majority of them are fitted with HEIDENHAIN encoders. In India too, we have started associating with the Elevator Industry in a significant way.

HEIDENHAIN is getting exciting feedback on the novel concept of “Dynamic Efficiency + Dynamic Precision” introduced in the last EMO from control users all over the world.

With “Dynamic Efficiency”, HEIDENHAIN control exploits the potential of the Machine and the cutting tool. Dynamic Efficiency combines performance-enhancing controller functions with time-saving machining strategies like Active Chatter Control, Adaptive feed Control and trochoidal milling. With “Dynamic Precision”, dynamic deviations of the Machine Tool are compensated at high feed rates and accelerations, and vibrations dampened without modifying Machine’s dynamics. This speeds up your machine and improves accuracy simultaneously,

We want our users of encoders and controls to be able to take full advantage of our products and keeping this in mind, we have been conducting value adding training programs on operation and maintenance at our Chennai centre, every month.

As a technology leader, we are aware of our responsibility towards the manufacturing fraternity and will do our best to bring in best of solutions to India and support them professionally. Please find some specific information in the pages that follow.



*A.P. Jayanthram*  
*Managing Director*



## Next generation Linear Encoders !

The sealed linear encoders of the LC 1x3 and LC 4x3 series have established themselves very successfully on the market. With the new LC 1x5 and LC 4x5 generation, HEIDENHAIN will complement its current product program. The development of the encoders was focused on the requirements for purely-serial absolute systems. The new interfaces from Fanuc, Siemens and Mitsubishi can be realized on the basis of the LC xx5 series. In addition, the EnDat and Siemens encoders can be used in safety-related axes.



## Advantages of the New LC 1x5 and LC 4x5 Linear Encoders over the current LC 1x3 and LC 4x3

### Support of new interfaces

The LC 1x5 and LC 4x5 series support EnDat 2.2 (up to 16 MHz) and the new interfaces from Fanuc ( $\alpha$ ), Siemens (DRIVE-CLiQ) and Mitsubishi (High Speed Interface up to 5 MHz).

LC xx5 Interfaces / Ordering designations		Accuracy grade 3 $\mu$ m	Accuracy grade 5 $\mu$ m
HEIDENHAIN	EnDat22	1 nm	10 nm
Fanuc	Fanuc05	1.25 nm ( $\alpha$ ) 10 nm ( $\alpha$ )	12.5 nm ( $\alpha$ ) 50 nm ( $\alpha$ )
Siemens	DQ01	1 nm	10 nm
Mitsubishi	Mit02-04	1 nm	10 nm

### Higher resolutions

The resolution of the LC 115 and LC 415 with an accuracy grade of 3  $\mu$ m was increased from 5 nm to 1 nm. The resolutions of the encoders with Fanuc, Siemens or Mitsubishi interface were largely matched to those of the EnDat encoders

## Functional safety for encoders with EnDat 2.2 or DRIVE-CLiQ interface

Functional-safety (FS) versions will be available for the EnDat 2.2 (purely serial) interface and the DRIVE-CLiQ interface. This means that these encoders can be used as single-encoder systems in safety-related applications—such as in axes with linear motor. In addition to the safe processing of the position values, these encoders provide fault exclusions for the loosening of the mechanical coupling for various types of mounting.

## Optimized sealing design—Doubled sealing lips on the LC 1x5

The LC 115 features an optimized sealing design with two successive pairs of sealing lips. When compressed air is introduced into the scale housing, a very effective sealing air between the two pairs of sealing lips is the result. This optimally protects the interior of the encoder from contamination and provides better resistance against contamination and consequent failures.



## Reduced height of the LC 4x5 scanning unit

The height of the LC 4x5 scanning unit was reduced to the dimensions of the LS 400 series. The mounting holes remain identical to those of the LC 483, so that the LC 415 can be mounted unaltered to existing geometries.

## Mechanical Compatibility with LC 1x3 LC 1x5

The LC 1x5 can be mounted to the same mating dimensions as the LC 1x3. However, since a new housing profile is used, the mounting aid for aligning the fixing element for the scanning unit of the LC 1x3 (ID 547 793-01) cannot be used.

