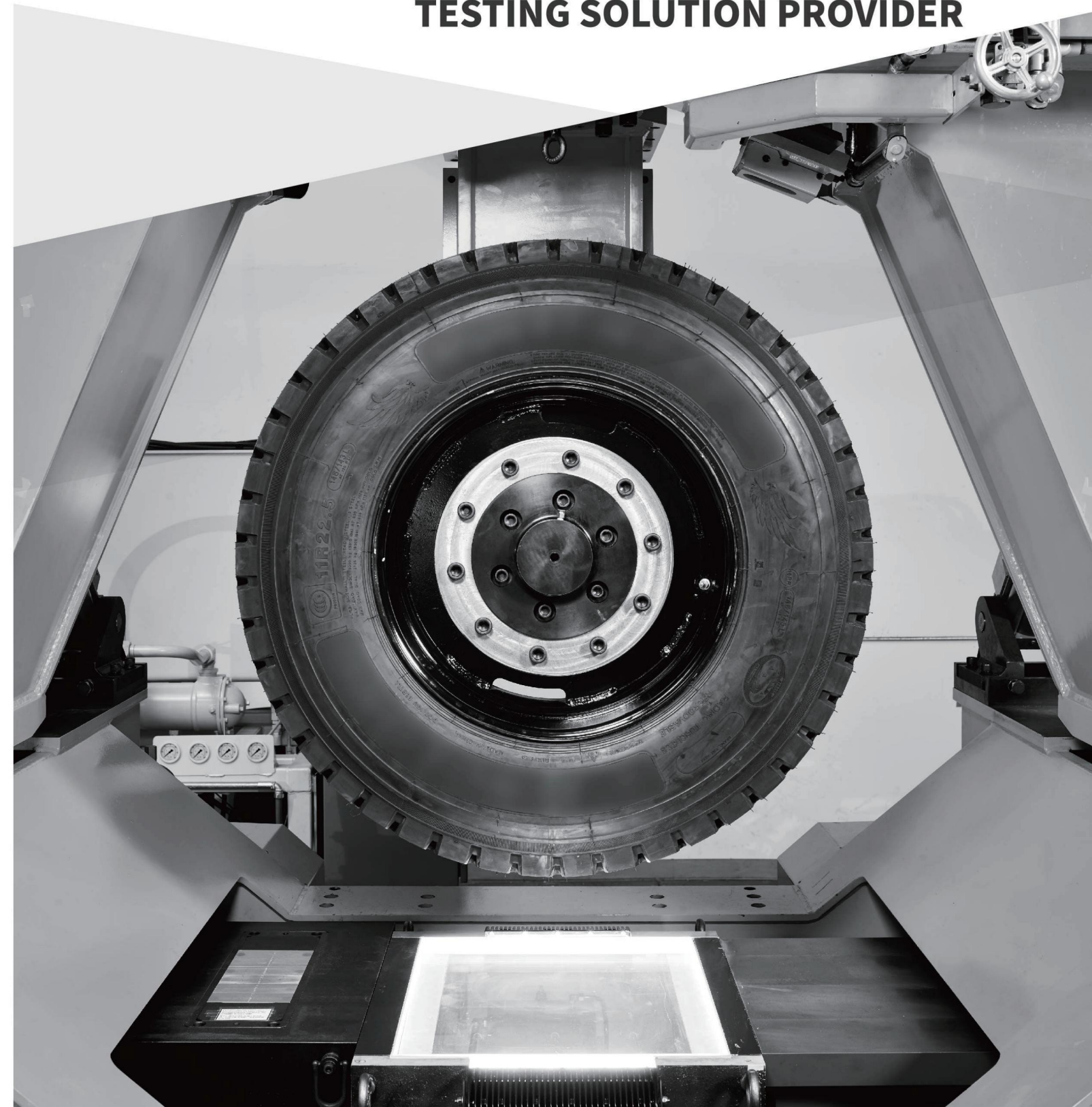




**WORLD LEADING
TESTING SOLUTION PROVIDER**



North American

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About TMSI

TMSI is a leading global solutions provider specializing in testing and simulation systems for the tire and automotive industries. Founded in 1991 and headquartered in North Canton, Ohio, the company leverages over 35 years of expertise to support leading manufacturers and independent testing labs worldwide.

