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Mining Flameproof Movable Substations

矿用隔爆型移动变电站

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Table of Contents

Mining Flameproof Movable Substations

1 Scope

This Standard specifies the terms and definitions, technical requirements, inspection rules, test items and methods, marking, packaging, transport and storage of mining flameproof movable substation (hereinafter referred to as movable substation) and its components, namely the mining flameproof dry-type transformer (hereinafter referred to as dry-type transformer), high-voltage load switch for mining flameproof movable substation (hereinafter referred to as high-voltage load switch) or high-pressure vacuum switch for mining flameproof movable substation (hereinafter referred to as high-pressure vacuum switch), cable connector for mining flameproof movable substation (hereinafter referred to as cable connector), and low-voltage feed switch for mining flameproof movable substation (hereinafter referred to as low-voltage feed switch) or low-voltage protect box for mining flameproof movable substation (hereinafter referred to as low-voltage protective box).

This Standard is applicable to movable substation and its dedicated dry-type transformer, high-voltage load switch or high-voltage vacuum switch, cable connector and low-voltage feed switch or low-voltage protect box.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 191 Packaging – Pictorial Marking for Handling of Goods

GB/T 311.1 Insulation Coordination – Part 1: Definitions, Principles and Rules

GB/T 1094.11 Power Transformers – Part 11: Dry-Type Transformers

GB/T 1984 High-Voltage Alternating-Current Circuit-Breakers

GB/T 1985 High-Voltage Alternating-Current Disconnector and Earthing Switches

GB/T 2900.1 Electrotechnical Terminology – Fundamental Terms

GB/T 2900.18 Electrotechnical Terminology – Low Voltage Apparatus

GB/T 2900.19 Electrotechnical Terminology – High-Voltage Test Technique and Insulation Coordination

GB/T 2900.20 Electrotechnical Terminology – High-Voltage Switchgear and Controlgear

GB/T 2900.35 Electrotechnical Terminology – Electrical Apparatus for Explosive Atmosphere

GB/T 2900.95 Electrotechnical Terminology – Transformers, Voltage Regulators and Reactors

GB/T 3309 Mechanical Test at Ambient Temperature for High-Voltage Switchgear

GB/T 3804 High-Voltage Alternating Current Switches for Rated Voltage above 3.6kv and less than 40.5kv

GB 3836.1 Explosive Atmospheres - Part 1: Equipment - General Requirements

GB 3836.2 Explosive Atmospheres - Part 2: Equipment Protection by Flameproof Enclosures “d”

GB/T 11022 Common Specifications for High-Voltage Switchgear and Controlgear Standards

GB/T 14048.1 Low-Voltage Switchgear and Controlgear - Part 1: General Rules

GB/T 16927.1 High-Voltage Test Techniques - Part 1: General Definitions and Test Requirements

AQ 1043-2007 Mining Products Safety Label

JB/T 501 Test Guide for Power Transformers

JB/T 8739 Mine Explosion-Proof High-Voltage Distribution Device

MT 871 Mining Blast-Proof Switchgear with Vacuum Circuit Breaker for Low-voltage Alternate Circuit

MT/T 947 Flameproof High-Voltage Cable Coupling Devices for Coal Mine

3 Terms and Definitions

For the purpose of this document, the terms and definitions given in GB/T 2900.1, GB/T 2900.18, GB/T 2900.19, GB/T 2900.20, GB/T 2900.35 and GB/T 2900.95 and the following apply.

5 Inspection Rules, Test Items and Methods

5.1 Inspection rules

Each component of the movable substation shall be respectively inspected in accordance with the provisions of the corresponding standards; the inspection procedures shall be in accordance with the relevant provisions of GB 3836.1.

5.2 Test items and methods

5.2.1 Routine test

5.2.1.1 Each movable substation shall withstand the following routine test items:

a) Inspect the flameproof gas BETWEEN high-voltage load switch or high-voltage vacuum switch, low-voltage feed switch or low-voltage protect box AND dry-type transformer; and the flameproof gas BETWEEN high-voltage load switch or high-voltage vacuum switch, low-voltage feed switch or low voltage protect box AND cable connector according to the requirements of GB 3836.2;

b) Carry out short-time power frequency withstand voltage test according to the requirements of GB/T 16927.1, and shall comply with the provisions of 4.3;

c) According to the different components of the movable substation and the requirements for technical conditions of each product, inspect the routine test report; and conduct connecting and disconnecting actions, and relevant tests such as display, etc.

5.2.1.2 The enclosure of each component of the movable substation shall be subjected to a static pressure test in accordance with the provisions of GB 3836.2.

5.2.2 Type test

5.2.2.1 The type test is a representative test that is conducted to verify whether the product meets the specified technical requirements. It shall be carried out on the basis of passing the routine test. When the products have the completely the same rated values and structures or only have minor differences, the type test for one product may represent them.

5.2.2.2 If the type test for each component of the mobile substation is qualified, the type test for the movable substation shall be regarded as qualified.

