



# Sensors and Systems for the Steel Industry



[www.delta-usa.com](http://www.delta-usa.com)

DELTA provides a wide range of high performance sensors and measuring systems for continuous casters, hot rolling mills, processing lines and other extreme condition applications.

Thanks to over 60 years of experience in the severe steel mill environment, DELTA has the know how to satisfy the most demanding applications.

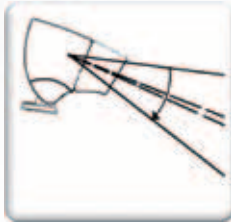
## Sensors

- Hot Metal Detectors
- Infrared Loop Scanners
- Optical / Laser Barriers
- Proximity Switches
- Encoders
- Smart Linear Cameras
- Laser Measuring Sensors

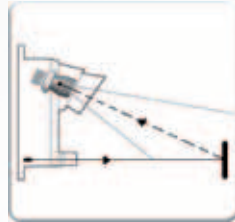
## Measuring Systems

- Stereoscopic Width Gauge
- Crop Optimization System

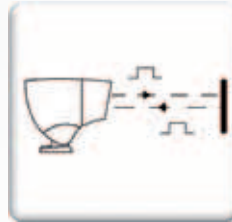
## Technologies



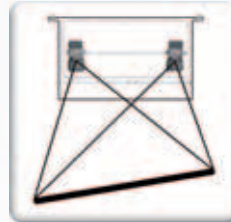
**SCANNING**



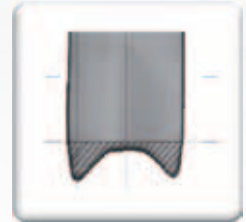
**TRIANGULATION**



**TIME OF FLIGHT**



**STEREOSCOPY**

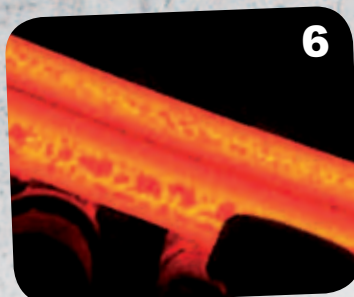


**IMAGE ANALYSIS**

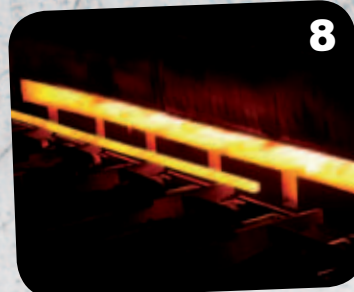
The core technologies used at DELTA include: infrared scanning (Rota-Sonde) for detection and position control of hot products, laser triangulation (Trilas TL) and laser time of flight (Dilas FT) for distance and dimensions measurement, stereoscopic vision (DigiScan) for width gauge and image processing (CropVision) for crop optimization.

These technologies are optimized for the extreme conditions of the metal industry and particularly for non-contact detection and measurement of products at very high temperature.

**Continuous  
Caster**



**Bloom / Billet  
Reheat Furnace**



**Long Product  
Rolling Mill**



Typical



## Application oriented

DELTA has the expert ability to determine the appropriate sensor to meet the unique demands within the steel industry. DELTA's design engineers expand sensors capabilities and features to keep pace with the ever changing modern industrial processes.



## Accuracy and Reliability

DELTA has invested years of experience creating reliable and accurate sensors that stand the toughest conditions created by modern steel production. The scanning infrared and laser sensors from DELTA are the reference in the metal industry for detection, positioning of the edges and dimension measurement of product at very high speed and at temperature from cold to 1300 °C.

Each sensor consists of waterproof cast aluminium body and electronics that exceed most stringent specifications. Many sensors utilize self diagnostics with tests and alarms that insure proper operation and provide the necessary inputs essential in modern processing.



## DELTA, the Reference for Sensors and Measuring Systems for the Steel Industry

Slab Reheat Furnace



Hot Strip Mill & Plate Mill



Measurement Systems



Cold Rolling Mill



# Product Line

## Sensors

### for steel mill automation

### The end result of over 60 years of experience !

DELTA's state-of-the-art features include:

- Special designs to withstand severe steel mill environmental conditions
- Rugged construction with cast metal housing, water cooling and air purging
- Sensors designed for easy installation, operation and maintenance



### *Hot Metal Detectors*

The scanning optical system, in association with state-of-the-art infrared photocell technology, is the optimal solution for accurate, fast and reliable detection of product, whatever its size and its temperature. The Scanning Hot Metal Detector Rota-Sonde DC works under adverse conditions such as water, steam, dust or scale. It is particularly well adapted to applications where the change of the process results in a significant variation of the temperature of the product or a variation of its emissivity factor.



### *Infrared Loop Scanners*

The Infrared Loop Scanner Rota-Sonde TS optically scans the field to be controlled and does not need any optical adjustment. It accurately measures the size of the loop on wire, rod and profile mills, even for special metals, and in the presence of steam and fumes.

DELTA infrared sensor TS controls loops, centers hot strip or plate and provides positioning information for a wide range of applications.

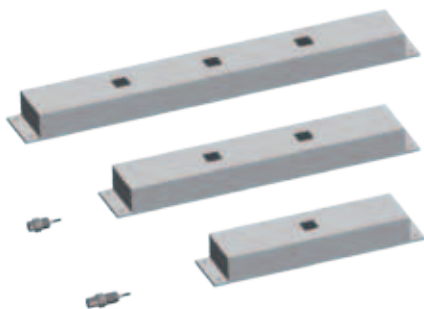


### *Optical / Laser Barriers*

The Optical Barriers V3 and VE/VR have been designed with aluminium cast housing, optional air purge and water-cooling for use in harsh steel mill environments.

Laser Barriers V5, VL/VRG and VLP21/VRH are used in applications where steam, dust or fumes are heavy, as in the case of a water spray chamber, a scarfing machine or a reheating furnace.

High temperature reflectors are able to work in ambient temperatures up to 400 °C.



### *Proximity Switches*

The Long Range Proximity Switches IG120 or IW100 are housed in sturdy fiberglass cases and are completely sealed from dust and moisture. They have a sensing range up to 120 mm and a sensing field up to 1200 mm.

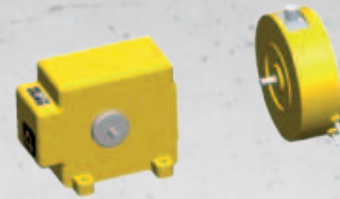
The High Temperature Inductive Proximity Switches IH can work in ambient temperatures up to 180 °C.

The MHM Magnetic Proximity Switches are robust sensors that are able to work in the difficult conditions of the steel industry.



## Encoders

The Heavy-duty Incremental Encoders GDP and GDC are used to control motor speed, to measure length or position on casters and rolling mills, in harsh environments with shocks, vibrations, water and high temperatures (up to 120 °C).



## Smart Linear Cameras

The TSP is a high-resolution Linear Camera for non-contact and on-line measurement. TSP directly delivers an analog signal proportional either to the edge position, to the centerline position, or to the width of the product. The DR3000 can detect any small section product in a large field of view.



## Laser Measuring Sensors

The Trilas TL series and Dilas FT series are digital, high resolution, non-contact laser distance meter sensor.

The target may be hot (up to 1300 °C) or cold, stationary or moving.

By combining several sensors, dimensional measurements and shape readings can be achieved.

Typical applications include slab width and length measurement on continuous caster; slab, bloom, billet positioning; measurement on forging machine; bloom, billet length; diameter measurement; strip loop control.



## Measuring Systems

### Stereoscopic Width Gauge

The DigiScan XD4000 is designed for very high accuracy and reliability in the extreme conditions of hot mills. Two high resolution and high speed digital cameras are mounted on an optical bed for stereoscopic measurement. Advanced filtering and algorithms make the sensor insensitive to the hot rolling mill environment (water, variation of temperature of the product edges...).

Compact and robust, with sealed aluminium housing, easy to install and maintain.

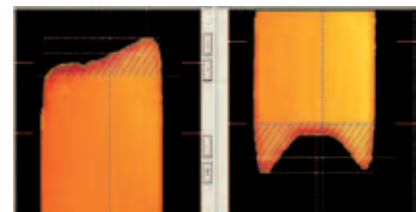
The gauge is delivered calibrated ready to install.

The system includes verification fixture for automatic accuracy confirmation.



### Crop Optimization System

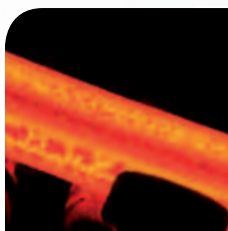
The CropVision CV3000 is based on an area camera capturing the head and tail images in a fraction of a second. This makes it insensitive to speed variation of the bar. Advanced edge detection software determines the head and tail shape. Several sets of cut strategy are stored in the system and can be selected for different range of rolled products to increase the yield.



# Continuous Caster

## Slab Caster

- Cut to length with scanning HMD Rota-Sonde DC and heavy duty Pulse Generator GDC.
- Slab width measurement with Laser Triangulation sensors Trilas TL.
- Dummy bar detection with Laser Barriers V5 or Optical Barrier VE/VR.



In order to deliver the right products to the hot rolling mills, it is important to measure the dimensions of slabs, billets or bloom produced in the continuous caster. DELTA has designed special laser sensors able to make non-contact measurement with high accuracy on hot products, and to withstand the difficult environment of the continuous caster. Typical applications of DELTA sensors include the detection of the product at different locations such as before marking machine or deburring machine.