Our comprehensive core product lines encompass: Force & Moment Testing (for testing performance characteristics such as flat-belt force moment system, high-speed uniformity, rolling resistance etc), Vision Test & Measurement, Tire Buffing/Grinding Solutions, and Simulation Systems (for applications including tire pattern and NVH analysis). These solutions enable customers to upgrade their R&D model from experience-driven to data-driven, thereby improving product performance and R&D efficiency.

Over the past 10 years, TMSI has successfully integrated AI technology with traditional inspection techniques, such as mold and tire sidewall character recognition and inspection, and automatic X-ray inspection, significantly improving inspection efficiency and accuracy.

Products and Technologies

Tire Industry

- Tire Dynamic Footprint Test Machine
- OnLEVEL™ Force and Moment Test Machine
- TBR Force and Moment Test Machine
- Tire Rolling Resistance Test Machine
- Tire High-Speed Uniformity Test Machine
- Tire Endurance Test Machine
- Tire Load Deflection Test Machine
- Tire Profile Scanning Measurement and Analysis System
- Tire Buffing Machine
- DIC-3D Analysis System

Automotive Industry

- Automatic Collision Testing
- Airbag Testing System
- Bumper Testing System
- Seat Headrest and Backrest Automatic Testing System
- Automatic Seatbelt Testing System
- Side and Top Impact Automatic Testing System
- Environmental Vibration Testing System

Technical Services

- Test Data Processing
- Customized OE Reports
- Data and Report Analysis
- Dynamic Simulation
- Software Development



Our team

TMSI associates are testing experts from automotive and tire industries around the world. With their extensive expertise and practical experience, TMSI continuously achieves breakthroughs and innovations in the fields of mechanical design, data acquisition, software analysis and testing automation and wins series of international testing invention patents. In order to continuously meet diverse and complicated testing needs of our customers, TMSI team is committed to providing you with high-end customized testing solutions and consultative technical consulting services and provides data and theory support for products' design and development to our customers.

01 / Tire Dynamic Footprint Test Machine

The Tire Dynamic Footprint Test Machine is used to simulate the ground contact pressure distribution and the changes in tire impressions and tread patterns during real-world road conditions. Compared to traditional drum testing methods, the tire walking frame combined with a flat road surface more accurately reflects the tire's behavior on the road. The system can simulate tire actions such as acceleration, deceleration, and lateral shift/tilt under load, allowing for the simulation of a wide range of driving conditions. During the testing process, parameters such as the tire's force and moment dynamic performance, friction energy, and tread pattern movement trajectory are measured using the TMSI ServoTrac data acquisition system and visual system, with analysis software generating the required reports for customers.



Main Functions

- Tire Footprint Testing (Static/Dynamic)

Optional Functions

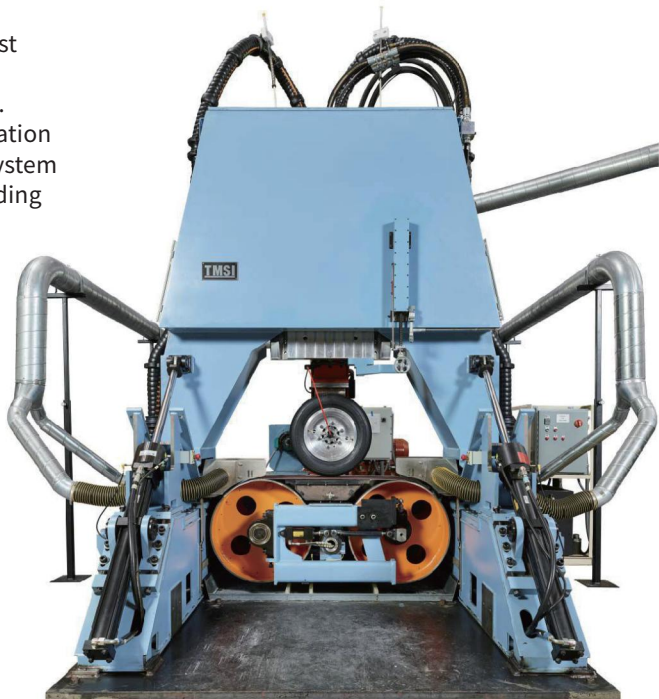
- Footprint Pressure Mapping
- Wear Energy Testing
- Force and Moment Testing
- PRAT/CRAT - Low-Speed Steady-State
- Radial/Longitudinal/Lateral/Torsional
- Stiffness Testing

Specification

Specification	PCR	TBR
Track Length (m)	10	10
Track Width (mm)	600	600
Min. / Max. OD (mm)	450/1200	500/1500
Maximum Load (kN)	20	60
Side Angle (°)	±30	±30
Tump Angle (°)	±10 (OD 600 mm to 1200 mm); 5-10 (OD 450 mm to 600 mm)	±10 (OD 600 mm to 1500 mm); 5-10 (OD 500 mm to 600 mm)
Maximum Fx (kN)	20	60
Maximum Fy (kN)	20	60
Maximum Fz (kN)	20	60
Maximum My (Nm)	±2440	±2440
Maximum Mz (Nm)	±4100	±4100

02 / OnLEVEL® Force and Moment Test Machine

The OnLEVEL® PCR/LTR Tire Force and Moment Test Machine provides highly accurate multi-condition testing under near-real-world flat road conditions. With precise computer control of speed, load, inflation pressure, steering angle, and camber angle, the system replicates a wide range of driving scenarios, including acceleration, braking, and cornering, as well as complex combined conditions. Throughout testing, it continuously measures the tire's force and moment characteristics in real-time. The TMSI analysis software processes the data, generates detailed reports, and exports results in customizable formats tailored to specific tire models.



Main Functions

- Camber Thrust
- Force and Moment (Steady-State/Dynamic)
- Dynamic Combined Slip Ratio Testing
- Dynamic Load Deformation
- Dynamic Slip Ratio at Zero Slip Angle (SA)
- High Slip Angle Sweep
- PRAT/CRAT - High-Speed/Low-Speed
- μ-Sliding
- Variable Frequency Testing

Optional Functions

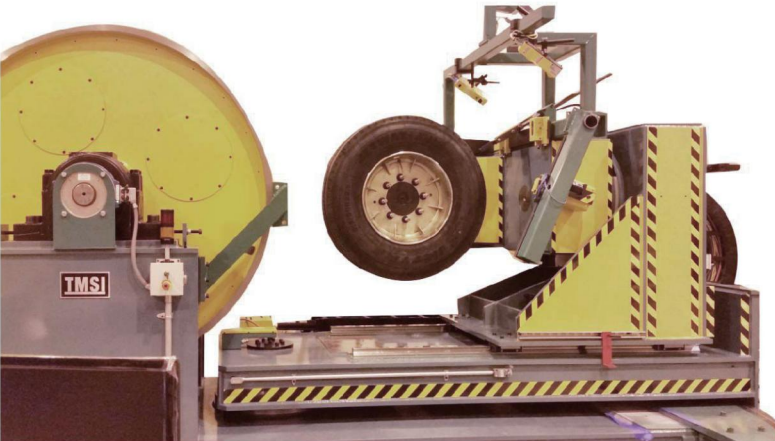
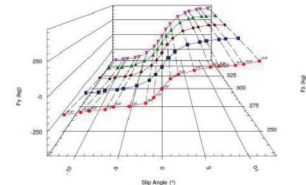
- High-Speed Uniformity/Flat Spot Testing
- Conicity Force/Angle Effect Force Testing
- Radial/Torsional Stiffness Testing
- Rolling Resistance Testing

