



Climate Wind Tunnel Center
for Passenger Cars and Commercial Trucks

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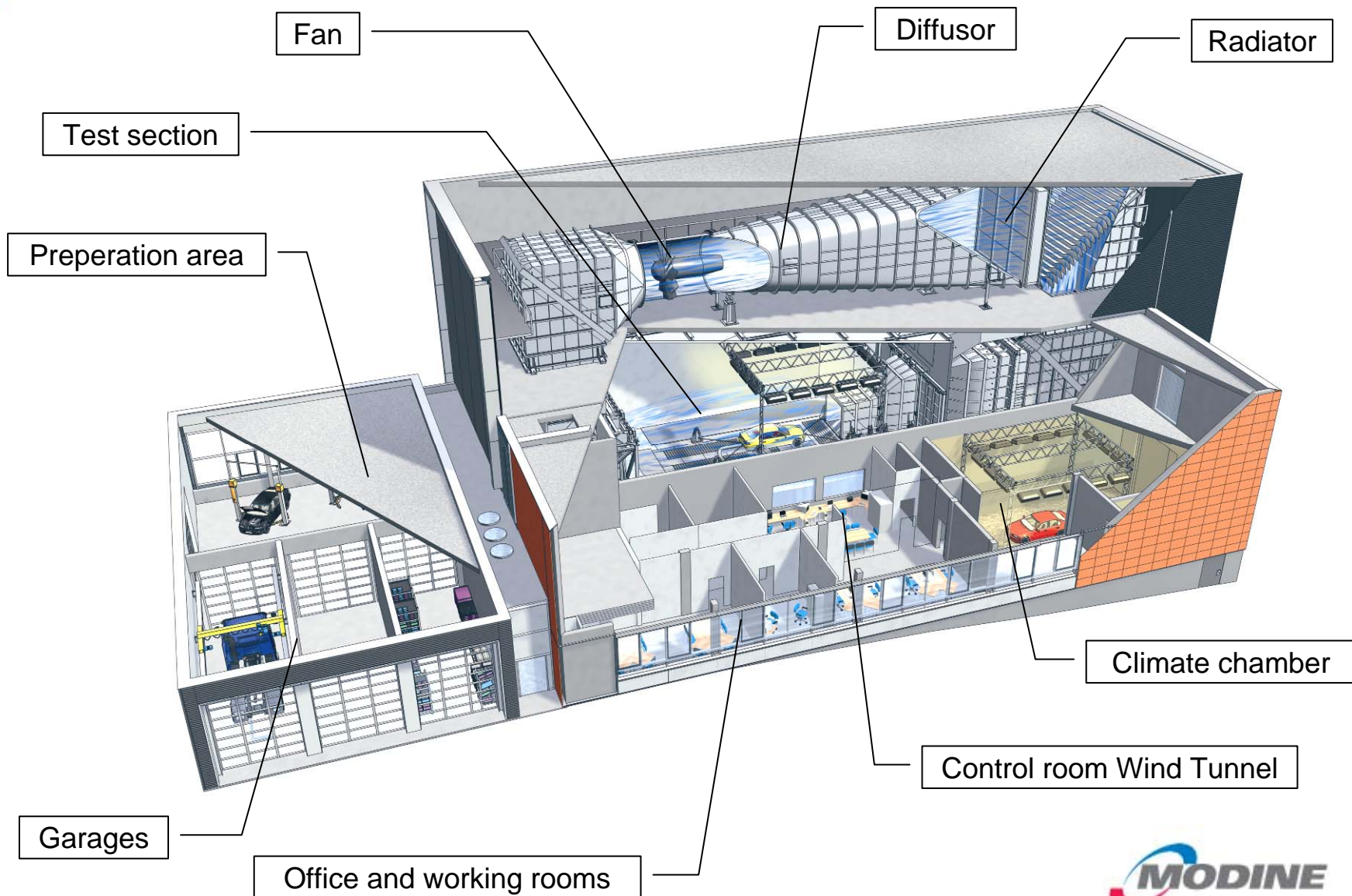
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Climate Wind Tunnel Center, Bonlanden