5.2.2.3 Periodic type test shall be conducted at least once every five years.

5.2.2.4 Each component of the mobile substation shall be tested for enclosures and enclosure components in accordance with the provisions of GB 3836.1 and GB 3836.2.

letter may be marked.

k) Short-circuit impedance;

l) Connection group label;

m) Cooling method;

n) Total mass, kg;

o) Name of manufacturing organization;

p) Exit-factory serial number;

q) Year of manufacture.

6.1.3 In addition to conforming to the provisions of 6.1.2, the nameplate of the movable substation shall have the following contents:

a) Explosion-proof mark of "ExdIMb";

b) Explosion-proof certificate number;

c) Approval certificate number for safety marks.

6.1.4 The nameplate and other signs on the enclosure shall comply with the provisions of GB 3836.1.

6.2 Packaging

6.2.1 There shall be an obvious product mark on the packing box. The product mark shall include the following contents:

a) Product name, model, specifications and quantity;

b) Box number;

c) Maximum external dimensions of the cabinet (length × width × height), mm;

d) Net mass and gross mass, kg.

6.2.2 There shall be obvious packaging, storage and transportation indication marks, which shall be in accordance with the relevant provisions of GB/T 191.

6.2.3 The packaging of the movable substation and its various components shall ensure that the products and accessories not to be damaged, rained or corroded during transportation.

make the cooling air temperature higher, the user shall clarify.

7.1.7.3 When the designed dry-type transformer is operated at an altitude of more than 1000m, but the test is carried out at a normal altitude, if there is no other agreement between the manufacturer and the user, the temperature rise limit value given in Table 7 shall be, based on the part of the operation site where the altitude exceeds 1000m, with every 500m as a level, reduced according to the following corresponding values:

a) For self-cooled dry-type transformers: 2.5%;

b) For air-cooled dry-type transformers: 5%.

If the test of the dry-type transformer is carried out at an altitude above 1000m and the altitude at the installation site is below 1000m, the temperature rise limit shall be corrected accordingly.

The temperature rise limit after the altitude correction shall be rounded off to the nearest integer value (unit: K).

7.1.8 Temperature monitoring

Temperature monitoring components shall be installed on the upper part of the dry-type transformer to facilitate temperature monitoring.

7.1.9 Roller

Flange rollers should be installed on the lower part of the dry-type transformer enclosure, the gauge is 900mm or 600mm; according to user needs, other forms may also be used.

7.1.10 Independent use requirements

When the dry-type transformer is used independently as a mining flameproof dry-type transformer, an interlock device and an emergency stop button shall be installed to cut off the incoming high-voltage power supply in an emergency; or a warning sign of "strictly prohibited to open the cover with electricity" is set.

7.2 Inspection rules, test items and methods

Routine tests, type tests and special tests of dry-type transformers shall meet the following requirements in addition to the provisions of Clause 5 and GB/T 1094.11, JB/T 501:

a) Transformer capacity for short-circuit withstand capability test: When the primary nominal voltage is 6kV and 10kV, and the secondary nominal voltage is 3450V, a set of dry-type transformer with a capacity of 2500kVA and above or the maximum capacity of the unit shall be tested. When the primary nominal voltage

and cannot represent other transformers. If special tests are required, the test circuit and test procedures shall be negotiated by the user and the manufacturer.

8.1.5 Mechanical life

The high-voltage load switch shall be able to withstand mechanical opening and closing operations for no less than 5000 times.

8.1.6 Mechanical characteristics

The mechanical characteristics of the high-voltage load switch shall comply with the provisions of product technical conditions.

8.1.7 Operating mechanism

The maximum operating force of the human energy storage operating mechanism of the high-voltage load switch shall be no greater than 250N.

8.1.8 Main-loop resistance

The main-loop resistance shall meet the requirements of the product technical conditions.

8.1.9 Interlock

8.1.9.1 The cavity of the high-voltage load switch box shall be equipped with an electrical interlock device, which can cut off the incoming high-voltage power supply when the cover is opened.

8.1.9.2 The high-voltage load switch shall be equipped with an emergency stop button, which can open the upward circuit breaker in an emergency.

8.1.9.3 The high-voltage load switch shall be equipped with auxiliary contacts for electrical interlocking with the low-voltage feed switch to ensure that when the power supply is disconnected under normal conditions, the low-voltage feed switch shall first open and the high-voltage load switch shall then open.

8.1.10 Indicating device

The high-voltage load switch shall have obvious mechanical indication of opening and closing positions.

8.1.11 Power supply lead-in device

The power supply lead-in device of the high-voltage load switch may use a cable connector, but it shall conform to the provisions of GB 3836.1 and GB 3836.2.

9.1.3.3 Transient recovery voltage (TRV) related to the rated short-circuit breaking current

The transient recovery voltage (TRV) related to the rated short-circuit breaking current shall comply with the provisions of GB/T 1984.

9.1.3.4 Rated short-circuit making current

The rated short-circuit making current is equal to 2.5 times the root-mean-square value of the AC component of the rated short-circuit breaking current.

9.1.3.5 Rated operation sequence

The rated operation sequence is: O-*t*-CO-*t*-CO; unless otherwise specified, otherwise *t* = 3min.

