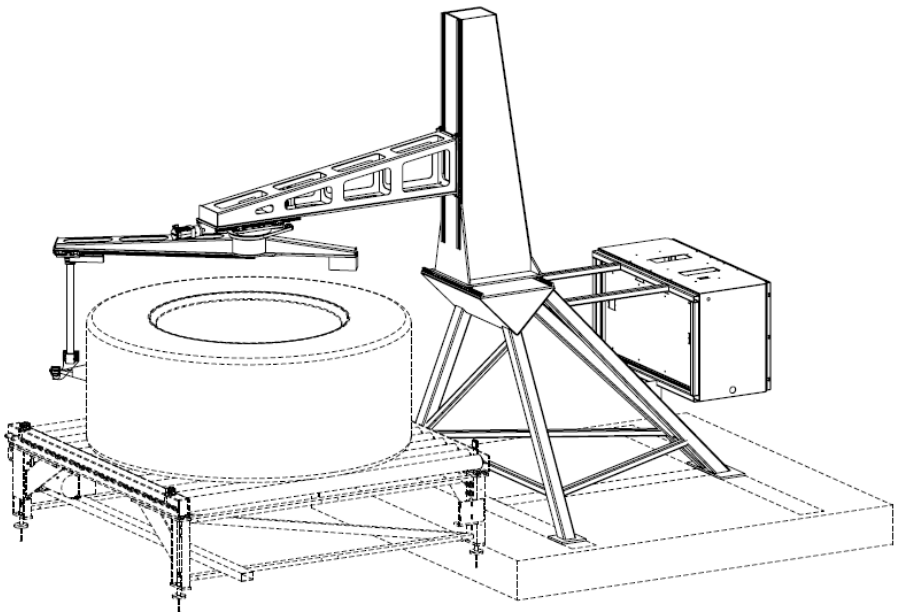
Data Sheet Wheel Measurement Station from 3defacto
(3DF_0211488)



Wheel Measurement Station

Sequentially analyzes the filled wheel using a profile laser sensor - contactless while positioned on a roller conveyor.

Measures runout deviation, diameter, and additional key parameters for an efficient quality assurance process.

Can be integrated into a fully automated assembly line or operated as a stand-alone solution with defined wheel placement (position tolerance ±100 mm).

Special Features

Sequential measurement of the hub bore, rim flange, tire sidewall, and tire tread.

- Positioning of the machine rotation axis and measurement positions is calculated after a “pilot measurement.” No position or geometry data from a higher-level control system is required.
- The measuring process operates independently of the tire tread pattern, with automatic detection of the tread surface.
- Measured values are referenced to the calculated wheel hub axis. Positioning tolerances between the wheel and the machine rotation axis do not affect the measurement results.

Configuration options

- Machine can also be configured for other wheel size ranges
- Shorter cycle times are possible upon request
- Reference to the bolt circle for bolt-centered wheels

Technical Data

SPECIFICATIONS	
Dimensions (LxBxH)	2800x4800x3800 mm
Wheel weight	ca. 1650 kg
Wheel diameter	500 – 2400 mm
Wheel width	200 – 1250 mm
Hub bore diameter	>= 90 mm
Cycle time	60 s
Measurement accuracy	±0,3 mm
Measurement program	With SQL database
Measurement technology	2D/3D Profile line sensor
Actuation	Servo-driven rotary and linear axes
Power supply	400 V / 50 Hz
Pneumatics	6 bar – oil free

Contact person in the WHEEL ASSEMBLY MACHINES division:
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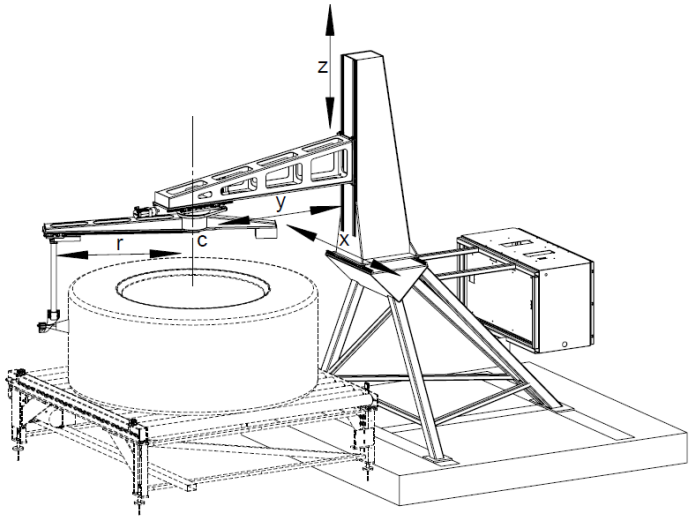
Mechanical Structure

Moving-column design with the x-axis positioned between the base frame and column,
the z-axis between the column and cantilever arm,
and the y-axis between the cantilever arm and carriage.

