Guideline No.: B-06(202502)

B-06

BLADDER ACCUMULATORS

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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 .

Historical versions and release date :

B-06（201510） 2015-10-20

B-06（201605） 2016-05-31

Main change:

The format of the guideline has been adjusted;

Refine the scope of application, test items, and test requirements.

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BLADDER ACCUMULATORS

1 Application

1.1 The guideline is applicable to the type approval and unit/batch inspection of marine bladder accumulators.

1.2 The guideline is applicable to the accumulators using petroleum base hydraulic oil or emulsion as the liquid end working medium and gas end filled with nitrogen gas. The general parameters are:

Design pressure:≤80MPa

Design temperature: -40°C~+120°C

Nominal capacity: ≤350L

1.3 For the structural forms, manufacturing material and working medium of accumulators not mentioned in the Guidelines, reference may be referred to the Guidelines as appropriate.

2 Normative references

2.1 CCS Rules for Classification of Sea-going Steel Ships

2.2 CCS Rules for Materials and Welding

3 Terms and definitions

The terms and definitions hereunder are listed in a simplified way to facilitate understanding of the Guidelines. Refer to relevant codes and standards for more specific details.

3.1 Working pressure: the maximum pressure of the accumulator that can be reached under normal working conditions.

3.2 Charged pressure: the gas pressure in the accumulator when there is no pressure at the liquid end.

3.3 Nominal capacity: the capacity of the accumulator bladder at charged pressure.

3.4 Design pressure: the maximum set pressure of the accumulator, which is used together with the corresponding design temperature as the design load conditions, and whose value is to be no less than the working pressure.

3.5 Design temperature: the set temperature of element metal (mean value of the temperature along the metal section of the element), with the accumulator being under normal working conditions.

3.6 Batch quantity: the specified quantity of accumulator shells which adopt the same container category, the same design conditions, have the same nominal diameter and wall thickness, are made of material of the same heat number by the same manufacturing process, and are heat treated by the same heat treatment method.

3.7 Bladder accumulator: an accumulator mainly composed of a shell and a bladder, with liquid and gas separated by flexible bladder.

4 Drawings and documentation

4.1 The following drawings and documentation to be submitted are to be submitted to CCS for approval:

(1) Main properties and specifications sheet (including structural type, nominal capacity, design pressure, connection type, working medium, etc.);

(2) General assembly drawing (including the accumulator body and components, connecting structures, accessories arrangement, etc.);

(3) Main parts diagram (including shell, oil inlet/drain valves, bladder, etc.);

(4) Strength calculations;

(5) Manufacturer test program;

(6) Summary sheet of material mechanical and chemical properties of main parts;

4.2 The following drawings and documentation to be submitted are to be submitted to CCS for review:

(1) List of suppliers of materials and main parts;

(2) Design calculations, technical specifications, process documents (enterprise standard, production process flow, heat treatment process, etc.);

(3) Product usage and maintenance manual,nameplate, and sample of manufacturer conformity certificate;

(4) Other valid documents, reports and certificates able to demonstrate the production capacity of the products within the scope of approval (e.g. production license issued by state administration).

5 Technical requirements

5.1 The shell of a bladder accumulator should generally be made of seamless steel pipes; Oil inlet/drain valves are to be manufactured with alloy steels such as 40Cr and quality carbon steels or other materials upon the approval of CCS; The bladder is to comply with the oil and low temperature resistant parameters specified in GB/T20663 or other equivalent standards.

5.2 Accumulators are to be grouped into batches based on the nominal capacity. Welding and repair welding are not allowed. The materials marks are to be kept during manufacturing to allow for traceability;

5.3 The internal and external surfaces of the accumulator shell are to be smooth and free from crack, fold, crease, double skin, inclusion, handling damage and other defects affecting the strength of the shell. A smooth transition is to be ensured between the cylinder body and sealing head. Surfaces are to be treated against rust and corrosion by coating or other means;

5.4 Shells and other pressure elements are to be heat treated in satisfactorily qualified heat treatment process;

5.5 The accumulators are to be assembled according to the drawings approved by CCS. The oil inlet/drain valves are to be installed without misalignment or inclination and are to be freely movable;

5.6 After a satisfactory assembly, the gas pressure inside the bladder is to be kept at 0.05~0.15MPa, and the oil ports of oil inlet/drain valves are to be fitted with dust covers;

5.7 Safety valves, burst discs and fusible plug (if any) are to comply with the relevant requirements of Section 7, Chapter 4, Part Three of CCS Rules for Classification of Sea-going Steel Ships and CCS Guidelines H01 for Inspection of Hydraulic Power Device.