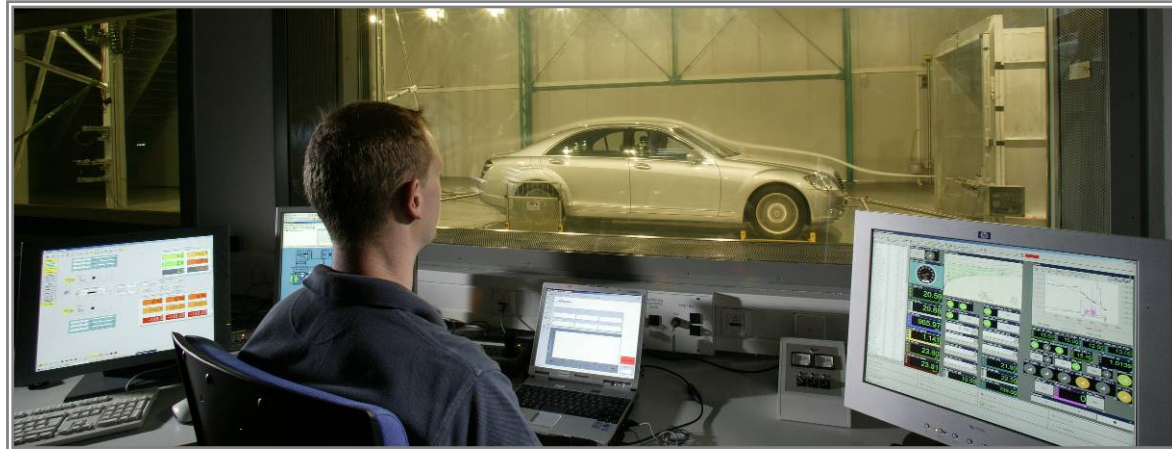


Climate Wind Tunnel Center, Bonlanden Overview



Climate Wind Tunnel Center, Bonlanden

Wind Tunnel control room and test section



Climate Wind Tunnel Center, Bonlanden Installation of Passenger Cars

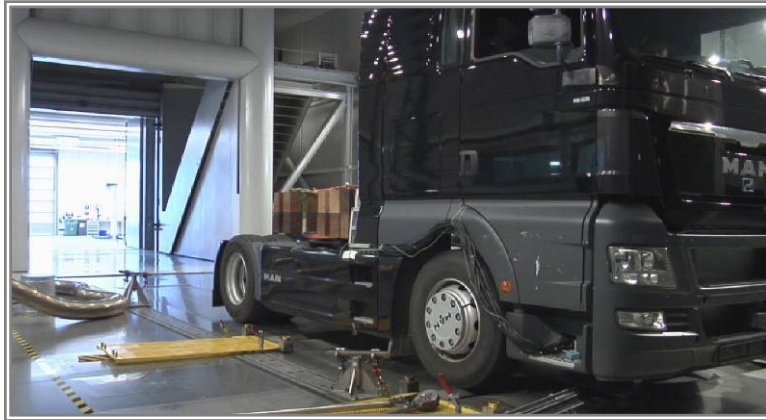


Vehicle fixing:

Front axle: Wheel hub

Rear axle: Tow lug or draw bar

Climate Wind Tunnel Center, Bonlanden Installation of Trucks and Buses



Vehicle fixing:

Steel chains and belts



Climate Wind Tunnel Center, Bonlanden Vehicle Preparation



Flatprobe

Microprobe

Thermocouple

Pressure sensor

Boundary layer measurement system

Electronic accelerator speed control

Calibration equipment

Data acquisition



Climate Wind Tunnel Center, Bonlanden

Technical Data: Wind Tunnel

Vehicles:

Wheelbase:

Nozzle Car (optional with insert):

Nozzle Truck:

Max. Velocity 5.3 (4.8) m²:

Max. Velocity 12 m²:

Plenum (L x W x H):

Temperature Range:

Humidity Range:

Rolls Diameter:

Front Dynamometer:

Peak Performance Front Dyno:

Rear Dynamometer:

Peak Performance Rear Dyno:

Max. Velocity Rolls:

Cars & Trucks, 2x2, 4x4

2.3 - 6.9 m

2.3 x 2.3 (2.1) m = 5.3 (4.8) m²

3.0 x 4.0 m = 12 m²

250 (268) kph

130 kph

14 (19.5) x 11.5 x 6.5 m

20 - 55 °C

10 - 90 % relative humidity

2.0 m

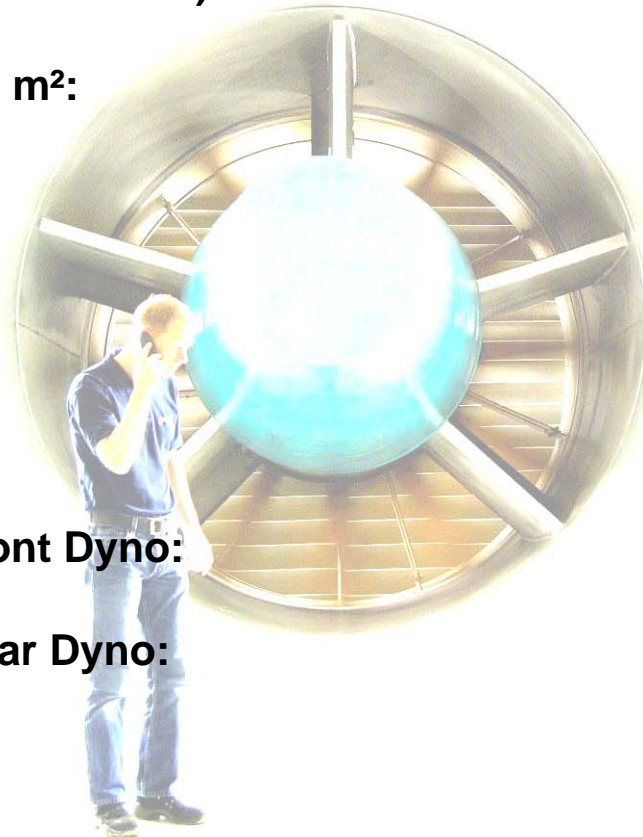
300 kW / 13 kN

380 kW / 16 kN

450 kW / 26 kN

586 kW / 35 kN

280 kph



Accessories:

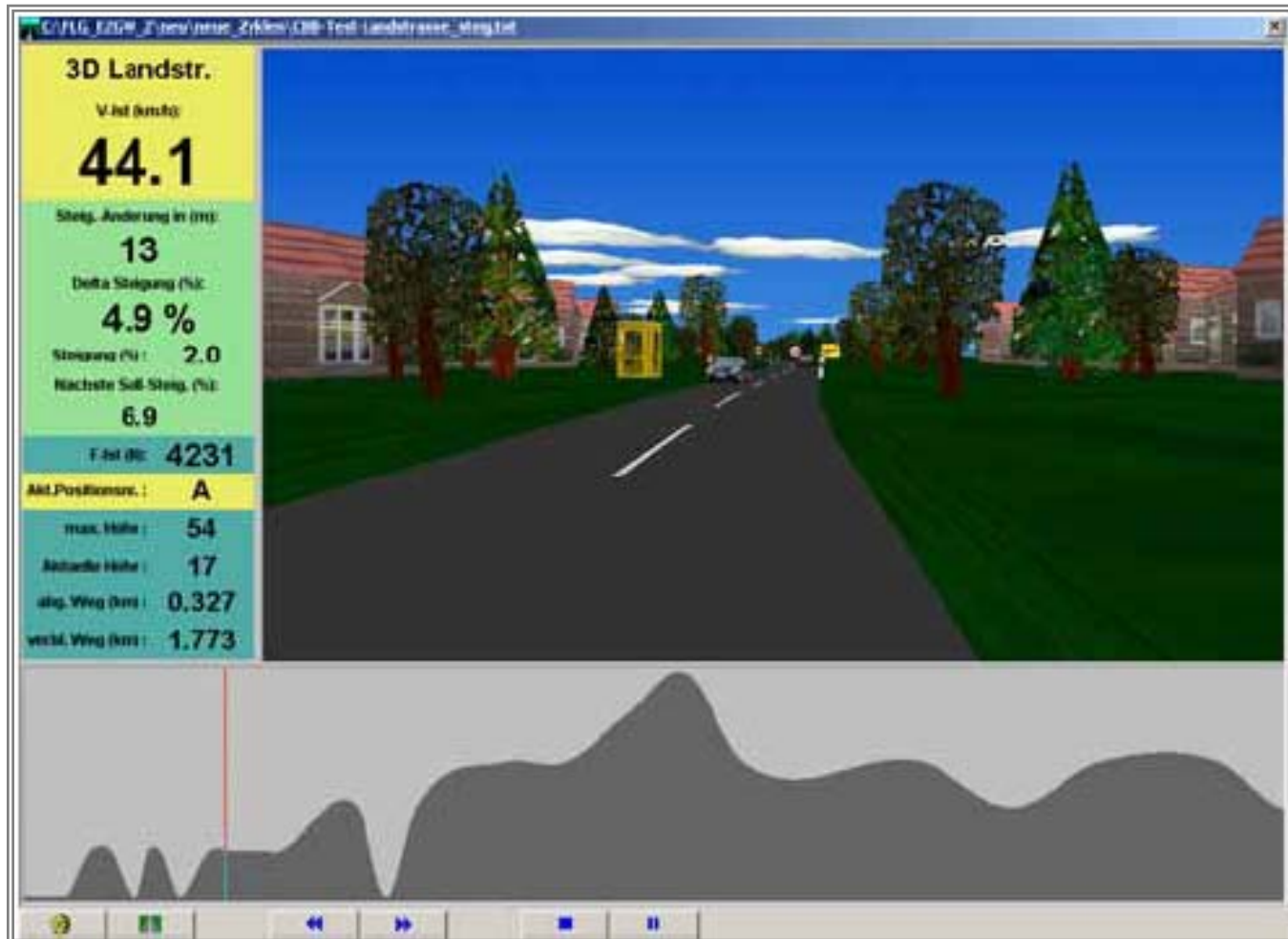
**Driver Assistance System to simulate Drive Cycles and Distance Profiles,
Pressure Scanner, Smoke**

