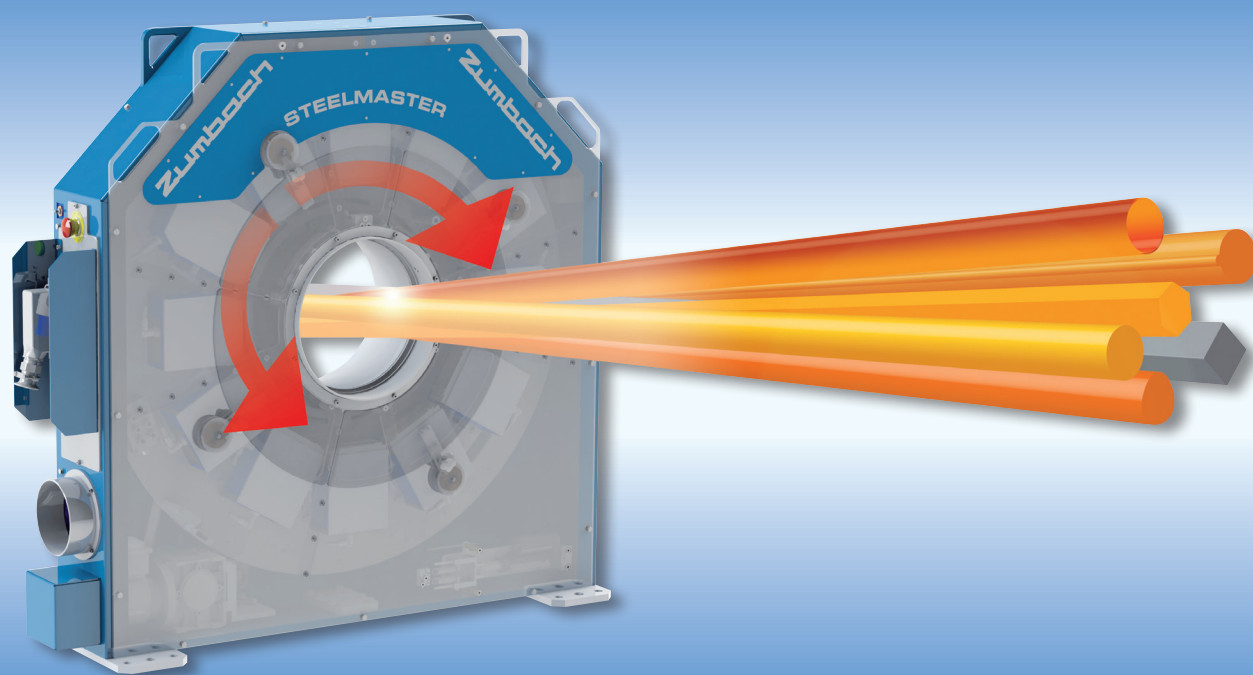


Zumbach

SWISS PRIME MEASURING SINCE 1957

STEELMASTER SMO



**Oscillating Multi-Mode Gauges
For Hot and Cold Rolling & Quality Control**

SMO is part of the STEELMASTER family with SMS & SMR

GENERAL

Oscillating multi-mode gauges STEELMASTER SMO from ZUMBACH are a well-proven line of precision gauges for hot rolling mills and for cold processes. They are available for various measuring ranges and in many versions in order to suit all needs. Over 400 systems are in operation worldwide. SMO gauges are mechanical simple, robust and very reliable.

Outstanding Advantages

- 1000 (option: 2000) measurements /s (each axis)
- Latest technology – Highest accuracy
- Extremely compact
- 3 measuring modes at choice
 - Static mode shows evolution over 1 billet
 - Oscillating mode captures entire profile
 - Selective oscillation over programmable angle, shows critical dimensions, especially for non-round products
- Measures rounds and non-round profiles, regardless of product twist
- Computes also cross section (mm²/in.²)
- Special versions for 3-roll mills incl. EPM and FPS software
- Reliable, thanks to unique protection system
- Uncritical guiding
- Fibre optics cable between local processing unit LPO and central control unit CPO
- No wear, minimum maintenance

APPLICATIONS

SMO: The Solution for Many Problems!

Thanks to the many ranges and versions an optimal solution for any mix of products is available. In the oscillating mode the full periphery is scanned for diameter and for faults. Alternatively, in the static mode, a high number of readings in axial direction and in selectable orientation are provided.

