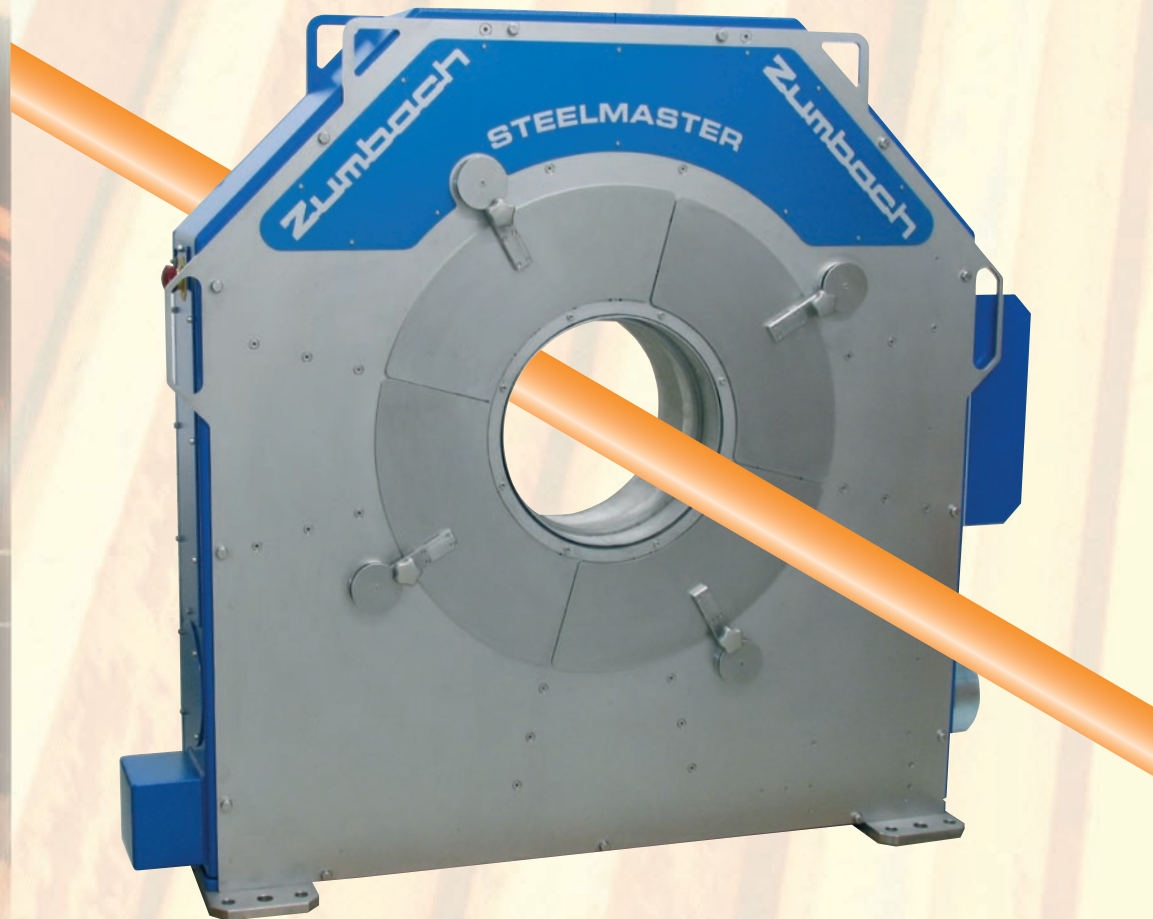


# STEELMASTER

**Non-Contact In-line  
Dimension Measurement  
in the Steel Industry**

Zumbach



**Dependable Solutions  
for Hot Rolling and for Quality Control**

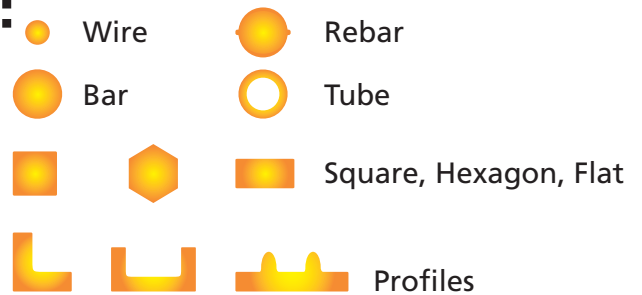
Zumbach  
ODAC  
Laser Diameter  
Monitoring System

# Wire Rod, Bar, Rebar, Profile, Tube, Pipe

## Hot, Cold, Quality Control

### What the market demands:

- Closer tolerances (1/2, 1/4 DIN)
- "Zero fault"
- 100% quality control
- Higher productivity
- Faster startup
- Less down time
- Less manpower



STEELMASTER gauges and systems definitely help fulfilling the requirements of the market. STEELMASTER systems are based on latest technology and on the experience with close to 300 units in hot rolling and similar processes and they are backed by many thousand ODAC scanners, operating in cold processes.