Climate Wind Tunnel Center, Bonlanden

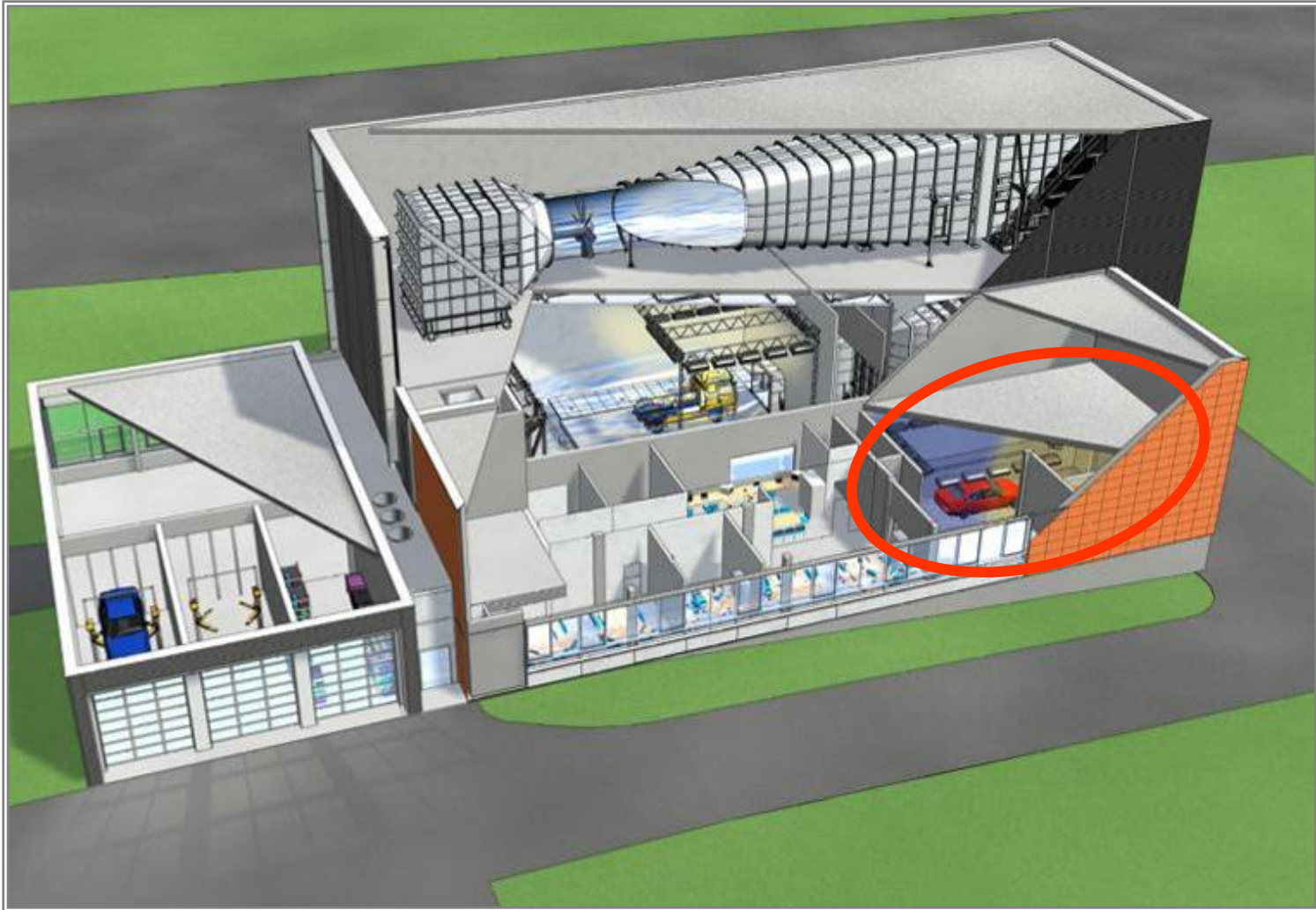
Dynamic Road Load Simulation

Reproduction of measured road profiles (GPS)