- Hot rolling – Round rod, bar, rebar, tube



- Hot rolling – Non-round rod and bar

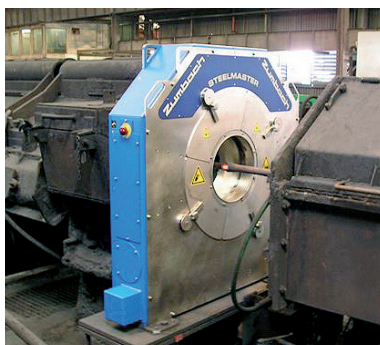


- Cold processes and quality control (peeling, grinding, polishing, ERW)



GAUGE VERSIONS

SMO 100 / 160



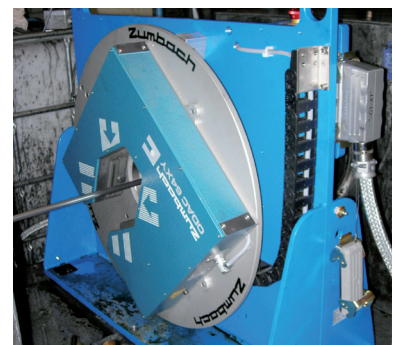
For rod and bar.

SMO 230 / 310 / 550



For seamless tubes.

SMO xxN (cold)



For cold ERW tubes.

BASIC CONCEPT

The simple and robust mechanical concept of SMO gauges has well proven its reliability and easy maintenance. Hundreds of units are operating worldwide since many years.

SMO measuring units can be fitted with 2 up to 6 laser heads (axes), depending version and application. With 2 or up to 6 heads, a full profile (section screen) is generated after 90 or even only 30 degrees of rotation in CW or CCW direction.

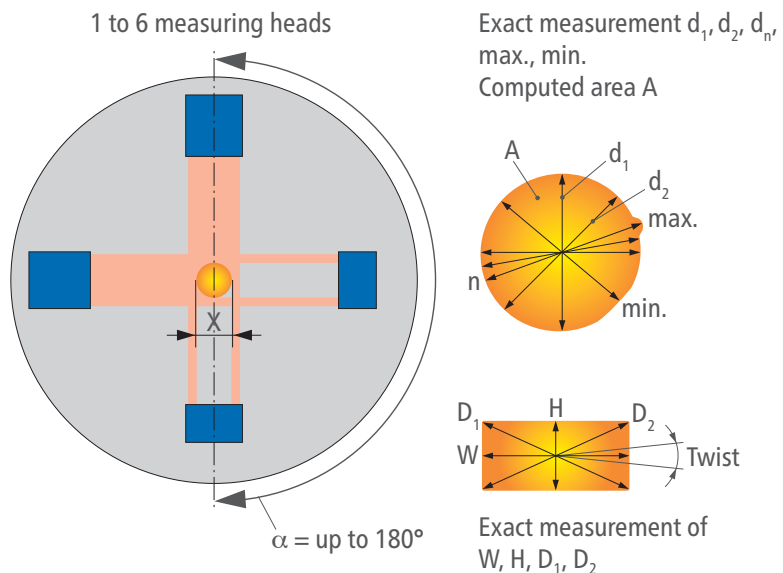
For non-round bars such as squares, hexagons, flats etc., the optional PROFILE software provides the respective processing and screens.

Any SMO measuring unit can be combined with other gauge models in a MULTIGAUGE system.

Oscillating Mode

For round products the standard mode provides the full product profile after each oscillation in CW or CCW direction. In case of 2 axes the profile is completed after 90°, in case of 3 axes after 60° etc. The max. angle is 180 or 90 degrees, depending model. The laser heads take 1000 measurements/s each (optionally 2000/s) in fully synchronized mode. This means that min. and max. and mean diameters are captured respectively calculated at high accuracy and, additionally, also the section (area) in mm² (in.²) is calculated. Also longitudinal faults, such as seams, overfills / underfills etc. are detected.

For non-round products, like flats, hex, squares etc. the exact width, height and diagonals can be measured in this mode, disregarding of torsion.



Static Mode

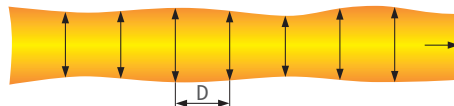
This mode provides extensive information in axial (longitudinal) direction. It is suitable for round products only. The oscillating disk with the laser heads can be positioned in a selectable orientation and the bar is measured at 1000 measurements/s (optionally 2000/s) in each axis. This means an extremely short distance "D" between the measurements.