### The STEELMASTER Processor

The STEELMASTER processor is the "brain" of the system. It processes the measuring data, communicates with the plant network and provides the operator with self-explanatory displays and key data. The process transparency is dramatically improved, especially if multiple measuring heads are installed.



### SMO... Oscillating Gauges

For Round and Non-Round Products

- Up to 6 measuring axes
- Seamless 360° coverage
- No blind zones
- Measurement independent of twist
- Computes also cross section
- Oscillating or static operation
- For rounds, squares, hexagonals, flats, rebar

### SMS... Static Gauges

Especially suited for Round Products

- Up to 6 fixed axes
- No moving parts
- Extremely compact
- Practically no maintenance
- Extremely fast measuring rate, short measuring distances
- Most economic version

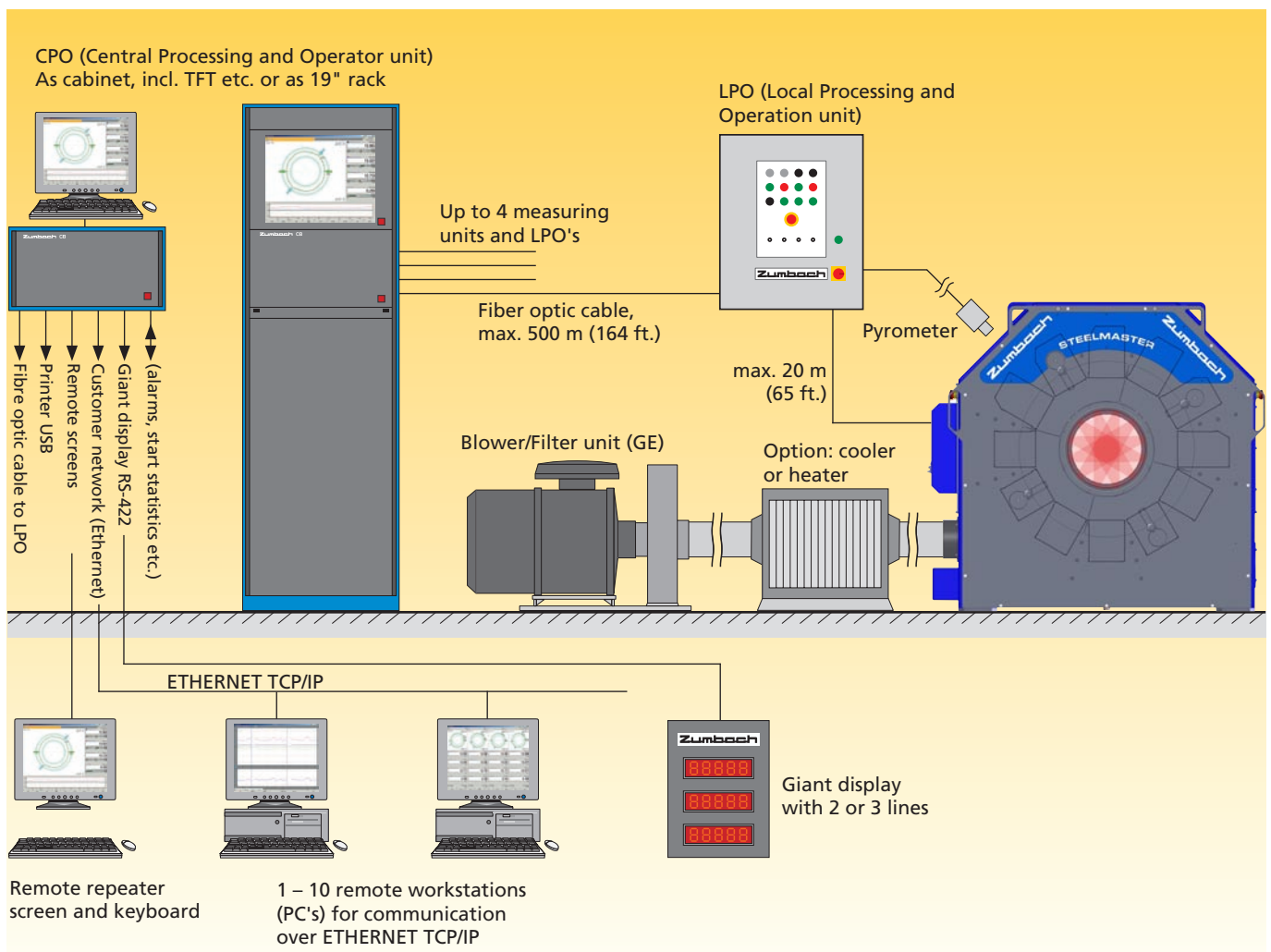
# Outstanding Advantages

STEELMASTER gauges offer decisive advantages for easy integration, dependable operation and the data processing and display:

- Hi-Tech laser scanners with top accuracy
- Up to 6000 measurements/s (1000 per scanner)