## LC 4x5

The LC 4x5 can be mounted to the same mating dimensions as the LC 4x3.

**For more technical information please contact our Sales Department !**

## HEIDENHAIN ROTARY ENCODERS IN ELEVATOR TECHNOLOGY

Every day, millions of people use elevators for transportation. Statistically speaking, every person on the earth rides an elevator once every 72 hours, and everyone considers the availability and reliability of elevators to be a matter of course.

The development of elevators began as early as the mid-1800's. At a trade show in New York, a man shocked a crowd of spectators as he stood on an elevator platform at maximum height and cut the platform's only bearer cable.



The platform sank by only a few centimeters before it immediately stopped. This pragmatic mechanic's revolutionary new safety brake ensured that the platform didn't crash. "All safe, gentlemen!" he announced. The man on the elevator platform was Elisha Graves Otis. With his safety brake, Otis practically founded the elevator industry. His invention made it possible for the first time that a building—and the fantasy of architects—could continue to grow and advance the course of urbanization. At present, half the world's population lives in cities; by 2050 it will be two-thirds of the approximately nine billion people then living.

Today, the "big four," consisting of Otis, Schindler, ThyssenKrupp and KONE, command about 60% of the world market.

As elevators consume up to 10% of a high-rise building's energy consumption, a core goal in this industrial sector, besides increasing comfort, is higher efficiency. Elevator efficiency gains can be attained that increase the load capacity while reducing required installation space, reduce noise

while increasing traversing speeds, lengthen maintenance intervals, and reduce environmental pollution in spite of increased performance.

The drive technology employed is an essential factor in achieving these goals. While years ago the high-volume segment still operated on drive designs with frequency-controlled gear motors and hydraulic installations (motors with pumps), the technology transformed itself in the late 1990s to direct drives (permanent-magnet actuated synchronous motors with high pole-pair numbers), also known as torque motors.

Thanks to the freedom from maintenance and the power density of torque motors, it was also possible to integrate them in the elevator shaft and do without the machine room. This option was as welcome to architects as to building owners because it enabled them to realize new building designs and savings.

The technology of these motors frequently requires an absolute position value to ascertain the rotor position so that the motor current is controlled with the correct phase. Also, the relatively low rated speed (60 to 1500 rpm) of these drive designs made high-resolution position acquisition a must to be adequate to the short control cycle times.

Here the story begins to become interesting for HEIDENHAIN with its program of rotary encoder products. Because of these requirements, the rotary encoders of the ExN 13xx series, which were developed for the high-quality drive control needed in machine tools and printing machines, can also find application in today's changing elevator drive technology. To be able to withstand the environmental conditions of an elevator shaft (e.g. concrete dust), some of the encoders have to be modified for a higher protection grade (sealing the housing and using sealed ball bearings).

This came together with a market requirement for providing large cable lengths from the encoder (up to 10 m) without using extensions. So, with relatively few R&D expenses, the ERN 1387 rotary encoder for servo motors became an ERN 487, and the ECN 1313 became an ECN 413 for elevator motors. See figure on the next page:



ECN/ERN 1300/400 series

ECN/ERN 100 series

In addition, the simple, purely axial installation of the encoders permits optimum integration in the motor design with mounted brake. Besides the encoders of the ExN 13xx/4xx series, which have established themselves in the low to medium motor power range, manufacturers also use the ExN 1xx series encoders for application in high-rise buildings.

The absolute encoder's EnDat interface provided customers with other benefits. Electrical zero point setting and the capability to save customer-specific data in the encoder enable them to install and configure the encoder more efficiently. The new opportunities of encoders with optimized scanning and EnDat 2.2 help HEIDENHAIN to ensure a competitive technological edge.

The encoder diagnostics capability and the transmission of motor winding temperature over the EnDat 2.2 protocol on the ECN 1325 should provide elevator manufacturers with new possibilities for monitoring and timely maintenance tips.

Almost all reputable manufacturers of servo amplifiers for this market segment feature an EnDat interface option for the encoder input. By now this has allowed an impressive market acceptance of HEIDENHAIN encoders for torque motors.

