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

GB/T 31211.2-2024

**Non-destructive testing - Ultrasonic guided wave testing - Part
2: Test method based on magnetostrictive transduction**

无损检测 超声导波检测 第2部分：磁致伸缩法

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Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Detection Principle	2
5 Safety requirements	3
6 Personnel Requirements	3
7 General testing procedures	3
8 Detection System	3
9 Testing procedures	8
10 Evaluation and processing of test results	12
12 Appendix A (Informative) Test Report Example	14

Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is part 2 of GB/T 31211 Nondestructive Testing - Ultrasonic Guided Wave Testing: GB/T 31211 has been published in the following two parts: part:

--- Part 1: General;

--- Part 2: Magnetostriction method: This document replaces GB/T 28704-2012 "Non-destructive testing - magnetostrictive ultrasonic guided wave testing method" and is compatible with GB/T 28704-2012 Compared with the previous version, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Some terms and definitions have been changed (see Chapter 3, Chapter 3 of the:2012 edition);
- b) The detection principle has been changed (see Chapter 4, Chapter 4 of the:2012 edition);
- c) The safety requirements have been changed (see Chapter 5, Chapter 5 of the:2012 edition);
- d) The personnel requirements have been changed (see Chapter 6, Chapter 7 of the:2012 edition);
- e) The general testing process specifications have been changed (see Chapter 7, Chapter

5 of the:2012 edition);

f) Added two categories: static guided wave detection equipment and dynamic scanning imaging guided wave detection equipment (see 8:1, 8:3, 8:4);

g) Changed the functional requirements of the testing equipment (see 8:2, 8:1 of the:2012 edition);

h) The standard specimens have been changed, and the standard specimens are specified according to the equipment classification (see 8:3:4, 8:4:4, and 8:4:1 of the:2012 edition);

i) The comparison sample has been changed (see 8:5, 8:4:2 of the:2012 edition);

j) Added equipment (see 8:6);

k) The maintenance and verification of testing equipment has been modified (see 8:7, 8:6 of the:2012 edition);

1 Scope

China's national standard for ultrasonic guided wave testing by magnetostrictive transduction. It is Part 2 of GB/T 31211 and replaces GB/T 28704-2012. It specifies the detection principle, the safety requirements, the personnel requirements, the general testing procedure, the detection system, the testing procedure, the evaluation and handling of results, and the test records and reports for this method. Magnetostriction is the property by which a ferromagnetic material changes its dimensions slightly when it is magnetised. A magnetostrictive guided wave probe exploits that directly: a coil applies an alternating magnetic field to a magnetised strip or to the component itself, the material responds with a mechanical strain, and that strain launches a guided wave along the component. The same arrangement works in reverse to receive. The consequence is a transducer with no piezoelectric element and no couplant, which can be a thin strip bonded or simply strapped around a pipe, can be left permanently installed under insulation, and can operate at temperatures that would depolarise a piezoelectric crystal. Those properties are what make the method attractive for permanently monitored installations and for hot lines. The 2024 revision restructures the document as part of the GB/T 31211 series, and its principal technical addition is the division of equipment into two categories - static guided wave testing equipment and dynamic scanning imaging guided wave testing equipment - with reference specimens specified separately for each. It also revises the equipment functional requirements, the comparison specimens, the preparation before testing, and the evaluation and handling of results, adds a clause on the implementation of the examination, and deletes the separate verification of test results. Issued and in force from 25 April 2024.

This document describes a method for magnetostrictive ultrasonic guided wave testing: This document is applicable to the testing temperature range of -20°C~550°C, diameter of 10mm~1000mm (wall thickness of 0.5mm~ 80mm) pipes, rods with diameters of

10mm~80mm, wires with diameters of 5mm~226mm, and plates with thicknesses of 0.5mm~80mm Inspection of materials and other components:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document: GB/T 12604:

1 Nondestructive testing terminology Ultrasonic testing GB/T 12604:

6 Nondestructive testing terminology Eddy current testing GB/T 31211:

3 Terms and definitions

The terms and definitions defined in GB/T 12604:1, GB/T 12604:6 and GB/T 31211:1 and the following apply to this document: 3:

1 Magnetostriction The phenomenon that the size and shape of ferromagnetic materials change when they are subjected to an external magnetic field: 3:

2 Inverse magnetostriction The phenomenon that the magnetic field state of ferromagnetic materials changes when subjected to external force: 3:

3 Ultrasonic guided waves excited or received by magnetostrictive sensors: 3:

4 Magnetostrictive foil Strip made of material with strong magnetostrictive effect (3:1):

Note: Such as nickel alloy strip, iron-cobalt hard magnetic alloy strip, iron-gallium alloy strip, terbium-dysprosium (Terfenol-D) iron alloy strip, etc: