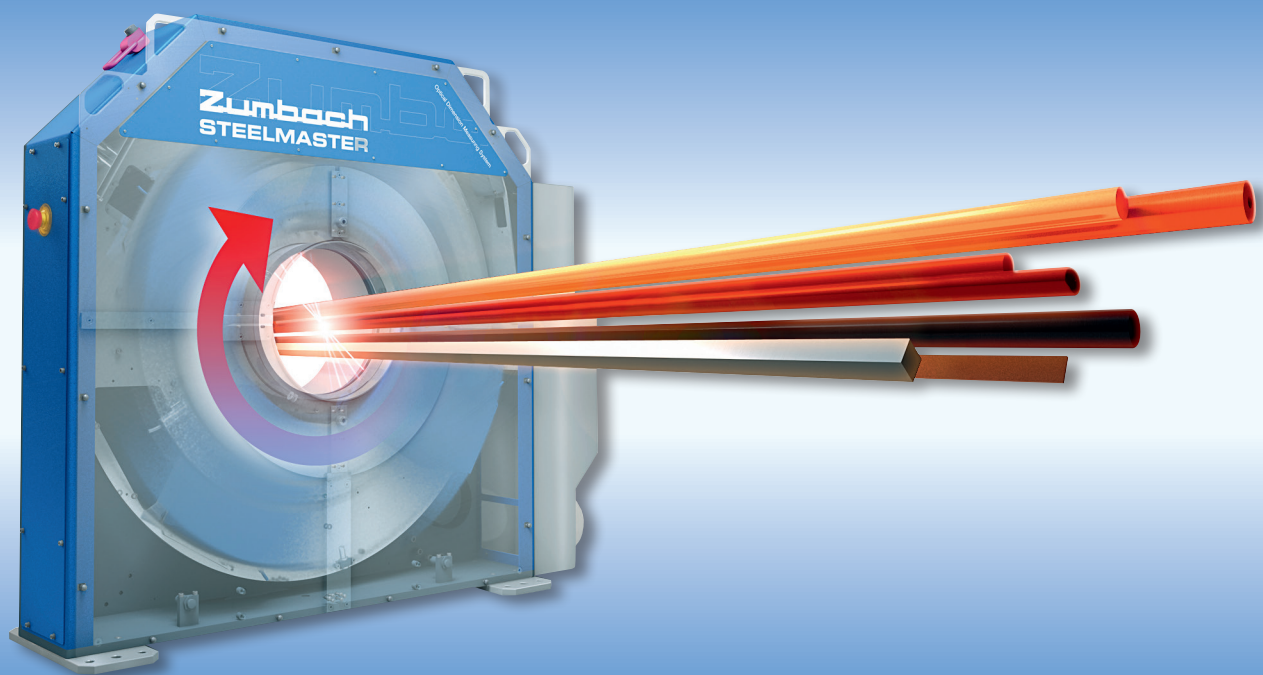


Zumbach

SWISS PRIME MEASURING SINCE 1957

STEELMASTER SMR



**The Revolutionary Rotating Gauges
For Hot and Cold Rolling & Quality Control**

SMR is part of the STEELMASTER family with SMS & SMO

GENERAL

The rotating SMR gauges from ZUMBACH are a new generation and concept of optical gauges for hot rolled rod and bar as well as for Quality Control. They bring completely new possibilities and solutions with high measuring performance. The SMR models are mechanically simple and very robust.

Outstanding Advantages

- Extremely fast: Up to 6000 measurements/s
- Rotates at high speed and measures along a shorter "spiral"
- Fully contact-free transmission of signals and power
- No need for compressed and instrument air
- Can work alternatively in static or orientable mode, with up to 6000 measurements/s
- Multi axes scanning: 1, 2 or 3 laser heads fully synchronised
- It can measure all shapes detecting faults and irregularities
- With 3 heads it only needs 60° of rotation to complete 1 full profile, i.e. up to 10 profiles/s at max. rotational speed
- Calibrated Single Scan (CSS); each scan = 1 calibrated measurement
- EPM (Enhanced Profile Measurement) for asymmetric, polygonal or any irregular shape
- FPS (Full Profile Synthesis) function for GT, DT and RONT (ISO).
This is essential for setting of 3 roll blocks and roundness definition
- The large clearance and only one overdimensioned bearing means no heat problems and unlimited lifetime
- No wear – Maintenance overall is "close to zero" and very easy to complete
- Immune to environmental conditions

APPLICATIONS

SMR: The Solution for Many Problems!

