

ICS 29.280

CCS S81



National Standard of the People's Republic of China

GB/T 45659-2025

Railway applications—Safety control system of power supply operation

Issued: May 30, 2025

Effective: December 1, 2025

State Administration for Market Regulation (SAMR)

Standardization Administration of the People's

Republic of China (SAC)

Issued

Translated by www.china-standards.com

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Foreword

This document was drafted in accordance with the provisions of GB/T 1.1-2020 Directives for Standardization—Part 1: Structure and Drafting Rules for Standardized Documents.

Attention is drawn to the fact that some contents of this document may involve patents. The issuing authority of this document shall not be liable for identifying any such patents.

This document was proposed by the National Railway Administration.

This document is administered by the National Technical Committee on Electrical Equipment and Systems for Rail Transit of Standardization Administration of China (SAC/TC 278).

Drafting organizations of this document: Guangzhou Metro Group Co., Ltd., Guangzhou Metro Design & Research Institute Co., Ltd., China Railway Electrification Survey and Design Institute Co., Ltd., Zhuhai Utmost Electric Power Technology Co., Ltd., CRRC Zhuzhou Electric Locomotive Research Institute Co., Ltd., Shenzhen Metro Group Co., Ltd., Foshan Metro Group Co., Ltd., Guangzhou Baiyun Electrical Equipment Co., Ltd.

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Railway applications—Safety control system of power supply operation

1 Scope

This document specifies the normal operating conditions, system composition, functional requirements, performance requirements, test methods, inspection rules, marking, as well as packaging, transportation and storage of the power supply operation safety control system for rail transit.

This document is applicable to the power supply operation safety control system in the field of urban rail transit. Urban (suburban) railways and intercity railways may be adopted in accordance with the needs of operation and management.

2 Normative References

The contents of the following documents constitute an indispensable part of this document through normative reference in this document. For dated referenced documents, only the edition corresponding to that date applies to this document; for undated referenced documents, the latest edition (including all amendments) applies to this document.

GB/T 311.1-2012 Insulation Coordination—Part 1: Definitions, Principles and Rules

GB/T 2423.1-2008 Environmental Testing for Electric and Electronic Products—Part 2: Test Methods—Test A: Low Temperature

GB/T 2423.2-2008 Environmental Testing for Electric and Electronic Products—Part 2: Test Methods—Test B: High Temperature

GB/T 2423.3-2016 Environmental Testing—Part 2: Test Methods—Test Cab: Damp Heat, Steady State

GB/T 4208-2017 Degrees of Protection Provided by Enclosures (IP Code)

GB 4824 Equipment for Industrial, Scientific and Medical Use—Radio Frequency Disturbance Characteristics—Limits and Measurement Methods

GB/T 9813.1 Generic Specification for Computers—Part 1: Desktop Microcomputers

GB/T 9813.3 Generic Specification for Computers—Part 3: Servers

GB/T 13384 General Specification for Packaging of Mechanical and Electrical Products

GB/T 17626.2 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Electrostatic Discharge Immunity Test

GB/T 17626.3 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Part 3: Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

GB/T 17626.4 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Electrical Fast Transient/Burst Immunity Test

GB/T 17626.5 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Surge Immunity Test

GB/T 17626.6 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields

GB/T 17626.8 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Power Frequency Magnetic Field Immunity Test

GB/T 17626.18 Electromagnetic Compatibility (EMC)—Testing and Measurement Techniques—Damped Oscillatory Wave Immunity Test

GB/T 21562 Rail Transit—Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)

GB/T 22239-2019 Information Security Technology—Basic Requirements for Cyber Security Classified Protection

GB/T 24338.6-2018 Rail Transit—Electromagnetic Compatibility—Part 5: Emission and Immunity of Ground-based Power Supply Equipment and Systems

GB/T 25890.1 Rail Transit—Ground Equipment—DC Switchgear—Part 1: General Rules

GB/T 25890.3 Rail Transit—Ground Equipment—DC Switchgear—Part 3: Indoor DC Disconnectors, Load Switches and Earthing Switches

GB/T 25890.6 Rail Transit—Ground Equipment—DC Switchgear—Part 6: DC Assembled Switchgear

GB/T 32580.2 Rail Transit—Ground Equipment—Specific Requirements for AC Switchgear—Part 2: Single-phase Disconnectors, Earthing Switches and Load Switches with $U_n > 1$ kV

GB/T 33602 General Service Protocol for Power Systems

DL/T 687-2010 General Technical Specifications for Microcomputer-based Electrical Misoperation Prevention Systems

DL/T 860.81 Power Automation Communication Networks—Part 8-1: Specific Communication Service Mapping (SCSM)—Mapped to MMS (ISO 9506-1 and ISO 9506-2) and ISO/IEC 8802-3

3 Terms and Definitions

3.1 safety control system of power supply operation

A system that adopts technical means including information collection, logical judgment, safety interlocking, remote grounding and process control to achieve safety control over the entire process of power supply operations.

3.2 power supply operation

Operation and maintenance work performed on electrical equipment of the power supply system.

Note: It includes operation control, work permit issuance, operation ticket issuance, catenary power switching-on and switching-off, catenary grounding, earth wire access, and electrical equipment inspection.

3.3 safety control

The use of technical means to protect the safety of personnel and equipment during power supply operations.

3.4 preventing mal-operation key

A handheld device that receives misoperation prevention programs, executes the program content, and transmits operation records back to the misoperation prevention locking device.

3.5 preventing mal-operation host

The main control unit of the misoperation prevention system, which consists of a computer and misoperation prevention software. It is pre-programmed with and stores misoperation prevention rules and operation programs, and performs information interaction with the preventing mal-operation key.

3.6 station operation terminal

A device that provides a human-machine interaction interface for the station, including real-time operation status monitoring, remote control misoperation prevention safety verification and execution.

3.7 track side operation terminal

An execution device that provides real-time monitoring of maintenance platforms or operation protection zones, executes step-by-step switching-on, switching-off and grounding of designated protection zones as per dispatching instructions, and confirms various types of information and statuses.

3.8 interlocking element

A mechanical or electrical interlocking component with unique coding, which is installed on electrical equipment or its locking accessories. It can be unlocked remotely via the preventing mal-operation host or locally via the preventing mal-operation key.

3.9 key management machine

A device used for storage and authorization management of emergency unlocking keys.

Note: It is equipped with functions such as identity recognition, remote authorization, remote control, recording, query and statistics.

3.10 earth wire manager

A device that standardizes the access of earth wires.

Note: By adopting technical means including status monitoring, misoperation prevention judgment and forced locking, it realizes the management of storage, locking and authorization of temporary earth wires for substations and catenaries.