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Environmental testing - Part 2: Test methods - Wind pressure

环境试验 第 2 部分：试验方法 风压

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Table of Contents

Environmental testing - Part 2: Test methods - Wind pressure

1 Scope

This Part of GB/T 2423 specifies the terminology for wind pressure test of electrical and electronic products using wind tunnels, requirements for test equipment and test samples (hereinafter referred to as test pieces), test conditions, test methods.

This Part is suitable for testing the adaptability of electrical and electronic equipment or components (such as radar antennas, microwave antennas, satellite antennas, etc.), which are installed outdoors, under wind pressure, AND assessing the rationality of their structures.

This Part does not apply to towers, which are used for fixing electrical and electronic equipment or components.

2 Terms and definitions

The following terms and definitions apply to this document.

2.1

Wind tunnel

A piping system, which is designed according to special requirements, uses a fan and other power devices to artificially generate and control airflow, to simulate the airflow around the test piece AND measure the effect of the airflow on the test piece. The part, where the test piece is installed, is called the test section.

Wind tunnels, which have wind speeds lower than 135 m/s, are called low-speed wind tunnels.

2.2

Wind tunnel test

Install the test piece in the test section of the wind tunnel; measure the aerodynamic force acting on the test piece, when the air flows through the

2.7

Aerodynamic coefficient

The aerodynamic force (torque) is divided by the characteristic area of the test piece (the characteristic area times the characteristic length) AND the dimensionless coefficient of the air flow pressure.

Aerodynamic coefficient $C_r = F/(Q \cdot S)$; Aerodynamic torque coefficient $C_m = M/(Q \cdot S \cdot L)$. Among them, F and M are the force and moment, respectively; C_r and C_m are their coefficients, respectively; S is the characteristic area, which is, in this Part, the maximum projected area of the solid part of the test piece; L is the characteristic length, which is, in this Part, the maximum extension length of the solid part of the test piece; Q is dynamic pressure, $Q = 0.5 \cdot \rho \cdot v^2$ (where ρ is air density, v is wind speed).

2.8

Wind pressure

The pressure, which is generated on the surface of the test piece, when the air flows through it. The wind pressure coefficient is $C_p = (p1 - p\infty)/Q$, where p_1 is the pressure value at a certain point of the test piece; $p\infty$ is the static pressure value, which is not disturbed by the test piece, far in front of the incoming flow.

2.9

Wind speed

The relative speed of the test piece and the airflow. For the test piece, which is installed on the moving equipment (such as ship radar), it refers to the vector sum of the wind speed in the atmosphere AND the moving speed of the equipment.

2.10

Reynolds number

The dimensionless parameter, which characterizes the relative magnitude of the air inertial force and viscous force, which is denoted as R_e. $Re = (\rho \cdot v \cdot L)/\mu$, where ρ is the air density, μ is the dynamic viscosity coefficient of the air, v is the wind speed, L is the characteristic length.

2.11

Body axes system

The orthogonal coordinate axis systems ox_1, oy_1, oz_1 (see Figure 1), which are fixed on the test piece. It conforms to the right-hand rule.

2.12

Wind axes system

The reference orthogonal coordinate axis system ox, oy, oz, based on the airflow direction (see Figure 1). It conforms to the right-hand rule.

3 Requirements for test equipment and test pieces

3.1 The diameter of the test section of the wind tunnel shall be greater than 2 m.

3.2 When the wind tunnel test equipment is doing wind speed test, its wind speed shall be adjustable. It can be increased slowly, from low to high. The wind speed is taken from the specified value, at the height of the center of the windward surface of the test piece; the tolerance shall be less than 5% as required by relevant standards.

3.3 The wind tunnel test equipment shall meet the requirements of uniformity, turbulence, pulsation (steady wind speed fluctuation) and other requirements, which are specified by relevant specifications. Meanwhile it shall provide blockage correction values.

3.4 The accuracy of measuring instruments of wind tunnel flow field and wind tunnel balance shall be in accordance with relevant specifications.

3.5 The extension length of the test piece shall not exceed 70% of the width of the test section of the wind tunnel.

3.6 The maximum projected area of the test piece shall not exceed 10% of the cross-sectional area of the wind tunnel's test section.

3.7 The rotation center of the test piece is located on the geometric center axis, of the test section of the wind tunnel.

3.8 When the test piece is a scaled model for wind tunnel test, the model shall meet the requirements of similar criteria.

4 Test conditions

4.1 Test wind speed

The test wind speed is 15 m/s, 30 m/s, 35 m/s, 45 m/s, 52 m/s, OR according

5.2.2 Force measurement in rotating state

5.2.2.1 The test piece is installed in the test section of the wind tunnel, according to the state of use. Increase the wind speed to 35 m/s OR according to the requirements of the relevant specifications, adjust and change the angle according to 4.2, to start the test piece; measure the force and torque. At the same time, carry out the test according to the requirements of the relevant specifications; AND whether to power on to test the performance index.

5.2.2.2 The test piece is installed in the test section of the wind tunnel, according to the state of use. Increase the wind speed is to 52 m/s OR according to the requirements of the relevant specifications, adjust and change the angle according to 4.2, to start the test piece; measure the force and torque. At the same time, carry out the test according to the requirements of the relevant specifications; AND whether to power on to test the performance index.

5.2.3 Pressure measurement in stationary state

The test piece is installed in the test section of the wind tunnel, according to the state of use, during the pressure measurement in stationary state. Carry out pressure measurement, according to the test conditions required by 4.1 and 4.2 OR relevant specifications. At the same time, the test the performance index, according to the test conditions, which are required by the relevant specifications.

For test pieces that are installed close to the ground, or have larger objects around which affect air flow, a typical case shall be selected for simulation test, to provide magnitude of the possible impact.

5.2.4 Deformation measurement of flexible components

For test pieces with greater flexibility, it shall also paste a pre-calibrated strain gauge, on the relevant positions of the test pieces, to measure the deformation on the relevant components of the test pieces.

5.3 Final inspection

Under standard atmospheric conditions, carry out testing of the electrical performance, mechanical performance of the test piece, as well as visual inspection, OR according to relevant specifications.

6 Data processing

6.1 Wind tunnel test data shall be corrected for support interference and tunnel wall interference, according to relevant specifications; AND subject to shafting conversion, to provide usable wind shafting aerodynamic coefficients. (See

Appendix C)

6.2 When the test piece is used for wind tunnel test, the revised test data can be directly compared with the original design data, to determine the rationality of the shape and structure of the test piece.

6.3 When the test piece is a scaled model for wind tunnel test, the revised test data can be compared with the original design data, after being converted according to relevant specifications.

7 Information to be given by relevant specifications

When relevant specifications include this test, the following detailed provisions shall be made, as far as possible, according to the degree of applicability:

a) Requirements for test equipment;

b) Description of the test piece;

c) Selection of test conditions (including test wind speed, test angle, test items);

d) Initial inspection content and requirements;

e) Intermediate inspection content and requirements;

f) Final inspection content and requirements.

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