Technical Specification

	OnLEVEL MKI	OnLEVEL MKII	OnLEVEL MKIII	OnLEVEL MKV
Tire Size and Motion				
Max. Outer Diameter (mm)	1,000	1,000	1,000	1,000
Min. Outer Diameter (mm)	400	400	400	400
Max. Section Modulus (mm)	318	450	450	450
Spindle Drive Type	Motor	Motor	Motor	Motor
Max. Speed (+/- km/h)	150	250	250	250
Min. Control Speed (+/- km/h)	1	1	1	1
System Capacity				
Fx (N)	10,000	10,000	10,000	25,000
Fy (N)	15,000	15,000	15,000	25,000
Fz (N)	24,000	25,000	25,000	25,000
Mx (Nm)	10,000	10,000	10,000	10,000
My (Nm)	10,000	3,500	3,500	2,500
Mz (Nm)	700	3,000	3,000	3,000
Drum Torque (t/-Nm)	N/A	N/A	3,500	6,000
Slip Angle (+/- degrees)	15	45	45	45
Max. Slip Angle Rate (deg/s)	500	60	60	60
Max. Camber Angle (t/- degrees)	10	45至-12	45至-12	45至-12
Max. Camber Angle Rate (deg/s)	5	5	3,000	5
Max. Inflation Pressure (KPa)	689	689	689	689

03 / TBR Force and Moment Test Machine

The TBR Force and Moment Test Machine is designed to conduct multi-condition testing of heavy-duty tires under high loads. The system, controlled by a computer, adjusts speed, load, inflation pressure, steering angle, and camber angle to simulate various driving scenarios such as acceleration, deceleration, and steering, as well as complex combined conditions. It simultaneously captures dynamic performance data for the tire's force and moment characteristics. TMSI analysis software can export test data and reports, and can also generate customized data formats based on the tire model.



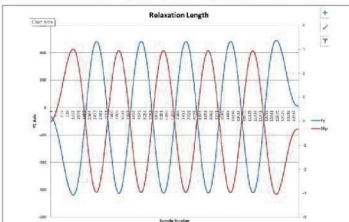
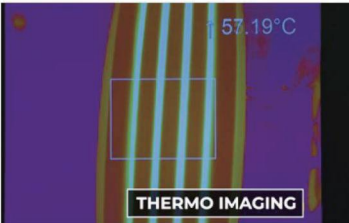
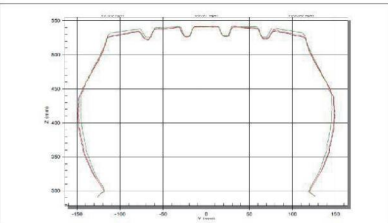
Main Functions

- Camber Thrust
- Force and Moment (Steady-State/Dynamic)
- Dynamic Combined Slip Ratio Testing
- Dynamic Load Deformation
- Dynamic Slip Ratio at Zero Slip Angle (SA)
- High Slip Angle Sweep
- PRAT/CRAT - High-Speed/Low-Speed
- μ-Sliding
- Variable Frequency Testing