The carriage includes the machine rotation axis (c-axis) with a radius-adjustable measuring arm (r-axis).

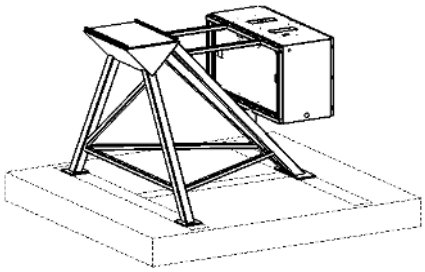
The profile laser is pneumatically pivoted for radial and vertical measurement.

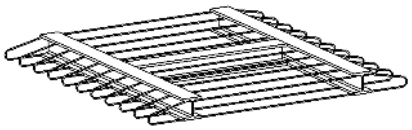
Servo-driven linear axes and rotary axis.

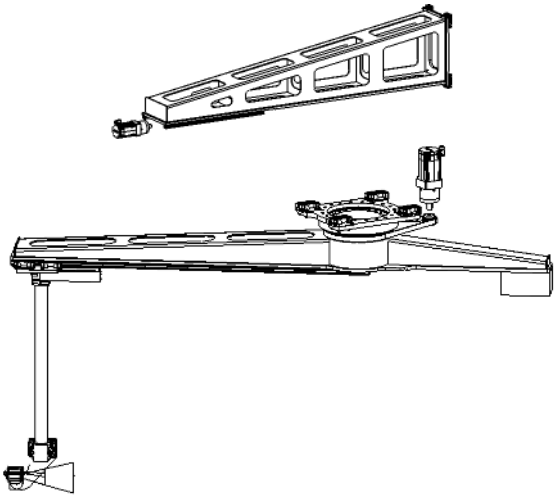


The scope of delivery includes the following components:

1x machine base frame with control cabinet
1x floor foundation with welded reinforcement (cut-out: 3200 x 3100 x 300 mm, concrete C25/30)
1x column
1x cantilever arm
1x carriage with measuring arm
1x 3DF measuring software for data evaluation
1x hardware and operator panel, PLC-controlled





