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

GB/T 45523.1-2025

**Remote handling devices for radioactive materials - Part 1:
General requirements**

放射性物质远程操作装置 第1部分：通用要求

(English Translation)

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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.

This document is part 1 of GB/T 45523 "Remote Operation Devices for Radioactive Material". GB/T 45523 has been published for the following part.

- Part 1: General requirements;
- Part 2: Mechanical master-slave manipulators;
- Part 3: Electric follow-up master-slave manipulator;
- Part 4: Power manipulator;
- Part 5: Sword-type manipulator.

Introduction

Radioactive material remote operation devices play a key role in the fields of nuclear energy and nuclear technology, and have a profound impact on the safe operation and environmental protection of the nuclear industry.

Its core function is to perform maintenance, dismantling, and operation tasks in a high-radiation environment, effectively isolating operators from radioactive materials.

This device not only ensures the safety and health of the workers, but also improves the work efficiency and reduces the risk of radiation exposure.

It reduces production and operation costs and is an important tool that is indispensable for the safe and efficient operation of the nuclear industry.

GB/T 45523 "Remote Operation Device for Radioactive Materials" focuses on mechanical master-slave manipulators, electric follow-up master-slave manipulators, power machinery these types of manipulators meet various needs with their respective control flexibility, load capacity and applicable scenarios.

The scientific and reasonable selection, deployment and continuous maintenance of these remote operation devices can effectively reduce the operator's Radiation exposure level, effectively control production and operation costs, and improve operating efficiency and overall system safety. This is not only a technological advancement it is an important contribution to human health, environmental protection and sustainable development. Therefore, we continue to optimize the design of the device and improve the automation level.

The key to promoting the sustainable development of remote operation technology of radioactive materials is to strengthen personnel training and management.

GB/T 45523 "Remote Operation Devices for Radioactive Materials" is planned to consist of five parts.

- Part 1: General requirements. The purpose is to specify the requirements that need to be met by the design, manufacture and application of remote operation devices for radioactive

materials.

General requirements.

--- Part 2: Mechanical master-slave manipulators. The purpose is to specify the design, manufacture and application of mechanical master-slave manipulators that need to meet Specific requirements on structure and function, technical indicators, tests, etc.

--- Part 3: Electric follower master-slave manipulator. The purpose is to specify the design, manufacture and application of electric follower master-slave manipulators that need to meet Specific requirements on structure and function, technical indicators, tests, etc.

--- Part 4: Power manipulator. The purpose is to specify the structure and function of the power manipulator that needs to be designed, manufactured and applied.

Specific requirements in terms of performance, technical indicators, tests, etc.

--- Part 5: Sword-type manipulator. The purpose is to specify the structure and function of the sword-type manipulator that needs to be designed, manufactured and applied.

Specific requirements in terms of performance, technical indicators, tests, etc.

Radioactive Material Remote Control Device Part 1: General requirements

1 Scope

This document defines the terms and definitions of remote control devices for radioactive materials, and specifies their classification, application and technical requirements.

This document applies to the design, manufacture and application of various types of remote-operated manipulators used in ionizing radiation environments.

2 Normative references

The contents of the following documents constitute 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 12163 Lead shielding components for 50 mm and 100 mm thick walls for protection against ionizing radiation
GB/T 12643 Vocabulary of robots and robotic equipment
EJ/T 1108 Design principles for sealed chambers
EJ/T 1175.1 Sealed chamber components Part 1: Glove receiving trays, bag receiving trays, glove hole covers, bag hole covers, sealing rings and interchangeable Replacement
EJ/T 1175.2 Sealed chamber components Part 2: Gloves, welding bags, sword-type manipulator sheaths and master-slave manipulator sheaths
EJ/T.20055 Design Guide for Nuclear and Radioactive Material

Processing Equipment EJ/T.20149.1 Hot Chamber Equipment Design Guidelines Part 1:
General Design Guidelines ISO 9404-1 Lead shielding components for protective structures
against ionizing radiation with 150 mm, 200 mm and 250 mm thick walls 200mmthickness)

3 Terms and definitions

The following terms and definitions apply to this document.

Manipulator

It can imitate certain movements and functions of human hands and arms, and is used to grasp, move objects or operate tools according to fixed procedures or the actions of operators.

The device of the tool.

3.1.1

Mechanical master-slavemanipulator Installed on a shielding wall or a sealed box, it realizes the movement of the active arm (3.2.1) and the driven arm (3.2.2) through a bidirectional drive mechanical transmission Synchronize (3.24) to reproduce the operator's hand and arm movements of the manipulator (3.1).

3.1.2

Electrical master-slavemanipulator the operation is reproduced by synchronizing the movements (3.24) of the active arm (3.2.1) and the passive arm (3.2.2) through electrical position control (force feedback).