Guideline No.: B-06(201510)

B-06 BLADDER ACCUMULATORS

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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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CONTENTS

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1 Application

1.1 The accumulators specified in the Guidelines are vessels which, utilizing the compressibility of gas, use the gas pressure inside the bladder to apply pressure on the liquid outside the bladder.

1.2 The Guidelines are applicable to the accumulators using petroleum base hydraulic oil or emulsion as the working medium and having the following general parameters:

Design pressure: p≤63MPa

Design temperature: -40 ℃~+93 ℃

Nominal capacity: 0.4L~250L

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

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 at the temperature 20 ℃±5 ℃ when the hydraulic circuit is not opened (in its initial state).

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 design conditions, have the same nominal diameter and design 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.

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 (including check of fatigue strength with surge);

(5) Manufacturer test program;

(6) Summary sheet of material mechanical and chemical properties of main pressure 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 description and nameplate, sample of manufacturer conformity certificate, asbestos-free declaration, etc. which comply with the requirements of CCS;

(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 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 product certificates or upon the approval of CCS, to be controlled by re-test upon arrival of each batch;

5.3 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;

5.4 The bladder is to comply with the oil and low temperature resistant parameters specified in GB/T20663 or other equivalent standards.

6 Technical requirements

6.1 Shells are to be approved and surveyed in accordance with CCS Guidelines for Inspection of Seamless Steel Gas Cylinders and the recognized standards acceptable to CCS;

6.2 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;

6.3 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;

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

6.5 The accumulators are to be assembled according to the drawings. The oil inlet/drain valves are

to be installed without misalignment or inclination and are to be freely movable;

6.6 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;

6.7 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 for Inspection of Hydraulic Power Device.

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 50% 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	Description	Remark
1	Wall thickness	See GB/T 20663 6.3.3	
2	Manufacturing tolerance	See GB/T 20663 6.3.1 and 6.3.2	
3	Quality of internal and external surfaces	See GB/T 20663 6.2.1	
4	Mechanical properties of shell	See GB/T 20663 6.4.3, 7.1 and 7.2	
5	Chemical components analysis of shell	See GB/T 20663 4.2.2	
6	NDT	See GB/T 20663 4.2.1 and 6.4.4	
7	Hydraulic test	See GB/T 20663 7.3.2	
8	Fatigue test	See GB/T 20663 7.4.2	

Continued Table 7.2

No.	Test item	Description	Remark
9	Burst test	See GB/T 20663 7.5.2	
10	Gas tightness test	See GB/T 20663 7.6	
11	Sealing test	See GB/T 20663 7.7	
12	Operation test	See GB/T 20663 7.8	

Note: Products designed according to other acceptable standards may be type tested in accordance with such applicable standards.

8 Unit/path 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, 2, 3, 4, 5, 6, 7, 10, 11 and 12 of Table 7.2.