Examples:

At 100 m/s → D = 50 mm

At 10 m/s → D = 5 mm

Short distance between measurements

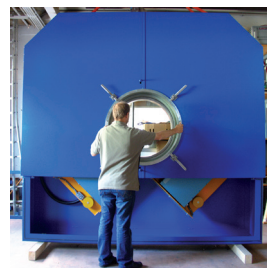


Up to 1000 measurements/s (optionally 2000 measurements/s)

At 100 m/s → D = 100 mm / 4 in. (optionally 50 mm / 2 in.)

Customized SMO Gauges

Upon request ZUMBACH can also provide customized SMO systems for special product ranges, restricted space conditions etc.



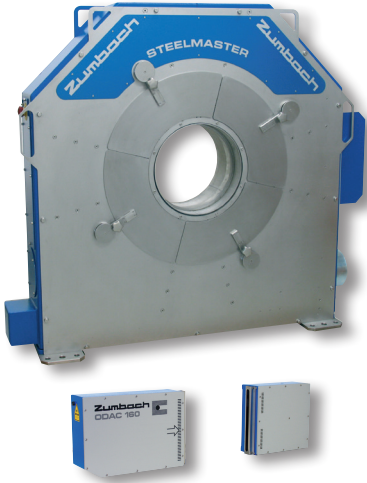
A large SMO gauge in assembly.



A special SMO in a seamless pipe mill.

BASIC SYSTEM COMPONENTS

Measuring Unit with ODAC® Diameter Measuring Heads



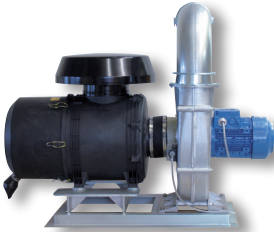
A robust, welded structure ensures protection of the laser heads against dust, scale, splashes and heat.

- Drive system for oscillation
- Central automatic shutter
- Easy exchangeable protection glasses
- Temperature control system
- Cooling for OD's up to approx. 30 mm (1.18 in.) by air only.
Over 30 mm (1.18 in.) additional water cooling is required.

ODAC® 100 / 160 high-tech laser measuring heads (inside the measuring unit)

- 1 emitter + 1 receiver for each head
- Fully synchronized scanning between the heads
- Principle: Laser scanning, 2000 measurements/s
- Calibrated Single Scan (CSS)
- Light source: Solid state laser, class II

Filter / Blower Unit GE 5-2



Providing filtered air at high volume to purge the laser shutter and for general cooling of the measuring unit.

3 kW, 1350 m³/h (47,600 cu. ft./h).

Local Processing and Operation Unit LPO



It forwards all pre-filtered measured values and transmits the data via a single fibre optic cable to the main control unit CPO.

- Inputs for mains supply, measuring unit, pyrometer (optional)
- PLC controller
- Built-in cooling unit

Central Control and Operating Unit CPO



For up to 4 measuring units of the SMR (rotating), SMO (oscillating) or SMS (static) models.

- Industrial embedded PC without fan in a 19" drawer (height = 8HU). Operating system on solid state disk, i.e no need for UPS unit (fail safe).
- Inputs/outputs: VGA for screen/keyboard/mouse, fibre optic connection to LPO unit, ETHERNET for customer (TCP/IP), USB for printer or other peripherals, RS-422 for giant displays, relay outputs for alarm etc., digital inputs (8) and outputs (4)

Software – Basic & Optional Packages



The sophisticated STEELMASTER software packages guarantee high flexibility in general, future safe upgrading, case specific solutions, personalized configurations, connectivity, process transparency.

