# Ensuring highest product quality at lowest cost per foot by employing proven innovative technologies

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# Why high precision process monitoring?

- Reduction of raw material
- Save of energy
- Increase productivity
- decrease production time
- Improve product quality by reduction of dimensional  tolerances

...SAVE COSTS, IMPROVE QUALITY

# Examples of sensor data for process quality check

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- Material quality (e.g. bulk density, humidity)
- Weight per foot

- Centering

- Vacuum
  - temperature

## Dimensional check

- Diameter / Ovality
- Wall thickness
- Eccentricity
- Pipe fault

- Line speed
- Cut-off length

# Ultrasonic Gauging

**proven and reliable OD and wall thickness measurement**

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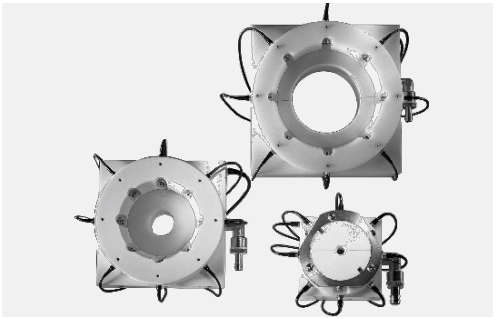
# Ultrasonic Technology:

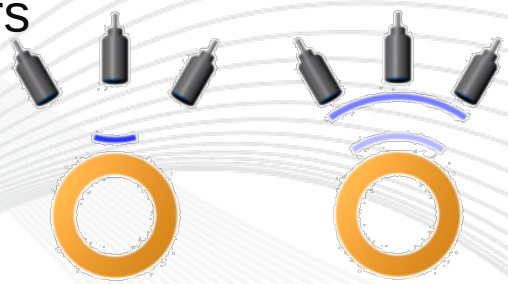
## …*“Reliable and proven“*

- Comprehensive product information (wall thickness, diameter, eccentricity, ovality)
- Control of wall thickness and OD
- Production process monitoring with continuous dimensional checks and accurate centering
- Multilayer measurement
- High-speed measurements possible

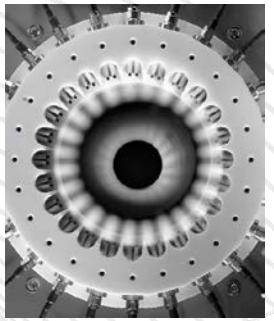
**Common 8-point measurement**



- Complete coverage of the product surface by sensor system
- Active and passive measurement by neighboring sensors
- Electronically rotating ultrasonic sensor system
- 50.000 values per second in each measuring cycle

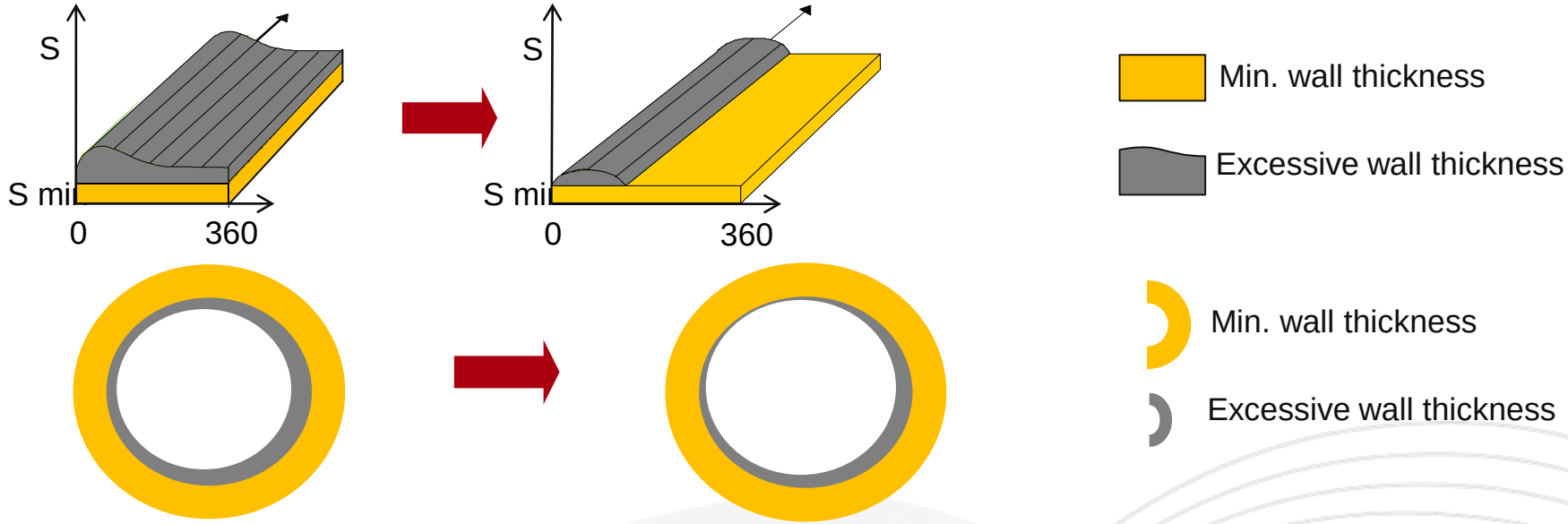


**100 % wall thickness measurement**



# Thin point control

- Deviations from set mass throughput rates AND wall thickness sizes are recorded and compensated by specific control loops → further reduction of weight per length




