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619 00 BRNO, Vídeňská 117

REPORT OF PERFORMANCE No: 80-12896

INDOOR INSTRUMENT VOLTAGE TRANSFOMERS TYPE VTS 25

Jaromír Mudra,Phd

Brno, July 5 1998

ivep®	**TEST REPORT** No: 80 - 12896 Tested subject: VTS25 Instrument Voltage Transformers	Page No.:1 Number of pages: 6

TYPE:

VTS 25

KIND OF TEST: type test

TESTING ACC. TO:

IEC 186

RATED VALUES:

Rated primary voltage

	10/√3kV	22/√3kV
Rated burden	50VA	50VA
	50VA	100VA
Accuracy class	0.5/3P	0.5/6P

Highest system voltage

	12 kV	24 kV
Limit burden	500VA	500VA

Rated secondary voltage 100/√3V and 100/3V

Rated frequency 50 Hz

TEST REQUEST ISSUED BY:

KPB INTRA, s.r.o.
Fučíkova 860
685 01 Bučovice

ORDER NUMBER: KPB INTRA 43/97 of June 4, 1997

TESTED SPECIMEN REG. NUMBER:

Reg. No. 346 and 348/97

Prod. No.2500001 and 2500003
drawing No. KPB-T-25001

ENVIRONMENTAL CONDITIONS:

TEMPERATURE:
ATMOSPHERIC PRESSURE:
AIR HUMIDITY:

PRODUCT MANUFACTURER

KPB Intra, s.r.o.
Fučíkova 860
685 01 Bučovice

TESTED SPECIMENS DELIVERED ON:

Octob. 1997

THIS TEST REPORT INCLUDES:

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TEST RESULT:

The instrument voltage transformers of VTS 25 type, manufactured by KPB INTRA, s.r.o, designed for 12 kV and 24 kV, did

c o m p l y

with the type test requirements according to the IEC 186.

DATE OF TEST:	TEST PERFORMED BY:	MANAGER OF TEST LAB
June 5, 1997	Vlastimil Rada	Ing. Karel Mudra, PhD.

ZKUŠEBNA EVIDOVANÁ VE SDRUŽENÍ ČESKÝCH ZKUŠEBEN ivep akciová společnost BRNO Zkušebny a laboratoře 019

Based on the Order No. KPB INTRA 43/97, the type test of 2 pieces of instrument voltage transformers of VTS 25 type series (3600 V to 25 000 V) to the IEC 186 standard was carried out.
The subject deals with single-pole, insulated, inductive instrument voltage transformers with rated transformer ratios of 10000/√3//100/√3/100/3V and 22000/√3//100/√3/100/3 V, intended to be used for the powering of measuring and protective instruments in outdoor power networks with non-effectively earthed neutral systems and with the highest voltage from 3.6 kV to 24 kV.

The secondary windings, marked as "a-n", are used for the measurement of electric energy, secondary windings marked as "da-dn" are used for the powering of protections.
The transformers were produced in accordance with drawings pertaining for the KPB-T 25001 equipment set.

During the test the following rating plate data was verified:

VTS 25 instrument voltage transformer - rated voltage of 10000/√3V

"a - n" winding	- 50 VA, accuracy class 0.5
"da - dn" winding	- 50 VA, accuracy class 3P
insulation level	- 12/28/75 kV
temperature insulation class	- E

VTS 25 instrument voltage transformer - rated voltage of 22000/√3V

"a - n" winding	- 50 VA, accuracy class 0.5
"da - dn" winding	- 100 VA, accuracy class 6P
insulation level	- 22/55/125 kV
temperature insulation class	- E

The type test was performed to the IEC 186 requirements, in the scope, as follows:

1. Verification of proper marking of transformer terminals
2. Temperature rise test Accuracy measurement
3. Impulse test
4. Power frequency withstand test on primary winding
5. Power frequency withstand test on secondary windings
6. Partial discharge measurement
7. Short-circuit capability test
8. Accuracy measurement

1. Verification of proper marking of transformer terminals

The polarity check was carried through during the accuracy measurement by using the polarity indication instrument. The transformer is compatible with the IEC 186 Publication, Clause 21.1

2. Temperature rise test

This test was performed conformably the IEC 186 requirements, Art.11

a) Test with 1.2 U_N and rated burden cos φ = 1 and rated frequency.

Measured temperature rise:

	$10/\sqrt{3}$kV	$22/\sqrt{3}$ kV
"A-N" primary winding	10.5°C	12.0°C
"a-n" measuring winding	11.2°C	11.6°C
"da-dn" residual winding	11.5°C	11.0°C

Ambient temperature t = 22°C

b) Test with increased voltage level of 1.9 U_N and with rated secondary burdens on the "a-n" measuring and the "da-dn" residual voltage windins, during a time period of 8 hours following the temperature rise test with 1.2 U_N voltage.