ACCESSORIES

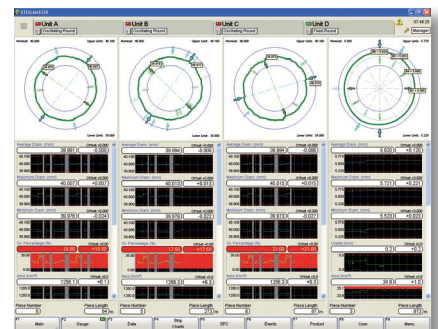
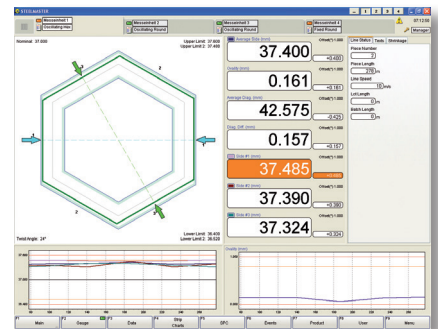
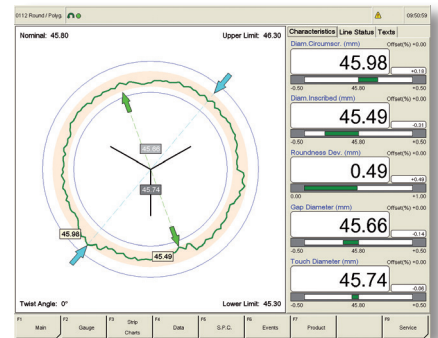
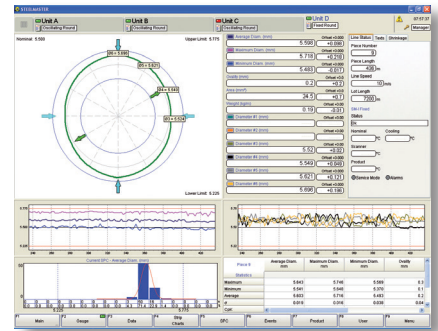
Remote repeater screen for mounting and operation up to 150 m (490 ft.) • **Remote giant display** (2, 3 or 4 groups of 5 digits) • **Pyrometer** for conversion to cold values (20°C / 68°F) • **Traversing system** for positioning or withdrawing of the measuring unit • **Air cooler or heater** for cooling and/or heating of blower air • **Water cooling system** (heat shield with circulating water) for product diameters exceeding 30 mm (1.2 in.)

STEELMASTER SOFTWARE

Basic Software Package

The basic package features all functions for round products:

- Start and end suppression
- Calculation of diameters, height, width, diagonals
- Display of mean value, min., max., ovality
- Hot and / or cold values
- Min. / max. alarms
- Head and tail scrap length indication
- Personalized screens
- Statistics, printed reports
- Optional software extensions
- 10 major languages; others on request
- Section, trend screens
- Split screens (MULTIGAUGE)
- Configuration, calibration screens



Optional Software Packages

Besides the basic package, STEELMASTER systems offer many additional modules and extensions such as:

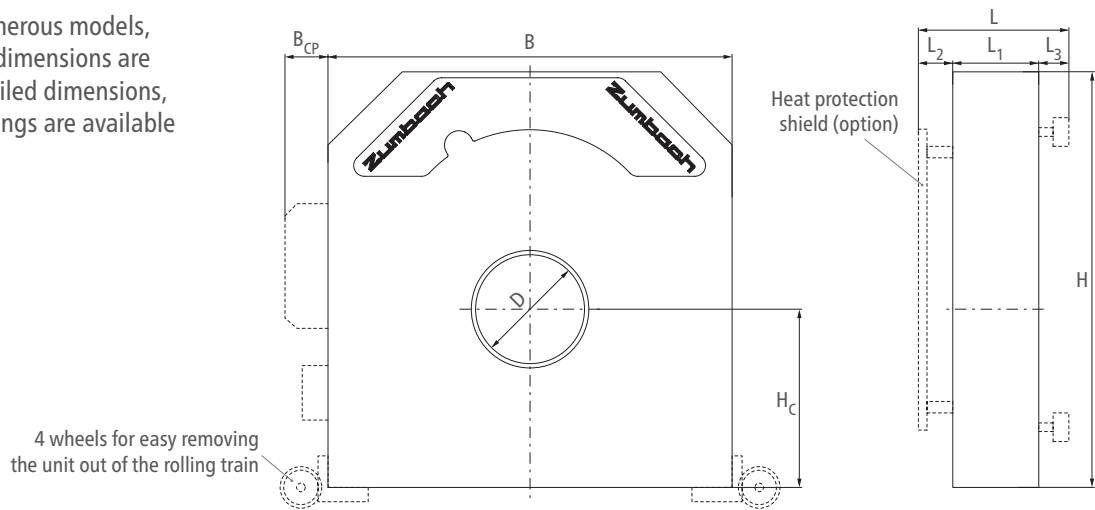
- **STEELDATA**
Data filtering, pre-processing, computation
- **STEELGAUGE**
System configuration (1...4 gauges)
- **PROFILES**
For squares, hexagons, flats, special profiles
- **REBAR**
For rebar with various geometries
- **SPC**
For SPC statistics, configurable
- **STEELHOST**
Standard protocol for ETHERNET TCP/IP
- **STEELDATABASE**
For post production viewing and archiving (to be installed on external PC's)
- **REMOTE STEELMASTER**
For networking via ETHERNET TCP/IP, with up to 10 independent PC workstations
- **POLYGON / EPM / FPS**
EPM and FPS method and software (with 3 axes only).
ZUMBACH's EPM and FPS algorithms and software (pat. pend.) solve many problems.

