

ICS 29.240.99; 31.080.20
CCS K 46



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

GB/T 20995-2020

Replacing GB/T 20995-2007

Static var compensators(SVC). Testing of thyristor valves

Issued on: December 14, 2020

Implemented on: July 1, 2021

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General requirements for type test, factory test and option test	2
4:1 Test overview	2
4:2 Sample	4
4:3 Implementation guidelines for type test and option test	5
4:4 Test conditions	5
4:5 Number of components allowed to fail in type test	7
4:6 Documentation of test results	7
5 Type test of TCR and TSR valve.....	8
5:1 Insulation test between valve end and ground	8
5:2 Insulation test between valves (only applicable to multiple valve units)	9
5:3 Insulation test between valve ends	10
5:4 Operation test	12
6 Type test of TSC valve.....	14
6:1 Valve end insulation test to ground	14
6:2 Insulation test between valves (only applicable to multiple valve units)	16
6:3 Insulation test between valve ends	18
6:4 Run test	20
7 Electromagnetic interference test	24
7:1 Test purpose	24
7:2 Test procedure	24
8 Factory test	24
8:1 Overview	24
8:2 Visual inspection	25
8:3 Connection check	25
8:4 Checking the equalizing/damping circuit	25
8:5 Withstand voltage check	25
8:6 Inspection of auxiliary equipment	25
8:7 Trigger check.....	25
8:8 Pressure test of cooling system	25

8:9 Partial discharge test	25
9 Option test of TCR and TSR valve	25
9:1 Overcurrent test	25
9:2 Transient forward voltage test during recovery period	26
9:3 Aperiodic trigger test	27
10 Option test of TSC valve	28
10:1 Transient forward voltage test during recovery period	28
10:2 Aperiodic trigger test	29

Foreword

This standard was drafted in accordance with the rules given in GB/T 1:1-2009:

This standard replaces GB/T 20995-2007 "Power electronic technology for power transmission and distribution systems, static reactive power compensation devices for thyristor valves"

Compared with GB/T 20995-2007, the main technical changes are as follows:

- Added the title of the hanging paragraph in the standard;
 - Added "The test product is generally a valve or an appropriate equivalent number of valve segments" (see 4:2:6);
 - Deleted "Some type tests can be performed on complete valves or valve components, see Table 1" (see 4:3 in the:2007 edition);
 - Deleted "The test items that can be performed on the valve assembly are shown in Table 1:" (See 4:4:1 of the:2007 edition);
 - Added "Atmospheric Correction" (see 4:4:1:2);
 - Added "Industry experience found that even if the valve is carefully designed, it is impossible to avoid accidental randomness of thyristor-level components during operation: malfunction: Although these failures may be stress-related, they are random to the extent that they cause failures, or failures cannot be predicted
- The relationship between rate and stress: Or there is no precise quantification that can stand the test: When performing a type test on a valve or valve section, in a short time, apply
- The multiple stresses are generally equivalent to the few worst stresses that the valve may withstand during its entire life: Taking into account
- As long as the failure is random and does not indicate any typical design defects, the type

test items listed below are successful

According to the permit, there are a small number of thyristor-level failures during the type test: "(See 4:5);

---Added "Table 2 The number of thyristor levels allowed to fail in the type test" (see 4:5);

---Added "within about 10s" and revised "reduced voltage to Uts2" to "reduced voltage from 100% Uts1 to Uts2" (see 5:1:2:3,

5:1:1:3 of the:2007 version);

---Added "within about 10s" (see 5:2:2:3);

--- Change "equal to the smaller of Utv11 and Utv12" to "equal to the smallest of Utv11, Utv12 and Utv13", the test coefficient ks13 is changed from

"1:3" was changed to "1:15" (see 5:3:2:2, 5:3:1:2 of the:2007 edition);

---Added "within about 10s" (see 5:3:2:3);

--- Change the test coefficient ks from "1:3" to "1:15" (see 5:3:3:2, 5:3:2:2 of the:2007 edition);

--- Deleted "The above three tests are determined by design: The specific additional conditions are as follows:" and the contents of the additional tests 1 and 2

Content (see 5:3:2:3 of the:2007 edition);

--- Modify "between 0:2ms before the current zero crossing to 1ms after zero crossing" to "0:2ms before the current zero crossing to zero crossing when the thyristor is turned off

Between the next 1ms" (see 5:4:1:2, 5:4:1:2 of the:2007 edition);

--- Deleted "This test should be performed on a complete valve or valve assembly", and added "The test safety factor is 0:95" (see

5:4:2:2, 5:4:2:2 of the:2007 edition);

--- Deleted "This test should be carried out on a complete valve or valve assembly" (see 5:4:3:2 of the:2007 edition);

--- Modify "3h test voltage Uts2" to "10min test voltage Uts2": The test voltage formula is modified to $U_{t2} = k_{s2} \times U_{ac2}$

sin(2pift), the test coefficient ks2 is changed from "1:2" to "1:15" (see 6:1:2:2, 6:1:1:2 of the:2007 edition);

---Added "within about 10s" and deleted the last five lines (see 6:1:2:3, 6:1:1:3 of the:2007 edition);

--- Modify " $U_{t2}(ac) = k_{s2} \times (U_{ac2} U_{dcm2})/2$ " to " $U_{t2}(ac) = k_{s2} \times U_{ac2}/2$ " and add "within about

10s",

Added "The test should be carried out separately for the positive and negative polarity of the DC voltage: 1) Within about 10s, adjust the voltage from $U_{t1}(dc)$

50% boost to 100%; 2) maintain $U_{t1}(dc)$ for 1 min; 3) reduce the voltage to zero: "(See 6:1:2:4, 6:1:1:4 of the:2007 edition);

--- Change "3h test voltage U_{tv2} " to "10min test voltage U_{tv2} ": The voltage formula is changed to $U_{tv2}=k_{s2} \times U_{ac2}$

sin(2pift), delete "not including DC component" in the definition of U_{ac2} (see 6:2:2:2,:2007 edition 6:2:1:2);

---Added "within about 10s" and deleted the last five lines (see 6:2:2:3, 6:2:1:3 of the:2007 edition);

---Added "within about 10s", modified the formula in b), and added "the test should be conducted separately for the positive and negative polarities of the DC voltage

Row: 1) In about 10s, the regulated voltage rises from 50% of $U_{t1}(dc)$ to 100%; 2) Maintain $U_{t1}(dc)$ for 1min; 3) Reduce the voltage

Press to zero: "(See 6:2:2:4, 6:2:1:4 of the:2007 edition);

--- "The test shall apply 3 positive and 3 negative lightning shocks respectively between the short-circuited valve ends and the ground" as

"The test shall apply 3 times of positive polarity and 3 times of negative lightning impulse voltage between the valves" (see 6:2:3:3,:2007 edition 6:2:2:3);

--- Modify the test coefficient k_{s1} from "1:3" to "1:15"; modify the "30min test voltage U_{tv2} " to "10min test voltage"

U_{tv2} ", modified the test voltage formula, the definition of U_{ac2} was changed from "the peak value of the maximum line voltage during steady state operation" to "between valve terminals

The peak value of the highest steady-state operating voltage", the test coefficient k_{s2} is changed from "1:2" to "1:15" (see 6:3:2:2,:2007 edition

6:3:1:2);

---Added "within about 10s" and revised "maintain voltage $U_{tv2}30min$ " to "maintain voltage $U_{tv2}10min$ " (see 6:3:2:3,

6:3:1:3 of the:2007 edition);

---Added "within about 10s" and "tests should be carried out separately for the positive and negative polarities of the DC voltage: 1) Within about 10s,