## Key products



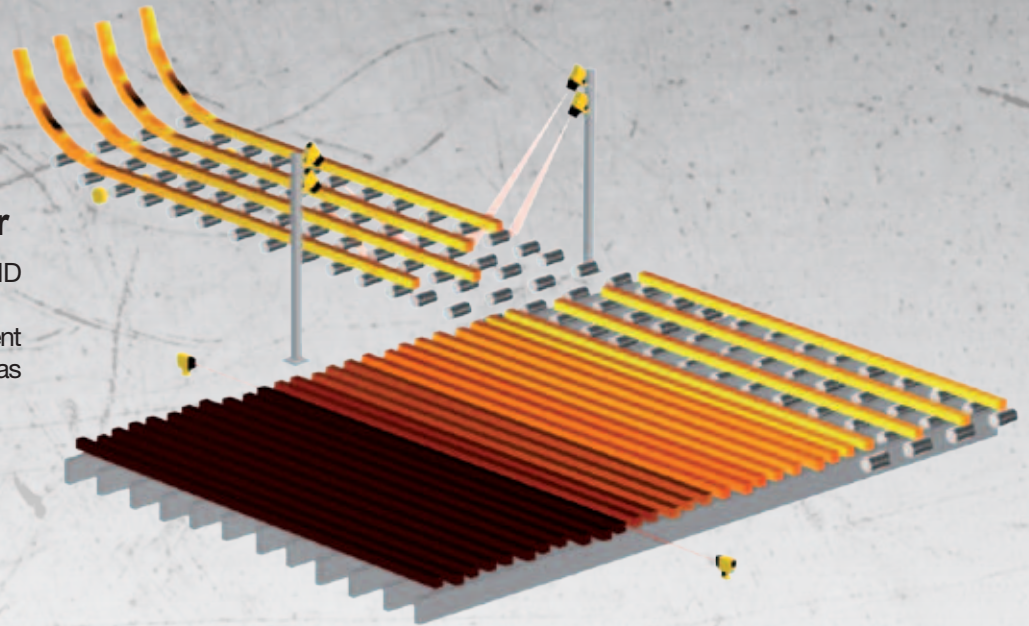
**DC**  
series

**TL & FT**  
series

**V**  
series

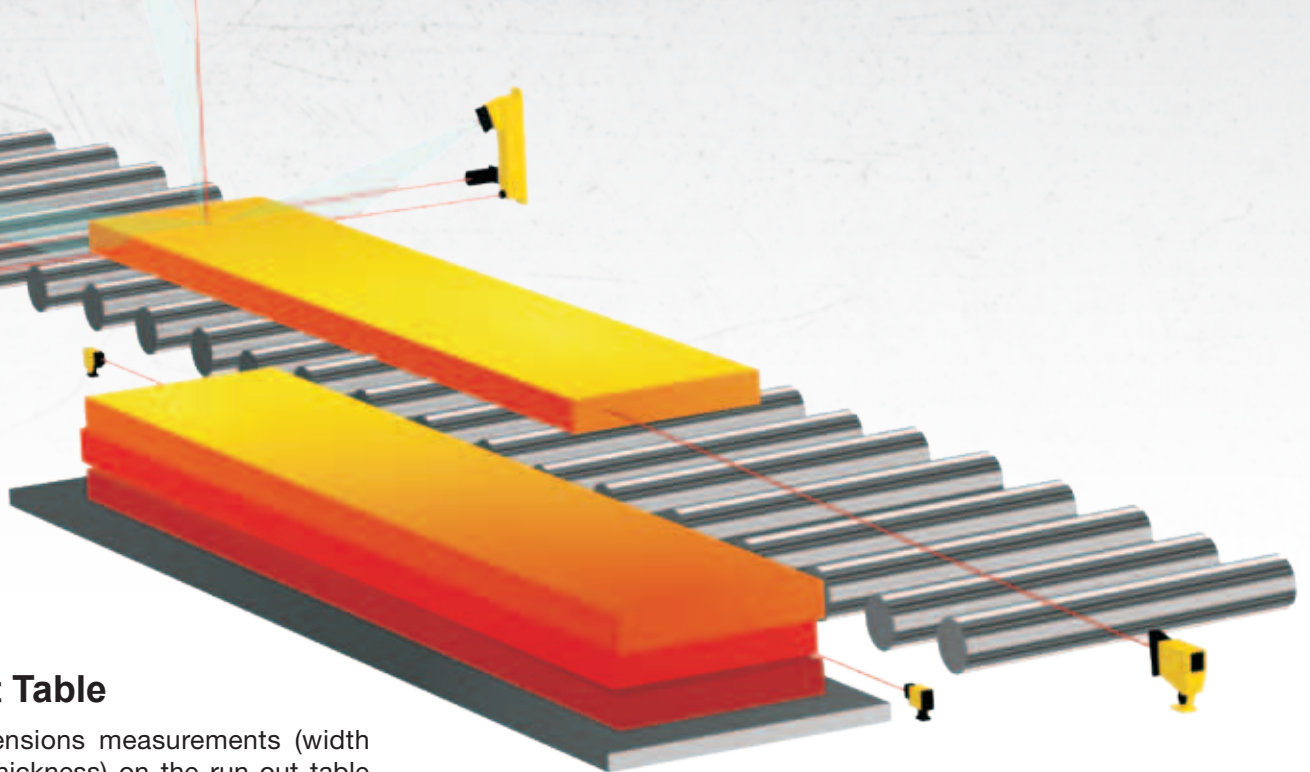
## Bloom / Billet Caster

- Detection with scanning HMD Rota-Sonde DC.
- Bloom / Billet length measurement on the cooling bed with two Dilas FT sensors.

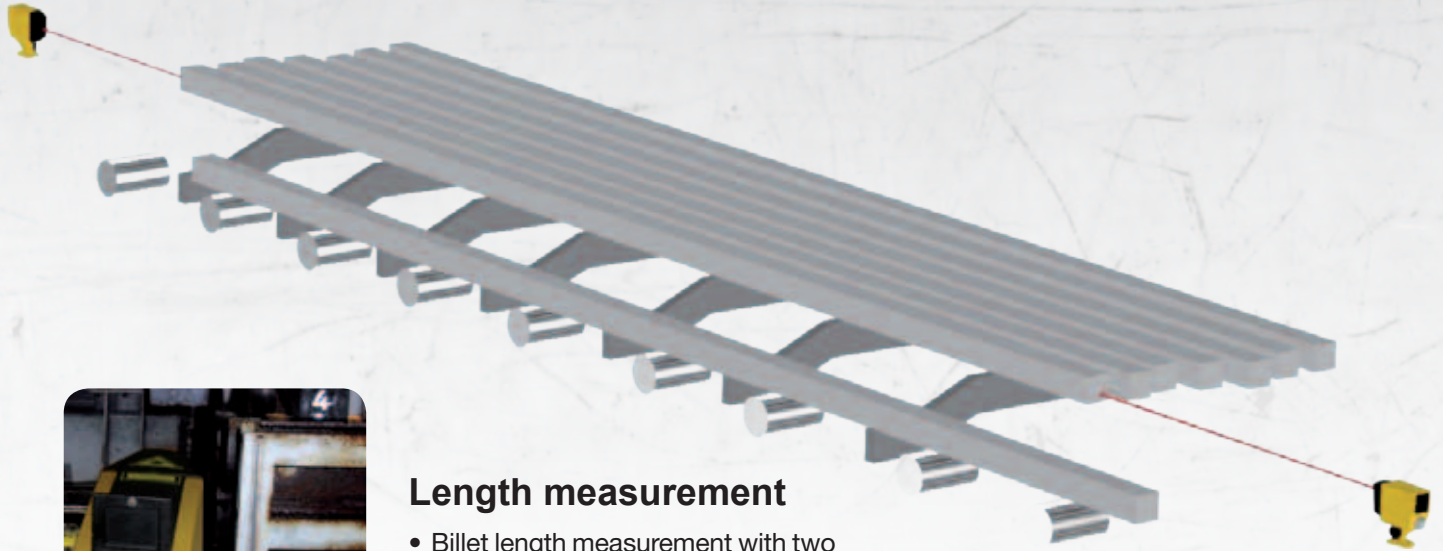


## Run-Out Table

- Slab dimensions measurements (width length – thickness) on the run-out table just before the marking machine with laser triangulation sensors Trilas TL, time of flight Laser Sensor Dilas FT and Laser Barrier V5.
- Control of the slab pile level with high power Optical Barrier VE/VR.

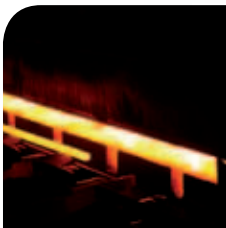


# Bloom / Billet Reheat Furnace



## Length measurement

- Billet length measurement with two Laser Sensors Dilas FT.

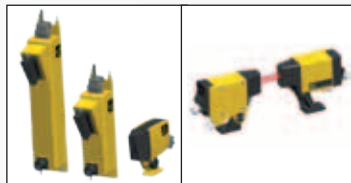


The charging operation is critical. It is important before moving the billet or bloom into the furnace to know the length and the position of the head and tail in order to avoid any damage.

On the discharging side, it is also important to detect the product and to know its position and eventually the skew.



