

# Full-scale Aero-acoustic Wind-tunnel

MACHINERY & STEEL STRUCTURES HEADQUARTERS  
BUSINESS DEVELOPMENT DEPARTMENT

Wind-tunnels are indispensable devices for the development of new-model automobiles. They are mainly used for measurement of the aerodynamic performance of a car body (air stream around the car body, the force impacting on the car body at time of traveling, etc.). In recent days, attention has been concentrated on not only aerodynamic performance but also measurement of the aerodynamic noise that the car body generates (wind cutting sound, etc.). Accordingly, the wind-tunnel itself is required to have higher aero-acoustic performance (to decrease noise generated by the wind-tunnel itself) in addition to its conventional performance (maximum wind velocity, air stream uniformity, etc.).

This product is a wind-tunnel having the world's highest aero-acoustic performance and is intended exclusively for testing new-model automobiles. It was delivered to Suzuki Motor Corp. in February 2006.

## 1. Outline specifications

**Fig. 1** shows an overall view of this wind-tunnel, and **Table 1** shows its outline specifications.

## 2. Characteristics

### 2.1 Aero-acoustic performance

A background noise level of 50 dB(A) or less at wind velocity of 100 km/h was achieved. This is the world's top level value among wind-tunnels in use by the world's automobile manufacturing companies.

### 2.2 Variable width nozzle

The nozzle width can be varied as shown in **Fig. 2** depending on the vehicle to be tested (**Table 1**). When the test vehicle is a two-wheeled motorcycle, the width

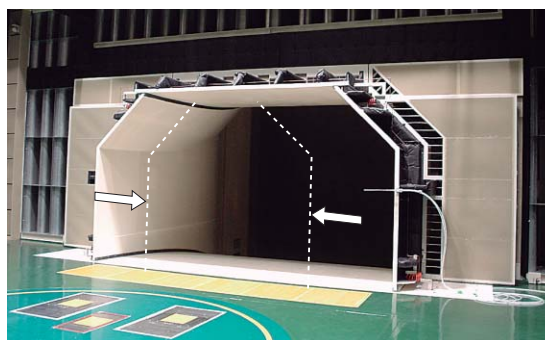
can be reduced to enable testing at higher air velocities. The time required to vary the width is approximately 2 minutes.

### 2.3 Six-component balance

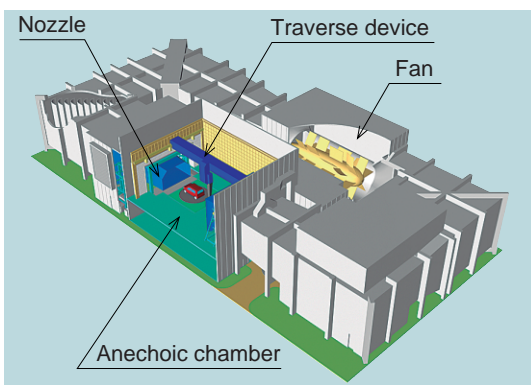
The six-component balance for measurement of drag force, lift force, etc. that are imposed by air when the vehicle is traveling can be used for all types of vehicles to be tested. Changes in wheel base, tread, etc. can be made from the control room.

### 2.4 Operability

This type of wind-tunnel can be operated from a single PC terminal so that measurements can be made by one person alone, apart from the vehicle setup.



**Fig. 2** Variable width nozzles



**Fig. 1** Overall view

**Table 1** Outline specifications

Item	Specifications	
Wind-tunnel type	Göttingen type	
Test vehicle	1/1 scale automobile, motorcycle and 1/4 scale automobile model	
Measurement positions	Type	3/4 open jet type
	Nozzle	Large nozzle for automobiles   Small nozzle for motorcycles
	Nozzle exit size	5.5m (W) x 3.1m (H)   3.0m (W) x 3.1m (H)
	Nozzle exit cross-section area	16.05 m <sup>2</sup>   8.30 m <sup>2</sup>
	Max. air velocity	190 km/h (52.8 m/s)   250 km/h (69.4 m/s)
	Measuring position length	12 m   12 m
Background noise level	50 dB (A) or less at 100 km/h	-
Major measuring device	<ul style="list-style-type: none"> <li>• Six-component balance</li> <li>• Frontal area measurement system</li> <li>• Noise source identification system</li> </ul>	
Major ancillary facilities	<ul style="list-style-type: none"> <li>• Anechoic chamber</li> <li>• Aerodynamic measurement traverse device (capable of resisting 180km/h air velocity)</li> <li>• Air cooler</li> <li>• Boundary-layer suction system</li> </ul>	
Overall size	40 m (W) x 70 m (L) x 16 m (H)	
Main fan	Dia.: 6m, Max rotation: 409min <sup>-1</sup> , Motor: 2 600 kW	