Driver assistance system presets: speed (dynamometer, wind), inclination, gear



Climate Wind Tunnel Center, Bonlanden Climate Chamber, Overview



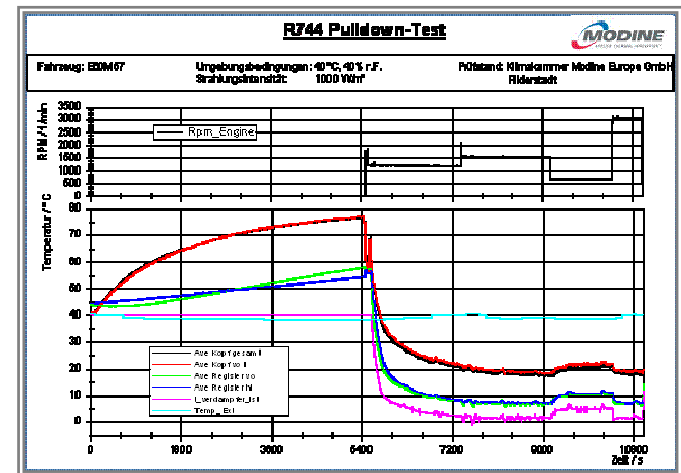
Climate Wind Tunnel Center, Bonlanden Climate Chamber



Hot- and deep temperature tests



Windscreen defrosting



AC Performance Tests

Climate Wind Tunnel Center, Bonlanden

Technical Data: Climate Chamber



| | |
|------------------------------|---|
| Chamber Size: | 12 x 5 x 5 m |
| Temperature Range: | -30 ... +55 °C |
| Cooling Capacity: | 30 kW at -30 °C 110 kW at -5 °C |
| Heating Power: | 50 kW |
| Air Humidity: | 10 - 90 % relative humidity Dew point max. 43 °C |
| Dyno Speed: | 200 kph |
| Brake Power: | 260 kW |
| Tractive Force: | 6 kN |
| Axle Load of Vehicle: | 2.5 tons |
| Sun Simulation Area: | 6 x 2.5 m |
| Radiation Intensity: | 1100 W/m² (solar spectrum) |
| Max. velocity: | 120 kph |

Climate Wind Tunnel Racine, USA (1999)

