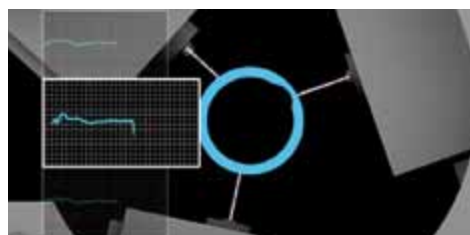
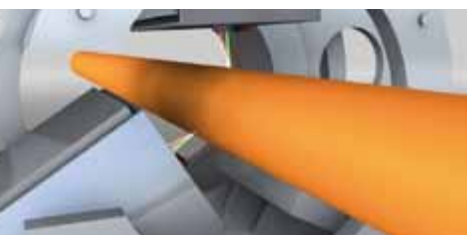




## LASUS<sup>®</sup> / LASUS<sup>®</sup> MULTI-SCAN

Precise measurements for high quality all around



# LASUS® MEASURING SYSTEM

## Assuring highest quality

The LASUS® measuring system from SMS group reliably measures the wall thickness of tubes – even during production at temperatures of up to 1200°C. With these data, seamless tube producers can control their rolling processes more precisely and thus achieve an outstanding product quality.

### HIGHLY PRECISE MEASUREMENTS THROUGH ADVANCED TECHNOLOGY

The measurement is based on a laser-ultrasonic technology in which the high-energy pulses of a laser induce ultrasonic waves in a hot tube. A second frequency-stabilized laser detects the ultrasonic waves reflected in the tube at the tube surface using the Doppler effect. On the basis of the ultrasonic velocity in the hot tube, the tube wall thickness can be calculated directly from the run time of two ultrasonic echo signals.

SMS group played a major role in the development of this technology from the beginning, and has already installed numerous LASUS® measuring stations worldwide. LASUS® measures the wall thickness of hot tubes using one measuring channel with the measuring heads being rotated around the tube by a robot arm or a rotating frame.

### NUMEROUS REFERENCES WORLDWIDE

Many reputable tube manufacturers across the globe rely on the LASUS® measuring system. For example:

- TPCO – Tianjin Pipe Corp. (China)  
QAS with 2 LASUS®-Systems
- Hengyang Steel Tube Corp. (China)  
QAS with 2 LASUS®-Systems
- Chengdu Iron & Steel (China)  
QAS with 2 LASUS®-Systems
- Anshan (China)  
QAS with 2 LASUS®-Systems
- Byelorussian Steel Works (Byelorussia)  
QAS with 1 LASUS®-System
- TMK Tagmet (Russia)  
QAS with 2 LASUS®-Systems
- TMK VTZ (Russia)  
QAS with 1 LASUS®-System
- Jindal Saw (India)  
QAS with 1 LASUS®-System
- Arcelor Mittal Al Jubail (Saudi Arabia)  
QAS with 2 LASUS®-Systems



# LASUS® SERVICE PACKAGE

## Profiting from all the benefits of the measuring system

To enable plant operators to make the most of their new plant from the very beginning, SMS group offers a comprehensive service package for the LASUS® measuring system:

### STARTING AID BY EXPERTS

Anyone who uses LASUS® wants to profit from the benefits quickly. For this reason, the experts from SMS group are on the customer's premises during the start-up phase. They share their know-how with the employees and show them how to make optimum use of the system.

### REGULAR SYSTEM UPDATES

To keep the technology up-to-date, SMS group updates the software of the LASUS® system as and when necessary. Plant operators thus benefit from all the improvements – and easily expand the existing system, for example into the multi-channel LASUS® Multi-Scan.

### LONG-LASTING RELIABILITY

To guarantee correct measurements even after a prolonged period of operation, SMS group service experts check the customer's system – every week, every month or once a year, as and when necessary. The technicians check the compiled data, evaluate the device parameters and test all the system components via remote control.

### ON-SITE SERVICE

Sometimes fast assistance is required. SMS group service specialists offer technical support on all questions associated with LASUS®: Customers receive a reply within 24 hours. If necessary, the service technicians even come directly to the works.

All services are tailored exactly to the customers' needs. This guarantees that plant operators profit from the LASUS® system – measurably and continuously.