With SAVEOMAT mass throughput control

With SAVEOMAT + ultrasonic thin point control

- Combination of SAVEOMAT gravimetry and ultrasonic wall thickness control
- Minimum wall thickness control
- Substantial reduction of overall wall thickness

# Ultrasonic Quality Check

## Beyond dimensional inspection

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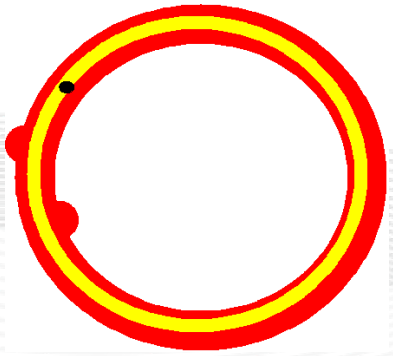
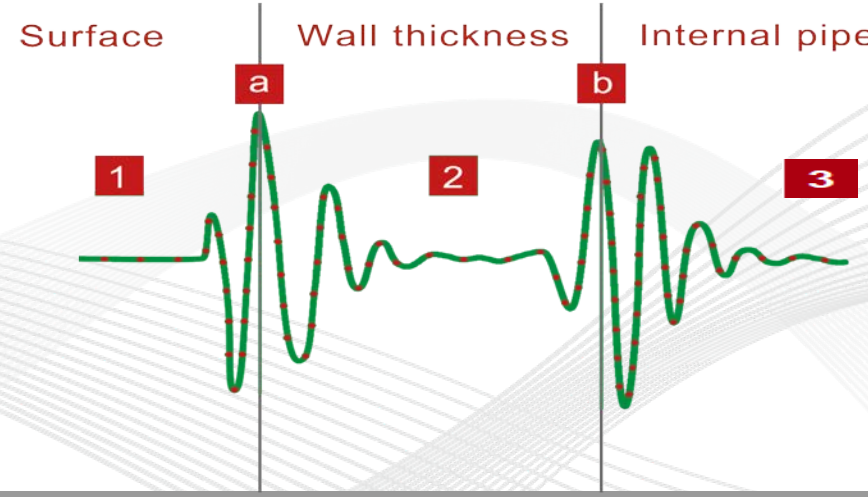
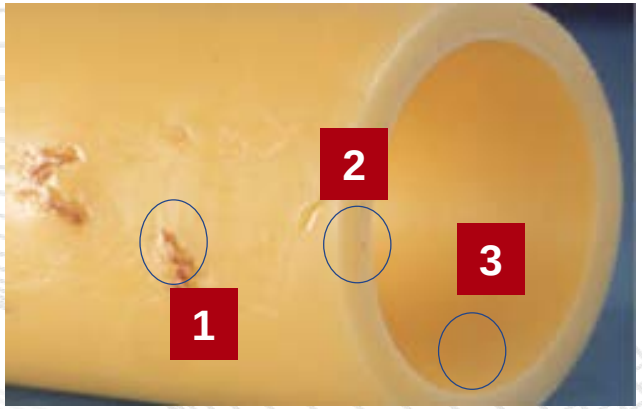
# Ultrasonic Quality Check

Recognizes inconsistencies in the exterior pipe surface, inside the material and on the inner pipe surface compared to wall thickness tolerances.

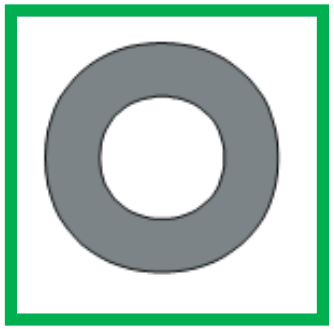
- **Detects small inner and outer surface flaws (section 1 / 3) and inclusions as well as structural flaws in the pipe wall (section 2)**



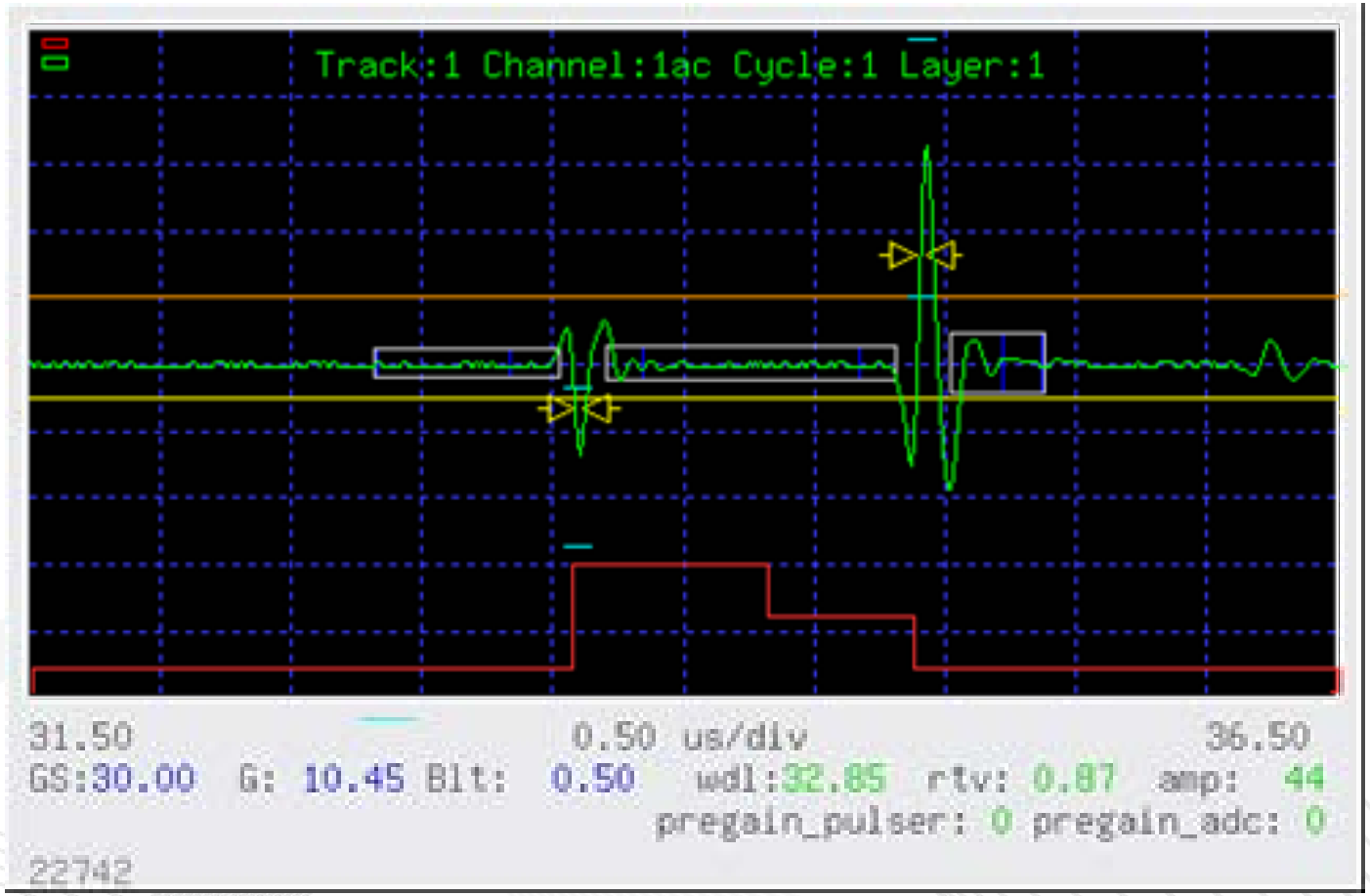


# Ultrasonic Quality Check



"good pipe"



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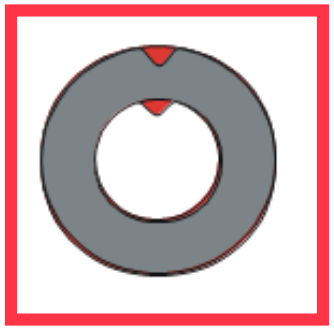
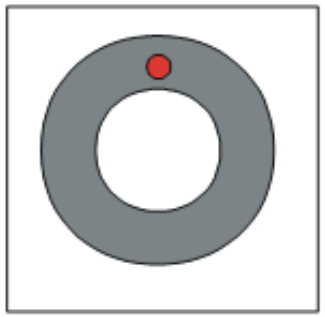
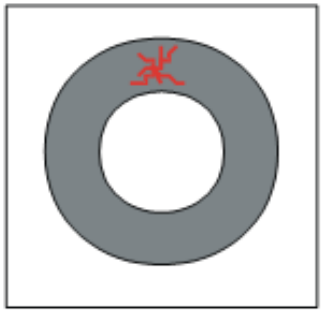