Optional Functions

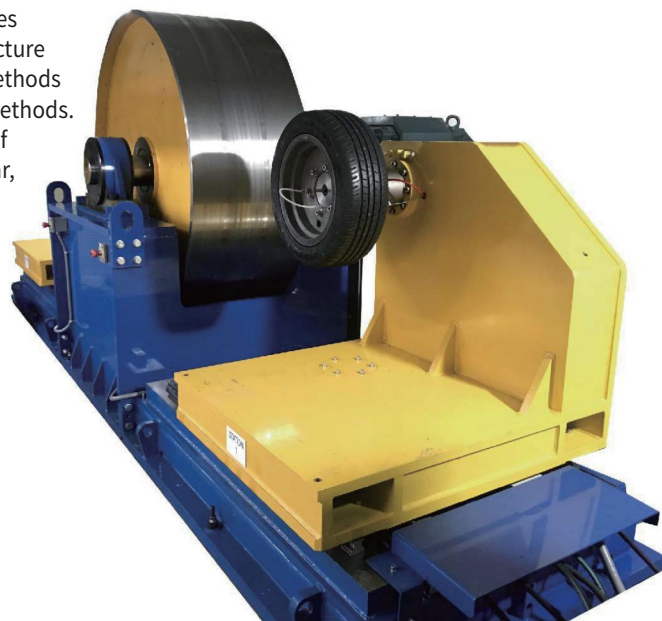
- High-Speed Uniformity/Flat Spot Testing
- Conicity Force/Angle Effect Force Testing
- Radial/Torsional Stiffness Testing
- Rolling Resistance Testing

Technical Features



04 / Tire Rolling Resistance Test Machine

The Tire Rolling Resistance Test Machine measures the rolling resistance generated by the tire's structure and materials during operation, using various methods such as force, torque, deceleration, and power methods. The system is designed for testing a wide range of tires, including bicycle, motorcycle, passenger car, light truck, and commercial truck tires, with different models and configurations. The testing system integrates standards such as ISO, SAE, and GB, and can be customized to meet specific customer requirements. The system's data stability far exceeds the repeatability standards required by ISO 28580.



Specification

	PCR & LTR	TBR
Drum		
Diameter (mm)	1707 or 2000	
Width (mm)	1707 or 2000	
Surface Coating (Optional)	80-mesh Sandpaper	
Max. Speed (km/h)	250	
Tire Size		
Max. Outer Diameter (mm)	1200	1600
Min. Outer Diameter (mm)	430	600
Max. Tread Width (mm)	450	600
Max. Tire Weight (with Rim) (kg)	150	300
Measurement Elements		
Max. Radial Load Force (Fz) (N)	22,000	66,000
Fz Measurement Accuracy (N)	± 7.5	± 10
Axial Force (Fx) (N)	2,500	9,000
Fx Measurement Accuracy (N)	± 0.3	± 0.6
Tire Pressure		
Max. Inflation Pressure (kPa)	689	1350
Control Accuracy (kPa)	± 1.4	± 1.4
Measurement Accuracy (kPa)	± 0.7	± 0.7

Main Functions

- Force Method
- Torque Method
- Deceleration Method
- Power Method
- RPK Testing
- Load and Rolling Radius Testing

Optional Functions

- Tread Temperature Measurement
- Spindle Temperature Measurement
- Spindle Cooling System
- High and Low-Temperature Rolling Resistance Testing

05 / Tire High-Speed Uniformity Test Machine



The Tire High-Speed Uniformity Test Machine utilizes TMSI's unique DFMS technology and high-precision force&moment sensors to ensure accurate measurement of tire uniformity signals up to 500 Hz, with speeds reaching up to 400 km/h. Additionally, the machine can be equipped with an optional tire rolling resistance testing feature, with test data exceeding the repeatability standards required by ISO 28580 for standard machines. In addition to supporting rolling resistance tests in accordance with ISO, SAE, GB, and other standards, the system also offers the flexibility to conduct custom rolling resistance tests based on specific customer requirements.