- Distributed intelligence
- One single (fiber optic) cable between LPO and CPO
- Compact industrial PC with highest working reliability
- Highly developed STEELMASTER software
- Sophisticated mechanics and protection system
- Close to zero maintenance

# System Architecture

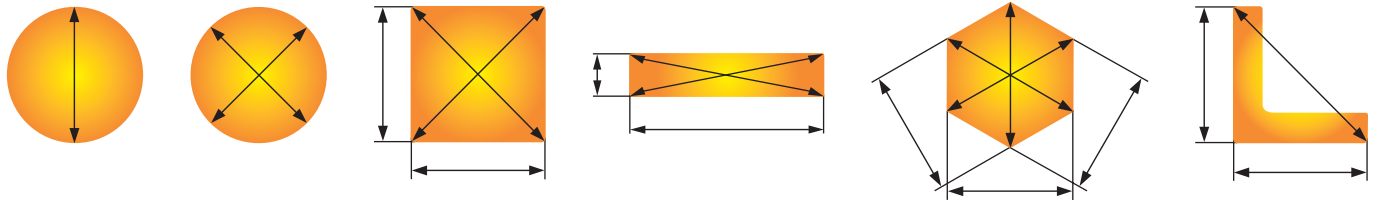
STEELMASTER systems allow for optimum configuration and layout of the measuring unit(s), processor, auxiliary, devices, networks and peripherals for each rolling mill.



# Dimension Measurement and Fault Detection

Modern In-line measuring systems not only provide accurate values for diameter, ovality, width, height etc., but they also detect shape deviations, rolling faults and other process problems instantly. STEELMASTER systems easily meet these requirements thanks to high measuring rates, intelligent software and oscillating measuring modes.

## Dimension measurement

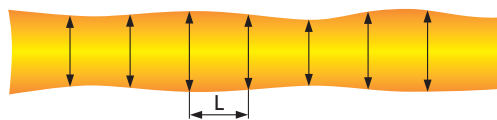


## Shape deviations, Faults

### Radial faults



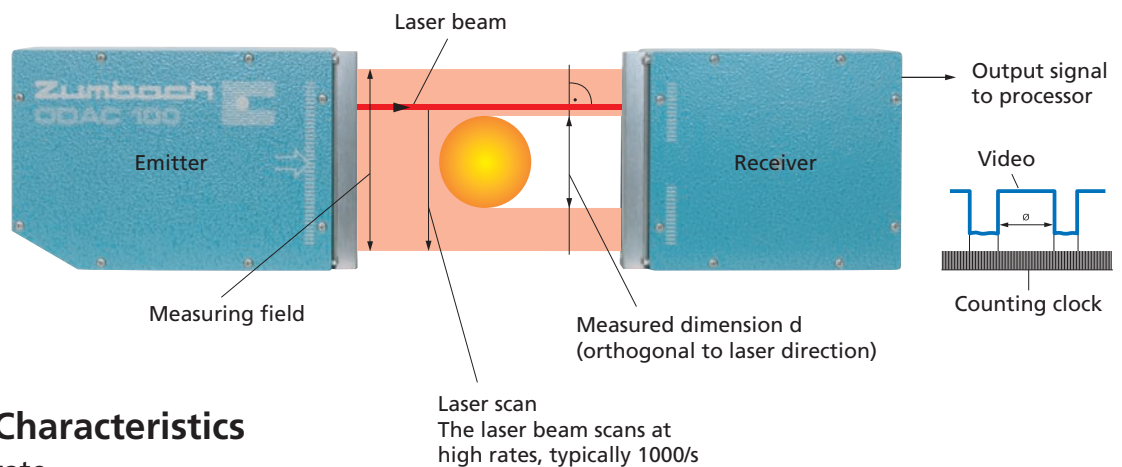
### Longitudinal faults



Up to 1000 measurements/s  
(At 100 m/s  $\rightarrow$  L = 100 mm (.4 in.))