Thanks to the fast measuring rates and the high resolution, the SMR concept is the perfect solution for high precision dimension measurement as well as for fault detection in both radial and axial direction.

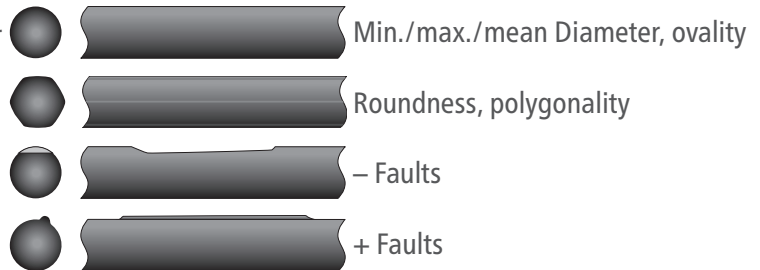
- Hot rolling – Round rod, bar, rebar



- Hot rolling – Non-round rod and bar



- Quality control (cold) – Black and bright bar

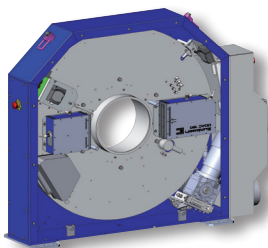


GAUGE VERSIONS

- **SMR 100-S1 / SMR 160-S1**

1-axis versions.

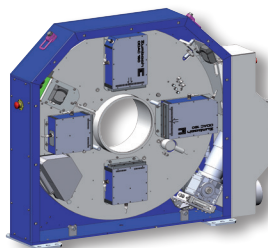
For round and non-round products.



- **SMR 100-S2 / SMR 160-S2**

2-axis versions.

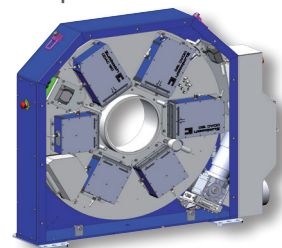
For round and non-round products; 2 times faster than the 1 axis versions.



- **SMR 100-S3 / SMR 160-S3**

3-axis versions.

Recommended for 3-roll blocks or for any asymmetric shape deviation from round.



BASIC CONCEPT

The mechanical concept and the basic elements are mostly the same as in the well proven oscillating gauges of the SMO series. Instead of power and signal transmission by a special cable solution, everything is now transmitted totally without contact. The rotating SMR models can be fitted with 1, 2 or 3 laser heads (axes). With 2 or even 3 heads, a full profile is generated after only 90 or 60 degrees respectively of the rotation. This means up to 10 full profiles/s.