Main Functions

- Force and Moment Variation
- Dynamic and Static Imbalance Testing
- Radial and Lateral Runout Testing
- Harmonic Amplitude and Phase (1st to 64th Harmonics)
- RPK Testing
- Load Radius and Rolling Radius Testing

Optional Functions

- Cleat Testing
- Flat Spot Testing
- Structural Noise Testing
- Dynamic Load Deformation Testing
- Rolling Resistance Testing (Force Method/Torque Method)

Specification

Drum Specifications		Force and Moment Measurement	
Diameter (mm)	1707 or 2000	Radial Force Variation (N)	±4000
Width (mm)	600	Lateral Force Variation (N)	±4000
Surface Coating	80 mesh sandpaper	Traction Force Variation (N)	±4000
Maximum Speed (km/h)	250 or 400	Angle and Conicity Effect (N)	±2000
Tire Specifications		Return Torque Variation (Nm)	±100
Minimum/Maximum Outer Diameter (mm)	430/1200	Reversal Torque Variation (Nm)	±100
Maximum Tread Width (mm)	450 to 550	Pressure Sensor Measurement Accuracy	
Maximum Tire Weight (including rim) (kg)	250	Radial Force (N)	±0.5
Maximum Tire Load (N)	22,000	Lateral Force (N)	±0.5
Tire Pressure		Traction Force (N)	±0.75
Pressure Range (kPa)	689		
Control Accuracy (kPa)	±1.4		
Measurement Accuracy (kPa)	±0.7		

06/ Tire Endurance Test Machine

The Tire Endurance/High-Speed Test Machine employs a hydraulic/servo system to apply load to the tire for comprehensive endurance and high-speed performance testing. With speeds reaching up to 450 km/h, the machine is available in single, dual, and four-station configurations, supporting testing for MC, PCR, TBR, AGR, and OTR tires. The system offers real-time data acquisition, including load and rolling radius measurements. Additionally, the machine can be equipped with a tire pre-blast detection system that uses machine learning to analyze and monitor data in real time, predicting tire blowouts in advance and providing valuable insights for tire structural analysis.



Main Functions

- Load
- Air pressure
- Speed
- Distance traveled tracking
- Runtime logging
- Load and rolling radius measurement

Optional Functions

- Tire Failure Warning system
- Slip /Camber testing mechanism
- Rolling resistance testing
- Tread/sidewall infrared temperature measurement
- Profiling measurement system
- Tread thermal imaging system
- Temperature control system
- Safety guard net
- CE certification

Specification

	PCR & LTR	TBR
Drum		
Drum Diameter (mm)	1,707	1,707
Width (mm)	500	600
Maximum Speed (km/h)	350 or 450	200
Tire Size		
Max. Outer Diameter (mm)	1,200	1,600
Min. Outer Diameter (mm)	400	500
Tire Load Range		
Max Load (kg)	5,000	15,000
Load Accuracy	±0.1% F.S.	±0.1% F.S.
Tire Pressure		
Max Inflation Pressure (kPa)	689	1,350
Control Accuracy (kPa)	±1.4	±1.4
Measurement Accuracy (kPa)	±0.7	±0.7

07/ Multi-Function Tire Load/Deflection Test Machine

The Tire Load/Deflection Test Machine utilizes a hydraulic/servo system to apply load or displacement to a tire according to user-defined parameters. The data acquisition system captures variations in load and displacement during testing, facilitating the analysis of the tire's stiffness properties. This data can be applied in tire development, performance evaluation, quality control, and automotive chassis validation. The machine is suitable for testing MC, PCR, LT, TBR, AGR, OTR, and aircraft tires. It primarily measures radial, lateral, longitudinal, torsional, and carcass stiffness, with optional features such as footprint measurement, resistance testing, and strength testing. The system incorporates TMSI's proprietary test unit (ServoTrac) and electrical control systems, enabling fully automated testing and data collection, as well as providing powerful software functions for data processing, analysis, calculation, and storage.