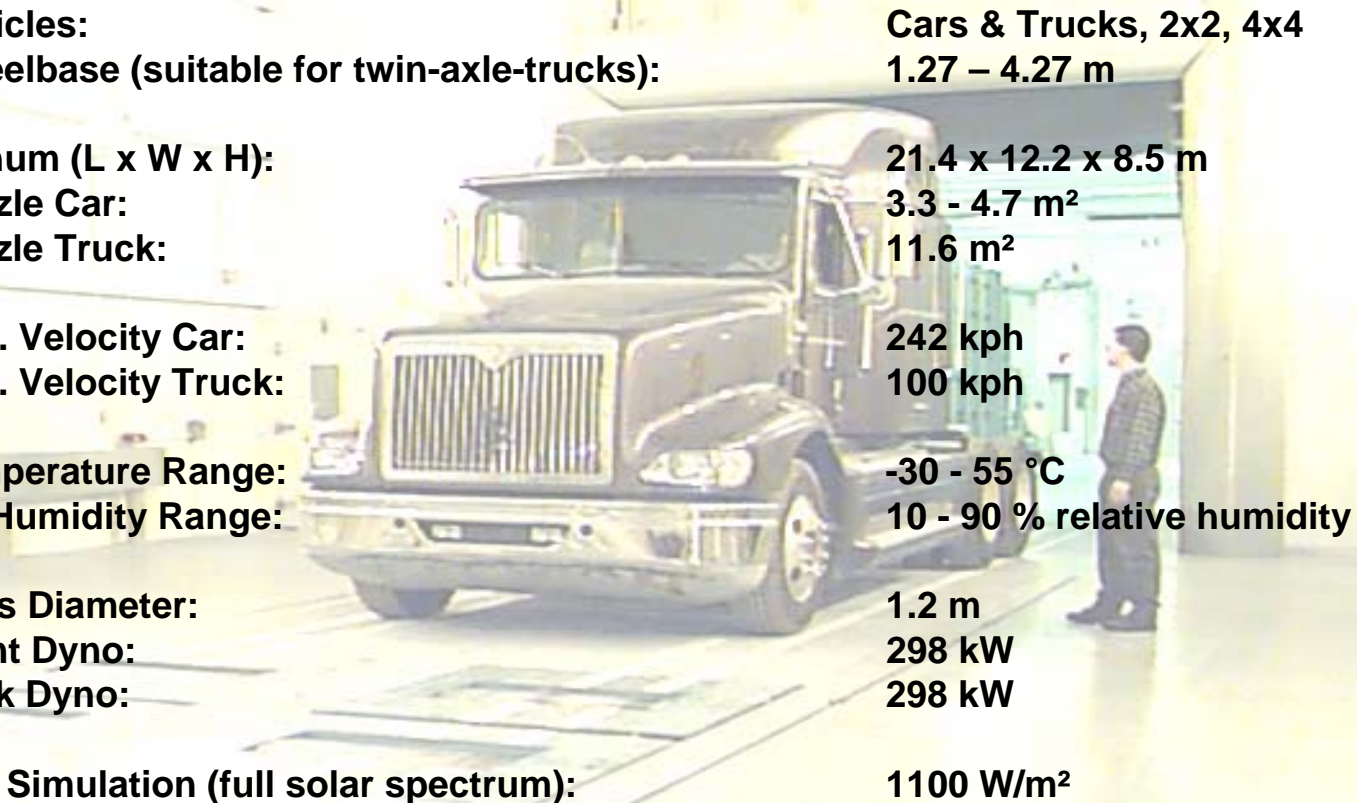


Plenum



Climate Wind Tunnel Racine, USA

Technical Data: Wind Tunnel



| | |
|---|------------------------------------|
| Vehicles: | Cars & Trucks, 2x2, 4x4 |
| Wheelbase (suitable for twin-axle-trucks): | 1.27 – 4.27 m |
| Plenum (L x W x H): | 21.4 x 12.2 x 8.5 m |
| Nozzle Car: | 3.3 - 4.7 m² |
| Nozzle Truck: | 11.6 m² |
| Max. Velocity Car: | 242 kph |
| Max. Velocity Truck: | 100 kph |
| Temperature Range: | -30 - 55 °C |
| Air Humidity Range: | 10 - 90 % relative humidity |
| Rolls Diameter: | 1.2 m |
| Front Dyno: | 298 kW |
| Back Dyno: | 298 kW |
| Sun Simulation (full solar spectrum): | 1100 W/m² |

Accessories:

Fuel Measuring and Conditioning System, Heated Road

Pricing:

Regular prices (valid from 04/01/2005):

Climate Wind Tunnel: 1.300,-- €/ h

Climate Chamber: 650,-- €/ h

Reduced prices (valid from 04/01/2005):

Climate Wind Tunnel: 1.100,-- €/ h

Climate Chamber: 550,-- €/ h

- ➔ The reduced prices can be given if test vehicles contain Modine components or if Modine is interested in test results and gets the measured data from the customer.
- ➔ The rates are charged for the whole booking period of each test facility.
- ➔ Minimum term of lease is 8 hours.

Prices include:

- Use of test facilities (incl. control room), customer office and vehicle preparation area within the booking period.
- Use of vehicle preparation area for another 8 hours per order.
- Operation of test stands and customer support by Modine staff in Wind Tunnel and Climate Chamber.
- Documentation of test procedure and test parameters (log file).

Prices do not include:

Human resource costs for extensive vehicle preparation (instrumentation) and costs for extra measurements (incl. test report). These costs are charged additionally.

Booking, Scheduling:

For long-dated scheduling wind tunnel and/or climate chamber may be reserved optionally. The option may be changed to a binding order within 3 work days, if another customer wants to place an order in the same timeframe.

All options may be changed by the customer to binding orders not later than 25 work days before the start of the booking period. If the required order in written form is missing, the option will be cancelled.

Cancellation:

Orders may be cancelled up to 20 work days before the fixed test date. In case of delayed cancellation, the following charges (percentages of full price) may be incurred:

up to 10 work days: 30 %,

up to 3 work days: 60 %,

shorter: 100 %

Any questions?

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