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Experimental Study on Reverse Recovery Characteristics of High Power Thyristors in HVDC converter valve

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The high power thyristor is the basic unit in HVDC converter valve, and its transient performance has a tremendous influence on the reliability, stability of the whole power system and designs of thyristor control unit. For this reason, each thyristor needs to be tested routinely before the operation of the power system. However, there is no specification for the routine test of thyristor valve. The test methods of thyristors are associated with the relationship between reverse recovery characteristics and external operating conditions. Therefore, to provide a reference and basic datum for the routine test of thyristor valve, it's necessary to investigate the reverse recovery characteristics of high power thyristor in converter valve. In this paper, we focus on the evaluation of thyristor reverse recovery time by forward current, namely forward current amplitude, conduction pulse width and rate of change of commutating current. The influences of thyristor reverse recovery time have been investigated to determine the parameters of thyristor testing based on testing the reverse recovery process of thyristor and analyzing the influence mechanisms. The results show that the reverse recovery time mainly depends on peak forward current and commutating $d<i>i</i>/d<i>t</i>$, where reverse recovery time decreases with the increase of the commutating $d<i>i</i>/d<i>t</i>$ and is directly proportional to peak forward current; the commutating $d<i>i</i>/d<i>t</i>$ relative to peak forward current is the main influence factor of reverse recovery time; the ration of turn off time and reverse recovery time is less than 1.2, which is particularly significant for the evaluation of thyristor reverse recovery ability by impulse test in thyristor testing.

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