Main Functions

Optional Functions

- Radial stiffness testing
- Lateral stiffness testing
- Longitudinal stiffness testing
- Torsional stiffness testing
- Plunger testing
- Bead unseating testing
- Electrical resistance testing
- Carcass stiffness testing
- Footprint visual system
- Footprint pressure mapping system
- Profile measurement system

Technical Specification

Specification	PCR/LTR	TBR	MC	OTR
Max Tire Diameter (mm)	1,000	1,600	900	4,100
Max Section Width (mm)	600	600	200	1,600
Min Rim Diameter (in)	12	17	5	27
Fz (Kg)	4,539	11,347	1,000	30/50/80/100/150t
Fx, Fy (Kg)	4,539	5,446	500	25t
Mz (Nm)	16,948	20,337	1,000	N/A
My (Nm)	27,116	27,550	N/A	N/A
Mx (Nm)	44,064	69,920	N/A	N/A
Inclination Angle	±10° (Optional)	±10° (Optional)	±50°	N/A
Machine Dimensions (mm)	2,030 × 2,533	2,030 × 2,533	4,000 × 5,000	N/A
Machine Height (mm)	3,700 with hoist	4,132 with hoist	2,200	N/A



08 / Tire Profile Measurement and Analysis System

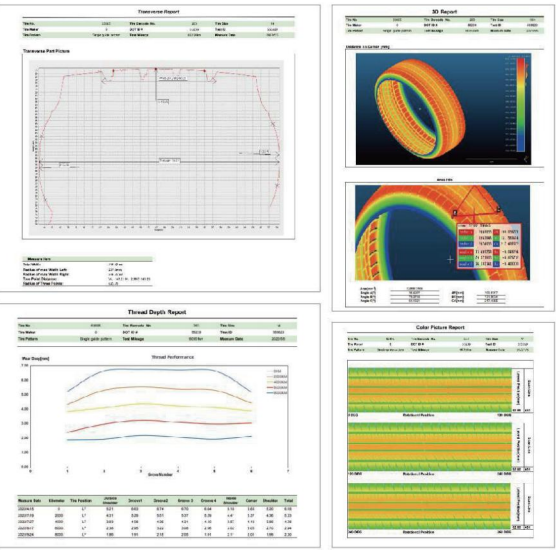


The tire profile measurement and analysis system is a non-contact 3D scanning system composed of a stable, precise mechanical structure and line laser sensors. The system utilizes multiple line laser sensors working together to capture the tire's profile and record test data. It can measure not only the external profile of the tire rim but also analyze tire geometry and wear, among other aspects.

Main Functions

- Tire circumference measurement
- Tire width measurement
- Crown radius measurement
- Section height measurement
- Section width measurement
- Tread groove depth measurement
- Tire wear measurement
- Radial/lateral run-out measurement
- Sidewall bulge/dent measurement
- Heel-toe abnormal wear analysis
- Other customizable measurement functions
- All the above test results can automatically generate a report

Main report content

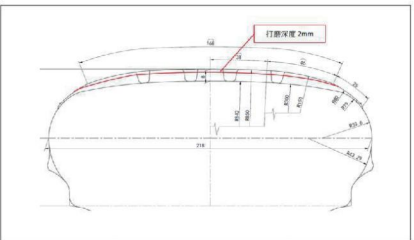


09 / Tire Buffing Machine

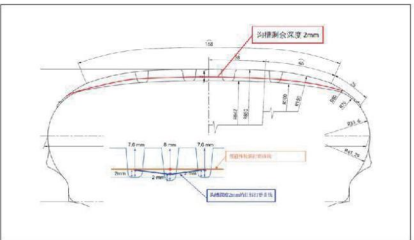
By using the buffing machine, customers can quickly and cost-effectively prepare tires in bulk for testing. This method ensures that the tires have optimal profile curves and surface roughness, making them ideal for tests like wet skid resistance and full lifecycle development. It produces high-quality worn tires that meet industry standards, including ECE R117 and GB/T 42359-2023. By replacing with specialized grinding wheel, this machine can also be used for tire retreading.



