



Inženýrsko-výrobní elektrotechnický podnik, a.s.

619 00 Brno, Videnska 117a

MEASURING TRANSFORMERS LABORATORY

TEST PROTOCOL No. 73 – 0049/04

VTS 25 Sch Voltage Measuring Transformers

(laboratory stamp)

(signature)

Ing. Rada Vlastimil

Measuring transformers laboratory manager
IVEP a.s.


In Brno on 15 March 2005

Changes and amendments in this protocol can be done only in measuring transformers laboratory of IVEP a.s.

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	Test protocol No. 73 – 0049/04 Test subject: VTS 25 Sch Voltage Measuring Transformers	Page: 1
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Type: VTS 25 Sch	Test type: Type test	
Rated values: Highest voltage for equipment 25 kV Serial number 013285, 013286 Rated transfer 22000/√3 // 100/√3 / 100/3 V Rated load 50 VA 50 VA Accuracy class 0.5 6P Serial number 006458 Rated transfer 22000/√3 // 100/√3 / 100/√3 / 100/3 V Rated load 50 VA 50 VA 50 VA Accuracy class 0.5 0.5 3P Extreme load 500 VA Rated frequency 50 Hz Isolation class E	Tested according to: CSN EN 60044-2 IEC 60044-2 CSN 351302 IEC 186 CSN 351360 Test customer: KPB INTRA s.r.o. Zdanska 477 685 01 Bucovice	
Serial Number: 013285, 013286, 006458	Atmospheric conditions: Temperature: °C Pressure: hPa Air humidity: %	
Products manufacturer: KPB INTRA s.r.o. Zdanska 477 685 01 Bucovice	Samples delivered on: 2002 - 2004	
Test result: <p style="text-align: center;">VTS 25 Sch voltage measuring transformers, producer KPB INTRA s.r.o., in design 3.6, 7.2, 12, 17.5, and 25 kV</p> <p style="text-align: center;">comply</p> <p style="text-align: center;">with the type test conditions pursuant to CSN EN 60044-2, IEC 60044-2, CSN 35 1302.</p> <p style="text-align: right;">(laboratory stamp)</p>		
Test date: 6/2002 - 4/2004	Tested by: Ing. Vlastimil Rada (signature) Ing. Maskova Hana (signature)	Chief: Ing. Vlastimil Rada (signature)



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In the laboratory of measuring transformers of IVEP, a.s. and the technical laboratory ABB, a type test according to standards CSN EN 60044-2, IEC 60044-2, and CSN 35 1302 were performed on three pieces of voltage measuring transformers of type VTS 25 Sch - Schneider design, for purpose of expansion of the Decision of type approval No. 2656/97/010. The measuring transformers of voltage were produced according to the assembly drawing 0213000/01 and the winding data no. 1213.

Type Test Scope

1. Terminal designation correctness check

The measuring transformers of voltage type VTS 25 Sch complied with CSN EN 60044-2 Art. 9.1., IEC 60044-2 Art. 9.1, and CSN 35 1302 Art. 15.

2. Atmospheric impulse test

The test was performed on measuring transformers s.no. 013285 and 013286 in the technical laboratory of ABB with positive and negative polarity of test voltage +/- 125 kV. The test results are stated in the test protocol No. 1VLRO16192.

Measuring transformers of voltage type VTS 25 Sch complied with CSN EN 60044-2 Art. 8.3, IEC 60044-2 Art. 8.3, and CSN 35 1302 Art. 13.

3. Alternate voltage primary winding test

a) Induced voltage test

It was performed in the technical laboratory of ABB with test voltage 50 kV / 77.6 Hz for a period of 1 minute at measuring transformers of voltage s.no. 013285 and 013286.

The test results are stated in the test protocol No. 1VLRO16192.

b) Applied voltage test

It was performed in the measuring transformer laboratory of IVEP, a.s. with test voltage 3 kV / 50 Hz applied between the terminal of primary winding that is grounded in operation and earth.

Measuring transformers of voltage type VTS 25 Sch complied with CSN EN 60044-2 Art. 9.2.2.2, IEC 60044-2 Art. 9.2.2.2, and CSN 35 1302 Art. 16.2.2.

4. Test using alternate voltage of secondary winding

The test was performed in the measuring transformer laboratory of IVEP, a.s. using alternate voltage of 3 kV/50 Hz for a period of 1 minute between the shorted terminals of the secondary winding and the earth and between the secondary windings mutually. The measuring transformers of voltage type VTS 25 Sch complied with CSN EN 60044-2 Art. 9.3, IEC 60044-2 Art. 9.3, and CSN 35 1302 Art. 17.

5. Measuring of partial discharges

The measuring was performed at the voltage transformer s.no. 013285 and 013286 in the technical laboratory of ABB. The measured values of partial discharges are stated in the test protocol No. 1VLRO16192.

The measuring transformers of voltage type VTS 25 Sch complied with CSN EN 60044-2 Art. 9.2.4, IEC 60044-2 Art. 9.2.4, and CSN 35 1302 Art. 16.

