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GB/T 44362-2024

Non-destructive testing of welds - Ultrasonic testing - Automated total focusing technique (TFM)

焊缝无损检测 超声检测 自动全聚焦技术（TFM）

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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 is required. This document is equivalent to ISO 23864.2021 "Automatic total focusing (TFM) and related techniques for non-destructive testing of welds" application". Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee on Welding Standardization (SAC/TC 55). This document was drafted by: Shanghai Materials Research Institute Co., Ltd., China Special Equipment Testing and Research Institute, Quzhou Metrology Quality Inspection Research Institute Institute, CGN Testing Technology Co., Ltd., Eintik Technology (Shanghai) Co., Ltd., Dongfang Boiler Co., Ltd. of Dongfang Electric Corporation Co., Ltd., Ningbo Special Equipment Inspection Institute, Nuclear Power Operation Research (Shanghai) Co., Ltd., Qinhuangdao Bocheng Engineering Technology Co., Ltd., Harbin Welding Research Institute Co., Ltd. of China Machinery Engineering Academy Group, Shandong Ruixiang Mould Co., Ltd., East China University of Science and Technology, Fushun Special Equipment Equipment Supervision and Inspection Institute, Hebei Yihai Pipeline Group Co., Ltd., Xinxiang Chengde Energy Technology Equipment Co., Ltd., Hangzhou Dianzi University, Qingdao Yibo Copper Group Co., Ltd. The main drafters of this document are. Zhang Yifeng, Jiang Jiansheng, Yuan Keyi, Tang Jianbang, Zhang Rui, Tan Yunhua, Qian Shengjie, Ding Jie, Tong Lianghuai, Wang Jianjun, Wang Fugui, Wei Yulong, Xiang Yanxun, Huang Yin, Yu Zhe, Zhong Dehuang, Liu Yong, Huang Hui, Su Jinhua, Yang Cheng, Wan Haitao, Liu Lishuai, Wang Xiaoning, Guo You, Xiang Wenli, Chen Jianxin, Kong Yaguang,

and Tan Shutao. Non-destructive testing of welds Ultrasonic testing Automatic Total Focusing Technology (TFM)

1 Scope

GB/T 44362-2024 specifies automated ultrasonic testing of welds by the total focusing method. TFM is the successor to conventional phased array: instead of forming a beam and sweeping it, the instrument captures every transmit-receive pair across the array and reconstructs an image focused at every point in the region of interest, which gives far better resolution and, crucially, a defined sensitivity everywhere in the image rather than only at the focal law. That changes what a procedure has to control, and this standard sets it out: the testing levels, the information required before testing, both for writing the procedure and for the operator at the workface, and the written procedure itself; then the requirements on the equipment, its verification and the setting of the reconstruction parameters, on the surface condition and coupling, on the scanning and coverage, on the evaluation and sizing of indications from a focused image, and on the reporting. It is the applied weld-inspection companion to the general FMC/TFM standard. It took effect on 23 August 2024, and for an inspection contractor or a fabricator adopting TFM in China it is the governing method.

This document specifies the semi-automatic welding of metal fusion welds with a base metal thickness of not less than

3.2 mm using total focusing mass flow meter (TFM) and related techniques. Automatic or fully automatic ultrasonic testing.

Note. Unless otherwise specified, "TFM" and "TFM technology" in this document refer to the TFM technology defined in ISO 23243 and all related technologies. See GB/T 43921-2024 and ISO 23243. This document applies to isotropic (same properties in different directions) and uniform metal welds, and also applies to isotropic and uniform low carbon Alloy steel welds and conventional aerospace grade aluminum and titanium alloy welds. This document applies to full penetration welded joints of simple geometries in plates, tubes and vessels. This document specifies four inspection levels (A, B, C and D), with different levels corresponding to different defect detection rates. Coarse grained metal and austenitic welds can be inspected when the requirements of this document are met. This document defines the specific capabilities and limitations of TFM techniques for the detection, location, quantification, and characterization of discontinuities in fusion welded joints. TFM can be used as a stand-alone technique or in combination with other non-destructive testing (NDT) methods for manufacturing, in-service, and post-repair testing. Detection. This document includes acceptance criterion evaluations based on length and maximum echo amplitude (equivalent reflector size), or length and height. This document does not cover discrete acceptance levels. This document describes the following two typical inspection techniques for inspecting fusion welded joints. Lateral scanning, that is, the probe is placed near the weld cap, usually using a wedge, to scan from one or both sides of the weld;

a) Top scanning, that is, the probe is placed on the top of the weld cap, using a flexible conformable delay line or immersion technology, or removing the weld cap Then the contact technique was used for scanning.

b) Semi-automatic testing includes a fixture (including guide bars, scales, etc.) that controls the movement of one or more probes through position sensors Measure the probe position and scan manually. In addition, the fully automatic inspection also includes a mechanical drive system.

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. in this document.

GB/T 43921-2024 Nondestructive testing Ultrasonic testing Full matrix acquisition/full focusing technology (FMC/TFM) (ISO 23865.2021, IDT)

ISO 5577 Non-destructive testing - Ultrasonic testing - Vocabulary lary

GB/T 12604.1-2020 Non-destructive testing terminology Ultrasonic testing (ISO 5577.2017, MOD)

ISO 5817 Welding of steel, nickel, titanium and their alloys - Fusion welds (except beam welds) - Quality grades for imperfections sionwelded joints in steel, nickel, titanium and their alloys (beam welding excluded)-Quality levels for imperfections]