

DIAROND

For rod bar and tubes.

For finishing, peeling, grinding, straightening, quality control (NDT).

DIAROND is a novel, non-contact measuring system from Zumbach.

It allows to measure, simultaneously the diameter and the roundness of cold processed steel products in the production or testing line.

The problem

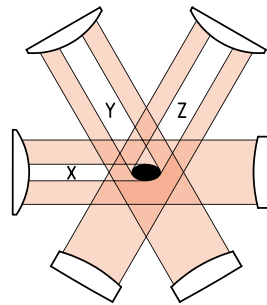
So far, a measurement of roundness and shape deviation can be done only on samples by means of tactile laboratory-measuring machines (e.g. MAHR, MITUTOYO, TAYLOR HOBSON etc) but not continuously in the production line.

Conventional optical in-line gauges, allow for accurate measurement of diameter and limited capability for ovality, but no possibility for roundness or shape.

The solution

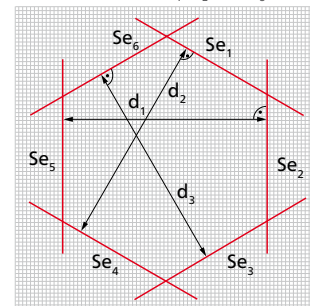
A high-precision, 3-axes laser head ODAC® TRIO measures at high frequency and fully synchronized, 3 x diameters at 60° offset to each other, and 6 x corresponding tangent points on the periphery of the product. All measured values are stored in the USYS IPC processor. For completing the whole profile there must be a self rotation of the product of at least 60° or a rotation of the measuring head by means of a rotary device. An angle information is not required. Without rotation, there can also be statistical evaluation of a number of parts, where results can be enhanced by any random manual oscillation or orientation.

3-axis measurement



Data capturing

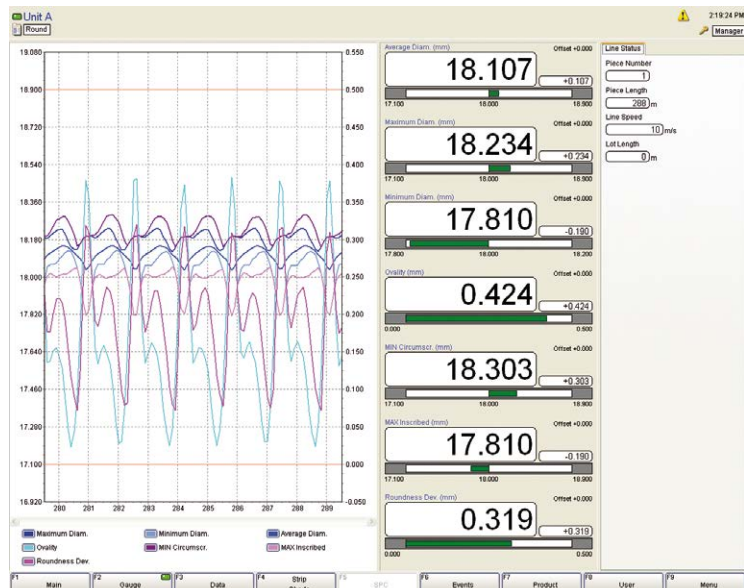
The 3 synchronized scans yield an "instant picture" of the position of 6 shadow edges (Se₁ – Se₆) of the product, related to an internal coordinate system and 3 precise diameters d₁, d₂ and d₃.



ZUMBACH's advanced STEELMASTER software with proprietary EPM algorithms analyses the stored data and calculates all relevant parameters for the profile:

The required parameters can be freely selected and configured for numerical and graphical display and they are also available at the computer interface.

1. Diameter: max., min., mean, max.-min.
2. Roundness RONt in accordance with ISO/TS 12181-1 (formerly DIN 4291/92):
 The roundness (peak-to-valley roundness deviation) is calculated exactly for any shape and deviation. Also, the maximum inscribed reference circle MICI and the minimum circumscribed reference circle MCCI are calculated and displayed.
3. Deviation of shape and polygonality:
 Shape deviations in general, especially polygonal shapes (3, 4, 5 & 6-lobed), can now be detected in-line. With this, problems in the process (rolling, peeling, centre-less grinding, etc) can be detected and corrected at an early stage.



Example of a configuration screen for bar.

Left: Current recording of various parameters. A 3-wave periodicity is easily recognizable.
 Right: the numerical values after a specified time or a number of bars.

System Components

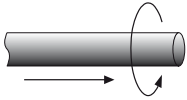
A DIAROND system consists basically of:

- **ODAC® TRIO Measuring Head**
Model ODAC® 33TRIO: for products up to approx. 30 mm (1.18 in.); model ODAC® 63TRIO up to approx. 60 mm (2.36 in.).
For larger diameters up to 500mm (20 in.) 3 separate ODAC® heads will be used.
- **USYS IPC Processor**
With STEELMASTER software; EPM and RON functions activated.
Screen, keyboard and mouse can be supplied by the customer.
- Depending on the case: a rotary or oscillating device

Typical Applications

A Bar advancing and rotating

Typically: Grinding or special NDT lines



ODAC® TRIO; 3-axis laser scanner or 3 separate heads under 60°.



B Statistical Evaluation



ODAC® TRIO; 3-axis laser scanner or 3 separate heads under 60°.

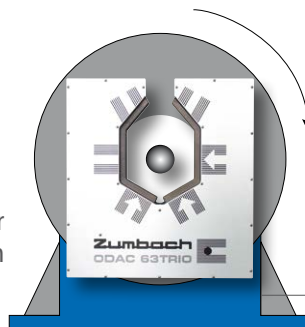


C Bar advancing without rotation

Typically: Peeling and NDT lines



ODAC® TRIO; 3-axis laser scanner or 3 separate heads under 60° on an oscillating or rotating device.



Key Data	
Measurement frequency	Standard 3 x 600/s (option = 3 x 1500/s)
Resolution	0.1 µm (.000004 in.)
Repeatability*	From +/- 0.1 µm (.000004 in.)
Linearity*	From +/- 1 µm (.000004 in.) +/- 0.08 ‰ per mm (per .04 in.)
Accuracy for roundness	ODAC 33TRIO (typically); dynamic on oscillating device: ≤ 5 µm (.002 in.) ODAC 63TRIO (typically); dynamic on oscillating device: ≤ 8 µm (.003 in.)

* For diameter values only. The values for the ovality depend, amongst others, on the averaging time of the measuring head.

- Technical specifications are subject to change without notice

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