## The Sensors

ODAC laser scanners with latest optical and laser technology are the "heart" of the STEELMASTER gauges. The field experience, gained from over 60'000 performing ODAC scanners and systems, represents a solid base for design refinements and quality. ZUMBACH offers ODAC models with measuring fields from 15 mm (.59 in.) up to 500 mm (19.68 in.), bigger models upon request.



## Outstanding Characteristics

- Extremely accurate
- Permanently calibrated
- High resolution
- High measuring rates, up to 1000/s
- High immunity to dirt
- Totally independent of position, vibration, temperature of rolled product, light intensity etc.
- Extremely long ZUMBACH lifetime

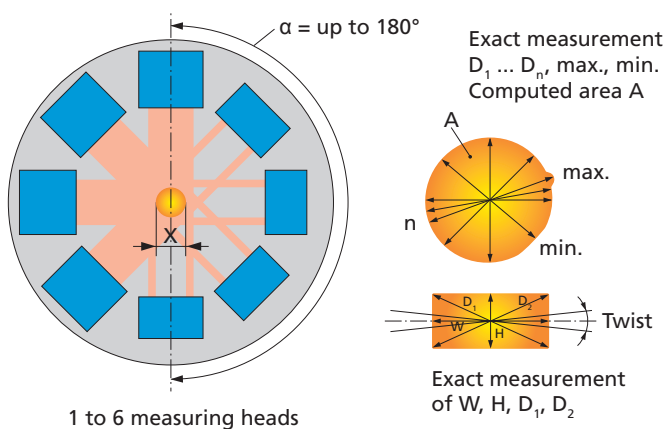
# Oscillating or Static – The Optimized Solution For Any Application

## SMO... Oscillating Gauges

SMO gauges "see" everything, all around!  
They are able to measure round and non-round products such as squares, hexagonals, flats etc. and this independent of twist and twist angle. This is made possible through dynamic regression analysis with sophisticated software. Depending on model, the number of measurement axes (scanners) can be 2, 3, 4 or 6. With an increasing number of axes, more data can be captured at the same time, and the measurement cycle per profile is shorter. SMO gauges can also be operated in static mode, in selectable orientation.

### Outstanding Advantages

- Measures all types of products
- Independent of twist
- Very short measurement times
- Also computes cross section (area)



## SMS... Static Gauges

Simple, compact and primarily suited for round products. SMS units are of the same design as SMO systems, with the exception of the oscillation mechanism. They are extremely compact and easy to integrate.

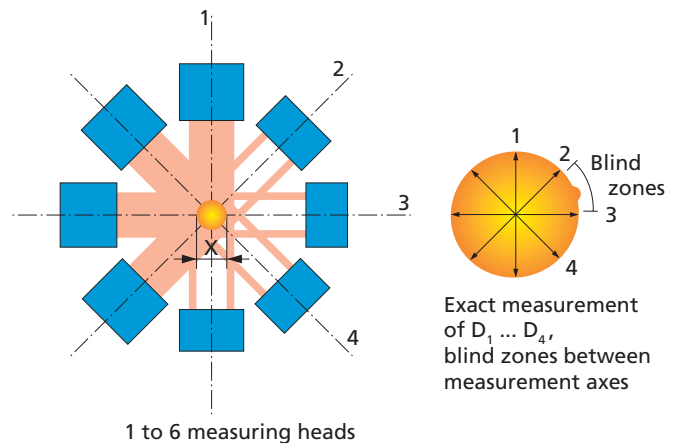
SMS units are available in several standard versions:

- S2 (2 axes)
- S4 (4 axes)
- S6 (6 axes)

Other versions on request

### Outstanding Advantages

- Extremely compact
- Very high measuring rate (1000/s in longitudinal direction)
- No moving parts
- Close to zero maintenance



## POLYGON, The Measuring Method for Special Product Geometries

ZUMBACH developed a novel measurement method, **FPS** (Full Profile Synthesis – patent pending), for special geometries of polygonal shape aberrations, generated by 3-roll blocks, for specific profiles or for asymmetrical shapes.