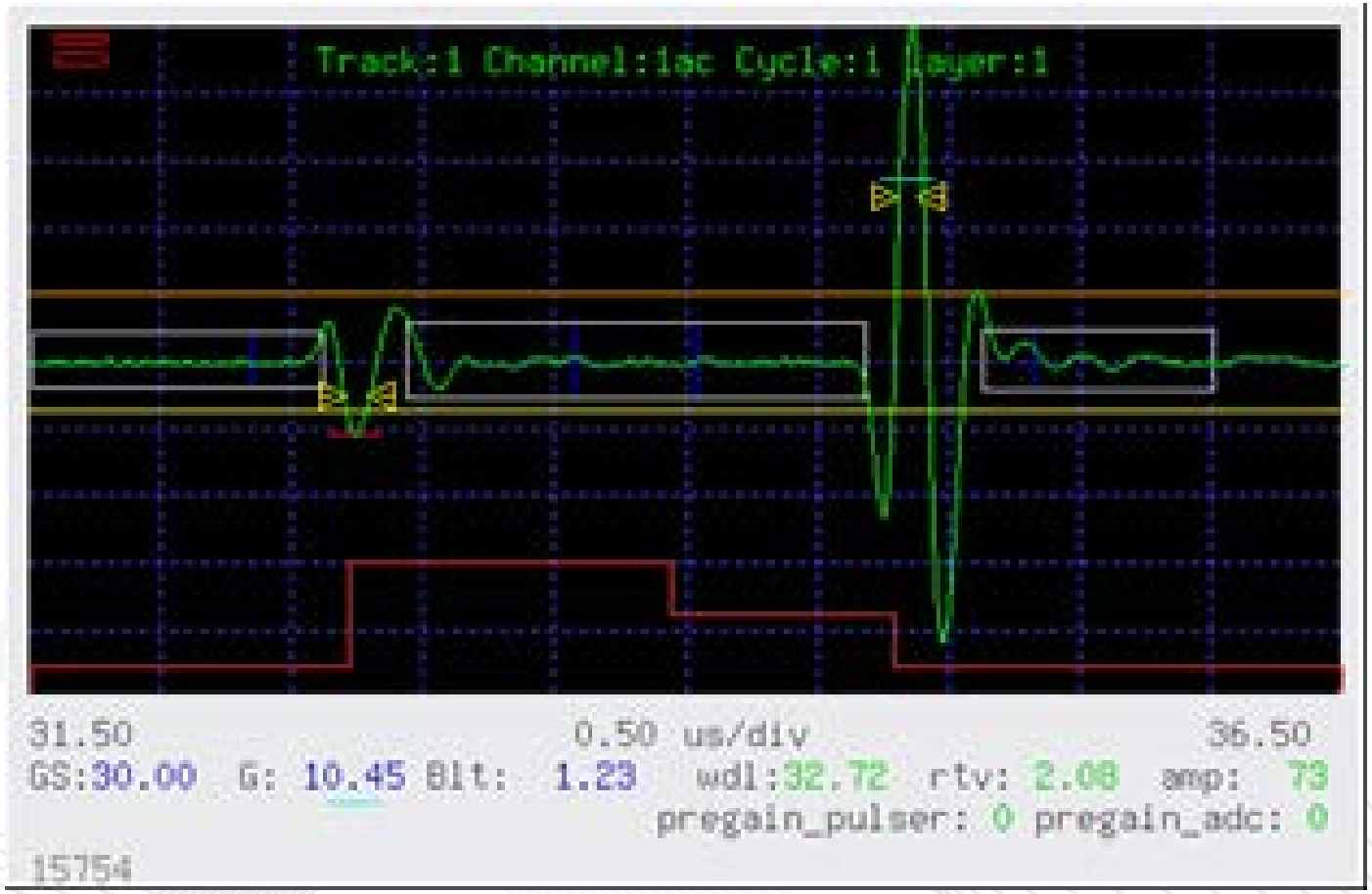
Surface flaws



Inclusions



Structural flaws



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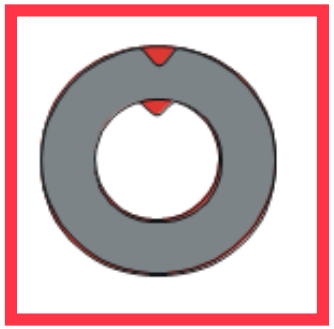
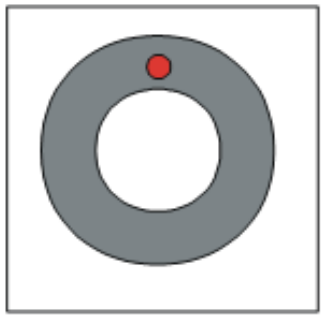
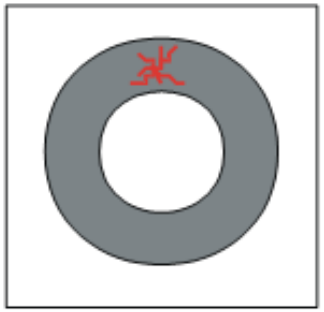