## Key products



**TL & FT  
series**

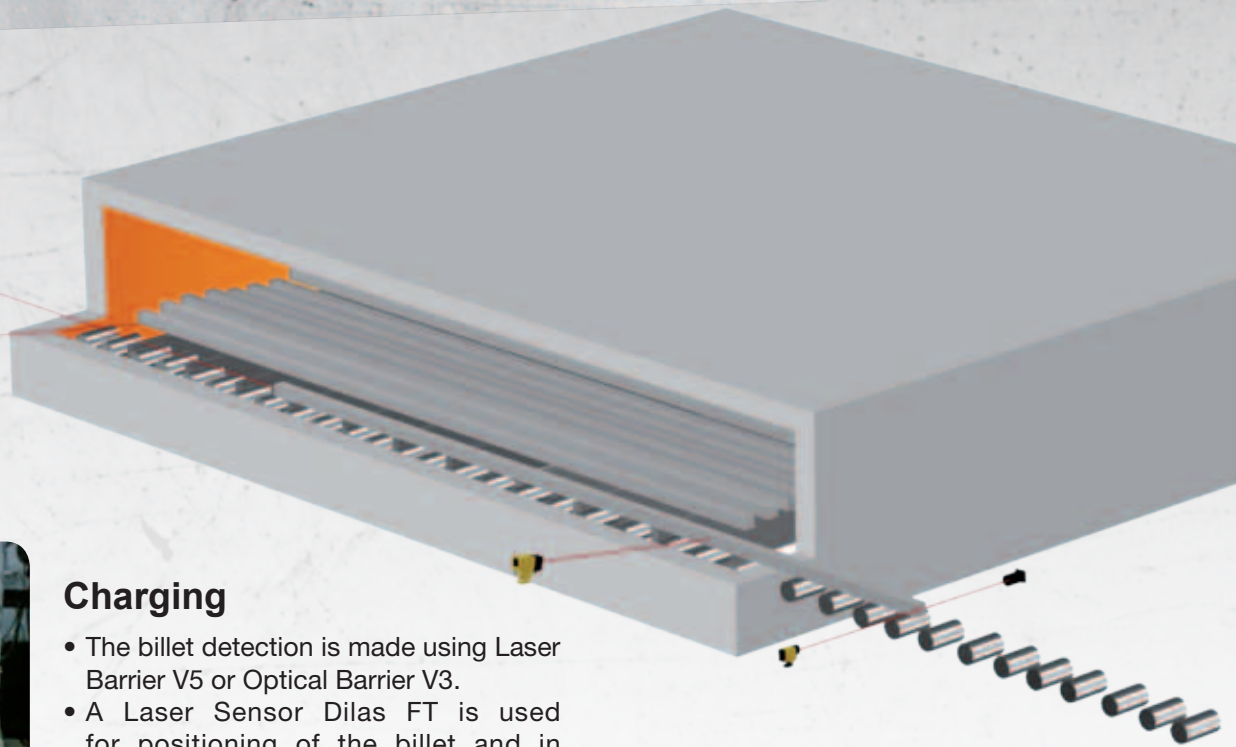
**VLP21/VRH  
series**





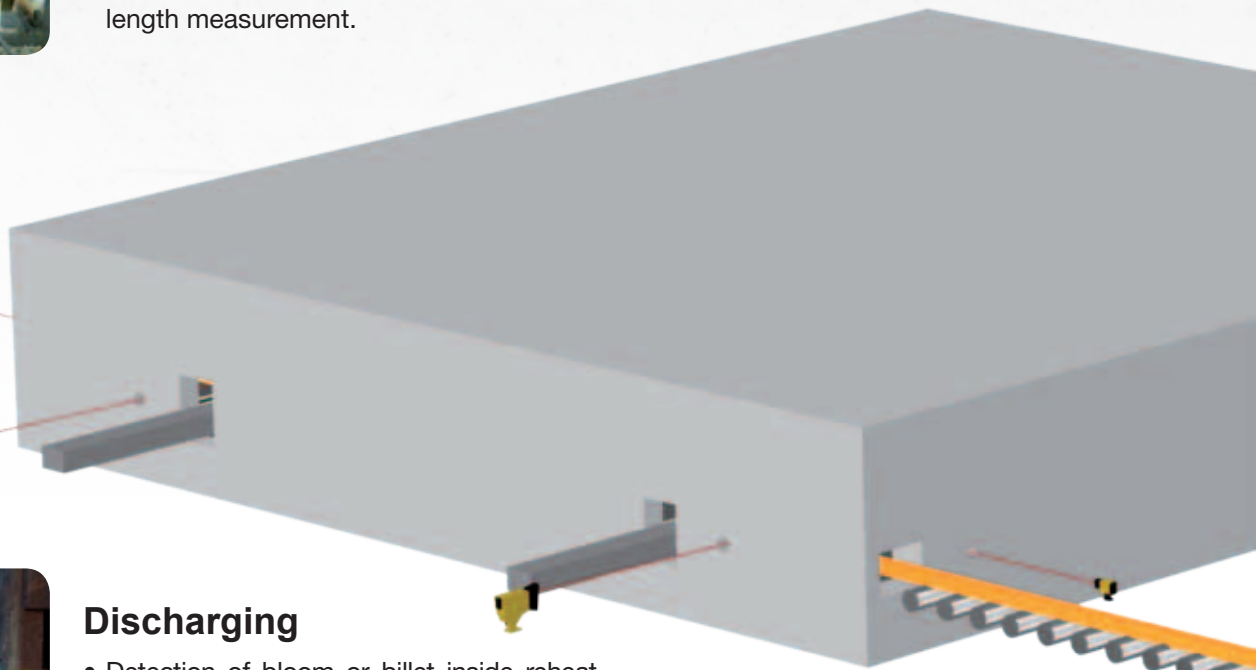
### Charging

- The billet detection is made using Laser Barrier V5 or Optical Barrier V3.
- A Laser Sensor Dilas FT is used for positioning of the billet and in combination with a Laser Barrier V5 for length measurement.

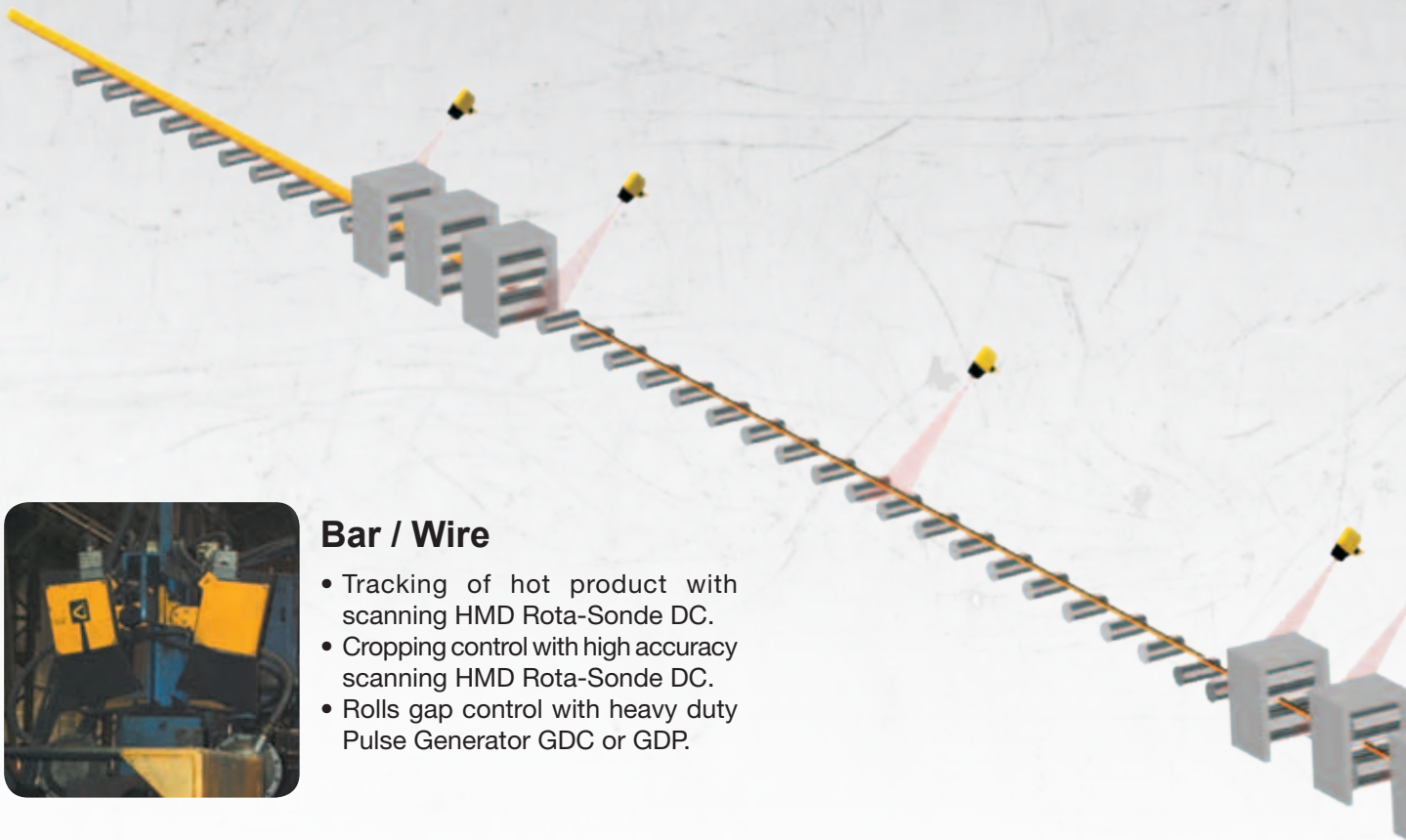


### Discharging

- Detection of bloom or billet inside reheat furnace with high power Laser Barrier VLP21/VRH.
- Measurement of the position and skew of the billet or bloom with Laser Sensors Dilas FT4200.



# Long Product Rolling Mill



## Bar / Wire

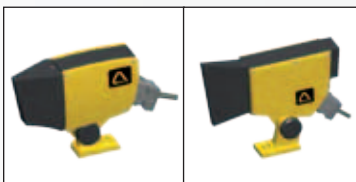
- Tracking of hot product with scanning HMD Rota-Sonde DC.
- Cropping control with high accuracy scanning HMD Rota-Sonde DC.
- Rolls gap control with heavy duty Pulse Generator GDC or GDP.



Hot Metal Detectors (HMD) are designed for tracking hot products at the different stages of the hot rolling process. In critical operation such as for the control of the shear (head/tail crop, or cut to length) it is important to rely on accurate sensors which will detect in less than 1 ms the head and tail, independently of the position, size or temperature of the bar. For these applications, scanning HMD are recommended due to their narrow lateral field. The use of the latest technology of infrared detector allows the detection of products down to 180 °C, for detection after water quenching.



## Key products



**DC**  
series

**TS**  
series

## Bar positioning

- Non-contact measurement of the position of a stopper with Laser Sensor Dilas FT.



