

TEST CHAMBER FOR BUSES AND ROOF-MOUNTED AIR CONDITIONING SYSTEMS





100% THERMAL MANAGEMENT

Tropical heat or severe cold: As a thermal management specialist for buses, we know that climate control in vehicles is a crucial comfort criteria nowadays. Passengers expect optimally air conditioned vehicle interiors. We operate test chambers for roof-mounted air conditioning systems and a bus environmental chamber at our research and development site in Renningen. We conduct various thermo-dynamic and mechanical-physical tests to ensure that our systems and new developments are optimally designed for various environmental conditions. We also carry out measurements on behalf of customers.

MEASURING CHAMBERS FOR BUS AIR CONDITIONING SYSTEMS:

The two test chambers allow investigations to be carried out on conventional roof-mounted air conditioning systems and heat pump systems at an ambient temperature of -15 to 60 °C. We can conduct system tests with electrically and mechanically operated compressors in both chambers.

SCOPE AND POSSIBLE SYSTEM TESTS:

- Determination of the cooling/heating capacity of the system
- Determination of the efficiency of the system
- Determination of the system cut-off temperature
- Condensation test in a humid environment
- Determination of the electrical power consumption of fans and blowers at different operating conditions
- Examination of expansion valve operation under worst-case conditions
- Characteristic diagram measurement with variation of fan, blower and compressor speed
- Fill quantity optimization at maximum load



Test chamber for AC system with mechanical compressor

GENERAL CONDITIONS:

Measurable cooling/heating capacity	1 – 50 kW
Refrigerant mass flow rate	up to 30 kg/min
Simulatable ambient temperature	-15 – 60 °C
Simulatable saloon temperature	15 – 50 °C
Simulatable saloon humidity	10 – 90% relative humidity
Saloon air flow rate	$1,000$ – $12,000$ m ³ /h
Saloon back-pressure	0 – 300 Pa
Mechanical compressors	Up to 30 kW
Electrical compressors	12/24 V or high-voltage compressors



Technical level to supply the measuring chambers



TEST CHAMBERS FOR BUSES:

Whether they be city buses, coaches, articulated buses or double-decker buses, our bus chamber is designed for all types of buses. We carry out cooling tests with or without passenger simulation at simulated ambient temperatures of 15 to 55 °C. Our heating test under real conditions is a special highlight: We conduct a test drive with your vehicle to determine the heating performance. Prior to testing the vehicle is fitted with various sensors to determine the temperature and air speed distribution.

SERVICES AND POSSIBLE BUS TESTS:

- Cool down test at various ambient temperatures with/without passenger simulation
- Heating test on test drives
- Measurement of the air speed distribution in the passenger cabin
- Noise measurement
- Rainwater test
- Air flow rate measurement
- Temperature distribution at outlet nozzles and in the passenger cabin
- Component test on request

GENERAL CONDITIONS:

Simulatable room temperature	15 – 55 °C
Rainwater flow rate	120 l/min (max.)
Bus chamber size	Length 23 m x Width 4 m x Height 5.5 m
Bus types	City buses, intercity buses and coaches

OTHER SERVICES THAT WE CARRY OUT TO QUALIFY OUR SYSTEMS INCLUDE:

- AC system vibration test
- Corrosion tests of heat exchangers and tubes
- Noise-Vibration-Harshness tests (NVH) of fans, blowers and compressors
- Pressure cycle test of the refrigerant and water circuit
- Temperature cycle test of housing and plastic components
- Function tests of bus heating systems

CONTROL CENTER:

We analyze and evaluate the tests in our control center. We use the results of all tests carried out internally and externally in our development work and make them available to our customers.



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