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中华人民共和国行业标准

NB/T 47013.10-2012(JB/T 4730.10)

Nondestructive Testing of Pressure Equipment Part 10: Ultrasonic Time of Flight Diffraction Technique

规范承压设备无损检测 第 10 部分：衍射时差法超声检测

Issued on: August 27, 2010 Implemented on: December 15, 2010

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Announcement of the National Energy Administration

No. 3, 2010

According to the requirements of "Management Method for Standardization of Power Industry" (tentative), the National Energy Administration hereby approves to issue 111 professional standards (see Annex) such as "Technical Code for Construction of Gathering and Transmission Distributing Station Projects in Highly Hydrogen Sulfide Gas Field", including 94 professional standards on oil and gas (SY), 10 professional standards on electric power (DL) and 7 professional standards on energy (NB).

Annex: Catalogue of Professional Standards

August 27, 2010

Annex:

Catalogue of Professional Standards

No.	Standard No.	Standard name	Replaced standard	Adopted standard No.	Approval date	Implementation date
1~104						
105	NB/T 47007-2010 (JB/T 4758)	Air Cooled Heat Exchanger			2010-08-27	2010-12-15
106	NB/T 47008-2010 (JB/T 4726)	Carbon and Low-alloy Steel Forgings for Pressure Equipment	JB 4726-2000		2010-08-27	2010-12-15
107	NB/T 47009-2010 (JB/T 4727)	Low-alloy Steel Forgings for Low Temperature Pressure Equipment	JB 4727-2000		2010-08-27	2010-12-15
108	NB/T 47010-2010 (JB/T 4728)	Stainless Steel and Heat-Resistant Steel Forgings for Pressure Equipment	JB 4728-2000		2010-08-27	2010-12-15
109	NB/T 47011-2010	Zirconium Pressure Vessels			2010-08-27	2010-12-15
110	NB/T 47012-2010 (JB/T 4750)	Pressure Vessels for Refrigerant Equipment	JB/T 4750-2003		2010-08-27	2010-12-15
111	NB/T 47013.10-2010 (JB/T 4730.10)	Nondestructive Testing of Pressure Equipment - Part 10: Ultrasonic Time of Flight Diffraction Technique			2010-08-27	2010-12-15

Contents

Foreword I
1 Scope 2
2 Normative References 2
3 Terms and Definitions 3
4 Testing Personnel 5
5 Testing Equipment 6
6 Reference Block 6
7 Method Summary and Basic Requirements 6
8 Testing Preparation 9
9 Setting and Calibration of Testing System 11
10 Testing 14
11 Analysis and Explanation of the Testing Data 14
12 Other Supplementary Testing 17
13 Flaw Evaluation and Quality Classification 17
14 Testing Report 20
Appendix A (Normative) Basic Performance Index of TOFD Testing Equipment 21
Appendix B (Normative) Reference Block 24
Appendix C (Informative) Ultrasonic Time of Flight Diffraction Technique Report 27

Foreword

This is Part 10 of "Nondestructive Testing of Pressure Equipment" (JB/T 4730): Ultrasonic Time of Flight Diffraction Technique

This Part is mainly based on the recent research achievements and application experience, thereof the methods are determined by reference to "TOFD on Weld Seams" (CEN/TS 14751-2004), "Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique" (ASTM E 2373-2004),"Non-destructive Testing - Ultrasonic Examination - Part 6: Time-of-flight diffraction technique as a method for detection and sizing of Flaws" (ENV 583-6-2000), "Guide to Calibration and Setting-up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws" (BS 7706-1993) and relevant contents of ASME Code Case 2235-9 while the flaw evaluation is main determined by reference to "Acceptance Criteria for The Time of Flight Diffraction Inspection" (NEN 1822-2005).

As for this Part, Appendixes A~B are normative and Appendix C is informative.

This Part was proposed by and is under the jurisdiction of the National Technical Committee on Boilers and Pressure Vessels of Standardization Administration of China (SAC/TC 262).

Drafting organizations of this Part: China Special Equipment Inspection and Research Institute, State Administration for Quality Supervision and Inspection and Quarantine (Bureau of Safety Supervision of Special Equipment, Jiangsu Province Special Equipment Safety Supervision Inspection Institute, Special Equipment Safety Inspection and Testing Institute of Hubei Province, Hefei General Machinery Research Institute, China First Heavy Industries, Wuhan Zhong Ke Innovation Technology Co., Ltd., Beijing Ouning Testing Technology Co., Ltd. and Huludao Special Equipment Supervision and Inspection Institute in Liaoning Province.

