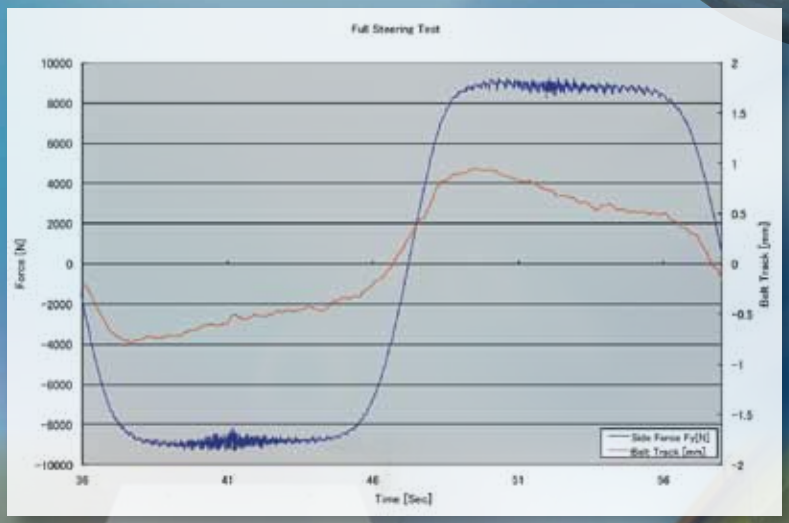
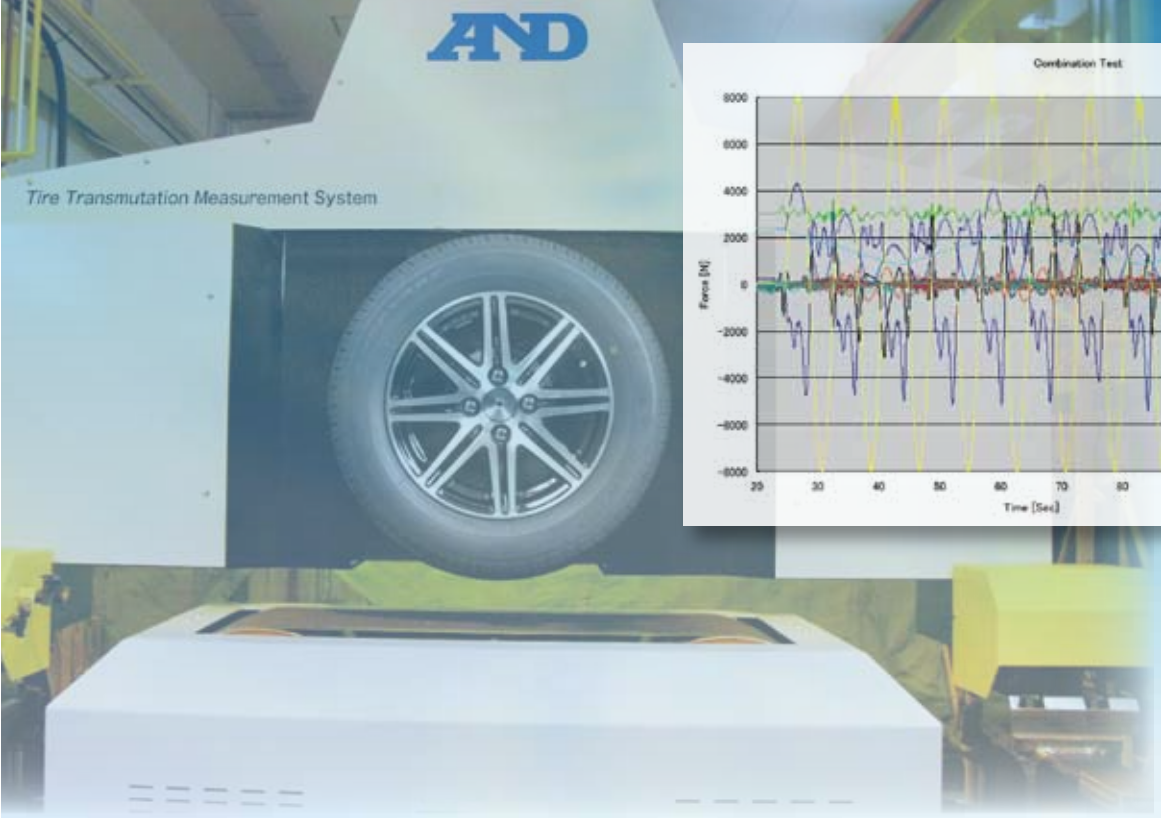
MBSim
Model Based Simulation

Flat Belt Tire Testing Rig

- Reproduces any vehicle condition by using six degrees of freedom
- Provides realistic road conditions for tire testing through accurate belt control
- Measures force precisely with the Model Based Sensor (MBS)
- Offers installation flexibility through its compact size





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Flat Belt Tire Testing Rig

Features

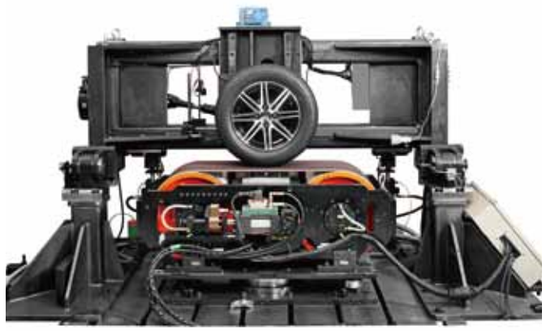
- **Six degrees of freedom enable various tire setups**
- **Vertical movement (option)**
- **Belt and Tire are fully driven by electronic motor**
- **Accurate steel belt control reproduces realistic road condition**
- **Precise force measurement with the Model Based Sensor (MBS)**
- **Belt crack detection sensors ensure safety operation**
- **Compact size**

Six degrees of freedom

A total of six degrees of freedom enable the reproduction of realistic vehicle and road conditions for tires.

- Flat belt system with belt speed control
- Flat belt mechanics with steer angle control (with dynamic tire stand) and vertical vibration (option)
- Dynamic tire stand with camber angle, tire speed and load force control
- Static tire stand with steer angle, camber angle, tire speed and load force control

All six degrees of freedom can be controlled so that combination tests can be performed.



Flat belt system

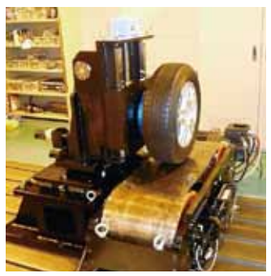
- The most disturbing aspect of tire testing with a steel belt system is the bending of steel belt at the tire patch under high load conditions and belt track drift when the tire generates large side force. The flat belt system is designed to minimize these effects and reproduce stiff road conditions.
- The flat belt system enables various tire slip tests at high speeds.

Flat belt mechanics

- The flat belt mechanics moves the flat belt system and allows dynamic steering of the flat belt. Vertical vibration movement is also offered as an option. The flat belt mechanics is used with the dynamic tire stand.

Movement of the dynamic tire stand

- The dynamic tire stand is designed for changing tire conditions dynamically.
- Full braking and spinning testing can be controlled dynamically, reproducing almost any spinning conditions.
- The camber angle can be controlled dynamically. When this control is combined with the steering control of the flat belt mechanics, almost any dynamic driving conditions can be reproduced.

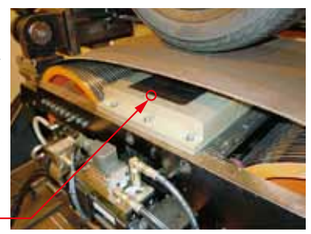


Movement of the static tire stand

- The static tire stand is designed for tests under static conditions.
- Basic settings for steering angle, camber angle, and tire speed control are available for standard static testing.

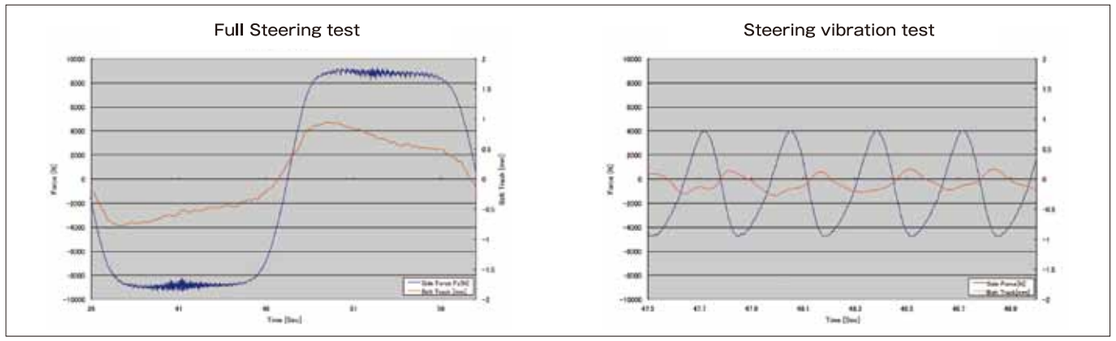
Safe operation

- Belt crack detection sensors ensure safe operation.
- Early detection of a crack may make it possible to salvage a damaged steel belt.