Scanning a multitude of shadow edges around the entire periphery captures the product shape. This is achieved with several ODAC measuring heads, scanning synchronously with high accuracy. This **FPS** method, based on special algorithms, generates a complete profile synthesis (contour). This very profile makes it possible to derive data, like out of round, reference centers and other key elements, used for the adjustment of the rolls.



Oscillating SMO systems are able to capture markedly more data, allowing for even more precise profile measurements.

Even in case of varying twist, or if the extreme points have not been captured by any scans, this method provides exact values of the minimum, the maximum, out of round condition and the derived data without fail.

# The STEELMASTER Software

This is a highly developed software, proven and refined over years.

A basic package offers all functions needed for round products.

For all non-round products, such as squares, hexagonals, flats, rebar as well as for polygonal shape deviations (3- roll blocks), additional software modules are available.

Also for additional functions such as network communication, data archiving, remote workstations, SPS statistics etc., optional modules are readily available.

## Important:

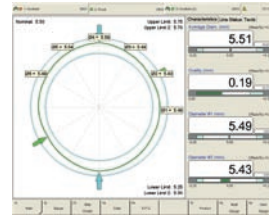
There is only one hardware and software for all STEELMASTER versions, which can be upgraded any time.

The main data such as measuring rate, accuracy, measuring parameters and all optional upgrades are the same.

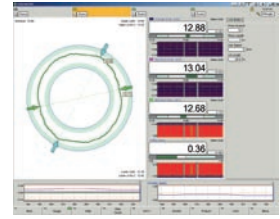
High flexibility allows for individual configuration of the screens with section and trend displays, (numeric and graphic), printing protocols, statistics etc. as per specific needs, and operating methods.

Several programmable access levels and passwords allow for optimum use and data safety.

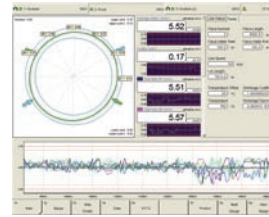
The state-of-the-art software allows an almost unlimited selection for the graphical and numerical display of the numerous parameters:



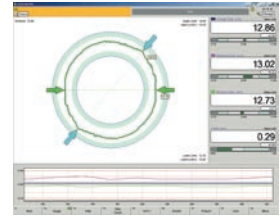
Cross section, current measurement values, bar graph, trend



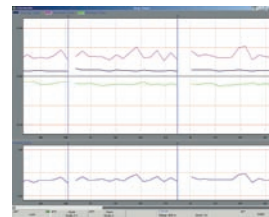
Oscillating measuring unit SMO: cross section, current measurement values, bar graph, trend and line status



Static measuring unit SMS: cross-section, current measurement values, bar graph, trend and line status



Cross section, current measurement values, bar graph



Trend of multiple parameters



MULTIGAUGE display of 4 measuring units

## Basic STEELMASTER Software

### STEELMASTER

#### All functions for round products

- Display of mean value, min., max., ovality
- Hot and/or cold values
- Min./max. alarm limits
- Section screen
- Split screen in case of MULTIGAUGE
- Trend graph
- Product recipe
- Product table / memory
- Statistics
- Printing protocols
- Monitoring
- Maintenance, calibration

### Sub-Modules

#### STEELDATA

- Data filtering
- Pre-processing
- Computation

#### STEELGAUGE

System configuration

## Software Options

### PROFILES

For squares, hexagonals, flats, special profiles

### POLYGON

FPS software for rounds and hexagonals of 3-roll blocks, for special shapes and for the determination of the out of round condition