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National Technical Committee on Boilers and Pressure Vessels of Standardization Administration of China (SAC:/TC 262) in charge of the explanation of this Part.

Nondestructive Testing of Pressure Equipment

Part 10: Ultrasonic Time of Flight Diffraction Technique

承压设备无损检测

第 10 部分：衍射时差法超声检测

1 Scope

This Part specifies the ultrasonic time of flight diffraction technique (hereinafter referred to as "TOFD") and the quality grading requirements of pressure Equipment.

This Part is applicable to welded connectors simultaneously provided with the following conditions:

a) the material is carbon steel or low alloy steel;

b) butt joint of full-penetration structure;

c) 12mm≤workpiece thickness (t)≤400mm (excluding weld reinforcement, where the base metal thickness on both sides of weld seam is different, the thickness of the thinner side prevails).

This Part may be adopted for the TOFD of support members and structural members related to pressure Equipment as reference; other isotropic fine grain low acoustic attenuation may also be used by reference to this Part, but the change of acoustic speed shall be considered.

2 Normative References

The following documents are indispensable for the application of this document. For dated references, only the dated edition is applicable to this document. For undated references, the latest edition (including all the amendments) applies.

GB/T 12604.1 Terminology for Nondestructive Testing - Ultrasonic Testing (ISO 5577: 2000)

JB/T 4730.1 Nondestructive Testing of Pressure Equipment Part 1: General Requirements

JB/T 4730.2 Nondestructive Testing of Pressure Equipment Part 2: Radiographic Testing

JB/T 4730.3 Nondestructive Testing of Pressure Equipment Part 3: Ultrasonic Testing

JB/T 4730.4 Nondestructive Testing of Pressure Equipment Part 4: Magnetic Particle

Testing

JB/T 4730.5 Nondestructive Testing of Pressure Equipment Part 5: Penetrant Testing

JB/T 4730.6 Nondestructive Testing of Pressure Equipment Part 6: Eddy Current Testing

JB/T 10061-1999 Commonly Used Specification for A-mode Ultrasonic Flaw Detector Using Pulse Echo Technique

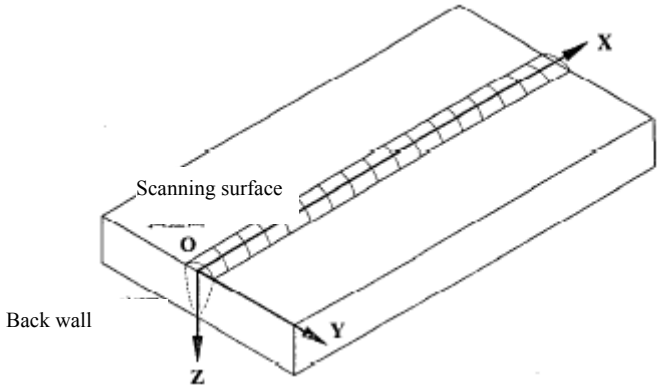
JB/T 1 0062-1 999 Testing Methods for Performance of Probes Used in Ultrasonic Flaw Detection

3 Terms and Definitions

For the purpose of this Part, the following terms and definitions as well as those specified in GB/T 12604.1 apply.

3.1 Coordinate definition

The meaning of the reference starting point O of testing and the X, Y and Z coordinates, as shown in Figure 1.



O: the set reference starting point of testing;

X: the coordinates in the length direction of weld seam;

Y: the coordinates in the width direction of weld seam;

Z: the coordinate in the thickness direction of weld seam.

Figure 1 Coordinate Definition

3.2 Time of Flight Diffraction (TOFD)

TOFD is an ultrasonic testing method to detect and measure the flaw dimension in a receiving-transmitting probe pair working mode by the flaw end diffraction wave signal.

3.3 Scanning surface

The scanning surface is placed on the workpiece surface of the probe so as to introduce the ultrasonic acoustic beam into the workpiece.

3.4 Back wall

The surface of workpiece on the opposite side of the scanning surface.

3.5 Lateral wave

The ultrasonic wave arriving at receiving probe through the shortest path along workpiece from the transmitting probe.

3.6 Back wall echo

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