

ICS 29.180
CCS K 41

DL

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

DL/T 1538-2016

**Application guide for vacuum on-load tap-changers for power
transformers**

电力变压器用真空有载分接开关使用导则

(English Translation)

Issued on: January 7, 2016

Implemented on: June 1, 2016

**Issued by: National Energy Administration of the People's Republic of
China**

Table of Contents

Foreword	II
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Classification and mounting	2
5 Technical performance	3
6 Motor-drive mechanism	4
7 Protection requirements	4
8 Selection principles	6
9 Tests	6
10 Installation and acceptance	8
11 Operation	9
12 Maintenance	9
13 Inspection and handling of abnormal conditions	11
Annex A (informative) Typical schematic diagrams of the diverter switch of vacuum on-load tap-changers	13
Annex B (informative) Test items and requirements of vacuum on-load tap-changers that differ from JB/T 8314	14
Annex C (informative) Filling pressure of SF6 vacuum on-load tap-changers and operating characteristics of the gas sudden-pressure relay	22
Annex D (informative) Typical service conditions and insulation levels of on-load tap-changers on power transformers of 220 kV and below	23
Annex E (informative) Test method for the combined waveform of vacuum on-load tap-changers	26

Foreword

This document was issued on 7 January 2016 by the National Energy Administration of the People's Republic of China, and has applied since 1 June 2016. Filing number 53959-2016.

It is a DL/T standard: a recommended industry standard of China's electric power sector.

This standard is drafted in accordance with the rules given in GB/T 1.1-2009, Directives for standardization - Part 1: Structure and drafting of standards.

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the Technical Committee for Standardization of Power Transformers of the Electric Power Industry (DL/TC 02).

This standard is issued for the first time.

Comments and suggestions arising in the implementation of this standard may be sent to the Standardization Management Centre of the China Electricity Council (No. 1, Baiguang Road Ertiao, Beijing, 100761).

1 Scope

This standard specifies the performance, protection configuration, test items, test methods, range of application and operation and maintenance requirements of resistor-type vacuum on-load tap-changers.

This standard applies to resistor-type vacuum on-load tap-changers fitted to power transformers of 220 kV and below. Vacuum on-load tap-changers for transformers other than power transformers may follow this standard or the manufacturer's instructions.

This standard does not apply to reactor-type vacuum on-load tap-changers.

2 Normative references

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

GB/T 6451-2015, Specification and technical requirements for oil-immersed power transformers

GB 10230.1-2007, Tap-changers - Part 1: Performance requirements and test methods

GB/T 10230.2-2007, Tap-changers - Part 2: Application guide

GB 11032-2010, Metal-oxide surge arresters without gaps for a.c. systems

GB/T 16927.1, High-voltage test techniques - Part 1: General definitions and test requirements

GB/T 22065, Pressure-type SF₆ gas density controllers

DL/T 537, Selection guide for high-voltage/low-voltage prefabricated substations

DL/T 574-2010, Guide for operation and maintenance of transformer tap-changers

DL/T 596-2005, Preventive test code for electric power equipment

JB/T 7065, Pressure relief valves for transformers

JB/T 8314-2008, Tap-changers - Test guide

JB/T 9647, Gas relays for transformers

JB/T 10372, Hydraulic pressure relays

JB/T 10892, Electronic SF6 density transmitters

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB 10230.1 and GB/T 10230.2 and the following apply.

3.1

vacuum on-load tap-changer

on-load tap-changer that uses vacuum interrupters to break and make the load current and the circulating current. The insulating medium of the tap-changer body is oil (mineral oil or other fire-resistant or environmentally friendly substitute oils, referred to as insulating oil) or gas (air or SF6).

3.2

transfer contact (connected with vacuum interrupter)

electrical contact of a vacuum on-load tap-changer that is connected in series with a vacuum interrupter and, together with it, performs the tap-change operation.

3.3

main switching vacuum interrupter

vacuum interrupter that makes and breaks the load current and/or the circulating current and has no transition resistor between it and the transformer winding.

3.4

transition vacuum interrupter

vacuum interrupter connected in series with a transition resistor, able to make and break the load current and/or the circulating current.

3.5

combined on-load tap-changer

on-load tap-changer in which the tap change is performed by a diverter switch combined with a tap selector.

3.6

compound on-load tap-changer

on-load tap-changer in which the tap change is performed by a selector switch.

4.1 Classification of vacuum on-load tap-changers

4.1.1

By the presence of main contacts

4.1.1.1

Vacuum on-load tap-changers with main contacts

The diverter switch or selector switch has independent main contacts that carry the load current continuously; the main switching vacuum interrupter only makes and breaks the operating current during the tap-change operation, and once the operation is complete the load current is again carried by the main contacts. Typical schematic diagrams are given in A.1.

4.1.1.2

Vacuum on-load tap-changers without main contacts

The diverter switch or selector switch has no independent main contacts for continuous load current, and the main switching vacuum interrupter carries both the continuous load current and the making and breaking of the operating current. Typical schematic diagrams are given in A.2.

4.1.2

By insulating medium

4.1.2.1

Oil-insulated vacuum on-load tap-changers

Tap-changers that use insulating oil as the insulating medium and vacuum interrupters to break and make the load current and circulating current. The diverter switch or selector switch requires a separate oil compartment isolated from the insulating oil of the transformer tank.

4.1.2.2

Air-insulated vacuum on-load tap-changers

Tap-changers that use air as the insulating medium and vacuum interrupters to break and make the load current and circulating current. The insulating medium is air at atmospheric pressure; these tap-changers are normally fitted to dry-type transformers.

4.1.2.3

SF6-insulated vacuum on-load tap-changers

Tap-changers that use SF6 gas as the insulating medium and vacuum interrupters to break and make the load current and circulating current. The diverter switch or selector switch requires a separate gas compartment isolated from the SF6 gas of the transformer tank.