

ICS 27.120
CCS F 49



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

GB/T 45523.2-2025

**Remote handling devices for radioactive materials - Part 2:
Mechanical master-slave manipulator**

放射性物质远程操作装置 第2部分：机械式主从机械手

(English Translation)

Issued on: April 25, 2025

Implemented on: April 25, 2025

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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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 2 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, inspection, 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, inspection, 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, inspection, 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, inspection, etc.

Radioactive Material Remote Control Device Part 2: Mechanical master-slave manipulators

1 Scope

This document specifies the structure and function, technical requirements and inspection requirements of mechanical master-slave manipulators.

This document applies to the design, manufacture and application of remotely operated mechanical master-slave manipulators for use 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 45523.1 Remote control devices for radioactive materials Part 1: General

requirements EJ/T 1096 Classification and inspection methods of airtightness of 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 1175.3 Sealed chamber components Part 3: Transfer devices - flat doors, airlock chambers, double-cover transfer devices, waste barrels Sealed connection mechanism

3 Terms and definitions

The terms and definitions defined in GB/T 45523.1 and the following apply to this document.

Ejection device

A device used to release an interchangeable part (such as a boot or sealing element) and replace it with another part without destroying the integrity of the seal.

Gaiter assembly

A sealing connection piece is mounted on one end and a support ring or expandable ring is mounted on the other end.

Replacement device replacement device A mechanical device located inside the hot chamber used to connect or remove certain parts of the remote operating device (such as clamps, claws, special tools, etc.).

4.1 Structure

4.1.1

Mechanical master-slave manipulator is a fixed device installed on the wall of a shielded sealed box. It consists of three main components. active the connecting tube is equipped with a mechanical part connecting the active arm and the driven arm.