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**Non-destructive Testing Instruments - Technical
Requirement of X-ray Real-time Imaging System**

无损检测仪器 X 射线实时成像系统检测仪技术要求

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Non-destructive Testing Instruments - Technical Requirement of X-ray Real-time Imaging System

1 Scope

This standard specifies the terms and definitions, requirements, test methods, test rules, packaging, marking, transportation, storage of X-ray real-time imaging system.

This standard does not apply to CT devices.

2 Normative references

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

GB/T 191, Packaging. Pictorial marking for handling of goods

GB/T 12604.2, Non-destructive testing. Terminology. Terms used in radiographic testing

GB/T 13384, General specifications for packing of mechanical and electrical product

GB/T 17618, Information technology equipment. Immunity characteristics. Limits and methods of measurement

GB 18871, Basic standards for protection against ionizing radiation and for the safety of radiation sources

GB/T 26837-2011, Non-destructive testing instruments. Stationary type and movable type industrial X-ray radiographic equipment

JB/T 7902-2006, Non-destructive testing. Image quality indicators (wire type) for radiographic testing

JB/T 9329, Basic environmental conditions and testing methods for instruments transportation and storage in the transportation

5.2.2 Frequency

Power frequency or frequency conversion (medium frequency, high frequency); it is recommended to use high frequency.

5.2.3 Tube voltage and tube current

Select appropriate tube voltage and tube current depending on the thickness of the workpiece. When the tube voltage, tube current, and operating power exceed the rated value, there shall be an automatic protection.

5.2.4 High pressure stability

A constant potential is recommended.

5.2.5 Ray tube

For the X-ray tube, it is recommended to use the method of forced cooling, so that it can work continuously for a long time.

5.2.6 Ray beam direction

Both orientation and circumferential direction can be used, depending on the way of working,

5.2.7 X-ray receiving and converting device

The X-ray receiving and converting device can be a ray detector, which includes a line array detector, an area array detector and an image intensifier system.

5.3 Image processing unit

The image processing unit shall meet the following requirements:

- a) Complete the functions of data acquisition and processing of the detected image;
- b) The image data acquisition modes may be a video image frame acquisition card or other digital image synthesis devices;
- c) The image density grade shall be no less than grade-256.

5.4 Image processing software

The image processing software shall meet the following requirements:

- a) It shall be equipped with basic functions such as noise reduction, brightness / contrast enhancement, edge enhancement;

5) Image assisting assessment procedure.

5.8 Appearance quality

The appearance quality of the instrument shall meet the following requirements:

- a) The surface coating shall be firm and free from falling off;
- b) The non-machining and easy-to-rust surfaces shall be protected against rust.

5.9 Safety

Relevant safety requirements of the instrument shall meet the following requirements:

- a) The ambient temperature range of the X-ray room shall meet the requirements of the system.
- b) Safety and environmental protection
 - 1) Electromagnetic interference: it shall meet relevant requirements of electromagnetic interference in GB/T 17618.
 - 2) Protect dose: the protect dose of the system shall meet the requirements of dosage in GB 18871.

6 Test procedure

6.1 Tube voltage protection

Perform in accordance with the provisions of 5.10 in GB/T 26837-2011.

6.2 Tube current protection

Perform in accordance with the provisions of 5.9 in GB/T 26837-2011.

6.3 Image processing

6.3.1 The imaging system shall, at least, process the following ways:

- a) Continuous frame superposition;
- b) Hooking processing;
- c) Contrast enhancement.

No processing method shall change the original data of the image.

6.5.3 Improve image quality

The following measures shall be taken to improve image quality:

- a) Shielding plate can be used to shield scattering line;
- b) Diaphragm can be used to limit the X-ray beam from radiating to the detected area;
- c) Filter plate can be used to attenuate low energy scattering.

6.6 Image storage

The original image parameters shall not be changed; instead, it shall be stored in storage media such as data-stream tape or CD, and be preserved in an anti-magnetic, moisture-proof, dust-proof and anti-squeezing environment.

6.7 Performance measurement interval and sensitivity calibration

6.7.1 Sensitivity calibration: before each power-on, the sensitivity shall be checked; when the condition changes, the sensitivity shall be re-verified; under the same conditions of power-on, the sensitivity shall be checked once every 4 hours.

6.7.2 System resolution shall be verified every 3 months.

6.8 Radiation protection

Radiation protection shall be carried out in accordance with the following provisions:

- a) Radiation protection shall comply with the relevant provisions of GB 18871.
- b) Protect dose
 - 1) Adjust the system to the specified maximum working tube voltage (kV) and the maximum power.
 - 2) Use the protective-grade radiation dosimeter to measure the leakage air kerma ratio at any position within 50 mm from the outside part of the protective device; take the maximum value.

6.9 Appearance inspection

For appearance inspection, use visual inspection. It shall be carried out under normal lighting in the factory and without auxiliary observation equipment.

8 Signs, packaging, transportation and storage

8.1 Signs

The nameplate shall include:

- a) Model specifications, product name;
- b) Main technical parameters;
- c) Name, address and trademark of the manufacturer;
- d) Delivery date and number.

8.2 Packaging

8.2.1 The system should adopt composite packaging, in accordance with relevant provisions of GB/T 15464.

8.2.2 The characters and signs on the outer wall of the package shall be clear and shall not be obscured by the long time, handling friction and rain. The contents include at least:

- a) Name of the manufacturer;
- b) Product name and model specifications;
- c) The receiving organization, address and delivery organization, address;
- d) Contents mentioned in package (length × width × height);
- e) The box shall be marked with words such as “upward”, “fragile items”, “fear of rain”, “no tumbling” in accordance with the text or symbol of packaging and transportation which are specified in GB/T 191;
- f) Product implementation standard number and name.

8.2.3 The following documents shall be attached to the package:

- a) Packing list;
- b) Product certification;
- c) Product specification;
- d) List of accompanying attached (prepared) parts.

8.3 Transportation and storage

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