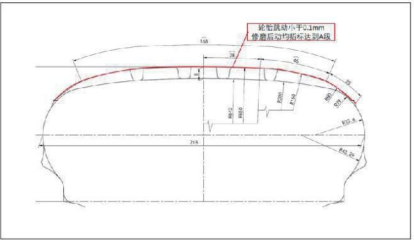
Multiple buffing methods are available



Buff the tire according to the target tire shape, specifying the tread depth.



Buff the tire according to the external profile shape, specifying the depth.



Automatically buff the tire to achieve the specified outer diameter or runout accuracy.

Technical Specifications

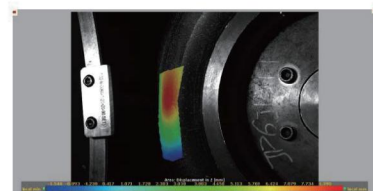
Tires	PCR / LTR / TBR
Buffing Range	Tread / Shoulder / Sidewall (Optional)
Buffing Appearance	Surface Roughness $\leq 15\mu m$
Buffing Efficiency	5mm / 60 minutes
Rim Type	Open-type rim, optional multi-stage rim
Rim Size	13" - 26" multi-stage rim, customizable upon request
Cooling System	Air-cooled via an eddy current tube
Operation Mode	Manual / Automated operation
Additional Features	Optional laser line profile scanning sensor for profile analysis
Interface	Touchscreen operation
Noise Level	< 80dB in operating area

Polishing effect



10 / DIC-3D Analysis System

The TMSI DIC-3D (Digital Image Correlation) Analysis System is a non-contact 3D measurement and analysis system based on visual image processing algorithms. It includes TMSI analysis software and industrial cameras, which can be paired with different camera lenses for various applications, enabling both dynamic and static measurements.



Main Features

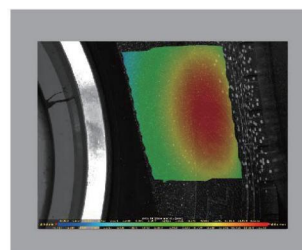
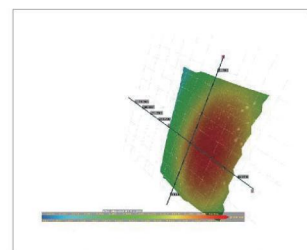
The system provides comprehensive analysis of the deformation and displacement of the measured object, including velocity and acceleration. Common measurements include:

- Vibration diagnostics
- Structural and material deformation
- 2D/3D motion measurement

*It is capable of high-strain rate, high-speed testing, vibration measurement, FEA (Finite Element Analysis), crack propagation analysis, dynamic testing, and quality control.

Application Cases in the Tire Industry

During loading, a tire undergoes radial, lateral, longitudinal, and torsional deformations depending on the loading direction. By combining the TMSI Tire load Deflection Test Machine with the DIC system, the full range of tire deformations and stress distributions under various loading conditions can be captured across the specified region.



Global Layout and Clients



Tire Industry

- | | |
|---------------|-------------|
| ► Bridgestone | ► Apollo |
| ► Michelin | ► Linglong |
| ► Goodyear | ► Sailun |
| ► Pirelli | ► Yokohama |
| ► Hankook | ► Nexen |
| ► Cheng Shin | ► JK Tyre |
| ► Giti | ► Titan |
| ► Cooper | ► Toyo |
| ► Kumho | ► Kumho |
| ► MRF | ► Changshan |
| ► Sentury | ► Hoosier |
| ► Eagle | ► Birla |
| ► Petlas | ► Fate |

Aumtomotive and Testing Industry

- Dongfeng Nissan
- General Motors (GM)
- FAW Group
- Geely
- Smithers (Smithers Rapra)
- DEJI
- China National Motorcycle Quality Inspection and Testing Center (Tianjin)
- Lembaga Getah Malaysia
- National Highway Traffic Safety Administration (NHTSA)