Precise belt control

- The graphs below show that a side force of more than ±8 kN is applied to the belt (The change of force is over 16 kN.). Even under high load and dynamic changeover conditions, belt track control stays within ±1 mm.

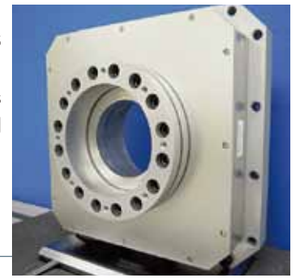


Air bearing technology

- The unique air bearing developed by A&D enables the optimum design for the high load conditions required for tire testing.
- The porous carbon material and an optimized airflow path offer the best belt levitation characteristics. Belt sink under load is less than 50μm.
- The air bearing is made of carbon material, which prevents damage to the steel belt and offers safety and durability.

Precise force measurement with the Model Based Sensor (MBS)

- Shear strain gauges detect shared force at the optimized spring element.
- Gauge signals are directly converted to digital signals and the 6 components of force are digitally calculated in the real-time DSP system.
- The model-based digital signal processing approach minimizes cross talk errors and achieves world-class measurement accuracy and robustness. Because of this approach, the sensor is called the Model Based Sensor (MBS).

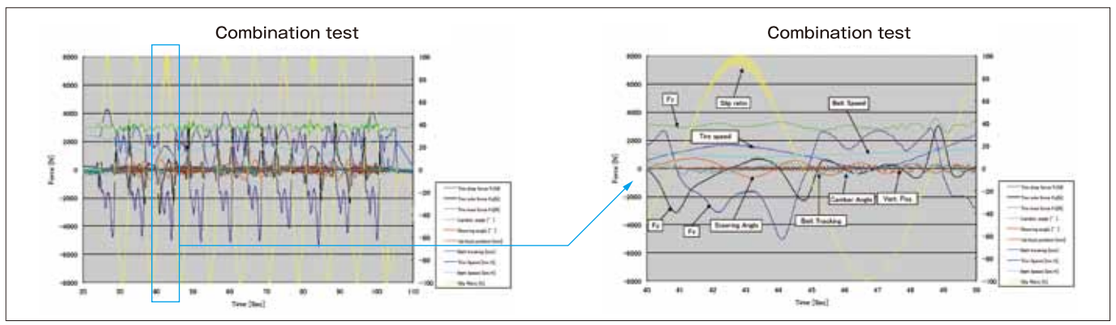


Compact size

- Belt Size: (W) 1160 mm × (D) 610 mm × (H) 600 mm
- The small and light design reduces the system requirements for hydraulic pressure, which means that the hydraulic pressure source and other onsite equipment can be small. This feature offers increased flexibility during installation and reduced maintenance.

Sample measurement data

- The left graph shows combination testing.
- All six degrees of freedom are controlled independently.



Specifications

Item		Specifications	
		Dynamic tire testing	Static tire testing
Belt speed	Standard	−200 to 200 km/h	
	Option	−300 to 300 km/h	
Tire speed	Standard	Max 1650 rpm	
	Option	Max 2475 rpm	
Loaded tire diameter		φ500 − 900 mm	
Loaded radius		220 − 500 mm	
Camber angle movement	Range	±15 deg	±5 deg
	Speed	5 deg/sec	Static test only
Steer angle movement	Range	±20 deg	±5 deg
	Speed	50 deg/sec	Static test only
Vertial movement (option)	Range	±50 mm	Not available
	Speed	30 Hz, 300 mm/sec	Not available
Loading force	Drag force (Fx)	±10 kN	±10 kN
	Side force (Fy)	±10 kN	±10 kN
	Load force (Fz)	0 − 15 kN	0 − 10 kN
Force measurement	Drag force (Fx)	Range : ±10 kN, Accuracy : ±0.1%	Range : ±10 kN, Accuracy : ±0.1%
	Side force (Fy)	Range : ±10 kN, Accuracy : ±0.1%	Range : ±10 kN, Accuracy : ±0.1%
	Load force (Fz)	Range : 15 kN, Accuracy : ±0.1%	Range : 10 kN, Accuracy : ±0.1%
	Each moment	Range : ±4 kNm, Accuracy : ±0.1%	Range : ±4 kNm, Accuracy : ±0.1%
Belt track control		Within ±1 mm	
Steel belt size	Standard	500 mm × 800 mm at effective flat surface	
Electrical motor	Belt driving motor	200 kW	
	Tire driving motor	200 kW	150 kW
Belt crack detection sensors		3 Eddy current sensors : 2 at the edge and 1 at the center	

Safety Warning!	●For proper use, read the instruction manuals carefully before use.

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