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

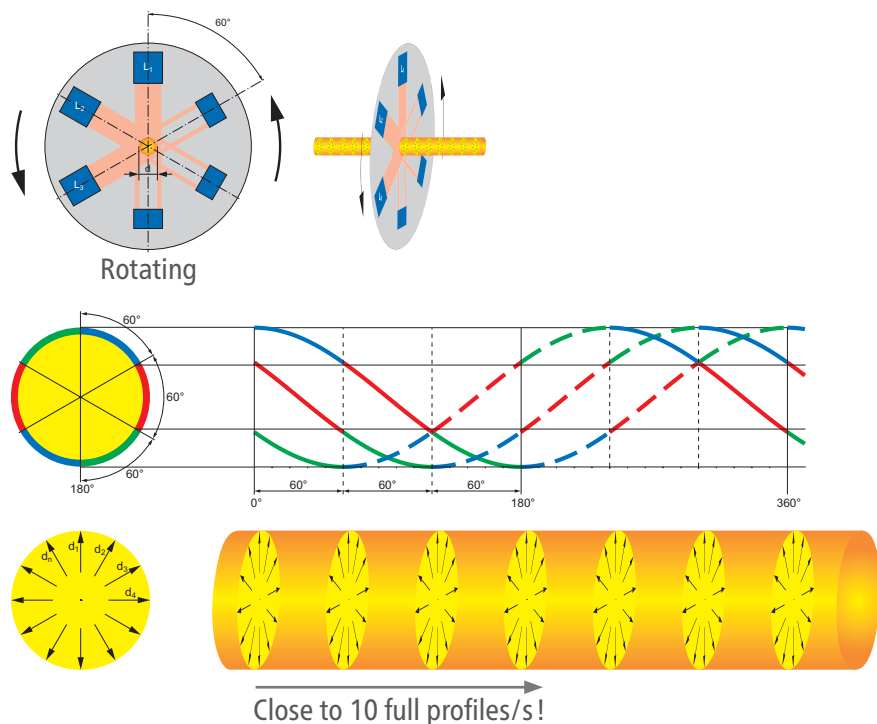
Any SMR can be combined with other gauge models in a MULTIGAUGE system. The SMR is the ideal gauge for high speeds and when short faults anywhere around the 360° periphery must be detected.

Rotating Mode

The rotating mode provides the full profile at a high update rate, including the absolute values for diameter and roundness, plus shape, faults and irregularities. The following explanations relate to 3-axis versions:

Three ODAC laserheads, mounted under 60°, rotate continuously at close to 100rpm and take 3 x 2000 measurements/s in a synchronous mode. This means approx. 10 measurements per degree, i.e. any irregularities like seams, overfills / underfills etc. are captured.

The periphery is divided into 2 x 3 segments. The software attributes then all arriving readings to the respective segments and a full profile is generated after only 60 degrees of rotation; this means close to 10 full profiles per second.

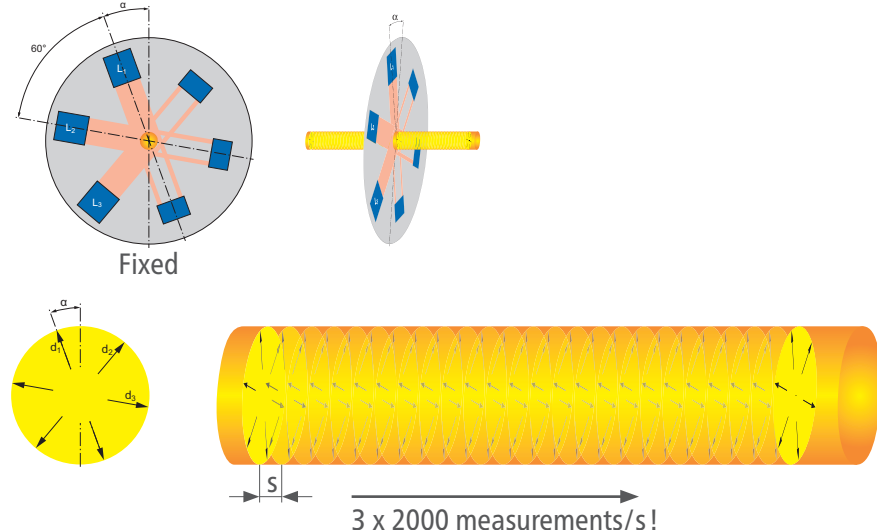


Static Mode

This mode provides extensive information and high resolution in an axial (longitudinal) direction.

The rotating disk with the 3 ODAC heads can be positioned in a programmable, fixed orientation α .

The bar is measured under 3 fixed axes d_1 , d_2 and d_3 at 3x2000 measurements/s or totally 6000 measurements/s. This means an extremely short distance "s" between the measurements.