### REBAR

For rebar, various geometries

### SPC

For SPC statistics, configurable

### STEELHOST

Standard protocol for ETHERNET TCP/IP

### STEELDATABASE

For retro viewing and archiving

### REMOTE STEELMASTER

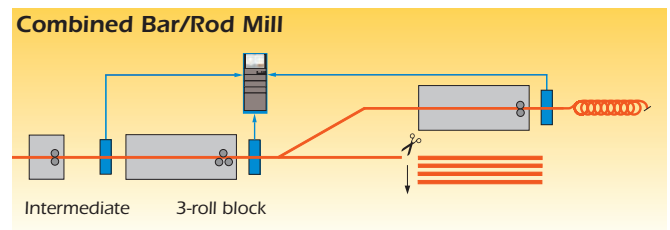
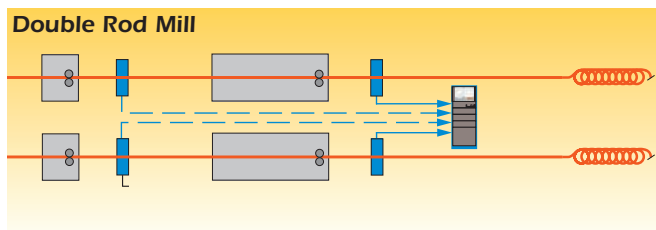
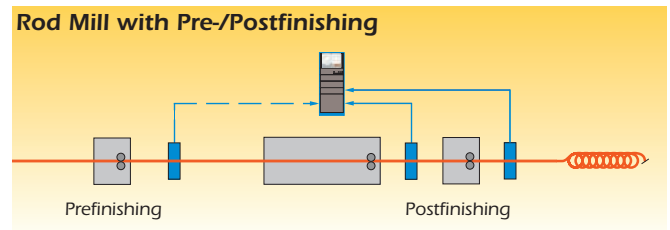
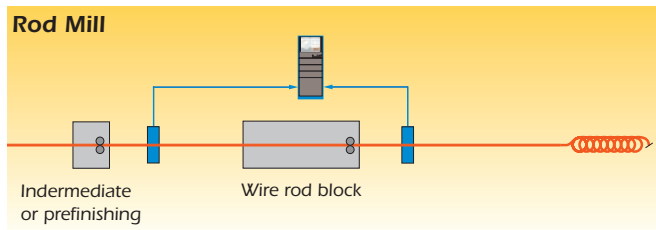
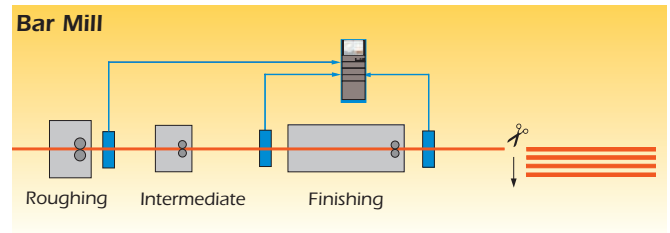
For networking via ETHERNET TCP/IP, with up to 10 independent PC workstations

# MULTIGAUGE Configurations

The STEELMASTER hardware and software permits to connect up to 4 measuring units to the central PC and to process and display all systems simultaneously. This configuration proved highly successful over the past few years because:

- it provides a better and quicker overview and full process transparency
- it is economical
- Substantially smaller investment

The illustrations show some typical configurations that have all proven their efficiency.



## General Data of the Measuring Units

|  |  |
|--|--|
| Measuring principle                    | Laser scanning tangential (shadow)   |
| Measuring rate                         | Up to 1000/s per axis*   |
| Laser                                  | Laser diode red, class II  |
| Number of measuring axes               | 2...6 (depending upon model)   |
| Resolution                             | 0.001 mm (.00004 in.)  |
| Repeatability                          | Typically $\pm 0.0025$ mm* (.0001 in.)   |
| Measuring times (depending upon model) | SMO: 1 complete profile in 0.4...4 s<br>SMS: 1 measurement (all axes simultaneously) in 1...20 ms* |
| Oscillation angle                      | Programmable up to 180° *  |

\* Depending upon model and version

## Standard Models

| Model   | Measuring Field             |      | Max. Product Diameter <sup>1)</sup> |      |
|---|-----------------------------|------|-------------------------------------|------|
|   | mm                          | inch | mm                                  | inch |
| SMO 60-SX <sup>2)</sup> / SMS 60-SX <sup>2)</sup>   | 60                          | 2.4  | 50                                  | 2    |
| SMO 100-SX <sup>2)</sup> / SMS 100-SX <sup>2)</sup> | 100                         | 4    | 80                                  | 3.2  |
| SMO 151-SX <sup>2)</sup> / SMS 151-SX <sup>2)</sup> | 150                         | 5.9  | 130                                 | 5    |
| SMO 310-SX <sup>2)</sup> / SMS 310-SX <sup>2)</sup> | 310                         | 12.2 | 280                                 | 11   |
| SMO 690-SX <sup>2)</sup> / SMS 690-SX <sup>2)</sup> | 690                         | 27   | 500                                 | 20   |
| SMO XXX-SX <sup>2)</sup> / SMS XXX-SX <sup>2)</sup> | Special ranges upon request |      |                                     |      |

