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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 16749-1997

Replacing GB/T 16749-1997

Bellows expansion joints for pressure vessel

压力容器波形膨胀节

(English Translation)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 16749-1997 "Pressure Expansion of Pressure Vessels". Compared with GB/T 16749-1997, except for editorial repair the main technical changes changed are as follows.

a) Expanded the scope of application of the standard.

--- Incorporate a wave expansion joint of non-ferrous metal materials by reference to standards (see Chapters 2, 4.1.2, 6.2.1 and 6.2.4);

--- Increased waveform and structure of the waveform expansion joint, improved design parameters, and expanded the scope of application of the standard (see 1.2 and 5.1, 1997 editions 1.2, 1.3 and 4.1.1).

b) Revised or added provisions for design calculation and thickness limits for waveform expansion joints.

--- Revised design calculations for unreinforced U-shaped single or multi-layer bellows and with straight-edged wave expansion joints (see Chapter 7, 1997) Chapter 6 of the annual edition);

--- Increased U-shaped, ohm-shaped single or multi-layer bellows design calculations (see Chapter 7);

--- Increased the classification of welded joints of wave expansion joints and the high temperature strength reduction coefficient of welded joints (see 4.3.1 and 4.3.3);

--- Increased the requirement for the axial displacement (axial or axial compression) of the bellows geometry (see 7.8.1);

--- Increased the waveform structure and thickness range requirements of the pressure vessel expansion joint (see 5.1 and 7.2.1).

c) Revised the requirements for manufacturing, testing and acceptance of wave expansion joints.

--- Propose the general requirements of the wave expansion joint, clear the basic requirements of material selection, welding, non-destructive testing (see Chapter 6, 8.2, 8.5.1 and 8.5.2, Chapters 5, 7.2, 7.5.1.1 and 7.5.1.2) of the 1997 edition;

--- Revised the dimensional tolerance of the U-shaped wave; increased the dimensional tolerance of the ohm wave; proposed welding and lossless for different welded joints Test methods, non-destructive testing ratio, qualification level and bellows heat treatment regulations (see 8.7, 8.5.3, 8.5.4, 8.5.5, 8.5.6) and 8.3, 1997 editions 7.5.2, 7.5.3, 7.5.4 and 7.3);

--- Revised the provisions for the thickness reduction of bellows (see 4.4 and 8.7.1.1, 1997 edition 3.3);

--- Added X-ray computer-aided imaging detection based on the original standard non-destructive testing film sensitization (RT) (see 8.5.3) and 8.5.5.1);

--- Increased the connection between the bellows and the end tube (or device housing) (see 4.3.1.3).

d) Added terminology and definitions, revised qualifications and responsibilities for users, design, manufacturing, etc. (see Chapters 3, 4.2.1 and 4.2.2, 1997) Year edition 3.1).

e) Revised the bellows type and expansion joint marking (see 5.2, 1997 edition 4.2.2).

f) Revised the contents of the appendix.

--- Amend the contents of Appendix A to. bellows waveform parameters (see Appendix A, 1997 edition of Appendix A);

--- Delete the original standard Appendix B (see Appendix B of the 1997 edition);

--- Added materials commonly used for bellows and approximate control content (see Appendix B).

This standard is proposed and managed by the National Boiler and Pressure Vessel Standardization Technical Committee (SAC/TC262).

This standard was drafted. Hefei General Machinery Research Institute Co., Ltd., China Special Equipment Inspection and Research Institute, Sinopec Engineering Construction Company, China Ryukyu Engineering Co., Zhejiang University of Technology, Nanjing Chenguang Dongluo Bellows Co., Ltd., Nanjing Sanbang New Materials Technology Co., Ltd.

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1 Scope

1.1

This standard specifies the terms and definitions, general requirements, classification and marking of the pressure vessel expansion joint (hereinafter referred to as the wave expansion joint).

Materials, design, manufacturing, inspection and acceptance, inspection rules, factory requirements, storage and installation.

1.2

The pressure vessel wave expansion joints specified in this standard are applicable to.

a) The pressure vessel is a single-layer or multi-layer wave expansion joint that is not reinforced U-shaped, reinforced U-shaped or ohm-shaped, and is subjected to internal pressure or external pressure, wherein the bellows complies with the provisions of 7.2.1.

b) The design pressure is not more than 12 MPa.

c) The design temperature applies to the following conditions.

1) The steel does not exceed the allowable temperature range of the materials listed in GB/T 150.2-2011;

2) Other metal materials are determined according to the permissible temperature of the materials listed in the corresponding reference standards.

d) The nominal diameter is not more than 4000mm.

e) The product of design pressure (MPa) and nominal diameter (mm) is not more than 2.7×10^4 .

1.3

Wave expansion joints beyond the range of 1.2 can be manufactured by reference to this standard.

1.4

This standard does not apply to the following waveform expansion sections.

a) a wave expansion joint for direct flame heating;

b) non-metallic waveform expansion joints;

c) A wave expansion joint in the nuclear power plant where there is a risk of neutron radiation damage failure.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 150-2011 (all parts) pressure vessel GB/T 713 steel plate for boiler and pressure vessel GB/T 985.1 Recommended groove for gas welding, electrode arc welding, gas shielded welding and high energy beam welding GB/T 985.2 recommended groove for submerged arc welding GB/T 1800.1-2009 Geometrical Product Specifications (GPS) Limits and fits. Part 1. Tolerances, deviations and fits basis GB/T 1800.2-2009 Geometrical Product Specifications (GPS) Limits and fits. Part 2. Standard tolerance classes and Limit deviation table GB/T 3098.1 Fastener mechanical properties bolts, screws and studs GB/T 3098.2 fastener mechanical properties nut GB/T 3098.6 Mechanical properties of fasteners Stainless steel bolts, screws and studs GB/T 3274 carbon structural steel and low alloy structural steel hot rolled steel sheet and strip GB/T 3280 stainless steel cold rolled steel plate and strip GB/T 3621 titanium and titanium alloy sheet GB/T 3880 (all parts) General industrial aluminum and aluminum alloy sheets, strips GB/T 5310 seamless steel pipe for high pressure boiler GB/T 6479 seamless steel pipe for high pressure fertilizer equipment GB/T 8163 seamless steel pipe for conveying fluid GB/T 9948 seamless steel pipe for petroleum cracking GB/T 14976 stainless steel seamless pipe for fluid transportation GB/T 24511 stainless steel and heat-resistant steel plates and strips for pressure equipment NB/T 47011 Zirconium pressure vessel NB/T 47013.2 Non-destructive testing of pressure equipment - Part 2. Radiographic testing NB/T 47013.3 Non-destructive testing of pressure equipment - Part 3. Ultrasonic testing NB/T 47013.4 Non-destructive testing of pressure equipment - Part 4. Magnetic particle testing NB/T 47013.5 Non-destructive testing of pressure equipment - Part 5. Penetration testing NB/T 47014 Pressure welding equipment welding process evaluation JB/T 4711 Pressure Vessel Coating and Transport Packaging JB/T 4734 aluminum welding container JB/T 4745 titanium welding container JB/T 4756 nickel and nickel alloy pressure vessel YB/T 5353 corrosion resistant alloy hot rolled sheet YB/T 5354 corrosion resistant alloy cold rolled sheet TSG21-2016 Safety Regulations for Fixed Pressure Vessels

3 Terms and definitions

The following terms and definitions as defined in GB/T 150-2011 apply to this document.

Nominal diameter DN it is expressed in the diameter of the container cylinder and is divided into two series. inner and outer diameter. It consists of the letter DN and the dimensionless integer number, which represents the specifications of the bellows.