Particularly in China, the primary growth region for new installations and motor manufacturing (also for export to the USA, Europe and the Far East), the demand for HEIDENHAIN encoders is extremely strong.

For the rapidly growing Indian elevator market as well, HEIDENHAIN is a preferred partner for all the major manufacturers.

## New Generation of Angle Encoders with EnDat 2.2 Interface

The absolute angle encoders from HEIDENHAIN with integral bearings and hollow shafts have long been setting the standard for angular measurement in the range of a few angular seconds. Particularly on rotational axes, such as rotary tables and tilting axes on machine tools, they are the best solution for position and speed control. Now the existing RCN 200 and RCN 700/800 series have been completely revised. The angle encoders were improved with new scanning technology, evaluation electronics and changed mechanical design, and are now offered in the RCN 2000 and RCN 8000 series. In addition, a new series RCN 5000 is available with a hollow shaft diameter of 35 mm.

### Advantages of the new absolute angle encoders:

The new scanning method permits a very high signal quality and at the same time even greater resistance to contamination. Thanks to the new scanning and evaluation electronics, it became possible to dramatically reduce the influence of the rotational speed on the generation of position values.

The new design of stator couplings feature even better behavior than the previous series in axial and radial deflection and torsional rigidity. Together with the new sealing design of the encoders, relatively large mounting tolerances are now permissible without restricting operating functions and accuracy.

The cable is connected with the new angle encoders by a quick disconnect, i.e. without need of a tool.

The EnDat interface makes extensive monitoring and diagnosis of an encoder possible without additional lines.

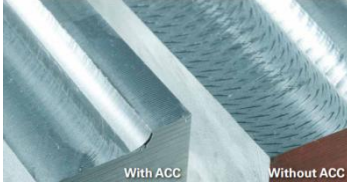


## Dynamic Efficiency: More chips in less time

Heavy machining—roughing at high cutting power—is primarily about removing as much material as possible in the shortest time. The forces that result from the cutting process place an extreme load on the machine and tool. With "Dynamic Efficiency," HEIDENHAIN offers innovative control functions that optimize the removal rate, maximize the tool life and minimize the load on the machine. Users can significantly increase the process reliability in heavy machining and roughing so that manufacturing as a whole becomes more efficient.

Dynamic Efficiency comprises three software functions:

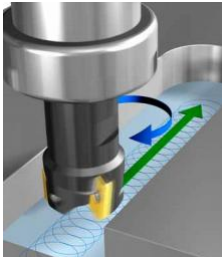
- Active Chatter Control (ACC): This option reduces chatter tendencies and permits greater infeeds



- Adaptive Feed Control (AFC): This option controls the feed rate depending on the machining situation



- Trochoidal milling: Cycle for the roughing of slots and pockets in a way that eases the load on the tool and the machine



Each function in itself provides advantages in the machining process. However, they can also be ideally combined to achieve decisive improvements.

- Reduced machining time thanks to higher material removal rates (ACC, AFC, trochoidal milling)
- Tool monitoring (AFC)
- Longer tool service life (ACC, trochoidal milling)

With Dynamic Efficiency, the manufacturing process becomes faster, easier on the machine and tool, and as a result, more efficient and economical.

## Dynamic Precision: Exact machining in the least amount of time

Under the concept of Dynamic Precision, HEIDENHAIN describes a group of functions for TNC controls that significantly improve the contouring accuracy of machine tools even at high feed rates and in complex contouring moves. The dynamic accuracy of a machine tool is determined by the feed-axis acceleration required in order to produce precise movement between the workpiece and tool. When feed axes are accelerated, machine components can be deformed by inertia forces or even begin to vibrate. With Dynamic Precision, the dynamic errors at the tool center point (TCP) that arise during machining are significantly reduced so that NC programs are run with better component accuracy and surface quality, and even noticeably faster.

The functions of Dynamic Precision are available as options for HSCI-based milling controls from HEIDENHAIN. They can be applied individually as well as in combinations.