Further models are available, depending on product and measurement range

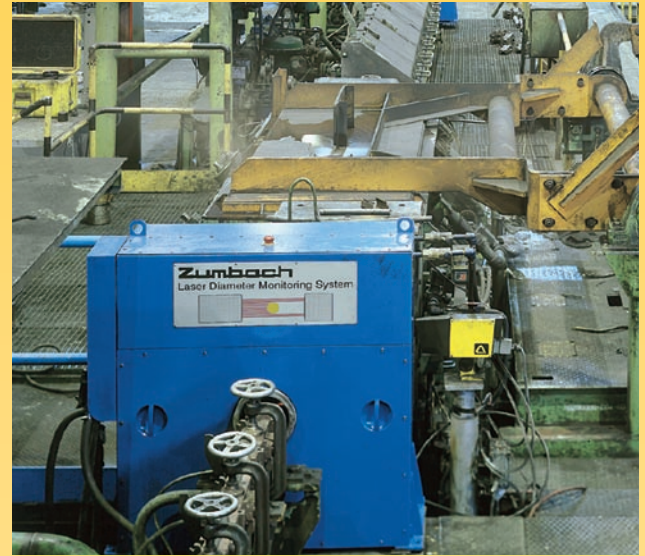
<sup>1)</sup> Max. diameter = depending on the guiding and vibration

Min. diameter = approx. 1 mm (.04 in.)

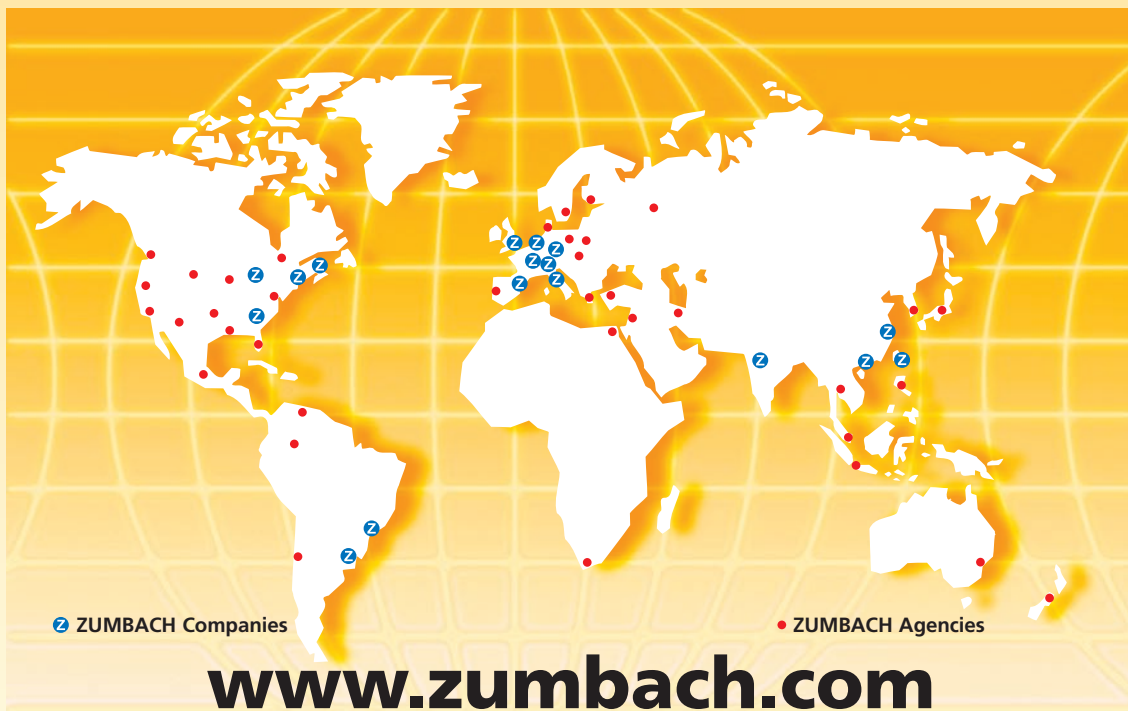
<sup>2)</sup> X = Number of measuring axes

\* Technical specifications are subject to change without notice

► Please ask for detailed literature about data and dimensions of the individual models.



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