Examples:

At 100 m/s \rightarrow s = 50 mm

At 10 m/s \rightarrow s = 5 mm

BASIC SYSTEM COMPONENTS

Measuring Unit with ODAC® Diameter Measuring Heads



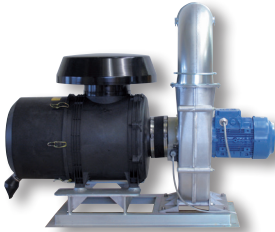
A robust, welded structure ensures protection of the laser heads against dust, scale, splashes and heat.

- Drive system for up to 100 rpm
- Fully contact-free power and signal transmission
- Easy exchangeable protection glasses
- Temperature control system
- Diagnostic outputs for checking the video signals
- Cooling for OD's up to approx. 30 mm (1.2 in.) by air only. Over 30 mm (1.2 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.

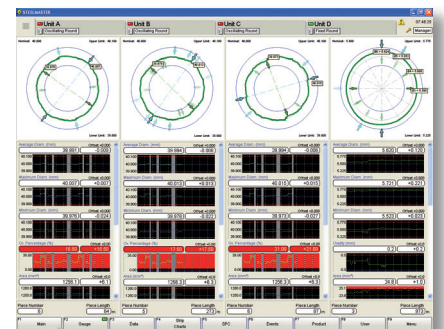
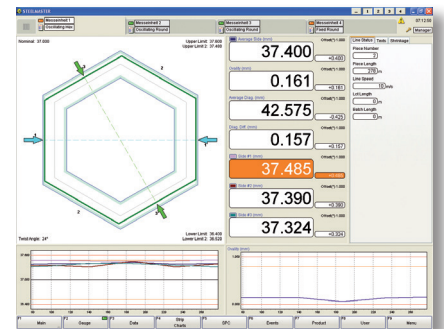
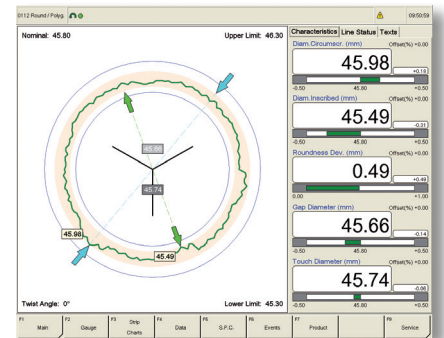
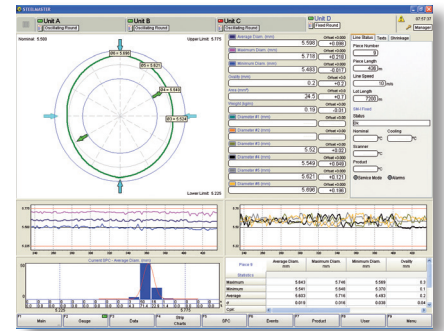
ACCESSORIES

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.).