EPM (Enhanced Profile Measurement) can measure and calculate non-symmetrical polygonal or any irregular product. The screen presents the product in an almost 1:1 real shape on the operator screen. The effective roundness RON_t (by ISO definition) gets calculated for any deviation from round.

FPS (Full Profile Synthesis) is an optional module, especially important for round or hexagonal bars rolled in 3-roll blocks. It provides 2-point and 3-point diameter values and in particular the DT and GT values which are essential for quick setting of 3-roll blocks.

DIMENSIONS

Due to the numerous models, only the main dimensions are listed. For detailed dimensions, separate drawings are available upon request.



Model	B	B _{CP} ¹⁾	D	H	H _C	L	L ₁	L ₂	L ₃	Heat prot. shield	Wheels (option)
SMO 100-Sx	1150 (45.28)	105 (4.13)	270 (10.63)	1200 (47.24)	630 (24.80)	343 (13.50)	210 (8.27)	95 (3.74)	38 (1.50)	✓ ²⁾	✓
SMO 160-S2/3	1150 (45.28)	105 (4.13)	270 (10.63)	1200 (47.24)	630 (24.80)	383 (15.08)	250 (9.84)	95 (3.74)	38 (1.50)	✓	✓
SMO 160-S4/6	1670 (65.75)	105 (4.13)	284 (11.18)	1690 (66.54)	855 (33.66)	385 (15.16)	252 (9.92)	95 (3.74)	38 (1.50)	✓	✓
SMO 230-S2/3	1150 (45.28)	105 (4.13)	270 (10.63)	1200 (47.24)	630 (24.80)	383 (15.08)	250 (9.84)	95 (3.74)	38 (1.50)	✓	✓
SMO 310-Sx	2180 (85.82)	300 (11.81)	500 (19.68)	2240 (88.19)	1130 (44.49)	524 (20.63)	400 (15.74)	80 (3.15)	44 (1.73)	✓	✓
SMO 550-Sx	2800 (110.23)	300 (11.81)	686 (27.00)	2700 (106.29)	1370 (53.93)	520 (20.47)	440 (17.32)	30 (1.18)	50 (1.96)	✓	✓

¹⁾ Space requirement for connection panel; the panel can either be on the left or on the right side of the measuring unit.

²⁾ For products till 30 mm (1.18 in.) = option.
For bigger products = obligatory.

Dimensions in mm (inch)

MAIN DATA

Measuring principle	Tangential laser scanning
Laser	Visible red laser, class 2
Measuring rate	1000 measurements/ s, each axis (optional 2000/s)
No. of axes	2 up to 6 (see below table)
Resolution	+/- 0.001 mm (.00004 in.)
Accuracy	Up to +/- 0.1 mm (.0004 in.) depending model
Power consumption	3 x 400V~ and 1 x 110...230V~, 50/60Hz, approx. 4.1kVA

Basic model	Measuring range / field*	Version	No. of meas. axes	Min. time / profile in oscillating mode	Max. oscill. angle
SMO 100-Sx	100 mm (4 in.)	SMO 100-S2	2	1.2 s	180°
		SMO 100-S4	4	0.6 s	
		SMO 100-S6	6	0.4 s	
SMO 160-Sx	160 mm (6.3 in.)	SMO 160-S2	2	1.2 s	180°
		SMO 160-S3	3	0.9 s	
		SMO 160-S4	4	0.6 s	
		SMO 160-S6	6	0.3 s	
SMO 230-Sx	230 mm (9.05 in.)	SMO 230-S2	2	2 s	180°
		SMO 230-S3	3	1.4 s	
SMO 310-Sx	310 mm (12.2 in.)	SMO 310-S2	2	3 s	90°
		SMO 310-S3	3	2 s	
SMO 550-Sx	550 mm (21.65 in.)	SMO 550-S2	2	3 s	90°
		SMO 550-S3	3	2 s	
SMO xx	Customised versions on request				
SMO xx-N	60...160 mm (2.36... 6.3 in.)	Various for cold applications	1, 2 or 3	0.9 s	180°

* Max. product dimension depends on worst case out-of-center position.

• All technical data are subject to change without notice.



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