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Translation

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Standard tests

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Lüftung, Heizung und Klimatisierung der Reisezugwagen - Typenprüfung



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Summary

This Leaflet defines a standard programme of tests as well as the method to be adopted for measuring the performance of air-conditioning equipment in accordance with the requirements set out in *UIC Leaflet 553*.

It is recommended that when testing air-conditioning equipment, functional tests should also be undertaken in respect of other equipment such as doors, toilet installations, power supply equipment, lighting, etc. in accordance with the relevant Leaflets.

1 - Scope

1.1 - The provisions of this Leaflet are applicable to the vehicles specified in *UIC Leaflet 553* (see Bibliography - page 34).

1.2 - The test conditions outlined in the Leaflet relate to coaches with compartments and coaches with open saloons according to *UIC Leaflet 567* (see Bibliography - page 34). This Leaflet also applies to vehicles of modified design. The special test conditions to apply in this case shall be agreed between the client and the test centre.

2 - Definitions

The essential technical terms and definitions relating to air-conditioning in vehicles are summarised in *UIC Leaflet 553*.

3 - Preliminary tests

The preliminary tests relate to the electrical equipment, the basic functions of the air-conditioning equipment, the functional logic of the control of the air-conditioning equipment and the air-tightness of the circuit.

4 - Air tests

o 4.1 - Static air tests

4.1.1 - Test conditions

The tests shall be carried out under the following conditions:

- Vehicle stationary and protected from weather,
- Height above sea level < 1 000 m,
- Speed of outside air << 4 m/s,
- Ambient temperatures between + 15 °C and + 30 °C.

4.1.2 - Air flow

The following air flows shall be determined:

- Outside air (or fresh air),
- Escaping air (where possible),
- Circulating air and/or conditioned air and/or mixed air.

4.1.3 - Differential pressures

The differential pressures between two defined areas can be revealed by means of the flow of smoke.

The measurements are to be taken in particular in the kitchens of restaurant cars, in mixed smoking/non-smoking vehicles, in toilets and in areas used for technical purposes (e.g. drivers' cabs), in order to demonstrate that the air-conditioning equipment has been correctly designed to prevent the spread of odours.

4.2 - Dynamic air tests

4.2.1 - It is recommended that measurements be taken of the air velocity and/or of the pressures set up during running on the track. The measurements may relate to the following parts of the circuit:

- outside air,
- escaping air.

It is recommended that during these dynamic tests the functioning of the condenser fan of the cooling system should also be checked.

The results should be compared with those of the measurements taken with the vehicle stationary.

4.2.2 - Dynamic testing of the pressure protection system

to be provided.

4.3 - Comfort tests

O 4.3.1 - Critical air speed

The purpose of these test is to determine the three most uncomfortable seats (at least three) in the comfort zone (see Appendix G - page 32).

O 4.3.2 - Measurement of air speed without simulated occupation

These tests are to be carried out during regulation tests according to point 5.4 - page 8 during which no thermal or physical occupation is simulated.

4.3.3 - Measurement of air speed with simulated occupation

It is recommended that:

- the air speeds in the passenger accommodation should also be recorded during the regulation tests according to point 5.4 with simulated occupation (see point 9.2 - page 15),
- tests should be carried out using models to simulate the passengers in a compartment or in a seating unit.

5 - Air-conditioning tests

5.1 - General

5.1.1 - Appendix **A** - **page 18** to **page 26** outlines a minimum programme of tests for evaluating the comfort parameters specified in *UIC Leaflet 553*.

The order in which the tests are carried out is optional; they may be adapted to the physical characteristics of the climatic chamber and to the test facilities available. During the tests continuous recording shall be taken of:

- all the measured values at each of the measuring points defined in point **10** - **page 17**;
- the energy consumption of the air-conditioning equipment alone and also where applicable of the whole vehicle according to *UIC Leaflet 550* (see **Bibliography** - **page 34**).

5.1.2 - Where it is necessary to check other installations too, such as doors, toilet facilities, power supply equipment, lighting, etc., the relevant tests shall not in any way interfere with the air-conditioning measurements.

5.2 - Pre-heating test

The pre-heating test is defined in Appendix **A**.

Before commencement of the pre-heating tests the temperatures of the room air and of the interior surfaces of the vehicle must have adapted themselves to the outside air temperature and have remained stable for at least one hour ± 1 K.

5.3 - Pre-cooling test

The pre-cooling test is defined in Appendix **A**.

Before commencement of the pre-cooling tests the temperatures of the room air and of the interior surfaces of the vehicle must have adapted themselves to the outside air temperature and have remained stable for at least one hour ± 1 K. Then, before the pre-cooling test is actually begun, the vehicle is to be exposed to the sun for two hours with the doors and windows closed; the intensity of this equivalent solar radiation shall be as specified in *UIC Leaflet 553* for this vehicle.

5.4 - Regulation tests

5.4.1 - Procedure

The regulation tests shall be commenced with the air-conditioning equipment in a stabilised condition with the temperature control at the middle setting; in this condition, and while adhering to the comfort requirements specified in *UIC Leaflet 553*, there should have been no change in the average room temperature (Tic) over a period of 90 minutes or during three identical regulation cycles.

If any of the parameters (inside or outside) have undergone any change, the variation of the other parameters should be observed for 90 minutes or during 3 identical regulation cycles.

The results must satisfy the specified comfort conditions of *UIC Leaflet 553*.

5.4.2 - Functional test in heating mode

These tests are to be carried out at the following outside temperatures (Tem):

Zone I	Zone II	Zone III
Temperatures [°C]	Temperatures [°C]	Temperatures [°C]
-	- 20	- 40
- 10	- 10	- 10
0	0	0
+ 10	+ 10	+ 10

5.4.2.1 - If the nominal room temperature is varied from the average towards the maximum or the minimum by regulating the temperature control, the requirements set out in *UIC Leaflet 553* are to be respected.

5.4.2.2 - In order to check the normal behaviour of the temperature variations in vehicles with compartments, the temperature controls are to be placed at the maximum setting in 20 % to 30 % of the compartments, and the controls in the remaining vehicles at the minimum setting. The same test is to be carried out with the controls in 70 % to 80 % of the compartments at the highest setting and the remainder at the lowest setting.

5.4.2.3 - In order to determine the effect of the rate of occupation on the regulation system the tests are to be carried out with full occupation and with partial occupation in accordance with point **9.2** - page 15.

5.4.2.4 - The purpose of the tests using wind is to make it possible to ascertain the performance and efficiency of the air-conditioning equipment, the air-tightness of the vehicle body and the effect on conditions around the air circulation apertures.