- CTC – compensation of acceleration-dependent position errors at the tool center point (TCP), thereby increasing accuracy in acceleration phases
- AVD – active vibration damping for better surfaces
- PAC – position-dependent adaptation of controller parameters
- LAC – load-dependent adaptation of controller parameters enhances accuracy regardless of load and age
- MAC – motion-dependent adaptation of controller parameters

Through a significant reduction of error at the tool center point during the highly dynamic execution of NC programs, Dynamic Precision makes a valuable contribution to improving the performance of machine tools.

The users' demands for reduced scrap, faster machining times, increased workpiece accuracy, and avoidance of manual rework can be met very effectively with the Dynamic Precision functions.



## Accuracy campaigns

During 2014 too, like in the last years, HEIDENHAIN India continued to conduct accuracy campaigns in partnership with the IMTMA as well as seminars at various Machine Tool OEMs and large machine tool users.

This accuracy campaign was to educate both builders and users of machine tools about the benefits of closed loop system on CNC machines and HEIDENHAIN's efforts in this area. The programmes were held at **Bangalore, Pune and Rajkot** and were very well received by the audience which consisted of well known companies from the machine tool fraternity.



The road show will continue also for the rest of 2014 and next year. To find the next **HEIDENHAIN seminar in your area**, please contact us at [sales@heidenhain.in](mailto:sales@heidenhain.in)

## It doesn't get more accurate than this !

The HEIDENHAIN measuring laboratory has been accredited since 1994 to perform measurements as per DIN EN ISO/IEC 17025. The German Accreditation Body (DAkkS), which is the successor organization to the German Calibration Service (DKD), regularly inspects and monitors the measuring laboratory and certifies HEIDENHAIN its personnel and metrological competence within the framework of the accreditation.

The HEIDENHAIN measuring laboratory performs the calibrations specifically for digital linear encoders and digital angle measuring systems. If the highest possible accuracy is necessary, then measuring equipment identical to that of the PTB, Germany's national metrology institute (which has the last word on all measurements in Germany), is used. This accuracy reflects the quality expectations from HEIDENHAIN since that's as accurate as it gets!

Measurand	Measuring range	Smallest measurement uncertainty
Angles: Digital angle measuring systems (rotary encoders)	Up to 360°	0.02"
Digital linear encoders	0 to 3000 mm	6 nm + 50 x 10 <sup>-9</sup> x l (l is the measured length)

### How long is a meter anyhow?



The original meter was first introduced in France in 1793, where it was defined to be the ten-millionth part of the distance from the North Pole to the equator, passing through Paris. It is

an X-shaped scale made of a platinum-iridium alloy, and is stored at the Bureau International des Poids et Mesures in Paris. The original meter was not replaced until 1960, when it was defined by way of physical constants. Today a meter is defined to be the length of the path travelled by light in a vacuum during 1/299,792,458 of a second. A practical realization of the highest accuracy of this definition is achieved with an iodine-stabilized helium-neon laser, such as the one HEIDENHAIN uses for calibration.

**Don't forget to visit HEIDENHAIN at upcoming exhibitions:**



**October 15<sup>th</sup>-18<sup>th</sup> at Mumbai Exhibition Centre**

## Training Schedule:

As you may be aware, HEIDENHAIN India is conducting these training courses at our state of the art Training Centre located at Chennai with a mix of theoretical and practical classes since our inception in 2008. These courses focus on two major branches, measuring systems and controls systems. The course on measuring systems spans 3 days while controls spans 4 days.

This programme has been very popular in the past with participants from major OEMs and end-users who use our products. The reviews have been excellent and most companies repeat nominations. The participants are either from service / maintenance functions or machine users.

Registrations and course content are available online. Please visit <http://training.heidenhain.in> for more information!

The detailed schedule is given below. We look forward to your nominations!

### TRAINING PROGRAMMES SCHEDULE FOR 2014

#### TRAINING ON MEASURING SYSTEMS

MONTH	DATES
July	16-18
September	17-19
November	12-14

#### TRAINING ON iTNC 530 CONTROL

MONTH	DATES
August	5-8
October	7-10
December	9-12

## Your contact to HEIDENHAIN INDIA

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