### BENEFITS AT A GLANCE

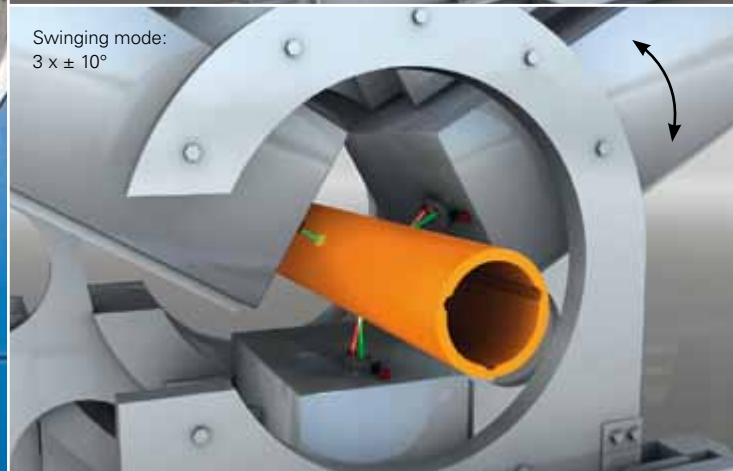
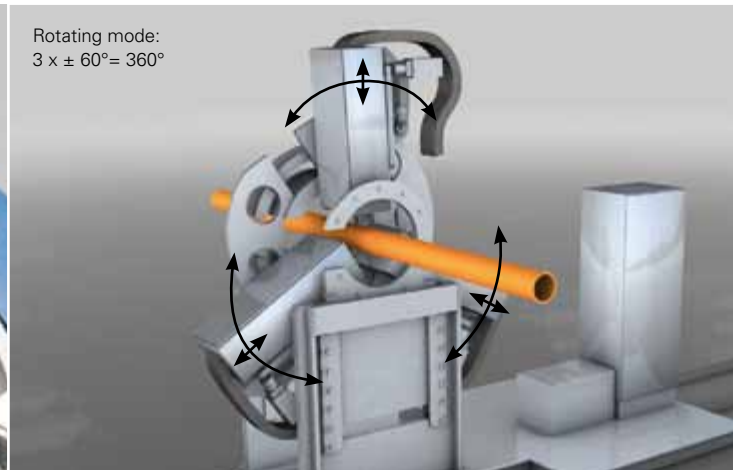
With the LASUS® service package ...

- plant operators make full use of the LASUS® potential.
- experts from SMS group regularly check the measurement data.
- the hardware and software always remains up-to-date.
- tube manufacturers optimally control their production.



# LASUS® MULTI-SCAN

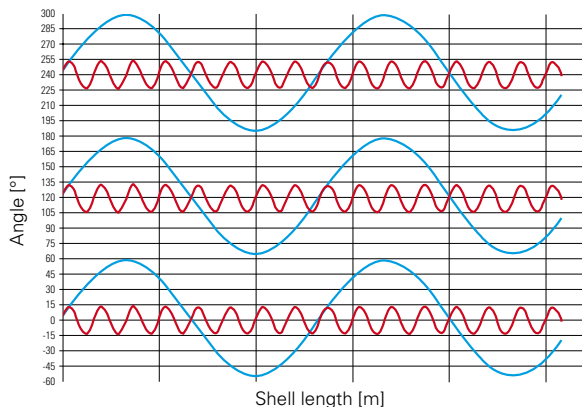
High-precision measurements – global and local



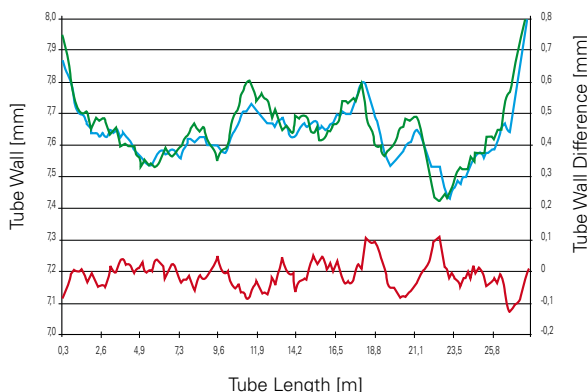
With LASUS® Multi-Scan, SMS group's newly developed expansion of LASUS®, several laser measuring systems are used in parallel. These are mounted on a common rotating frame. With modern 3-roll rolling mills (PQF®, sizing mill, stretch-reducing mill) this involves three laser measuring systems and for conventional 2-roll rolling mills (MPM) it can involve up to four systems. Compared with measuring methods to date, these systems offer significant benefits: They increase the accuracy of the measurement and allow for even measurements around the complete tube circumference as well as targeted high-resolution measurements.