## Bar detection

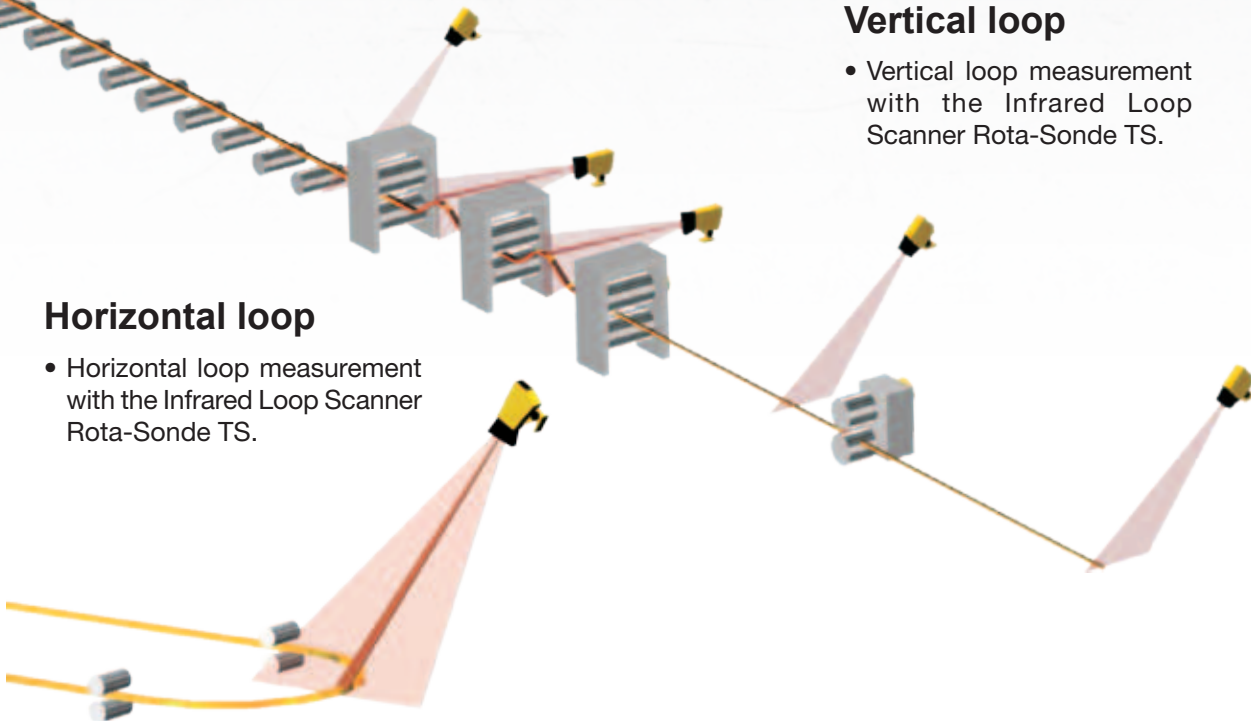
- Detection of a bar with the scanning HMD Rota-Sonde DC.

## Vertical loop

- Vertical loop measurement with the Infrared Loop Scanner Rota-Sonde TS.

## Horizontal loop

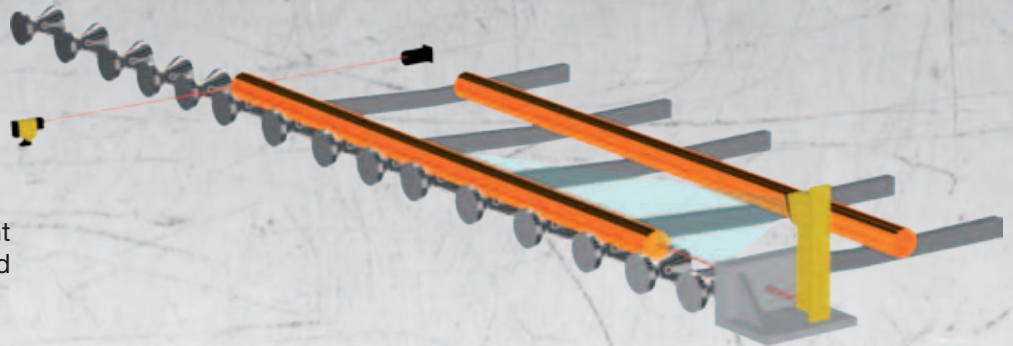
- Horizontal loop measurement with the Infrared Loop Scanner Rota-Sonde TS.



# Long Product Rolling Mill

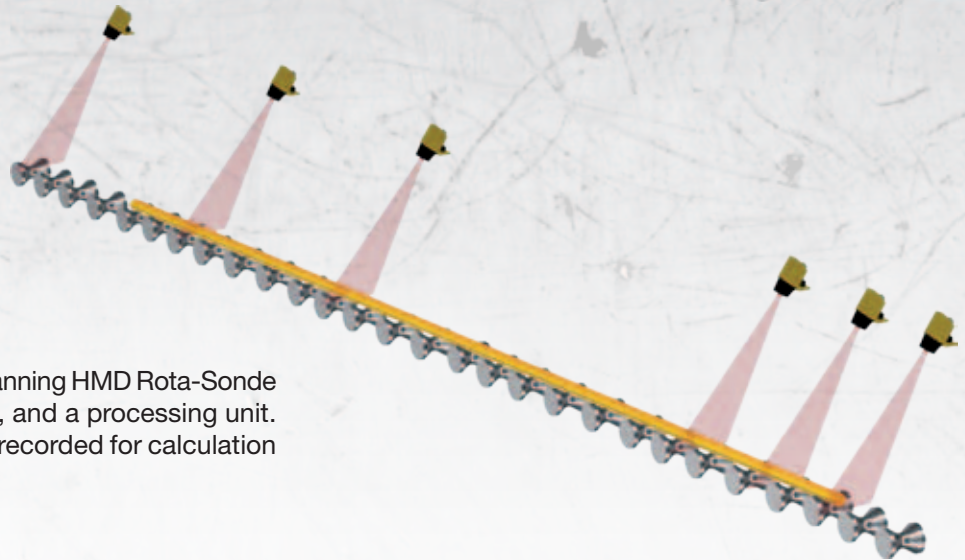
## Length measurement

- On the fly length measurement with Laser Sensor Trilas TL and Laser Barrier V5.



- On the fly length measurement

This system includes a set of scanning HMD Rota-Sonde DC detecting the head and tail, and a processing unit. The detection time is precisely recorded for calculation of the speed and its variation.



The optimization of hot rolling processes requires the use of accurate and reliable sensors for detection and measurement. DELTA has developed a range of non-contact sensors able to survive the extreme conditions of the steel mills environment: high ambient temperature, high infrared radiation level, dust and steam.



## Key products



**DC**  
series

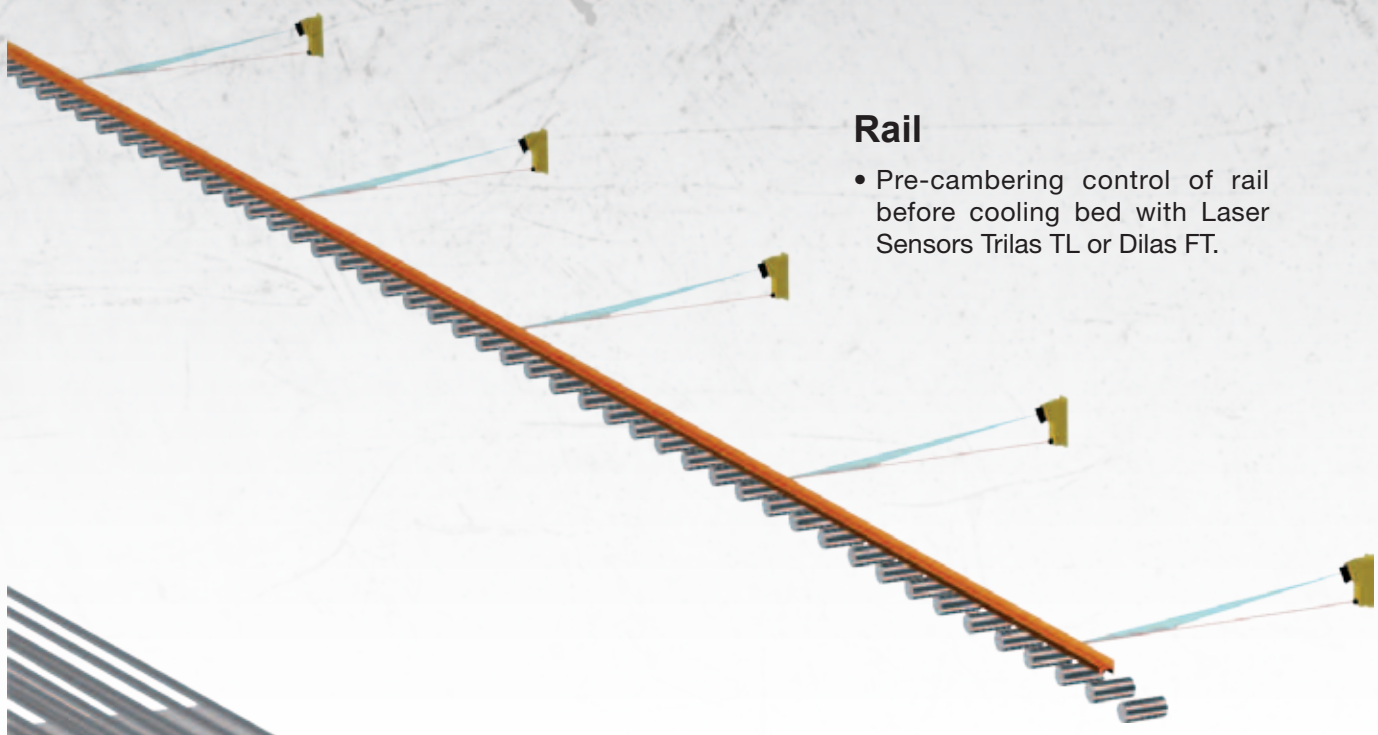
**TL & FT**  
series

**V**  
series



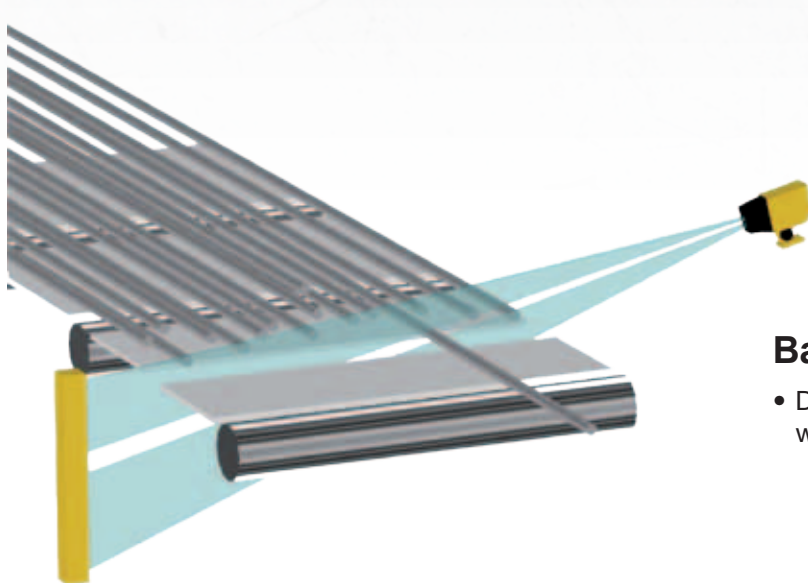
### Bloom

- Bloom width measurement after blooming mill with Laser Sensor Trilas TL.