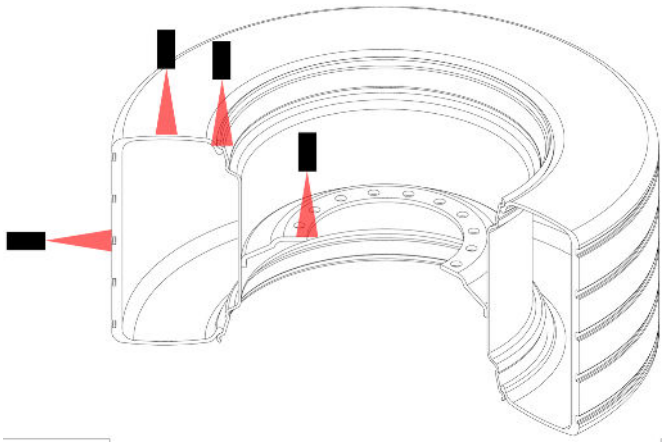


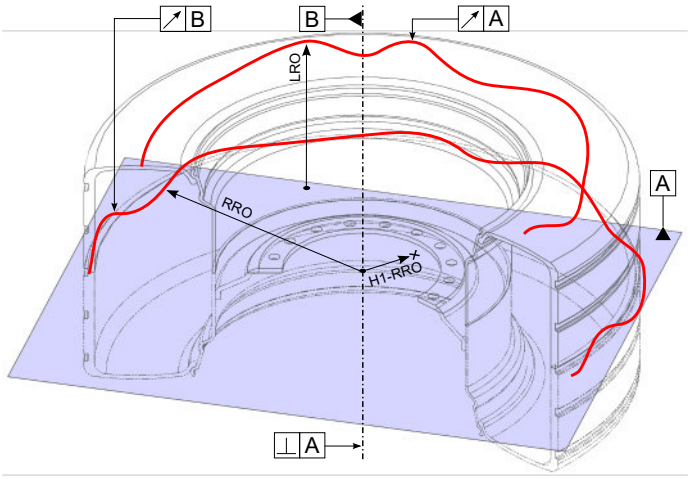
Process description

1. The wheel is moved on the roller conveyor to the center position beneath the measuring station. Positioning tolerance ±100 mm, machine rotation axis within the hub bore.
2. Flange height, hub bore diameter, and center position are measured/calculated.
3. The machine rotation axis is positioned centrally above the wheel; the profile laser is positioned radially and vertically over the centering surface of the hub bore.
4. Measurement of the hub bore / flange surface. The machine rotation axis rotates 425° (385° vibration-free at constant speed during measurement).
5. Rim diameter and rim width are measured.
6. The profile laser is positioned radially and vertically over the rim flange.
7. Measurement of the tire bead seat at the transition to the rim shoulder. Rotation 425°.
8. Measurement of wheel diameter and wheel width.
9. The profile laser is positioned at the center of the tread surface.
10. Measurement of the wheel tread surface. Rotation 425°.
11. The profile laser is positioned above the tire sidewall.
12. Measurement of the wheel tire sidewall. Rotation 425°.
13. Output of measurement results and graphical evaluation.

Measurement Data Evaluation

With the wheel in a stationary position, a sequential measurement of the radial tread surface, the lateral tire sidewall, the upper rim shoulder, and the hub bore is performed using a profile laser. The measuring software generates reference plane A on the flange surface of the wheel bowl. In addition, a reference axis B is generated concentrically within the hub bore and positioned perpendicular to plane A.The 3DF measuring software references the recorded measurement values to the wheel-specific generated reference geometries and evaluates them accordingly. The measurement results are output and displayed graphically.





Wheel Radial Runout (RRO-Wheel)

Wheel RRO describes the radial variation of the tire tread surface in relation to the rim hub bore, represented by reference axis B.The peak-to-peak RRO is determined from the minimum and maximum RRO values, enabling quality assurance to verify the specified assembly tolerances. In addition, the mean radius is calculated.

Wheel Lateral Runout (LRO-Wheel)

Wheel LRO describes the axial variation of the tire sidewall in relation to the center plane of the tire, represented by reference plane A (or a plane parallel to it).The peak-to-peak LRO is determined from the minimum and maximum LRO values, enabling quality assurance to verify the specified assembly tolerances.

1st-harmonic Wheel RRO(H1-RRO-Wheel)

Wheel H1-RRO describes the eccentricity of the tire tread surface relative to the rim hub bore, represented by reference axis B. This value is a commonly specified inspection criterion in quality assurance, as it has a significant influence on the vibrations of the rotating wheel and therefore on driving comfort. The radius and angular position of the H1-RRO are determined, enabling quality assurance to verify the specified assembly tolerances.

Upper Rim Radial Runout (RRO-Rim Top)

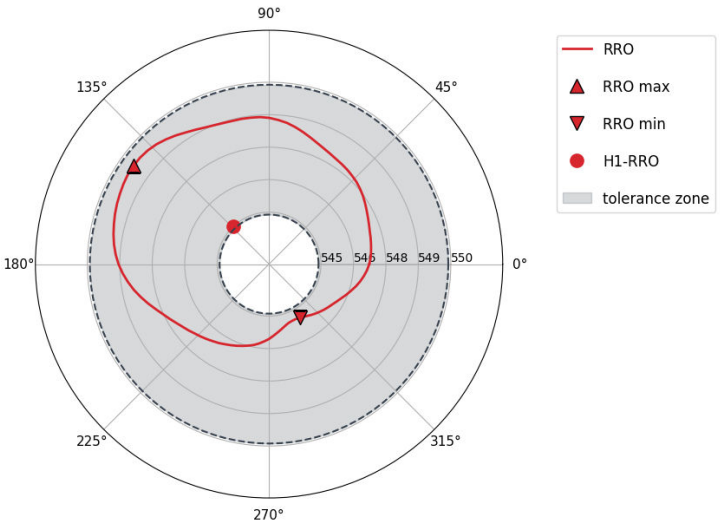
Upper Rim RRO describes the radial variation of the upper tire bead seat at the transition to the rim shoulder in relation to the rim hub bore, represented by reference axis B. The peak-to-peak RRO is determined from the minimum and maximum RRO values, enabling quality assurance to verify the specified rim tolerances. In addition, the mean radius is calculated.

Upper Rim Lateral Runout (LRO-Rim Top)

Wheel LRO describes the axial variation of the radius of the upper tire bead seat at the transition to the rim shoulder in relation to the hub flange surface, represented by reference plane A (or a plane parallel to it). The peak-to-peak LRO is determined from the minimum and maximum LRO values, enabling quality assurance to verify the specified rim tolerances.

Wheel Circumference and Diameter

Wheel circumference and wheel diameter are calculated from the mean value of all Wheel RRO measurement values.


90°
135°
45°
180°
0°
225°
315°
270°
545
546
548
549
550
RRO
RRO max
RRO min
H1-RRO
tolerance zone