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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 2423.101-2025

Replacing GB/T 2423.101-2008

Environmental testing - Part 2: Test methods - Test: Inclinations and swings

环境试验 第2部分：试验方法 试验：倾斜和摇摆

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1 Scope

GB/T 2423.101-2025 is the Chinese national standard covering testing equipment for life on a moving platform - the static inclination in each direction and the rolling and pitching motion, the amplitudes and periods that represent a ship at sea, and the functional checks made while the specimen is moving. It replaces GB/T 2423.101-2008, in force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026, replacing GB/T 2423.101-2008.

This Document describes the test methods for three test items. inclination, swing, and

combined inclination and swing tests. It specifies the terms and definitions, test items, test requirements, severity levels, pretreatment, initial inspection, testing, and final inspection for inclination and swing tests, as well as the information that shall be provided in the relevant standards and the information that shall be given in the test report. This Document applies to inclination and swing environment testing of components, equipment, and other products installed on ships to determine their operational suitability and/or structural integrity.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2422 Environmental testing - Guide to drafting of test methods - Terms and definitions

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 2422 and the following apply.

3.1 Inclination The tilting or heeling of a ship from its normal horizontal reference plane. Heeling and trimming refer to the angles at which a vessel tilts around its longitudinal (X-axis) and transverse (Y-axis) coordinate axes on a horizontal plane, respectively. The X-axis is the direction of the ship's travel, and the coordinate axes indicate directions as shown in Figure 1. NOTE. There are two modes of inclination. Trimming and heeling.

3.2 Swing It indicates the reciprocating angular movements of a ship deviating from its normal position and around one of its coordinate axes. Roll, pitch, and yaw refer to the reciprocating angular displacement movements of a ship around its longitudinal (X-axis), transverse (Y-axis), and vertical (Z-axis) coordinate axes. NOTE. There are three modes of swing. Roll, pitch, and yaw.

4 Test Items

This test includes three test items.

a) Inclination test. The inclination test is mainly applicable to products that require normal or reliable operation when the ship undergoes a large-angle inclination due to marine damage, maneuvering, loading imbalance, wind, etc.; and to products whose performance is significantly affected by the inclination environment.

b) Swing test. The swing test is mainly applicable to products that require normal or reliable operation when the ship undergoes prolonged swing due to external forces such as wind and waves; and to products whose performance is significantly affected by the swing

environment.

c) Combined inclination and swing test. The combined inclination and swing test is mainly applicable to products that require normal or reliable operation when the ship simultaneously inclines and swings, and to other situations where the expected combined effect cannot be assessed by individual or sequential inclination or swing tests. Unless otherwise specified in relevant standards, it should conduct only trimming and heeling tests, and pitch and roll tests. The test sequence is inclining first, then swinging; longitudinal first, then transverse. A combined inclination and swing test may also be conducted. The environmental effects of the test items are detailed in B.1 of Appendix B.

5 Test Requirements

5.1 Sample condition Whether the test sample is in working condition during the test shall be specified in the relevant standards.

5.2 Test stand Inclination test may be conducted on a swing test stand or platform. Swing test, the combined inclination and swing test shall be conducted on a swing test stand. The requirements are as follows:

a) During inclination test, the test stand shall be able to stably maintain the specified position under its maximum test load, without significant swinging or drifting.

b) During swing test, the swing test stand shall be able to simulate at least one mode of ship swinging, typically roll and/or pitch. Its amplitude and period shall be continuously adjustable and meet the requirements of

5.5 and Clause 6.

c) When the swing test stand cannot meet the test mode required by the relevant standards, it is permissible to use a rotating installation direction, a different mode of test stand, or a method agreed upon by both parties for testing.

d) The swing waveform produced by the swing test stand after the test sample is installed shall be a continuous, smooth sine wave. The distortion of the angular displacement sine waveform shall be less than 15%.

5.3 Measurement requirements During the test, the amplitude and period of inclination and swing shall be monitored.

5.4 Installation of sample The test sample shall be installed according to the actual installation orientation and method in use, or as specified in relevant standards, in a form sufficient to withstand the specified test conditions, directly or using fixtures to install on the test platform. When multiple installation methods are available, the method that can withstand the most severe conditions shall be selected, or all installation methods shall be tested. The rigidity of the fixture shall be sufficient to ensure that the fixture does not deform

significantly due to the weight of the test sample and the additional inertial force generated by swinging during the application of test conditions. The additional mass and constraints imposed on the test sample by external connections necessary to ensure the operation or power supply of the test sample during the test shall be kept to a minimum or as similar as possible to those during actual installation. In actual installation, equipment with shock absorbers shall be tested together with the shock absorbers.

5.5 Test control tolerances The tolerances for inclination angle, swing angle (amplitude), and period are ±5% of the specified values.

6 Severity Level

6.1 Severity level of inclination test The severity level of an inclination test is jointly determined by two parameters. the inclination angle and the test duration. It shall be selected from Table 1; special requirements may be specified according to relevant standards. For an example of the application of test severity level, see B.2.