

ICS 19.100
CCS N78



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

GB 22448-2025

Replacing GB 22448-2008

**Non-destructive testing instruments - Protection rules for
industrial X-ray radiographic equipment below 500kV**

无损检测仪器 500kV以下工业X射线探伤机防护规则

Issued on: August 1, 2025

Implemented on: August 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

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1 Scope

GB 22448-2025 is the Chinese national standard on non-destructive testing instruments - protection rules for industrial x-ray radiographic equipment below 500kv, in the field of testing. It carries no /T suffix, which in the Chinese system means compliance is mandatory: a product or a practice within its scope has to meet it to be lawfully made, sold or carried out in China. It was issued on 1 August 2025 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 August 2026. Classification: ICS 19.100, CCS N78. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the protection requirements for industrial X-ray flaw detectors below 500 kV, the protection requirements for X-ray flaw detection work sites, radiation protection monitoring during use, safe operation requirements for X-ray machines and radiation protection testing for X-ray machines, etc. This document applies to the design, manufacture, installation and use of industrial X-ray flaw detectors below 500 kV (including stationary, mobile and portable X-ray flaw detectors). Non- destructive testing equipment with the same radiation source range but not used for flaw detection may refer to this document for further information.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB 18871 Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources

GB/T 36416.2 Testing Machine Vocabulary - Part

3 Terms and Definitions

The terms and definitions defined in GB 18871 and GB/T 36416.2 are applicable to this document.

4 Protection Requirements for X-ray Machines

4.1 Ambient Dose Equivalent Rate Caused by Leakage Ray When industrial X-ray flaw detectors below 500 kV (hereinafter referred to as the "X-ray machines") are in operation, the main beam window of the X-ray tube shall be covered with a light shield. At the maximum operating value specified by the manufacturer, the ambient dose equivalent rate caused by leakage ray at a distance of 100 cm from the X-ray tube focal point shall be measured using a protective-level dosimeter. The measured results shall comply with panel key switch is turned on. The key shall only be removed when the machine is stopped or in standby mode.

4.4 X-ray Generator It shall be ensured that the controller can only issue a transmission command when the X-ray generator is on. When the X-ray generator is off, no X-rays shall be emitted. The connection status of the X-ray generator shall not be arbitrarily changed.

4.5 Shielding Material The thickness of the shielding material inside the X-ray tube shall meet the requirements of

4.1 regarding the ambient dose equivalent rate caused by leakage ray.

4.6 Connecting Cable The length of the connecting cable between the controller of the portable X-ray machine and the high-voltage generator shall be greater than or equal to 20 m.

4.7 X-ray Protection Facilities

4.7.1 It shall be ensured that the X-ray generator is off before turning on the X-ray protection facilities to prevent the escape of effective X-ray beam radiation. When the X-ray protection facilities are in protective mode, there shall be no leakage X-ray radiation.

4.7.2 Door-machine interlocking devices shall be installed on the protection facilities. When the interlocking device is open, it shall be ensured that there is no voltage output.

5.1 Protection of X-ray Flaw Detection Room

5.1.1 The flaw detection room shall be separated from the operating room to ensure the radiation safety of the surrounding area.

5.1.2 The shielding design of the flaw detection room shall ensure that the annual effective dose to operators is less than the corresponding limit. The reference control level for the ambient dose equivalent rate at 30 cm outside the shield shall be less than or equal to 2.5 Sv/h. For the outer surface of the flaw detection room roof where no personnel access, the reference control level for the ambient dose equivalent rate at 30 cm is typically 100 Sv/h. NOTE. the design reference content for the shield of the flaw detection room includes the direction and range of the useful beam irradiation, the workload of the device, and outdoor conditions, etc.

5.1.3 The protective performance of the flaw detection room door shall be the same as that of the wall on the same side. A door-machine interlocking safety device and an irradiation signal indicator shall be installed to ensure that radiographic inspection can only be performed after the door is closed.

5.1.4 An emergency stop switch shall be provided inside the flaw detection room.

5.1.5 A ventilation device shall be provided inside the flaw detection room.

5.1.6 A safety protection monitoring device shall be installed in the flaw detection room.

5.2 On-site X-ray Flaw Detection Operations When conducting on-site radiographic inspections, appropriate protective measures shall be taken based on factors such as the distance among the controller and the X-ray tube and the object being inspected, the direction of irradiation, the duration of irradiation, and the shielding conditions to ensure that the radiation dose received by the flaw detection personnel is below the dose limit.

6 X-ray Protection Monitoring During Use

6.1 Occupational Exposure Dose Limits Routine personal dose monitoring shall be conducted for personnel subject to occupational exposure, and personal dose and health management files shall be established. The monitored values shall meet the requirements of GB 18871 and include the following contents.

- a) The average annual effective dose over five consecutive years;
- b) The effective dose in any given year;
- c) The annual effective dose to the lens of the eye;

d) The annual equivalent dose to the limbs (hands and feet) or skin.

6.2 Area Monitoring and Management

6.2.1 Area division of fixed workplaces The flaw detection workplaces shall be divided into areas, and the division method and corresponding management shall comply with the provisions of GB 18871.

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