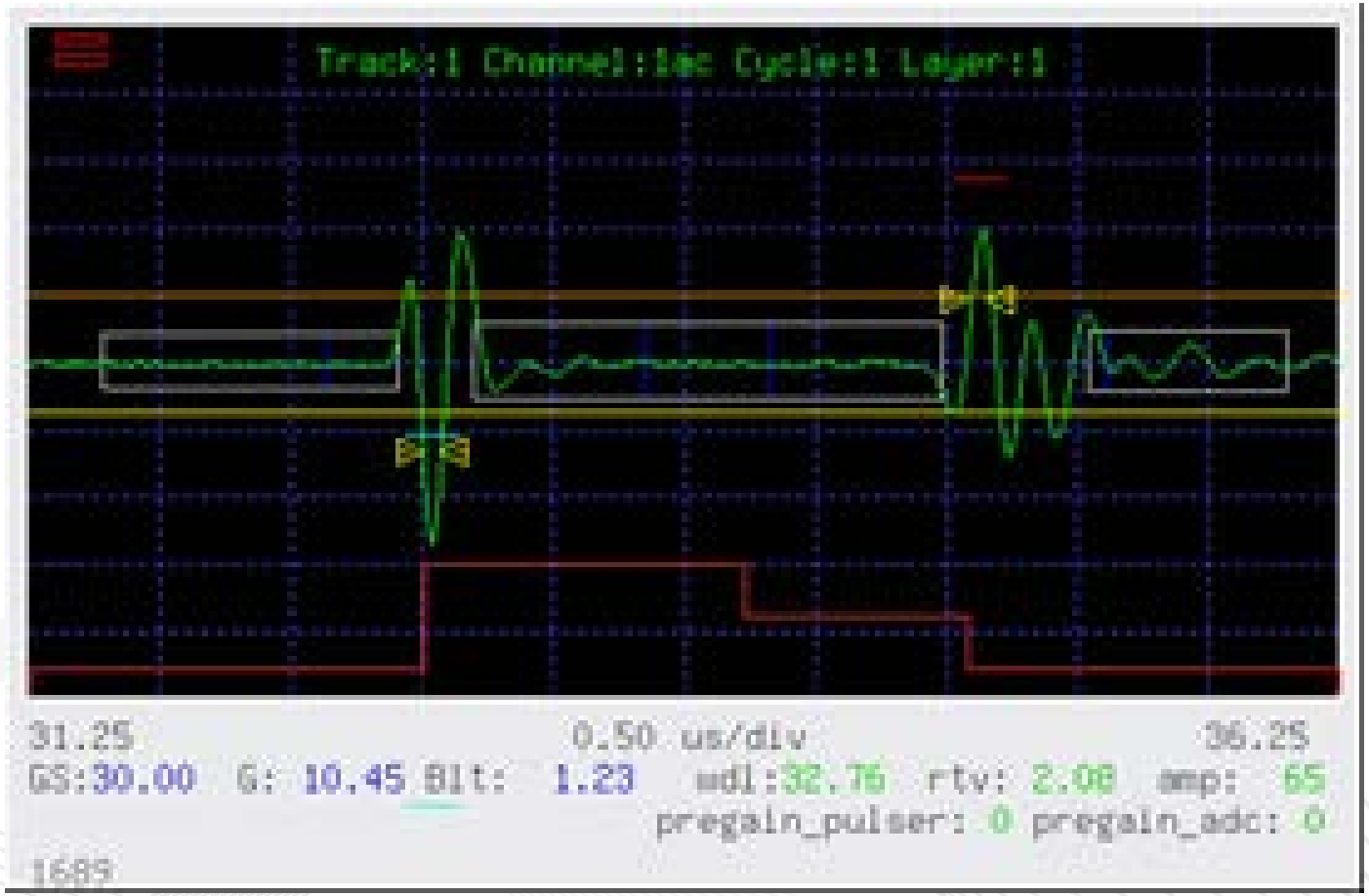
Surface flaws



Inclusions



Structural flaws



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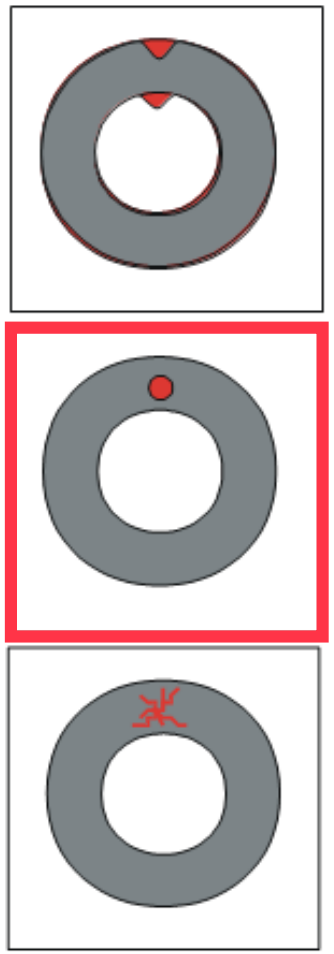
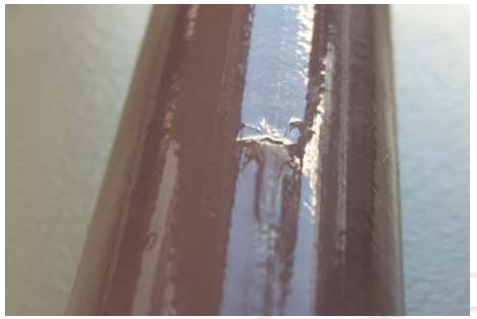


Surface flaws

Inclusions

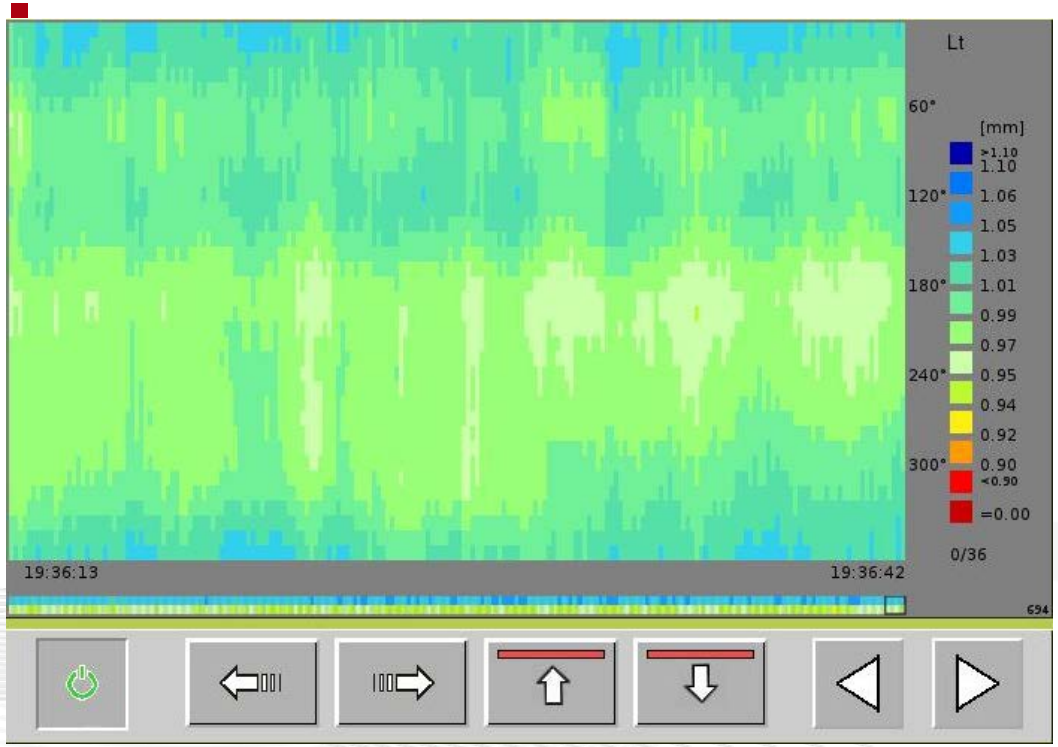
Structural flaws

# Ultrasonic quality check

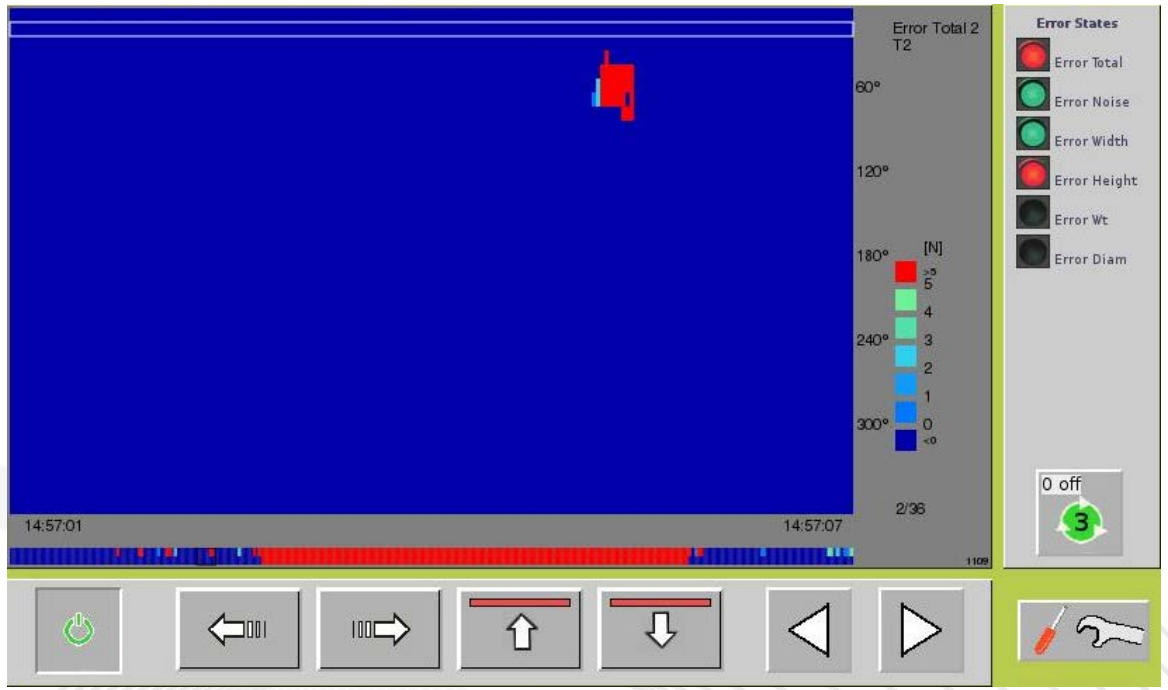


# Ultrasonic quality check

- **ERS wall thickness measurement**




**visualization of defects by Quality Check**



# Terahertz

Plug & Play Wall Thickness Measurement

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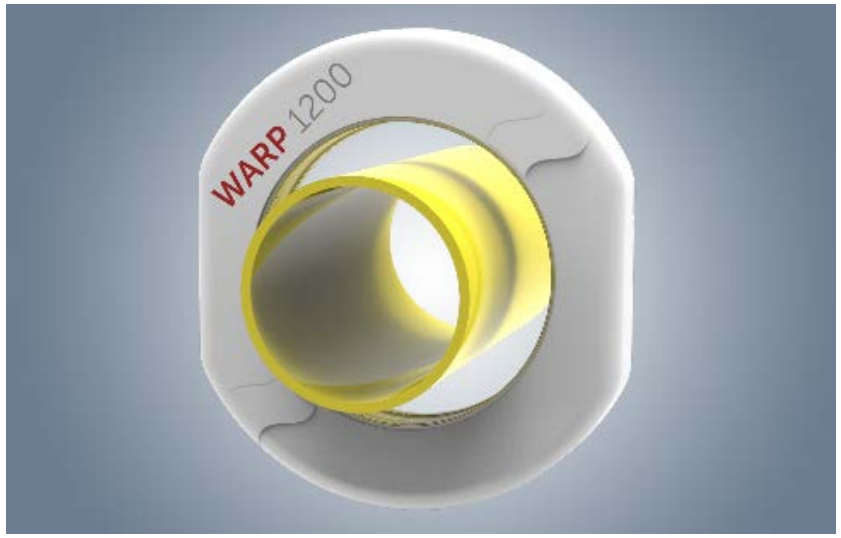
# Why Terahertz?

- **Absolute measuring values**
- **No coupling medium required**
- **Simple configuration**
- **Contactless measurement**
- **Plug & Play**



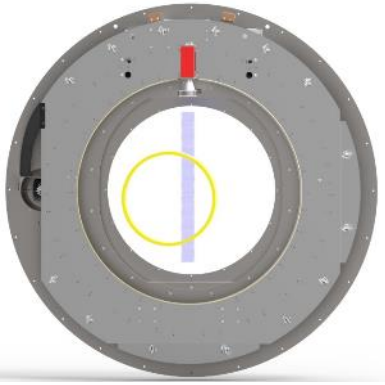

Improved Usability

- **Applicable for corrugated pipes, foam pipes, profiles, sheets, film, blow moulding, etc.**

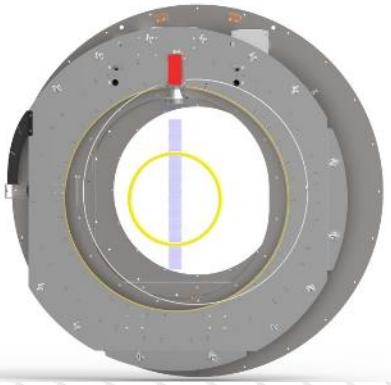
# Automated Scanner Centering

**The sensor needs to be centered well for a high accuracy measurement result**

- Perpendicular orientation of the THz signal to the product is essential for a reliable & correct measurement
- Centering of the sensor is done automatically by QUANTUM & WARP
- Even after dimensional changes,  iNOEX Terahertz scanners automatically adjust to the new position of the product.



- THz system not centered



- THz system centered

# WARP portable
# The solution for direct measurement within seconds

- Mobile battery-powered hand-held system for a fast and easy point measurement of the pipe wall thickness

**Benefits:**

- Measurement during production online and in the lab offline
- Robust, splash-proof housing (IP54)
- Easy to use
- Data logging with timestamp and measurement position on pipe circumference
- Data transmission via WLAN or USB to Smartphone or PC

# IIoT

## OD and Wall Thickness Measurement in the Plastic Material Industry

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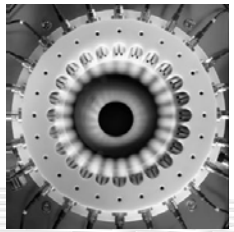
## Supported Interfaces

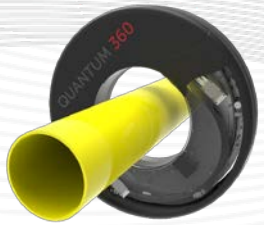
- OPC UA
- EtherNet/IP
- MODBUS TCP

## Benefits

- Seemles Integration into OEM Systems
- Simple Upgrade for Existing Equipment (Plug‘n‘Play)
- Interfaces to Mobile Devices (Smartphones, …)
- Standardized Connections to Other Service Providers, such as:
  - Process Visualization
  - Data Analysis
  - Statistical Process Control (SPC)

# IDM 2 data flow




History data is pushed over the company network

SQL/ OPC UA

ETHERNET

SERVER

VIRTUALIZATION

iNOEX IDM (virtual machine)

WEB SERVER

SQL SERVER

...

Microsoft Azure

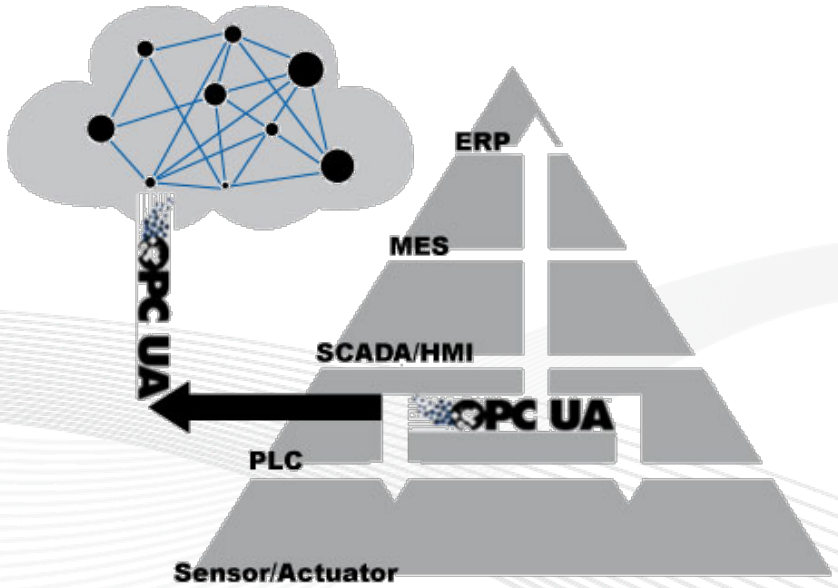
Cloud

MQTT/ OPC UA

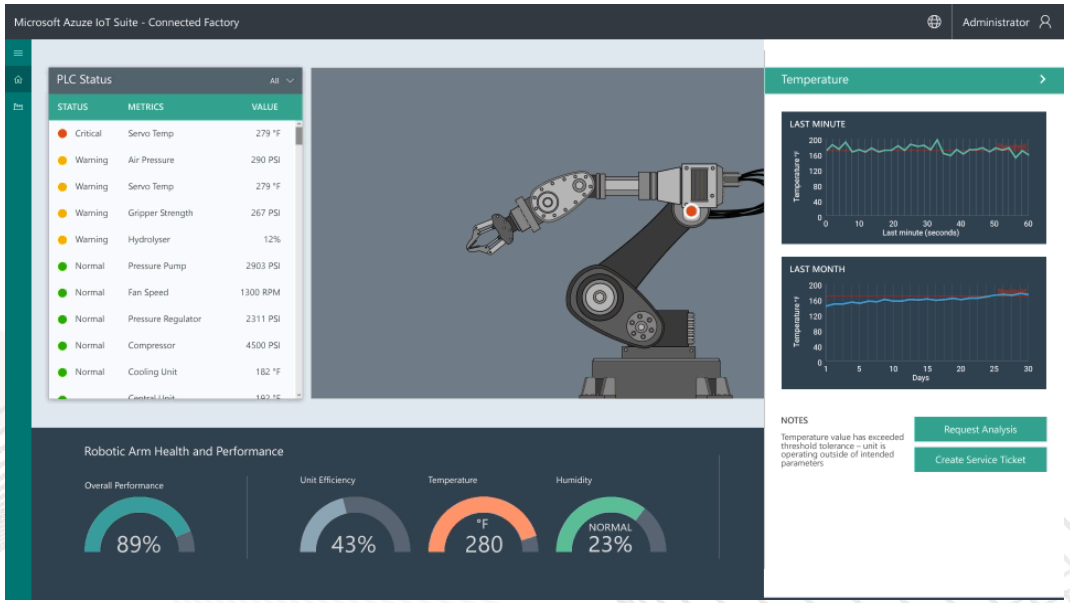
# IIoT @ iNOEX

## Focus on OPC-UA

- Standardization as a Common Platform
- Facilitates the Requirements for IoT, Industrie 4.0 und Machine 2 Machine Communication
- SU Integration




Source: www.mesco-engineering.com




Source: https://azure.microsoft.com/de-de/features/iot-accelerators/connected-factory/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