### Rail

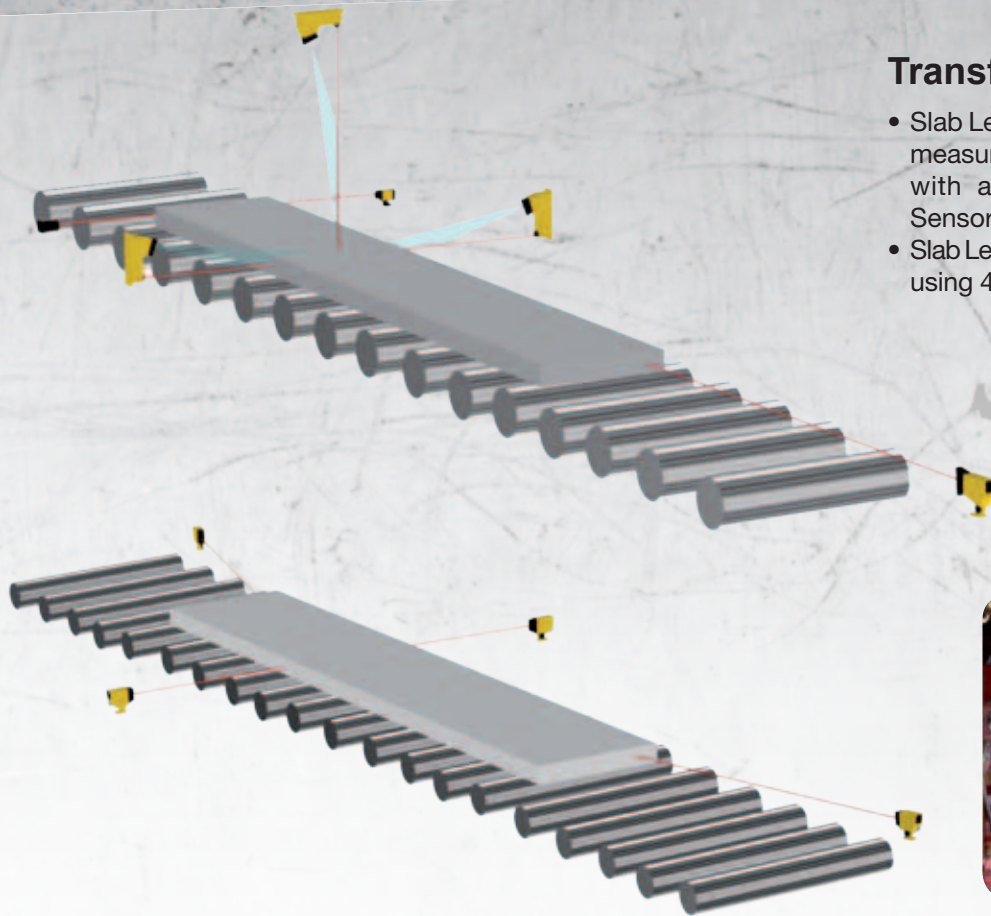
- Pre-cambering control of rail before cooling bed with Laser Sensors Trilas TL or Dilas FT.



### Bar

- Detection of small bar on a wide table with Linear Camera DR3000.

# Slab Reheat Furnace



## Transfer table

- Slab Length – Width – Thickness measurement on a transfer table with a combination of Laser Sensors Trilas TL and Dilas FT.
- Slab Length – Width measurement using 4 Laser Sensors Dilas FT.



Typical applications in slab reheat furnace include detection, positioning and measurement of slabs on the charging table. DELTA sensors are able to work even on the very rough surface of slabs and to survive to the vibration and the heat especially in case of hot charging. DELTA has also developed some unique sensors for detection of slabs inside reheat furnace.