## MEASURING FLEXIBLY, EXACTLY AS REQUIRED

LASUS® Multi-Scan has two operating states. In the first operating state, all three measuring heads rotate around the tube, whereas in the second operating state the three measuring heads are fixed in the Y or anti-Y position and "swing" around an individual pivot point while the wall thicknesses are being measured. The measuring station can easily switch back and forth between the two operating states before a new tube arrives. In rotating mode, LASUS® Multi-Scan typically measures wall thicknesses



Measurement density in rotating and swinging mode



Comparison between LASUS® and manual measurement

several times around the tube circumference, thus determining tube characteristics such as eccentricity and polygonization as well as local and average wall thicknesses. In swinging mode, on the other hand, the system measures the wall thicknesses at the roll gaps of a 3-roll arrangement with high resolution.

The measured value recording density of the tube wall thickness along the angle of rotation, and hence the resolution of the scanned structure, varies with LASUS® Multi-Scan according to the range of angles (depending on the operating state): The

## FURTHER BENEFITS AT A GLANCE

- Local wall thickness measurement permits the detection of local tube flaws
- 360° scan of the tube wall thickness together with high measurement frequency (100 Hz) guarantees complete tube detection with high resolution
- Three simultaneous wall thickness measurements provide the local wall thickness eccentricity directly every 10 ms
- Technology permits practically any measuring position in the line (e.g. measurement with mandrel bar inside the tube, no diameter limitation) and hence repositioning of the LASUS® measuring device within the line
- Genuine wall thickness measurement with high resolution and no double wall measurement
- Independently operating measuring channels
- High dependability
- Special operating states to detect polygonization and linear flaws downline of a 2-roll or 3-roll rolling mill
- Optional with SecControl® for mills with hydraulic capsules.

angular measurement density in swinging mode is increased by a factor of 4 compared with that in rotating mode. For this reason, this mode is very suitable for inspecting small areas of a tube, such as the roll gaps of a 3-roll arrangement. With the laser systems employed, the wall thickness of hot tubes is measured with a precision of  $\leq \pm 0.1$  mm, a significantly increased accuracy compared to a manual measurement. Thanks to an improved laser measurement technology LASUS® Multi-Scan allows for measurement of tube wall thicknesses up to 40 mm during production.

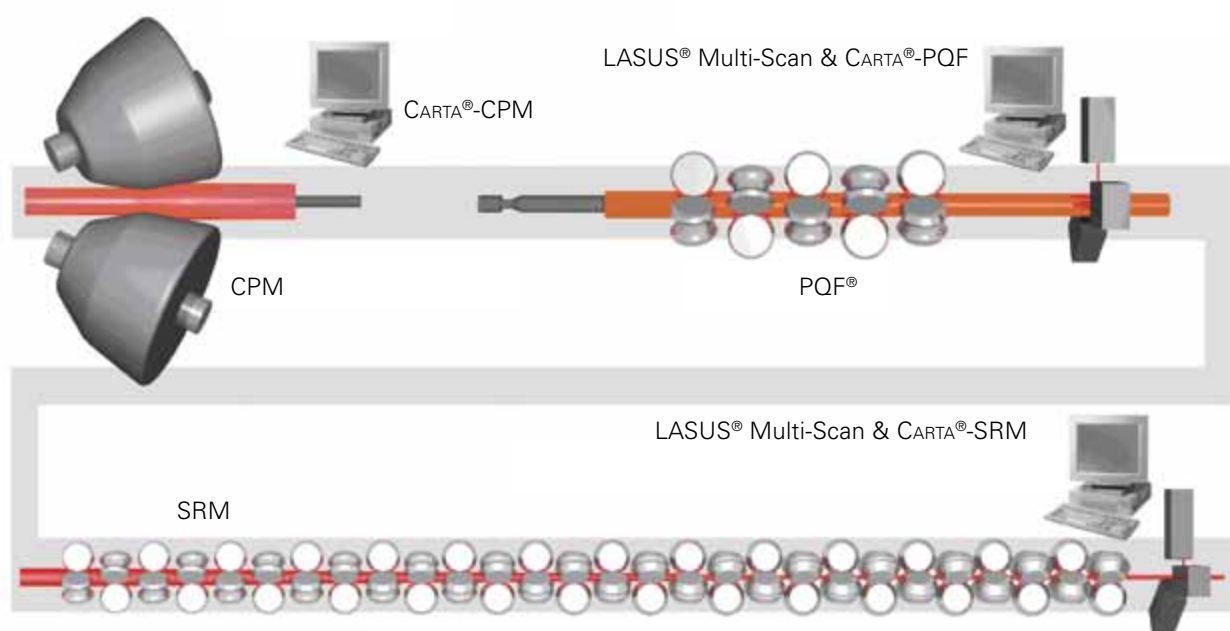
# QUALITY ASSURANCE SYSTEM

## A holistic approach to quality

Quality assurance systems (QAS) of hot mills for seamless tubes typically capture the weight, length, diameter and temperature of the billets and pierced billets. In the further course of the production process, the pierced billets are rolled out to form shells and ultimately tubes. During this time, the LASUS® measuring system measures the wall thickness. SMS group's quality assurance system supplements these material parameters with information on the measured roll forces in the cross-roll piercer and in the mandrel thrust block. All these measured values come together in a central station. This allows for a large variety of features to improve the tube quality:

- Visualization of the measured values
- Calculation of characteristic parameters (such as the length of lay of an eccentric)
- Monitoring of the product quality (possibly also with warning messages)
- Communication with the CARTA® Technology System (transmission of measured values for control and optimization of the rolling process)
- Archiving of the measurement data
- Generation of statistics on the basis of archived data

LASUS® Multi-Scan creates the preconditions for further improving the existing QAS in seamless tube mills: The measured data can be used in real-time to optimize multiple stages of the rolling process, and hence to significantly and sustainably improve the product quality.

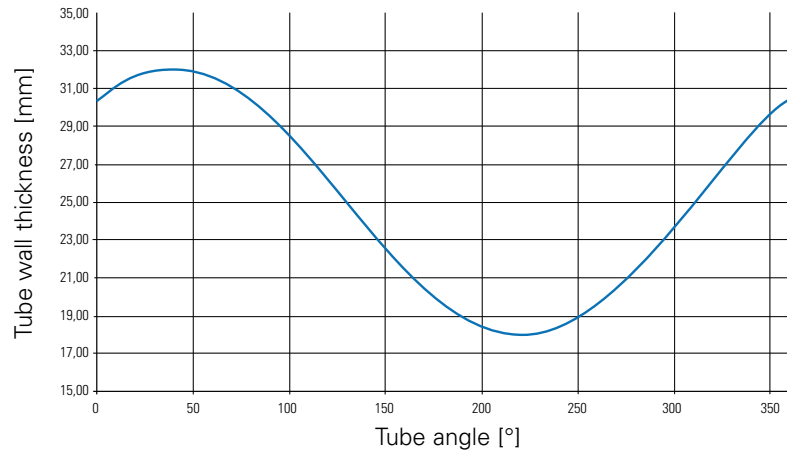


LASUS® Multi-Scan embedded in a QAS for the hot production of seamless tubes

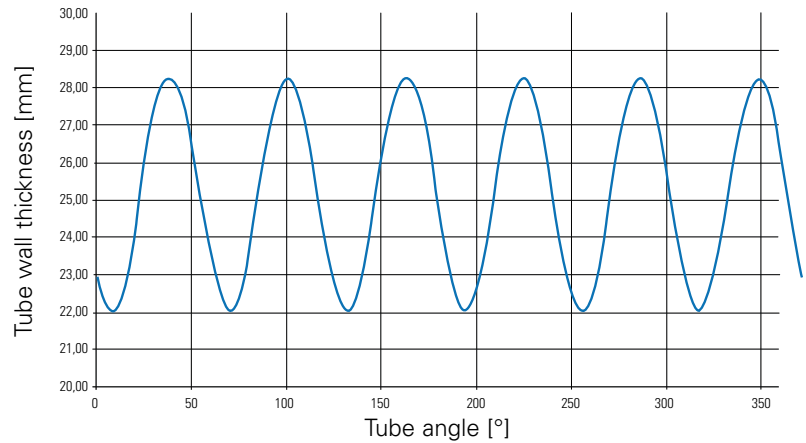
## ROLLING FLAWS WITH CHARACTERISTIC WALL THICKNESS DEVIATIONS



Eccentricity – first-order error



Hexagon – sixth-order error



### ELIMINATING SOURCES OF ERRORS

During the production of seamless tubes, process-specific flaws can occur in the tubes, depending on the rolling method employed. When using the cone-type piercer process for piercing the billet, this is most frequently reflected in an eccentricity running in the longitudinal direction of the tube, and on the downline 3-roll mills such as PQF® plants and SRM, this takes

the form of polygonization of the third and sixth order in the tube cross-section. These flaws are clearly identifiable by the frequency of the wall thickness change along the tube circumference. On the other hand this means that plant manufacturers who integrate LASUS® Multi-Scan into their QAS reliably detect rolling flaws – they can immediately take countermeasures and hence permanently reduce rolling flaws.



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