



Guidelines No.W-25 (202501)

W-25

HUB CAP WITH FINS

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Foreword

China Classification Society (hereinafter referred to as CCS) Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at <http://www.ccs.org.cn>. Your comments or suggestions are welcomed and may be sent to our email addressed mp@ccs.org.cn

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HUB CAP WITH FINS

1 Application

The Guidelines are applicable to the factory approval and product inspection of ship copper alloy cast hub cap with fins. For hub cap with fins produced by other manufacturing methods, refer to the relevant requirements of the Guidelines.

Note: Hub cap with fins, also known as boss cap fins, is an energy-saving device installed behind the propeller. It is usually cast integrally from copper alloy (CU1, CU2, CU3 and CU4 in Section 1, Chapter 9, Part 1 of Rules for Materials and Welding) of the same material as the mating propeller. The hub cap with fins can reduce the energy loss caused by propeller vortex by rotating together with the propeller, thus saving energy and reducing underwater noise.

2 Normative references

2.1 Basis for approval and inspection of hub cap with fins are as follows:

- (1) CCS Rules for Classification of Sea-going Steel Ships;
- (2) CCS Rules for Materials and Welding;
- (3) ISO 23453 Guidelines for the design and manufacture of the hub cap with fins for a fixed-pitch marine propeller.

3 Terms and definitions

3.1 The definitions given in CCS Rules for Classification of Sea-going Steel Ships, CCS Rules for Materials and Welding and ISO 23453 Guidelines for Design and Manufacture of Hub Cap with Fins for a Fixed-pitch Marine Propellers are applicable to the Guidelines.

4 Drawings and documents

4.1 Drawings and documents submitted for check of products drawings

The Design and Manufacturing Drawings of Hub Cap with Fins and relevant calculation data shall generally be taken as a part of the ship drawing and submitted to CCS for approval.

The following drawings shall be submitted for approval:

- (1) Strength Calculation Sheet of Hub Cap with Fins;
- (2) Diagram of Hub Cap with Fins (including Blade Diagram);
- (3) Strength Calculation Sheet of Connecting Bolts.

The following drawings shall be submitted for note:

- (1) Arrangement Plan of Hub Cap with Fins;
- (2) Hydrodynamic Performance and Energy Efficiency Assessment Report (if necessary);

- (3) Information such as the material of accessories of hub cap with fins.

The drawings shall be dimensioned in sufficient detail and with the parameters necessary to verify the calculations.

4.2 Plans and documents submitted for works approval

4.2.1 During initial approval, the following drawings and documents shall be submitted for review:

- (1) Factory overview: including factory name, address, production history, production capacity, main products, legal representative, business license, ISO 9000 quality system certificate, list of personnel in key technical management positions such as inspection, testing, welding and NDT personnel and major technical management personnel, and the qualification certificates or qualifications required;
- (2) Details of the product applied for accreditation, including alloy type, maximum diameter and maximum weight;
- (3) Main production and testing equipment, including smelting, casting and other production equipment, physical and chemical property testing equipment, shape value testing equipment, metallographic testing equipment (if applicable) and other equipment;
- (4) Brief production process, NDT and welding procedure of the product to be approved.

5 Technical requirements

5.1 The design and technical requirements of hub cap with fins shall comply with the relevant requirements in Chapter 11, Part 3 of Rules for Classification of Sea-going Steel Ships and ISO 23453 Guidelines for Design and Manufacture of Hub Cap with Fins for a Fixed-pitch Marine Propellers;

5.2 The materials of hub cap with fins shall comply with the relevant requirements in Chapter 9, Part 1 of Rules for Materials and Welding;

5.3 The corrosion resistance of materials shall be considered for the connecting bolts of hub cap with fins, and corresponding pre-tightening and reliable anti-loosening and anti-corrosion measures shall be taken during installation.

6 Materials and components

N/A.

7 Type test

7.1 Selection of Typical Samples

The selection of typical samples for factory approval shall be carried out according to the following principles:

- (1) Select typical parts according to copper alloy materials of different alloy types, in which CU1 and CU2 can cover each other;

- (2) The diameter of at least one alloy type of hub cap with fins reaches more than 90% of the maximum diameter applied for, or the weight reaches more than 80% of the factory's application capacity.

7.2 Type Test Items and Requirements

7.2.1 Chemical composition analysis: The alloy type of the material of hub cap with fins shall be generally consistent with that of the matching propeller, and the finished product analysis results shall comply with the requirements of 9.1.3 in Chapter 9, Part 1 of Rules for Materials and Welding of CCS.

7.2.2 Metallographic inspection: It is applicable to hub cap with fins made of CU1 and CU2. The reading of α phase in metallographic inspection shall be the average value of a set of five readings of each test sample. The results of metallographic examination shall comply with the requirements of Rules for Materials and Welding in 9.1.3 in Chapter 9, Part 1 of CCS.

7.2.3 Mechanical property test: The mechanical property test samples and group lots shall comply with the requirements of 9.1.5, Chapter 9, Part 1 of Rules for Materials and Welding of CCS. The mechanical property test and results shall comply with the requirements of 9.1.6, Chapter 9, Part 1 of Rules for Materials and Welding of CCS.

7.2.4 Inspection of appearance, dimension and geometric tolerance: The appearance, dimension and geometric tolerance of hub cap with fins shall comply with the requirements in drawings approved by CCS and relevant standards (such as ISO 23453).

7.2.5 NDT: The penetrant testing of blade area of hub cap with fins shall be carried out according to the requirements for propeller zone B, and that of other areas shall be carried out with reference to the requirements for propeller zone C. The test results shall comply with the requirements of Section 4, Chapter 8, Part 3 of Rules for Materials and Welding of CCS. Penetrant testing of blade areas should normally be carried out in the presence of the surveyor.

7.2.6 Pressure test: The hub cap with fins shall be subjected to a pressure test under a hydrostatic pressure or air pressure of not less than 0.2 MPa for more than 30 minutes.

7.2.8 Repair of defects: The imperfection repair of hub cap with fins can be carried out according to the requirements of Section 4, Chapter 8, Part 3 of Rules for Materials and Welding of CCS. If welding repair is required, it shall be carried out according to the approved welding procedure (the welding procedure approval of propeller is applicable to hub cap with fins of the same alloy type). Generally, large-area welding repair shall be avoided for hub cap with fins. The welding repair area of blade areas shall be carried out with reference to the requirements of Area B in Table 7(4) of Product Inspection Guidelines W-10 Copper Alloy Propeller.

8 Unit/batch inspection

8.1 The inspection items for unit/batch of hub cap with fins shall include: chemical composition, metallographic structure (only applicable to CU1 and CU2), mechanical properties, appearance, dimensions, geometric tolerance, NDT, pressure test, etc. Generally, the inspection shall be carried out according to the requirements of 7.2 of the Guidelines.

8.2 Each casting of hub cap with fins shall be properly marked by the manufacturer as follows:

- (1) Alloy type or corresponding abbreviated designation;
- (2) Mark of manufacturer/brand owner;
- (3) Heat number or other marking which will enable the full history of the casting to be traced;
- (4) Number of CCS certificate;
- (5) Mark of CCS.