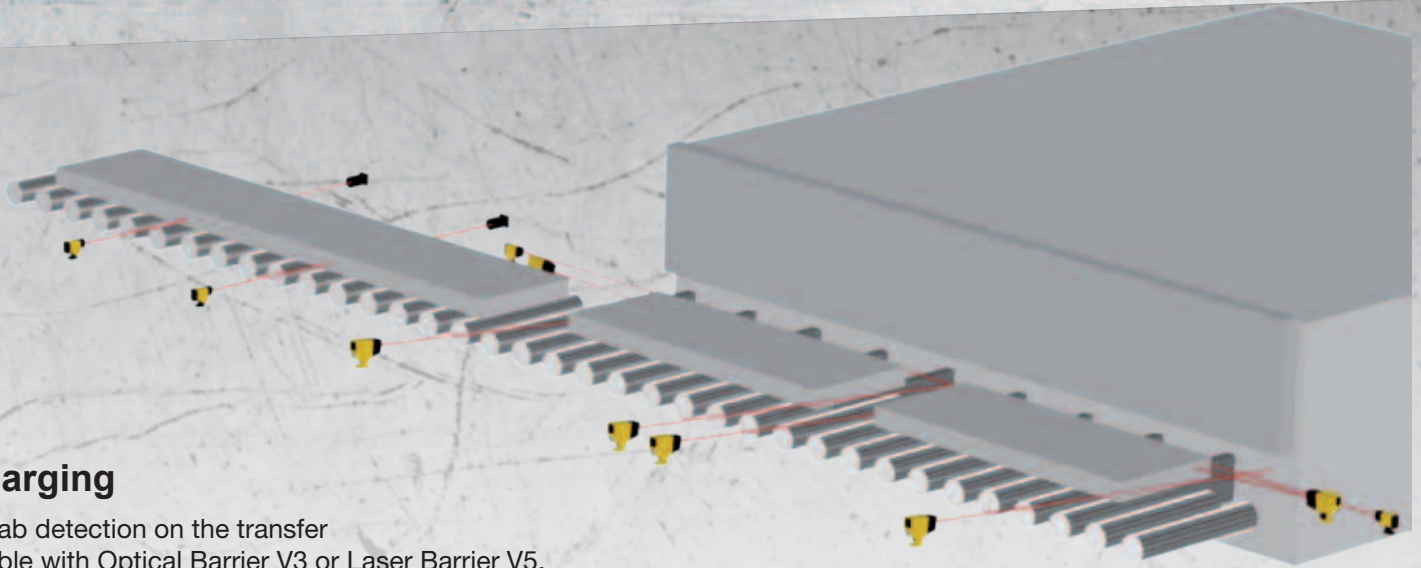


## Key products



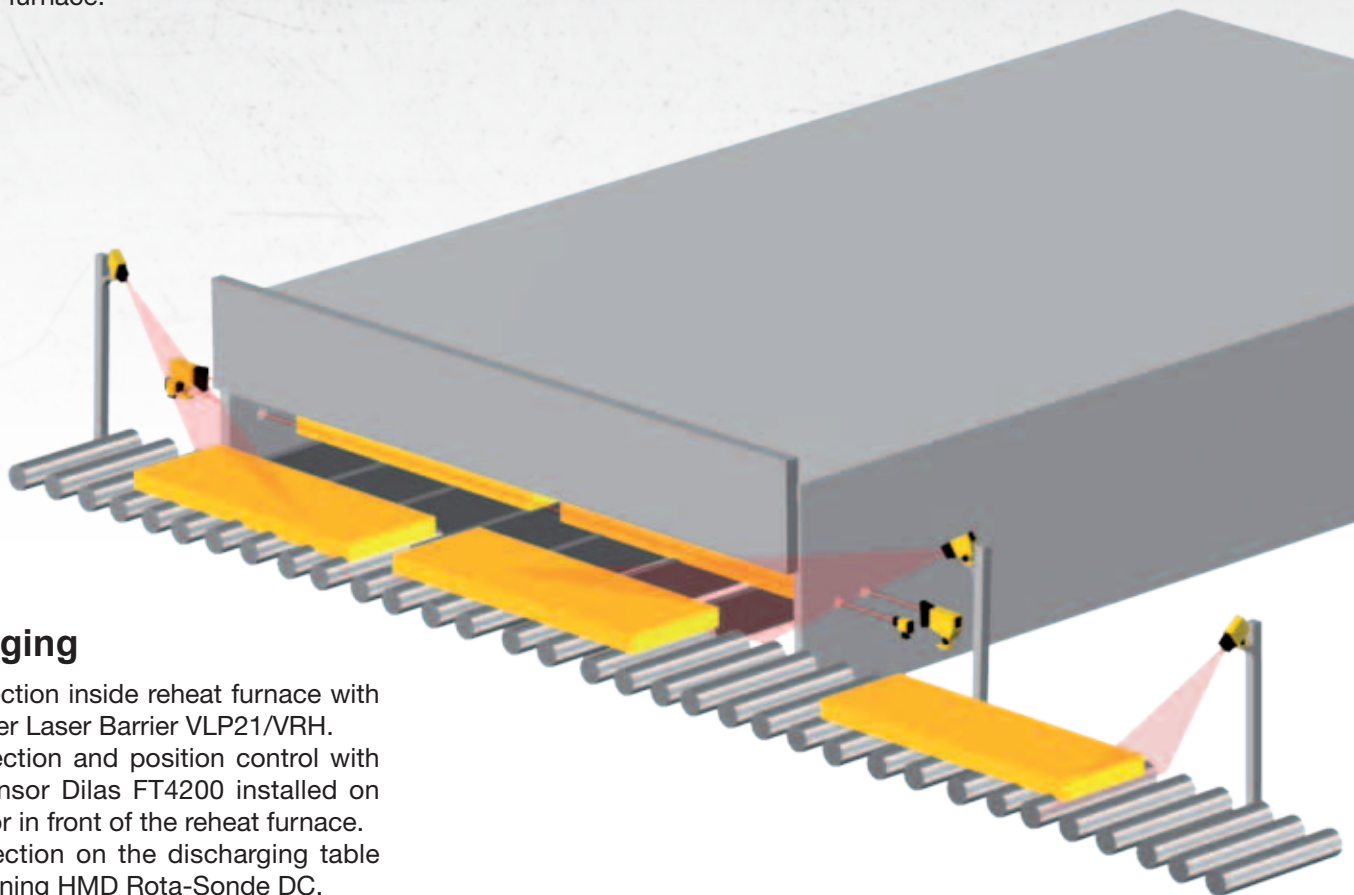
**TL & FT  
series**

**V  
series**



## Charging

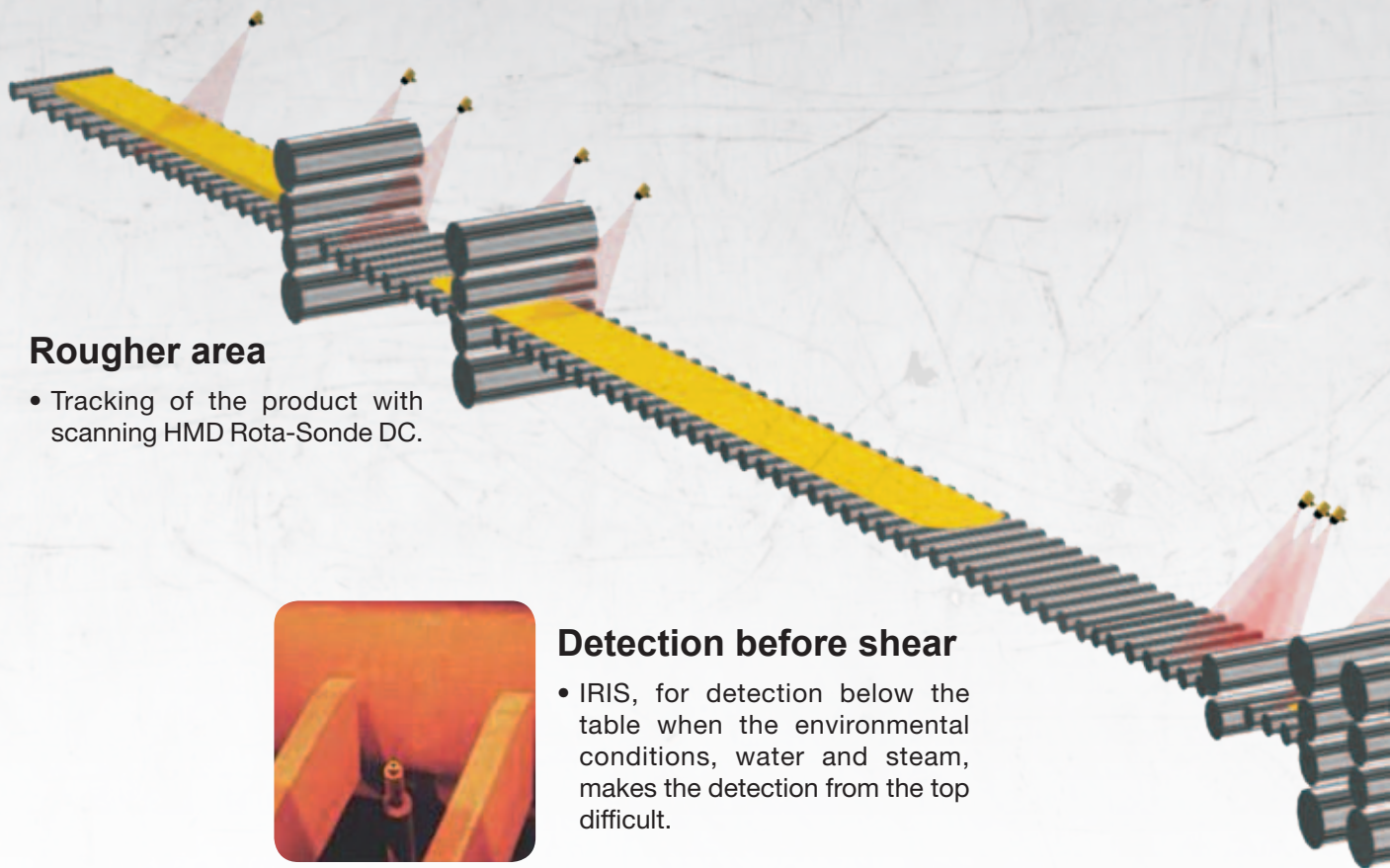
- Slab detection on the transfer table with Optical Barrier V3 or Laser Barrier V5.
- Slab detection in front of the reheat furnace with Laser Detector Dilas FT.
- Slab detection and width confirmation when pushing the slab with high power Optical Barrier VE/VR.
- Slab accurate positioning with Laser Sensors Dilas FT before pushing the slab inside the furnace.



## Discharging

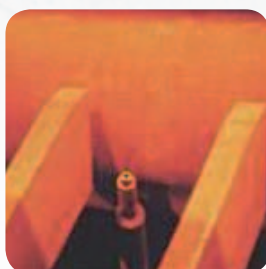
- Slab detection inside reheat furnace with high power Laser Barrier VLP21/VRH.
- Slab detection and position control with Laser Sensor Dilas FT4200 installed on the side or in front of the reheat furnace.
- Slab detection on the discharging table with scanning HMD Rota-Sonde DC.

# Hot Strip Mill & Plate Mill



## Rougher area

- Tracking of the product with scanning HMD Rota-Sonde DC.



## Detection before shear

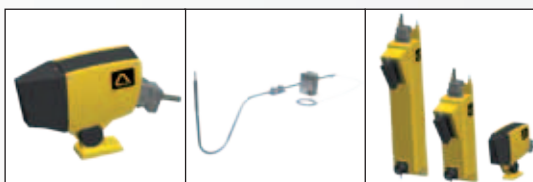
- IRIS, for detection below the table when the environmental conditions, water and steam, makes the detection from the top difficult.



From the exit of reheat furnace to down coiler, DELTA hot metal detectors, infrared scanner and laser measuring sensors are extensively used for detection, edge positioning and measurement. They are able to work with high accuracy and reliability in the harsh environment of hot mills: high ambient temperature, heat radiation, steam, water, dust...



## Key products



**DC**  
series

**IRIS**  
series

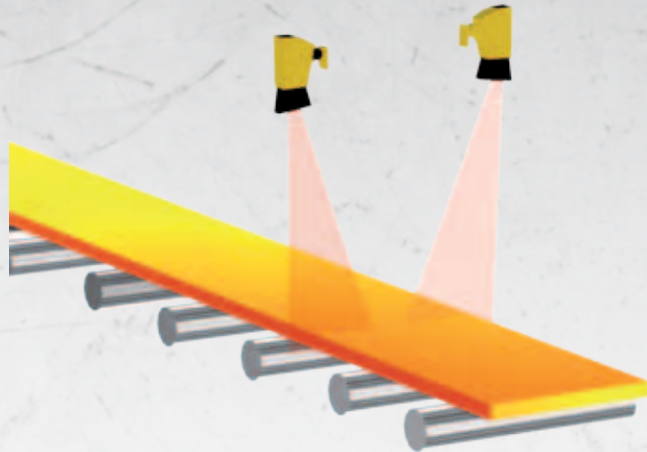
**TL & FT**  
series





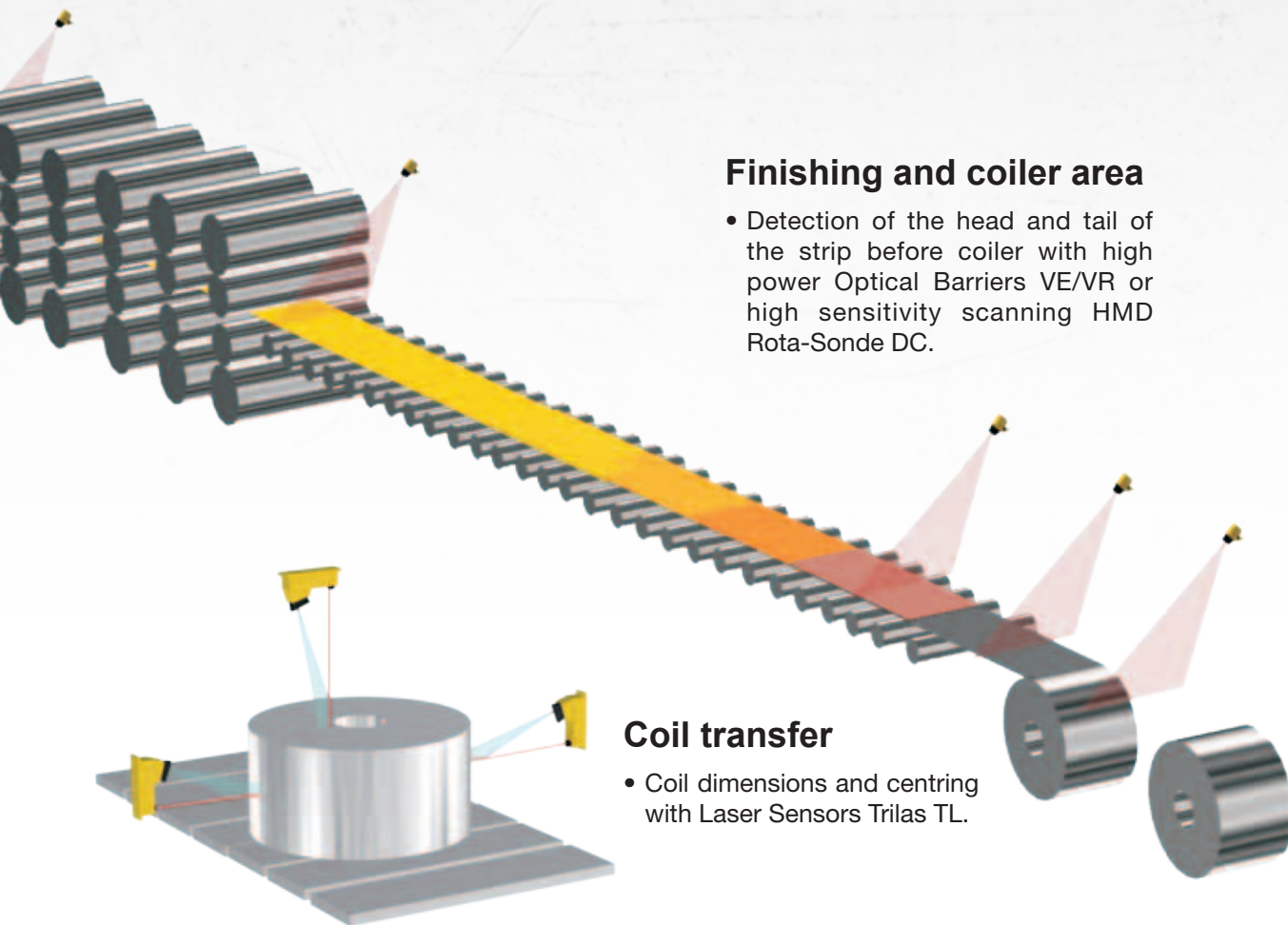
### Centring

- Strip centring with Infrared Loop Scanner Rota-Sonde TS.