9.1.4 Mechanical life

The mechanical life of the high-voltage vacuum switch is 10,000 times.

9.1.5 Mechanical interlock

The mechanical interlock of the high-voltage vacuum switch shall meet the following requirements:

a) When the circuit breaker is in the closing position, the isolating switch cannot be operated;

b) When the isolating switch is in the closing position, the box door cannot be opened. Only when the isolating switch is opened in place (or reliably grounded), the box door can be opened;

c) When the box door is in the opened position, the isolating switch cannot be closed;

d) For the spring energy storage mechanism, when the circuit breaker is in the closing position, the energy storage closing operation can no longer be performed.

9.1.6 Mechanical characteristics

The mechanical characteristics of the high-voltage vacuum switch are specified by the product technical conditions, and shall include the following contents:

a) Rated contact stroke;

b) Overtravel;

c) Average closing speed;

cable connector, but it shall conform to the provisions of GB 3836.1 and GB 3836.2.

9.1.14 Isolating switch

The high-voltage isolating switch shall comply with the provisions of GB/T 1985.

9.2 Inspection rules, test items and methods

9.2.1 Routine test

9.2.1.1 Mechanical operation and mechanical characteristic test

The mechanical operation and mechanical characteristics test shall conform to the provisions of product technical conditions, such as: synchronousness of opening and closing, speed and stroke of opening and closing, etc.; the test shall be conducted in accordance with the provisions of GB/T 3309.

9.2.1.2 Main-loop resistance measurement

The main-loop resistance measurement shall be carried out in accordance with the provisions of GB/T 11022.

9.2.1.3 Main-loop power frequency withstand voltage test

The main-loop power frequency withstand voltage test shall be conducted in accordance with the provisions of GB/T 1984.

9.2.1.4 Protection characteristic test

The protection characteristic test shall be conducted in accordance with the provisions of JB/T 8739.

9.2.2 Type test

9.2.2.1 Rated short-circuit making and breaking current test

The rated short-circuit making and breaking current test shall be carried out in accordance with the provisions of GB/T 1984.

9.2.2.2 Mechanical life test

The mechanical life test shall be carried out in accordance with the provisions of GB/T 1984.

9.2.2.3 Temperature rise test

The temperature rise test shall be conducted in accordance with the provisions of GB/T 1984.

wiring diagram.

10 Cable Connector for Mining flameproof Movable Substation

In addition to the connection size shall conform to the provisions of 4.5, the rest of the performance shall conform to the provisions of MT/T 947.

11 Low-Voltage Feed Switch for Mining flameproof Movable Substation

In addition to the connection size shall conform to the provisions of 4.5, the rest of the performance shall conform to the provisions of MT 871.

12 Low-Voltage Protect Box for Mining flameproof Movable Substation

12.1 Technical requirements

12.1.1 Rated value

12.1.1.1 Nominal voltage

The nominal voltage of a system is 380V, 660V, 1140V, 3300V.

12.1.1.2 Rated current

The rated current is 315A, 400A, 500A, 630A, 800A, 1000A, 1250A, 1600A, 2000A.

12.1.2 Insulation level

The insulation level of the low-voltage protect box is as specified in Table 13.

The control loop is 2kV.

When the operating conditions do not conform to the provisions of 4.1, then the correction of insulation level can refer to GB/T 311.1.

The low-voltage power supply lead-out device may use a plug-in cable connector or a fixed connection cable lead-in device.

12.2 Inspection rules, test items and methods

12.2.1 Routine test

12.2.1.1 Insulation test

If the nominal voltage of a system is 1.14kV and below, it shall be conducted in accordance with the provisions of GB/T 14048.1. If the nominal voltage of a system is 3.3kV, it shall be conducted in accordance with the provisions of GB/T 11022.

12.2.1.2 Short-circuit protection, overload protection

If the nominal voltage of a system is 1.14kV and below, it shall be conducted according to the provisions of MT 871. If the nominal voltage of a system is 3.3kV, it shall be conducted according to the provisions of 9.2.1.4.

12.2.1.3 Leakage lockout and leakage protection

The leakage lockout and leakage protection test shall be carried out in accordance with the provisions of MT 871.

12.2.1.4 Overvoltage and undervoltage protection

The overvoltage and undervoltage protection shall be carried out in accordance with the provisions of 9.2.1.4.

12.2.1.5 Mechanical and electrical interlock

The Mechanical interlock adopts checking the plan review with the sample; electrical lockout adopts checking the plan review with the actual operation of the energized sample.

12.2.1.6 Short-time power frequency withstand voltage test

If the nominal voltage of a system is 1.14kV and below, the low-voltage protect box shall be conducted according to the provisions of GB/T 14048.1. If the nominal voltage of a system is 3.3kV, the low-voltage protect box shall be conducted according to the provisions of GB/T 11022.

12.2.1.7 Protection characteristic test

If the nominal voltage of a system is 1.14kV and below, the low-voltage protect box shall be conducted according to the provisions of MT 871. If the nominal voltage of a system is 3.3kV, the low-voltage protect box shall be conducted according to the provisions of JB/T 8739.

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