Guideline No.: W-23 (201510)

# W-23 MARINE ALLOY STERNTUBE BEARING(COMPOSITE MATERIAL)

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Foreword:

This Guide is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

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# MARINE ALLOY STERNTUBE BEARING(COMPOSITE MATERIAL)

## 1 Application

1.1 This Guideline applies to the type approval and unitinspection of marine alloy sterntube bearings.

## 2 Normative references

2.1 Chapter 9, PART ONE of CCS Rules for Materials and Welding;

2.2 Chapter 11, PART THREE of CCS Rules for Classification of Sea-going Steel Ships;

2.3 ISO 4381 Lead and Tin Casting Alloys for Multilayer Plain Bearings;

2.4 ISO 4386-1 Plain Bearings-Metallic Multilayer (Part 1: Non-destructive Ultrasonic Testing of Bond) ;

2.5 ISO 4386-2 Plain Bearings-Metallic Multilayer (Part 2: Destructive Testing of bond for Bearings Multilayer thickness ≥2mm);

2.6 ISO 4386-3 Plain Bearings-Metallic Multilayer (Part 3: Non-destructive Penetrant Testing).

## 3 Definitions

3.1 Marine alloy sterntube bearing (composite material): for the purpose of saving noble metals, two kinds of metals are combined by means of certain process to produce composite material for sterntube bearings;

3.2 Bearing housing: the housing not in direct contact with the propeller shaft and only providing support, which forms part of the sterntube bearing of composite material;

3.3 Bearing alloy: in sterntube bearing of composite material, the shaft lining material in direct contact with the propeller shaft, usually made of alloy materials, is referred to as bearing alloy.

## 4 Drawings and documentation to be submitted

4.1 Sterntube bearing is directly related to the ship’s parameters and is to be reviewed and approved by the plan approval unit of CCS depending on the specific type of ships.

4.2 The drawings and documentation to be submitted to be submitted to CCS for approval are to be in accordance with the relevant requirements in Chapter 11, PART THREE of CCS Rules for Classification of Sea-going Steel Ships.

4.3 Documents and information to be submitted for applying for works approval

(1) Basic information of the manufacturer, including the manufacturer’s name and address, production history, customer evaluation, quality statistics and analysis, etc. The documents submitted by manufacturer may not be limited to these items as the main objective is to state their basic information. The manufacturer are to provide, as far as possible, the evidences demonstrating their stability of production process and reliability of product quality;

(2) Introduction of the certification of the enterprise's quality control system, currently valid quality control system certificates;

(3) List of combined elements of the composite material to be approved and the thickness range of bearing alloy;

(4) List of production process documents;

(5) Basic flow chart of production process;

(6) List of production equipment and testing equipment;

(7) Qualification certificates of NDT personnel (if applicable);

(8) Enterprise internal control standard;

(9) Factory acceptance test procedure;

(10) Type test plan.

**5 Materials and components**

The bearing housing is to be manufactured by the manufacturer which has been approved by CCS and holds works approval certificate issued by CCS.

For the raw materials of bearing alloy, the enterprises are to submit the material quality certificates provided by the manufacturers for review by CCS surveyor.

**6 Design and technical requirements**

6.1 The length of sterntube bearing is to comply with the requirements in Chapter 11, PART THREE of CCS Rules for Classification of Sea-going Steel Ships.

6.2 The clearance between the sterntube bearing and propeller shaft is to comply with the requirements in Appendix 5-Bearing Wear-out Clearance of Propeller Shaft or Sterntube Shaft, Chapter 5, PART ONE of CCS Rules for Classification of Sea-going Steel Ships.

6.3 Cast steel, cast iron and cast copper alloys are generally to be selected as the material for sterntube bearing housing of composite material. The chemical composition and mechanical properties of the material are in general to be in compliance with recognized standards. Use of materials under other standards by an enterprise is to be approved by CCS.

6.4 In general, cast tin-base or lead-base alloy materials are to be used as the material for bearing alloys. The chemical composition and mechanical properties of the material are generally to be in compliance with recognized standards. Use of materials under other standards by an enterprise is to be approved by CCS.

6.5 The actual bonding strength between the bearing alloy and bearing housing is to be no less than 42N/mm$^2$. And it is to be ensured that the two parts can remain firmly joined at all times under practical service environment.

6.6 The technique to join the bearing alloy with the bearing housing is to ensure the bonding

quality of the bonding face.

**7 Sampling principle of type test**

7.1 Each kind of bearing housing and bearing alloy material combination is to be approved by CCS and mutual substitution and coverage between combinations are not allowed.

7.2 The same bearing housing and bearing alloy material combination with different bonding techniques is to be approved by CCS.

7.3 For the same bearing housing and bearing alloy material combination with the same bonding technique, two test specimens, one of minimum bearing alloy thickness and the other of the maximum bearing alloy thickness, are to be selected.

**8 Type test**

8.1 Quality inspection of bearing housing material

The mechanicaland chemical properties and internal and external quality of the bearing housing material are to comply with the reference standard of the material.

8.2 Quality inspection of bearing alloy

The mechanical and chemical properties and external quality of the bearing alloy prior to bonding are to comply with the reference standard of the material.

8.3 Macrographic inspection

The surface of the bearing alloy is to be smooth, clean and free of slag and inclusion.

8.4 Bonding strength test

The actual bonding strength between bearing alloy and bearing housing may be tested by the method specified in ISO 4386-2 Plain Bearings-Metallic Multilayer (Part 2: Destructive Testing of bond for Bearings Multilayer thickness ≥2mm). The final measured bonding strength is to be no less than the design value specified in the enterprise standard and no less than 42N/mm².

8.5 Bonding quality NDT

The bonding quality of the bonding face between the bearing alloy and bearing housing may be examined by the testing method specified in ISO 4386-1 Plain Bearings-Metallic Multilayer (Part 1: Non-destructive Ultrasonic Testing of Bond) and ISO 4386-3 Plain Bearings-Metallic Multilayer (Part 3: Non-destructive Penetrant Testing). The measured strength is to be no less than 3C grade specified in these standards.

8.6 Inspection of tolerance of dimension, form and position

The tolerance of dimension, form and position of a finished product is to comply with the drawings.

**9 Unit/batch inspection**

9.1 Each alloy sterntube bearing (composite material) is to be subject to the following manufacturer tests and inspections:

(1) Quality inspection of bearing housing

(2) Quality inspection of bearing alloy;

(3) Macrographic inspection of sterntube bearing;

(4) NDT;

(5) Inspection of tolerances of dimension, form and position.

9.2 Upon completion of product inspection, the manufacturer is to submit the documents including the following items to CCS surveyor for review and issuance of product certificate based thereon:

(1) Bearing housing material certificates;

(2) Bearing alloy material certificates;

(3) NDT reports;

(4) Dimension, form and position tolerance inspection report.

9.3 Marking requirements

Each alloy sterntube bearing qualified through inspection is to be identified with the following marks:

(1) Product number or other traceability marks;

(2) CCS steel stamp.