### Finishing and coiler area

- Detection of the head and tail of the strip before coiler with high power Optical Barriers VE/VR or high sensitivity scanning HMD Rota-Sonde DC.

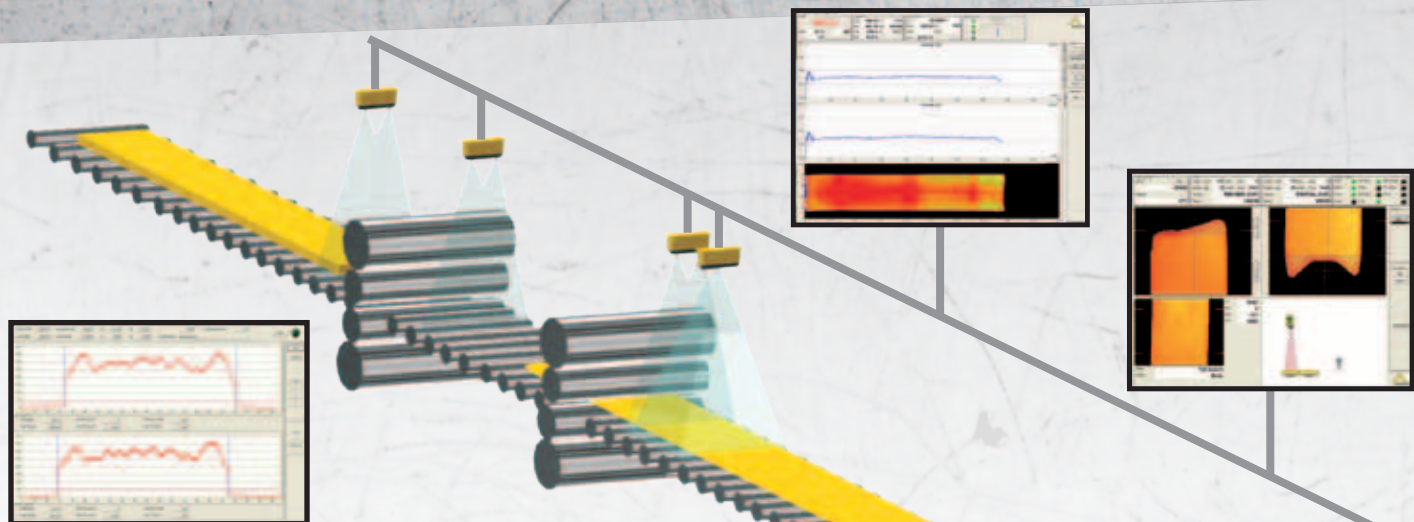


### Coil transfer

- Coil dimensions and centring with Laser Sensors Trilas TL.



# Measurement Systems for Hot Strip Mill and Plate Mill



## Stereoscopic Width Gauge

- The Stereoscopic Width Gauge DigiScan XD4000, designed for installation above the roll tables in hot mill is state-of-the-art technology for measuring the width of strip / plate product. For use in the roughing mill or finishing mill exit, the self-emitted optical radiation of the hot strip provides contrast for width determination. In areas where the product is below 600 °C, an optional backlight or frontlight is available.
- The stereoscopic principle overcomes the inherent problems of hot strip and plate width measurement, such as thickness variations or tilt, lift and bounce of the strip.

## Crop Optimization

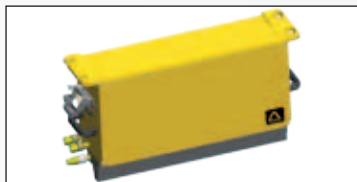
- The Crop Optimization gauge CropVison CV3000 captures the bar ends. It analyses the images, computes the contour and determines the optimum cut lengths based on the shape of the head and tail and a set of strategies. These cut set points can be adjusted by the operator and transferred to the shear controller. The CV3000 can reduce significantly the crop losses.



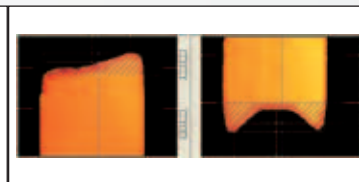
The ability to precisely measure the strip and plate dimensions during the hot rolling process is essential for the production of high quality steel and for achieving an optimum yield. DELTA has developed a range of gauges for installation in the extreme environmental conditions of the metal industry using the latest technologies with high resolution and high speed digital cameras.



## Key products



**XD4000**  
series



**CV3000**  
series

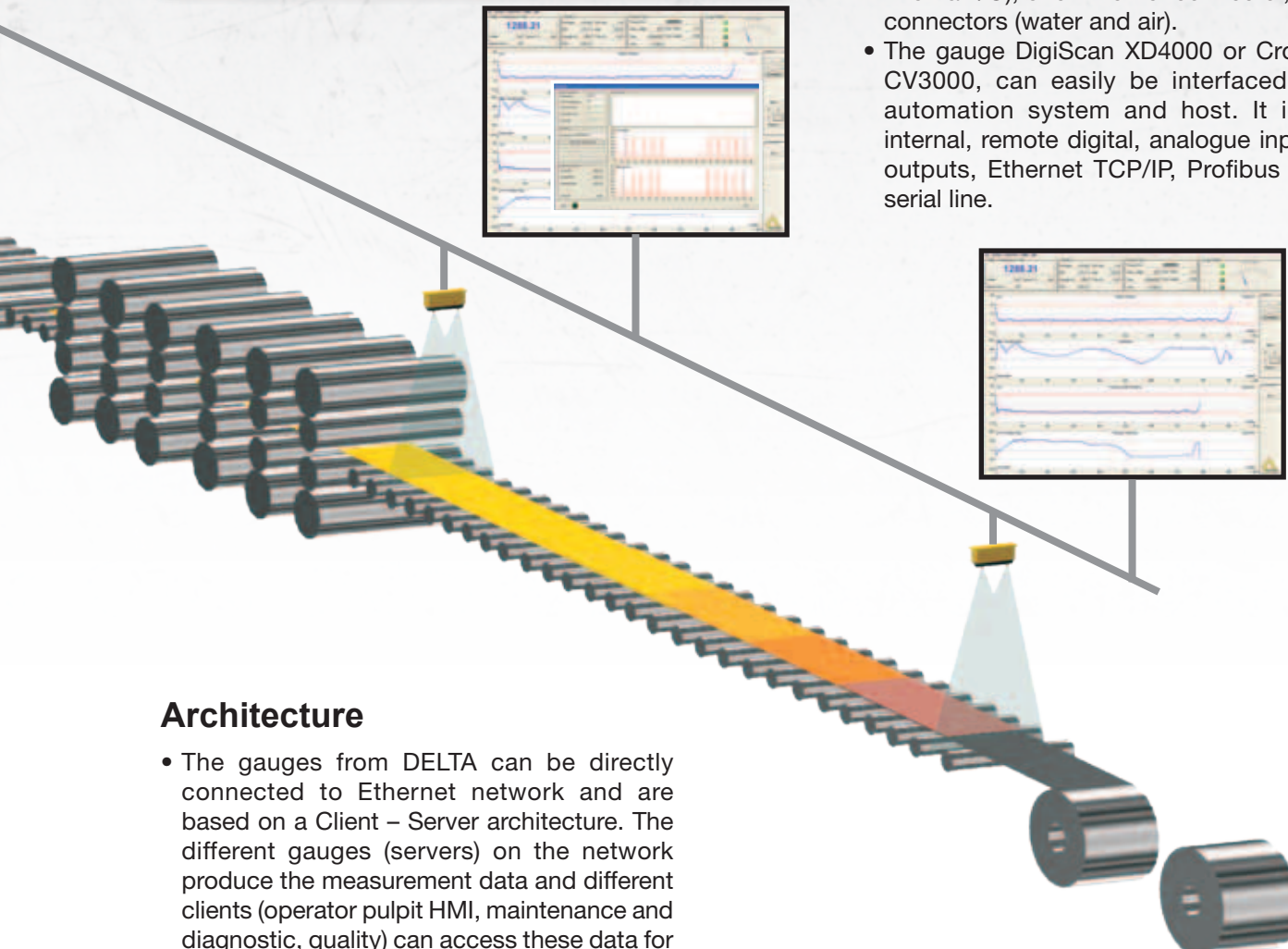
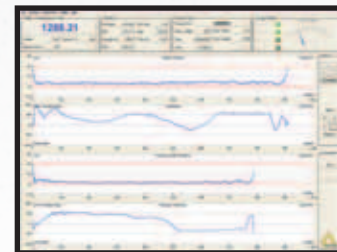
## Key features

- Very high accuracy and reliability in the extreme conditions of Hot Strip Mill.
- User friendly graphic displays
- Modular architecture allowing easy extension and implementation of effective solutions with end user:  
Camber / Plate shape  
Thermal profile / Crop Optimization
- Simplicity of installation and maintenance.
- Reliability, no moving parts.
- Rugged construction with cast metal housing, water cooling and air purging.
- Cost effective sensor.



## Installation

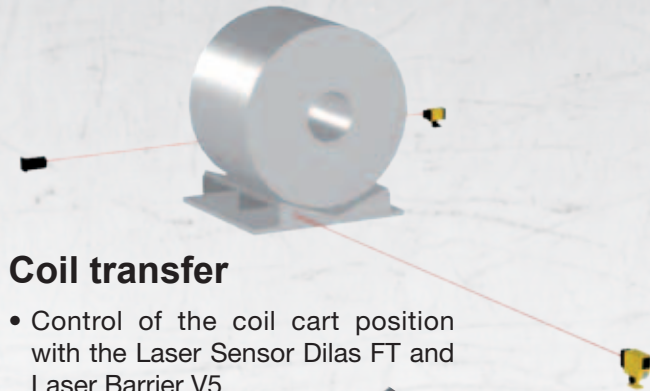
- The gauge can be quickly installed, just one electrical connector (power supply and internal I/O), one Ethernet connector, 3 quick connectors (water and air).
- The gauge DigiScan XD4000 or CropVision CV3000, can easily be interfaced to any automation system and host. It includes internal, remote digital, analogue inputs and outputs, Ethernet TCP/IP, Profibus DP and serial line.



## Architecture

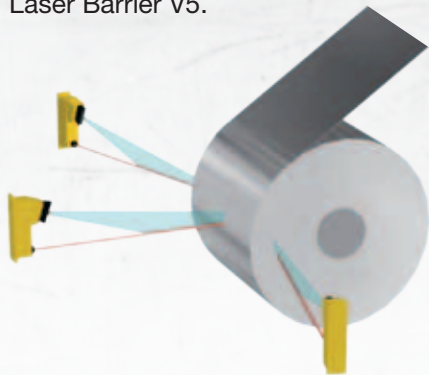
- The gauges from DELTA can be directly connected to Ethernet network and are based on a Client – Server architecture. The different gauges (servers) on the network produce the measurement data and different clients (operator pulpit HMI, maintenance and diagnostic, quality) can access these data for display or recording.

# Cold Rolling Mill & Processing Line



## Coil transfer

- Control of the coil cart position with the Laser Sensor Dilas FT and Laser Barrier V5.



## Coil measurement

- The width of the coil is checked when it is transferred on the uncoiler, and the diameter is measured with Laser Sensors Trilas TL.



## Width measurement

- The stereoscopic Width Gauge DigiScan XD1000, measures the width of the strip. The accuracy is maintained even if the strip is waving vertically.

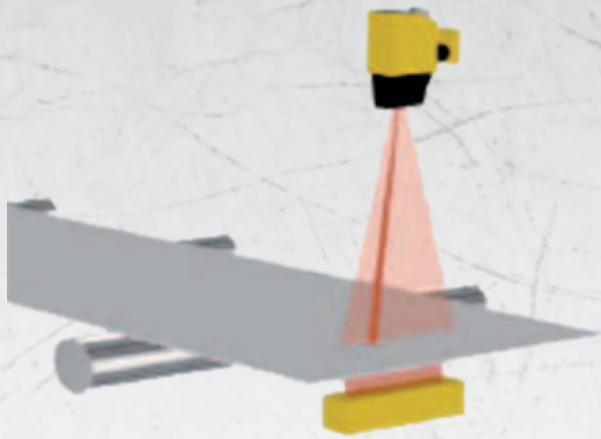


DELTA has a range of non contact laser sensor for measurement of coil dimensions and positioning, strip width, centring. The stereoscopic Width Gauge DigiScan XD1000, with direct Ethernet connection and extensive data recording capability, helps customer to deliver product with the highest quality standards.



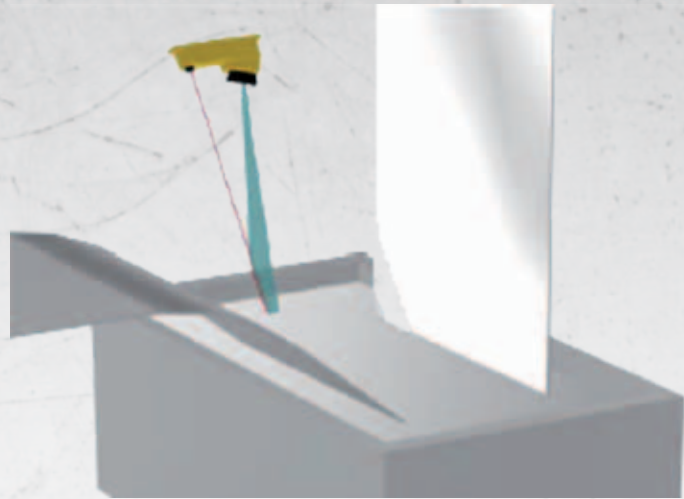
## Key products





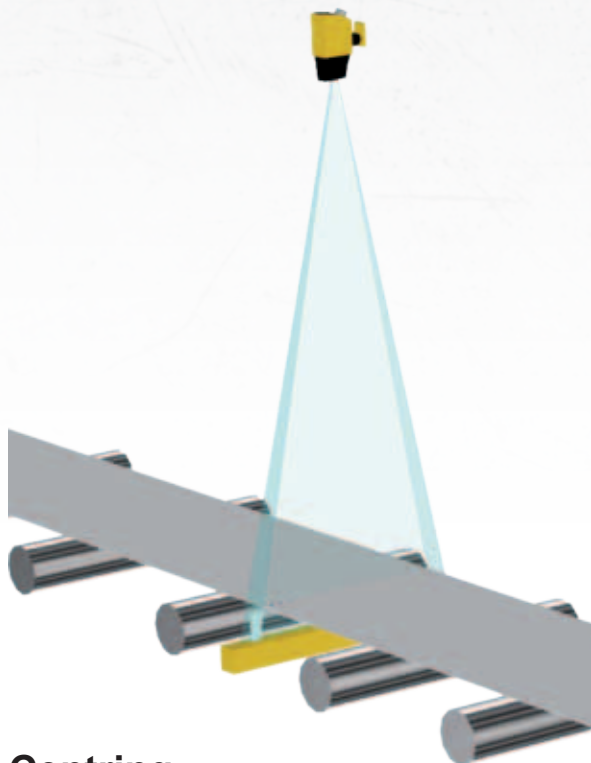
### Weld Hole Detection

- Infrared scanning sensor DTS240/EMR-M.



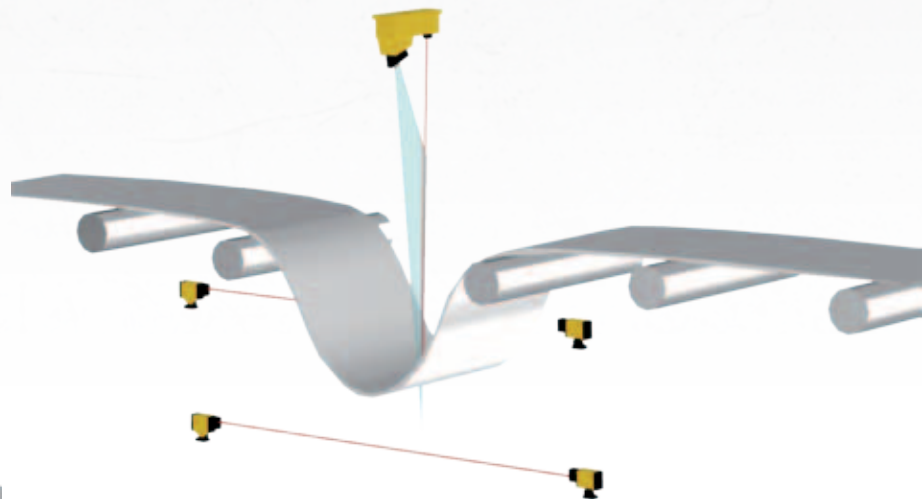
### Galvanization bath

- Zinc level measurement with Laser Sensor Trilas TL.



### Centring

- Centring or edge positioning of the strip with Linear Camera TSP.



### Loop control

- Loop measurement with Laser Sensor Trilas TL.



# Other Applications



## Aluminium Rolling

- Detection: The Rota-Sonde DC4500 is used for aluminium product at temperature over 300 °C. For other detection applications, the optical or laser barriers are used. In difficult environmental conditions such as dust, the use of sensors with very high margins such as VE/VR is recommended. All sensors include a protective hood with the possibility of air purging if required.
- Width measurement of aluminium slab with Trilas TL.
- Stereoscopic width measurement of aluminium plates or strips with DigiScan XD1000.
- Coil measurement.

## Copper Rolling

- Loop control with the Infrared Loop Scanner Rota-Sonde TS (high sensitivity version).
- Slab and coil measurement.

## Forging

- Diameter measurement: the stereoscopic diameter gauge DigiScan XD4500 has been developed for the measurement of large diameter (from 500 to 5000 mm). It works directly with the radiation emitted by the product, thus the equipment is installed on one side only, and can be placed away at several meters from the hot product.
- Ring forging: a laser triangulation sensor, able to work on target with temperature up to 1300 °C, measures the diameter during the forging process.



## Iron and Steel making plants, Coke plants

- Torpedo and ladle car positioning: the very robust design of DELTA laser distance meter make them a perfect solution for the difficult environment found in steel making plants.
- Hot coke detection.



# More about us



DELTA, founded in 1954, has a global presence with headquarters in France near Strasbourg, five subsidiaries in China, Germany, India, North America and Russia, and numerous agents around the world.

Research & Development investment are very important in DELTA: over 20% of the staff maintain and develop the product line. DELTA development teams, including electronic, mechanical and software engineers, are part of an international network with close contact with customers.



DELTA production team is highly qualified, and follows strict processes to insure the highest level of quality and long term support of our sensors. Some of DELTA products, which are installed in very difficult environmental conditions, are still in use after more than 30 years with indefectible support from DELTA.

## *Worldwide support*

DELTA is committed to provide excellent support to its customers. DELTA believes that for this purpose local engineering support is important. With this driving philosophy, DELTA has set up facilities in Europe, USA, China and India to provide adequate support to its customers.

Over 40.000 sensors are currently in operation worldwide in more than 70 countries.

## *Quality*

DELTA is committed to deliver the highest quality and the most reliable sensors. The strictest quality standards are applied to the design and manufacturing of every DELTA product. DELTA S.A.S. is certified ISO 9001:2008 N° 1995/4590.4 since 1995 by Afnor certification.



## Worldwide presence and Global Network



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