6. Accuracy test

In the measuring transformer laboratory of IVEP, a.s., measuring was performed at the measuring transformer s.no. 006458 with two depending secondary windings in accuracy class 0.5 and with one winding for signalling of ground connection using the differential method and equipment by Tettex type 2765, s.no. 136 176 - Calibration sheet no. 817-KL-0028-03.

During measuring, the following was also used:

High voltage divider system producer Tettex-Calibration sheet no. 817-KL-0018-03

Voltage load, producer Tettex - type 3683/KS - Calibration sheet no. 817-KL-653-4/00

Voltage load, producer Hartmann & Braunn - type NBKv - Verification sheet no. 817/057/99

The measured values of voltage and angle errors within the range of 80, 100, and 120 % U_N are stated in the following table.



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Table of Measured Values

Serial No.	Errors	Rated primary voltage %			Load [VA] cos $\beta = 0.8$	
		80	100	120	1a-1n	2a-2n
006458	ϵ_U [%]	+ 0.35	+ 0.35	+ 0.35	12.5	0
	δ_U [']	+ 0.70	+ 0.75	+ 0.87		
	ϵ_U [%]	+ 0.04	+ 0.04	+ 0.04	12.5	50
	δ_U [']	-4.57	-4.50	-4.37		
	ϵ_U [%]	-0.48	-0.48	-0.49	50	50
	δ_U [']	-2.35	-2.30	-2.20		
	ϵ_U [%]	-0.18	-0.18	-0.18	50	0
	δ_U [']	+ 2.90	+ 2.95	+ 3.00		
	ϵ_U [%]	+ 0.36	+ 0.36	+ 0.36	0	12.5
	δ_U [']	+ 1.45	+ 1.50	+ 1.65		
	ϵ_U [%]	+ 0.05	+ 0.05	+ 0.05	50	12.5
	δ_U [']	-3.80	-3.70	-3.55		
	ϵ_U [%]	-0.48	-0.48	-0.49	50	50
	δ_U [']	+ 0.20	+ 0.25	+ 0.35		
	ϵ_U [%]	-0.17	-0.17	-0.17	0	50
	δ_U [']	+ 5.45	+ 5.50	+ 5.55		

The measuring transformer of voltage type VTS 25 Sch with two mutually depending windings complied with the accuracy test pursuant to standards CSN EN 60044-2 Art. 12.2, IEC 60044-2 Art. 12.2, and CSN 35 1302 Art. 25.

Other combinations of accuracy classes and rated loads when verifying the voltage measuring transformers must comply with the requirements of TPM 2272-99.

From the aforementioned measuring and the measuring performed at the prototypes of measuring transformers of voltage type VTS 25 (see test protocol of IVEP, a.s. No. 83-0116), this range of rated secondary loads result, provided the thread correction at the measuring winding is performed:

- One measuring winding design
5 VA - 30 VA - accuracy class 0.2
5 VA - 100 VA - accuracy class 0.5, 1, 3 (3P; 6P)
- One measuring winding design + auxiliary windings in accuracy class 6P
5 VA - 30 VA in accuracy class 0.2
5 VA - 100 VA - accuracy class 0.5, 1, 3 (3P; 6P)
- Two depending measuring (securing) windings design + (auxiliary winding in accuracy class 6P)
5 VA -15 VA in accuracy class 0.2 + 5 VA -15 VA in accuracy class 0.2 (0.5; 1; 3; 3P; 6P)
5 VA -15 VA in accuracy class 0.2 + 5 VA -15 VA in accuracy class 0.2 (0.5; 1; 3; 3P; 6P)+ auxiliary winding
5 VA - 50 VA in accuracy class 0.5 + 5 VA - 50 VA in accuracy class 0.5 (1, 3P, 6P) + auxiliary winding

The voltage measuring transformers type VTS 25 Sch complied with the conditions of standards CSN EN 60044-2 Art. 12.2, IEC 60044-2 Art. 12.2, and CSN 35 1302 Art. 25.

Further tests that were performed at the prototypes of measuring transformers of voltage VTS 25 according to standards CSN 35 1360 and IEC 186 are in their performance identical to standards CSN EN 60044-2, IEC 60044-2, and CSN 35 1302 and valid also for VTS 25 Sch.



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7. Heating test

The heating test results at the prototypes of type VTS 25 Sch are stated in protocols of IVEP, a.s. No. 83-0116 and No. 80-12896 and for VTS 25 Sch, these conclusions result from them:

The extreme load of measuring winding 1a-1n and 2a-2n - 500 VA

The extreme rated load of auxiliary winding da-dn - 100 VA

Total secondary load of measuring windings must not exceed 100 VA.

Total secondary load of auxiliary winding must not exceed 100 VA.

Measuring transformers of voltage VTS 25 Sch complied during the heating test for insulation class E with standards CSN EN 60044-2 Art. 5.4, IEC 60044-2 Art. 5.4, and CSN 35 1302 Art. 8.

8. Short circuit resistance test

The test results at the prototype of VTS 25 are stated in protocol of IVEP a.s. No. 88-0122.

The measuring transformers of voltage type VTS 25 Sch complied with standards CSN EN 60044-2 Art. 8.2, IEC 60044-2 Art. 8.2, and CSN 35 1302 Art. 12.