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PEOPLE'S REPUBLIC OF CHINA**

NB/T 11077-2023

**Technical specifications for high-voltage alternating-current
fault current limiter based on current-limiting reactor**

基于限流电抗器的高压交流故障电流限制器技术规范

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Foreword

This document was issued on 6 February 2023 by the National Energy Administration of the PRC and takes effect on 6 August 2023.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 29.130.10, Chinese classification K 43.

This document was drafted in accordance with the rules given in GB/T 1.1-2020 Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents.

Please note that some of the content of this document may be the subject of patent rights. The issuing body of this document assumes no responsibility for identifying patents.

This document was proposed by, and is under the administration of, the energy industry standardization technical committee concerned.

This document is issued for the first time.

1 Scope

NB/T 11077-2023 is the Chinese specification for the fault current limiter built from a current-limiting reactor, for AC systems of 3 kV and above at 50 Hz. It exists because of a problem that grows with the grid rather than with age: as more generation and more interconnection are added, the short-circuit current available at any given busbar rises, and eventually it exceeds what the switchgear installed there was rated to break. The conventional answers are all expensive - replace every breaker in the substation, split the busbar and lose the redundancy, or leave a permanent series reactor in circuit and pay for its losses and voltage drop for the life of the plant. The current-limiting reactor type limiter is the fourth answer: a limited purpose circuit breaker sits in parallel with the reactor and short-circuits it, so in normal operation the reactor is bypassed and the limiter is a low-impedance link. When a fault occurs the control device detects it, opens the parallel breaker at the end of the first large half-wave of fault current, and the reactor is inserted, taking the limiter to its high-impedance state and holding the current down to what the downstream switchgear can clear. Everything then hinges on speed, and this document defines it: the quick fault determination requirement is to establish the starting point, the rate of rise and the maximum value of the short-circuit current within 5 ms. The document names and defines the whole vocabulary of the technique - the C mode and CL mode, the C-CL and CL-C transitions, the limited purpose circuit breaker and the control device - and it is explicit about the limitation, that a limiter of this type may not limit the peak of the very first half-wave. It then sets the service conditions, the ratings, and the design and construction requirements including composition, structure, communications, power supply, protection current range, device components, main circuit resistance, temperature rise and the design of the insulating support structure. The type test clause covers insulation, surge current, continuous current, short-time and peak withstand current, the short-circuit current limiting test itself, harmonic distortion, current breaking, recovery, EMC, noise and seismic tests, together with verification of the limited purpose breaker, the circuit resistance measurement and the limiter starting test; routine tests and selection guidelines close the document. It was issued on 6 February 2023 by the National Energy Administration and took effect on 6 August 2023.

This document specifies the service conditions, the ratings, the design and construction, the type tests, the routine tests and the selection guidelines for high-voltage alternating-current fault current limiters based on a current-limiting reactor.

This document applies to high-voltage alternating-current fault current limiters based on a current-limiting reactor that are designed for indoor or outdoor installation and operate in

power systems of 3 kV and above at a frequency of 50 Hz. The individual components fitted in a current-limiting reactor type limiter are designed and tested in accordance with the provisions of their own standards.

This document does not apply to limiters that use a current-limiting reactor alone.

A limiter of this type may not limit the peak of the first half-wave of the fault current.

Note: a high-voltage alternating-current fault current limiter based on a current-limiting reactor is abbreviated to current-limiting reactor type limiter.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies to this document. For undated references, the latest edition, including all amendments, applies to this document.

GB/T 1094.1-2013 Power transformers - Part 1: General

GB/T 1094.6-2011 Power transformers - Part 6: Reactors

GB/T 1984-2014 High-voltage alternating current circuit-breakers

GB/T 2900.20-2016 Electrotechnical terminology - High-voltage switchgear and controlgear

GB/T 11022-2020 Common specifications for high-voltage alternating current switchgear and controlgear standards

GB/T 16927.1-2011 High-voltage test techniques - Part 1: General definitions and test requirements

DL/T 478-2013 General technical requirements for relay protection and automatic safety devices

NB/T 11076-2023 General technical specification for high-voltage alternating current fault current limiters

3 Terms and definitions

The terms and definitions given in GB/T 2900.20-2016, GB/T 11022-2020 and NB/T 11076-2023, together with the following, apply to this document.

3.1 General terms and definitions

3.1.1 fault current limiter, FCL

A device that, by increasing its resistance and/or its reactance so as to change from the non current-limiting mode to the current-limiting mode, limits the expected peak and/or root-mean-square value of the fault current in an alternating current system to the required