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

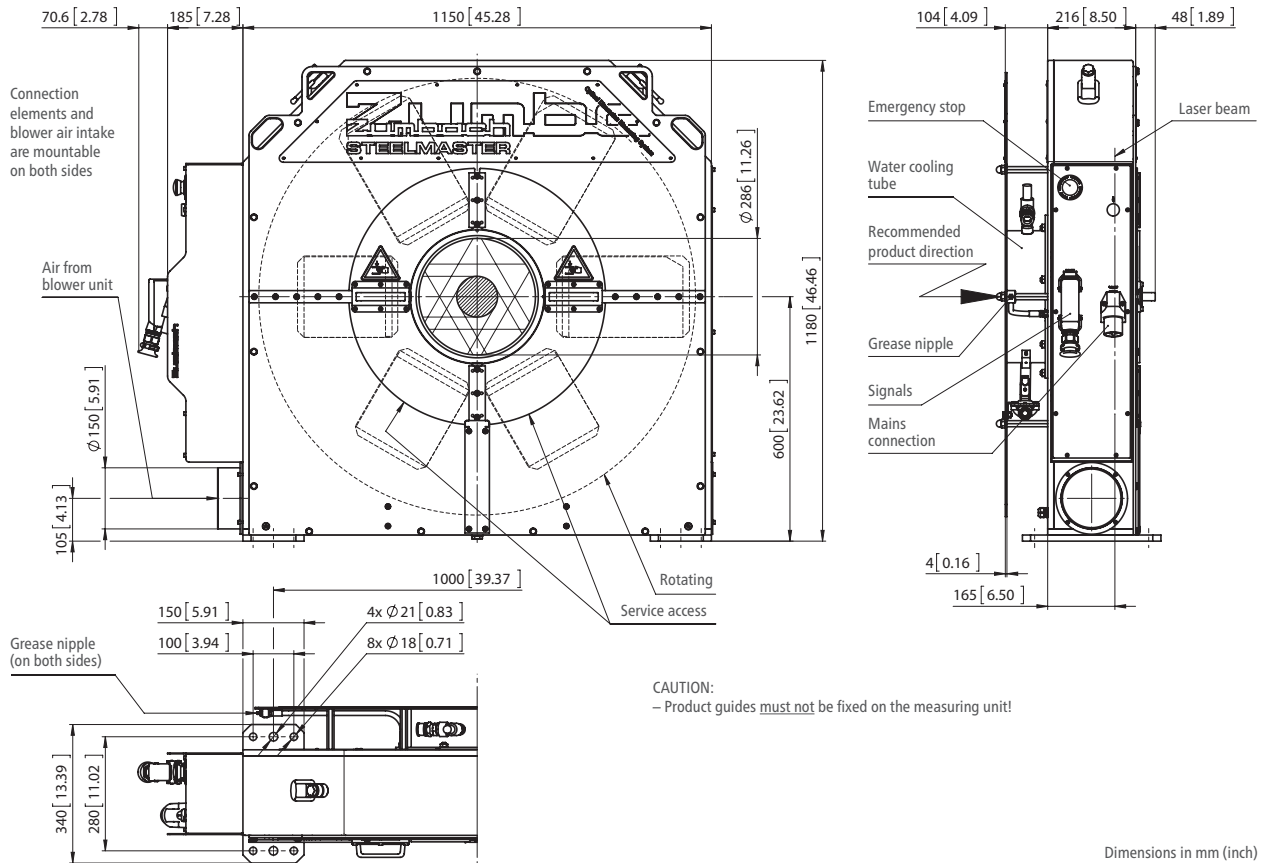
Besides the basic package, STEELMASTER systems offer many additional modules and extensions such as:

- **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 SMR 100/160-Sx WITH HEAT PROTECTION

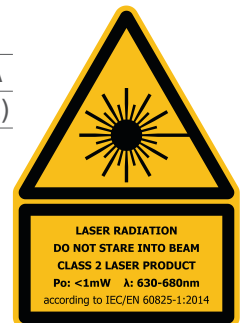


MAIN DATA

| Model | STEELMASTER SMR 100-Sx | STEELMASTER SMR 160-Sx |
|-----------------------------------|--|---|
| Measuring field | 100 mm (4 in.) | 160 mm (6.3 in.) |
| Product diameter * | 4 up to approx. 80 mm (.16 up to approx. 3.2 in.) | 4 up to approx. 135 mm (.16 up to approx. 5.3 in.) |
| No. of measuring heads (axes) | 1, 2 or 3, depending on model | |
| Measuring rate | 2000 measurements/ s, each axis | |
| Resolution | +/- 0.001 mm (.00004 in.) | |
| Accuracy (Repeatability) | +/- 0.01 mm (.0004 in.) | |
| Approx. time for 1 profile in ... | | |
| ... rotating mode: | 1 axis = 0.3 s 2 axes = 0.15 s 3 axes = 0.11 s | |
| ... static mode: | 0.5 ms (screen update=0.5 s) | |
| Power consumption | 3x400 V~ and 1x110...230 V~, 50/60 Hz, approx. 4.1 kVA | |
| Weight (without heat protection) | 400 kg (882 lbs.) | 465 kg (1.025 lbs.) |

* Depending on centring, resp. guiding or product vibration

• All technical data are subject to change without notice.



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