Guideline No.: E-03(202009)

E-03

MOTORS

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Foreword:

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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Main changes:

1. Partly based on the document in accordance with the current validspecifications and standards update.

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2. Edit modifications and corrections.

~~3.~~ Modify test sampling content.~~Modify the motor shaft non-destructive examination content.~~

CONTENTS

MOTORS

1Application

1.1This Chapter applies to motors for ships and offshore installations, but not to micro control motors.

1.2This Chapter is applicable to motors for general purposes. Where motors, which are intended for special purposes or for which special tests are required, are not specifically covered by this Chapter, the standards for such motors are to apply.

2Normative references

2.1The approval and inspection of motors are to be based on the following documents:

(1) CCS Rules for Classification of Sea-going Steel Ships, 2015 and its amendments;

(2) CCS Rules for Materials and Welding, 2015 and its amendments;

(3) CCS GD 22-2015<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version);

(4) IACS UR E13 (Rev.2 Aug 2015 Corr.1 June 2018) Test requirements for Rotating Machines;

(5) IEC 60092-301:1980{Ed.3.0}Electrical installations in ships - Part 301: Equipment–Generators and motors;

(6) IEC 60092-301-am1:1994 {Ed.3.0};

(7) IEC 60092-301-am2:1995 {Ed.3.0};

(8) IEC 60034-1:2017 {Ed.13.0} Rotating machines - Part 1: Rating and performance;

(9) IEC 60085:2007{Ed.4.0} Electrical insulation – Thermal classification;

(10) IEC60034-5:~~2006~~2020 {Ed. ~~4.1~~5.0} Rotating machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification;

(11) IEC 60034-6:1991 {Ed.2.0} Rotating machines - Part 6: Methods of cooling(IC code);

(12) IEC 60034-7:2001{Ed.2.1} Rotating machines - Part 7: Classification of types of construction, mounting arrangement and terminal box position (IM Code);

(13) IEC60034-8:2014 {Ed.3.1} Rotating machines - Part 8: Terminal markings and direction of rotation;

(14) IEC60034-15:2009 {Ed.3.0} Rotating machines - Part 15: Impulse voltage withstand levels of rotating AC machines with form-wound stator coils;

(15) IEC60068-2-30:2005 {Ed.3.0} Environmental testing - Part 2 – 30: Tests-test Db: Damp heat, cyclic (12h + 12h cycle);

(16) IEC60068-2-11:1981 {Ed.3.0} Environmental testing - Part 2: Tests – test Ka: Salt mist;

(17) IEC60079-0:2017{Ed.7.0} Electrical apparatus for explosive gas atmosphere - Part 0: General requirements;

(18) IEC60079-1:2014 {Ed.7.0} Electrical apparatus for explosive gas atmosphere - Part 1: Flameproof enclosures “d”;

(19) IEC 60079-2:2014{Ed.6.0} Electrical apparatus for explosive gas atmosphere - Part 2: Pressurized enclosures “p”;

(20) IEC60079-7:2017 {Ed.5.1} Electrical apparatus for explosive gas atmosphere - Part 7:Increased safety “e”;

(21)CB /T 3907-1999 Ultrasonic testing of marine forged parts;

(22) IACS Rec.68 Guidelines for non-destructive examination of hull and machinery steel forgings;

(23) IEC 60092-501:2013 Electrical installations in ships - Part 501: Special features - Electric propulsion plant.

2.2In lieu of the standards referred to in this Chapter, other equivalent standards or standards acceptable to CCS may be applied as appropriate.

3Terms and Definitions

3.1For the purpose of this Chapter:

3.1.1 Rules for Classification of Sea-Going Steel Ships, It means the CCS Rules for Classification of Sea-Going Steel Ships.

3.1.2AC high-voltage motor is a 3-phase AC motor rated over 1 kV.

4Plans and documents

4.1The following plans and documents are to be submitted for review:

(1) General plans;

(2) Detailed drawings of main parts, including assembly of stators, assembly of rotors, turning axle, assembly of collector rings or commuters, bedplates, and structure of terminal boxes;

(3) Technical specifications of the products;

(4) Type test program.

(5) Drawing of nameplate;

(6) Specimen of test quality certificate;

(7) Operation instructions for the products.

5Technical requirements

5.1The design and manufacture of products is to comply with the requirements of CCS Rules for Classification of Sea-going Steel Ships, CCS Rules for Materials and Welding and IEC 60092-301; thermal classification of electrical insulation is to comply with IEC 60085; classification of degrees of protective enclosures is to comply with IEC 60034-5; methods of cooling are to comply with IEC 60034-6; construction and mounting arrangement is to comply with IEC 60034-7;terminal markings and direction of rotation are to comply with IEC60034-8;explosion-proof motors are to comply with IEC 60079;Propulsion motors are to comply with IEC 60092-501.

6Materials and components

6.1Materials and components are to comply with relevant requirements of CCS Rules;for motors operated at 100kW and above, the material selected for design is to comply with the requirements of CCS Rules for Materials and Welding.

6.2 For the propulsion motor, the shaft should be non-destructive examination, and the material of the shaft should have the certificate issued by CCS.

6.3 The non-destructive examination can be carried out using recognized international, national or industry standards.The following non-destructive testing for common standards, corresponding to the agency determines the acceptable level specified in Table 6.3. When other countries or regional standards, subject to the agency to assess and confirm the level determined before use.

Acceptable non-destructive testing standards and minimum acceptance level①Table 6.3

Ultrasonic Testing		Magnetic particle testing		Penetrant testing	
Standard	Level	Standard	Level	Standard	Level
CB/T3907	II				
IACS Rec.68	qualified	IACS Rec.68	qualified	IACS Rec.68	qualified

①If manufacturers have acceptance criteria can also accept the manufacturer's acceptance criteria.

7Type test

7.1Selection of typical samples

7.1.1Types and specifications of test samples are to cover the products for which approval is sought and be technically representativefor determining, through type test, whether the manufacturer has the capability to manufacture the approval products as required by CCS. At least one of the samples taken from different series is to be rated not less than 80% of the maximum power to be approved.

7.1.2 Samples selected from the same series of motors are to be representative in terms of power, speed, construction type, installation type (vertical or horizontal), degree of protection, duty, method of cooling, insulation level, purpose and manufacturing process. ~~Two motorsare to be takenfor each specification where approval is requested for the first time.~~

~~7.1.3 At least one of the test samples is to be rated not less than 80% to 100% of the maximum power for which approval is requested.~~

7.1.3 The international standards referred to in this guideline are their respective latest versions.

7.2Items and requirements for type test

7.2.1 The type test of motors is to be in accordance with Table 7.2.1(1) and Table 7.2.1(2).

Type Test Items for Motors Table 7.2.1(1)

No.	Test item	Technical requirements	Test method
1	Visual examination	Approved plans and technical documents	Visual examination of Compliance
2	Measurement of insulation resistance	3.2.9.6, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.6, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
3	Measurement of winding resistance	Technical specifications	3.2.9.7, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
4	Overload/overcurrent test	3.2.5.1, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.5.1, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
5	Overspeed test①	IEC 60034-1para.~~8.5~~9.7	IEC 60034-1para.~~8.5~~9.7
6	Withstand voltage test	IEC 60034-1para.9.2~~8.1~~	IEC 60034-1para.9.2~~8.1~~
		IEC 60034-15	IEC 60034-15 (for high-voltage motors)
7	No-load test	3.2.9.14,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.14,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
8	Examination of bearings	3.2.9.16,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.16,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
9	Rated load test and measurement of temperature rise	3.2.3.1, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	IEC 60034-1para.7
10	Test of degree of protective enclosure	IEC60034-5	IEC60034-5
11	Power supply variation test	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.4	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.4
12	Inclination test	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.6	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.6
13	Damp heat test	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.10	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.10
14	Salt mist test Ka	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.13	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 2.13

15	Electromagnetic compatibility-measurement of conducted emission②	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 3.2	<Guidelines for Type Approval Test of Electric and Electronic Products> (current valid version),, 3.2

①Notapplicable for squirrel cage motors.

② Only applicable for synchronous motors and DC motors.

Type Test Items for Motors – Test of Explosion-Proof Motors① Table 7.2.1(2)

No	Test item	Technical requirement	Test method
1	Explosion-proof performance test	IEC60079-0 IEC60079-1 IEC60079-2 IEC60079-7	IEC60079-0 IEC60079-1 IEC60079-2 IEC60079-7

①The explosion-proof motorsare to be certified as required by the Administration.

8 Unit/batch inspection

8.1 The manufacturers holding a CCS Type Approval B Certificate are still to carry out ~~The manufacturer is to carry out~~ routine tests for each motor according to Table 8.1. The routine test report is to contain test results,the manufacturer's serial number of the motor and the type approval certificate number of the motor.

8.2 The number of generators to be inspected by CCS is to be 5% of the total number of submitted ones, but not less than 2 sets, unless the inspection is requested for one generator only.~~For manufacturers with CCS Type Approval B, the Surveyor is to witness the testing of 5% of motors or at least 2 motors on site.~~

8.3All motors rated at 50kW or above and intended for essential services are to be inspected by CCS Surveyor during the test and if necessary, in the manufacturing process.

8.4Additional test items may be required where deemed necessary by the Surveyor.

8.5Material certificates are to be checked according to requirements of 6.

Routine Test Items forMotorsTable 8.1

No	Test item	Technical requirement	Test method
1	Visual examination	Approved plans and technical documents	Visual examination of Compliance
2	Measurement of insulation resistance	3.2.9.6, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.6, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
3	Measurement of winding resistance	Technical conditions	Bridge method or voltage-current method
4	Overload/overcurrent test①	3.2.5.1, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.5.1, PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
5	Overspeed test②	IEC 60034-1para.9.7~~8.5~~	IEC 60034-1para.9.7~~8.5~~
6	Withstand voltage test	IEC 60034-1para.9.2~~8.1~~	IEC 60034-1para.9.2~~8.1~~
		IEC 60034-15③	IEC 60034-15 (for high-voltage motors)
7	No load test	3.2.9.14,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.14,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships
8	Examination of bearings	3.2.9.16,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships	3.2.9.16,PART FOUR of CCS Rules for Classification of Sea-going Steel Ships

① Applicable for motors rated over 100 kW intended for essential services.

② Not applicable for squirrel cage motors.

③ Review the test report, tests will be witness if the surveyor considers necessary.