6 Materials and components

5.1 Materials and components are to comply with relevant requirements of CCS Rules.

5.2 In principle, the shell material is to have CCS marine product certificates or upon the approval of CCS, to be controlled by re-test upon arrival of each batch.

7 Type test

7.1 Selection of prototype

Accumulators of each type are to be type tested. Products of high design pressure and of the maximum capacity and minimum capacity indicated in the product nominal capacity distribution chart are to be selected as the prototypes for initial approval.

Targeted selection of the prototype for approval for certificate renewal may be made according to the manufacturer’s quality statistical data, sales volume and customer feedbacks.

And the selection of the prototype for approval of additional types is to be made with focus on the performance index of the new additional types and the difference between the new types and approved types. The accumulators with inner diameter change in excess of 5% or length change in excess of 60% compared with the original design are to be type tested again.

7.2 Prototype test items

Refer to Table 7.2 below for specific test items.

Prototype Test Items for Bladder Accumulator **Table 7.2**

No.	Test item	Test requirements
1	Wall thickness	The minimum thickness of the shell should meet the requirements of the approved drawings by CCS.
2	Manufacturing tolerance	The manufacturing tolerance of the shell should meet the requirements of the approved drawings by CCS.
3	Quality of internal and external surfaces	The inner and outer surfaces of the shell should be treated, and the cylinder and head should transition smoothly without cracks, folds, wrinkles, double skin, inclusions, grooves, mechanical damage, and other defects that affect strength and corrosion resistance, and should comply with the requirements of the approved drawings by CCS.
4	Mechanical properties of shell	(1)The mechanical performance samples of the shell after heat treatment should be taken from one shell in the same batch of heat treatment, and the number and location of samples should meet the requirements of the approved drawings by CCS and product execution standards; (2)The shape, dimensions, testing methods, and retesting of tensile and impact specimens should meet the requirements of CCS Rules for Materials and Welding; (3)Mechanical properties should meet the requirements of the approved drawings by CCS.
5	Chemical components analysis	Chemical components analysis of shell should meet the requirements of the approved drawings by CCS.
6	Flattening test (cold bending test)	should meet the requirements of the approved drawings by CCS and product execution standards.
7	Hardness measurement	Hardness testing locations, test points, and acceptance indicators should meet the requirements of the approved drawings by CCS and product execution standards.
8	Non-destructive testing	should meet the requirements of the approved drawings by CCS and product execution standards.
9	Hydraulic test	The hydraulic test pressure of the shell should be 1.5 times the design pressure. During the hydraulic test, the holding time under the test pressure shall not be less than 1 minute, the pressure gauge pointer shall not drop back, and the shell shall have no obvious deformation, leakage or other abnormal phenomena, and no abnormal sound.
10	Burst test	should meet the requirements of the approved drawings by CCS and product execution standards.

Continued Table 7.2

No.	Test item	Test requirements
11	Bladder leakage test	Fill the bladder with nitrogen or air with a pressure not exceeding 0.05 MPa, immerse it in a water tank for inspection, or apply soapy water to the entire surface of the bladder for inspection, and no leakage is allowed.
12	Fatigue test	(1)should meet the requirements of the approved drawings by CCS and product execution standards; (2)If the manufacture can provide calculation of fatigue analysis ,fatigue test can be exempted.
13	Sealing performance test	The sealing performance test should be carried out according to the approved drawings and product execution standards, with the inflation pressure and test pressure specified. The pressure holding time should not be less than 1 minute, and there should be no air or oil leakage at each sealing point.
14	Operation performance test	The operation performance test should be conducted in accordance with the approved drawings and product execution standards, including the range of inflation pressure and hydraulic oil pressure changes. The number of actions should not be less than 10, and there should be no air or oil leakage during the test process.

Note: Test items 1-10 are applicable to the shell, test item 11 is applicable to the bladder, and test item 12-14 are applicable to the accumulator; Products designed according to other acceptable standards may be type tested in accordance with such standards.

8 Unit/batch inspection

8.1 Unit/path inspection after CCS approval is to be carried out in accordance with the product inspection plan approved during the approval;

8.2 Unit/path inspection may be carried out according to the requirements of 1～9、11、13 and 14of Table 7.2.