Measured temperature rise:

	$10/\sqrt{3}$kV	$22/\sqrt{3}$ kV
"A-N" primary winding	17.8°C	35.6°C
"a-n" measuring winding	23.7°C	49.4°C
"da-dn" residual winding	24.6°C	41.5°C

Ambient temperature t = 22°C

The measured temperature rise values comply with the IEC 186 requirements, Art.11 for the "E" class of insulation.

3. Impulse test

This test was performed with the 1.2/50μs lightning-impulse, with 15 impulses of positive and negative polarity - see test report No. 82-0567. The transformers did comply with IEC 186, Art. 13 requirements.

4. Power frequency withstand test on primary winding

a) insulation test of primary terminal which is earthed in service.
This test was performed with 3 kV AC testing voltage, rated frequency 50 Hz during the time period of 1 min as defined by the IEC 186, Art. 9.2.2

b) insulation test with AC testing voltage of frequency 200 Hz, on primary winding, during the time period of 30 sec, see test report No. 82-0567.
Transformers did comply with the IEC 186 standard, Art. 9.2.2 and Art.16

5. Power frequency withstand test on secondary windings

This test was performed with 3 kV AC testing voltage, frequency 50 Hz during the time perios of 1 min. as defined by the IEC 186 Art. 17 standard, by applying the voltage between the following transformer parts:

a) between the primary and secondary windings
b) between the measuring and the secondary residual voltage windings
c) between the secondary windings and earthed frame

Transformers did comply with the IEC 186 standard, Art. 17

6. **Partial discharge measurement**

This kind of measurement was performed conformably to the Appendix No. 2 of IEC-1995-09 Publication, for both network earthing modes methode "B".
The following partial discharge values were measured:

Transformer reg. No. 346/97 - prod. No. 2500001 - Um=12kV

$1.2U_m$ - Q = 0.3 pC
U_m - Q = 0.3 pC
$1.2U_m/\sqrt{3}$ - Q = 0.3 pC

Transformer reg. No. 348/97 - prod. No. 2500003 - Um=24kV

$1.2U_m$ - Q = 40 pC
U_m - Q = 10 pC
$1.2U_m/\sqrt{3}$ - Q = 0.3 pC

The values of partial discharges, measured on the instrument voltage transformers of VTS 12 type, comply with the prescribed values for the highest operated voltages of U_m = 12 to 24 kV, in both the impedance earthed and the effectively-earthed neutral systems.

7.Short-circuit withstand capability test

The test was performed to IEC 186 standard, Art.12 see test report No. 88-0122.
After finishing the test the tested transformers did not exhibit any visual damage and complied with all the repeated testing requirements.

8. Accuracy measurement

The accuracy measurement was carried out by using the compensation method and by means of the Harmann & Braun measuring bridge of the "Keller" system, MEWK type, prod. No. 640 6857, verification sheet NO. LPM /451/93. Additionally, the following other measuring instruments were used:

voltage standard: instrument voltage transformer, manufactured by Messwandler - Gallspach, NUZG 35 type, production number:72/454315 verification sheet No. CM 10/115/48/94

voltage burden of measuring winding:

a) manufacturer Hartmann & Braun AG, NBKa type, prod. No. 3154032, verification sheet No. LPM/451/93
b) Tettex 3683/KS, prod. No. 136626, verification sheet No. CM 114/1/083/95

Values of voltage and phase displacement errors of "a-n" measuring windings, for 80, 100 and 120 percent of U_N, are given in table No. 1.

Table No. 1

Transformer ratio	U_N	80%	100%	120%	P_N VA a-n
10000/√3//100/√3V	[%]	+0.42	+0.42	+0.41	12.5
	[´]	+0.23	+0.36	+0.54	
	[%]	+0.04	+0.04	+0.04	50
	[´]	+0.51	+0.60	+0.77	
22000/√3//100/√3V	[%]	+0.28	+0.29	+0.29	12.5
	[´]	+1.33	+1.45	+1.67	
	[%]	-0.16	-0.15	-0.15	50
	[´]	+1.74	+1.83	+2.0	

Measuring winding with the 10 000/√3//100/√3 V transformer ratio corresponds with the requirements for 0.5 accuracy class. Measuring winding with the 22 000/√3//100/√3 V transformer ratio corresponds with the requirements for 0.5 accuracy class. Other combinations of accuracy classes and rated burdens must correspond with the relevant regulations for official verification of instrument voltage transformers.

Values of voltage and phase displacement errors of "da-dn" residual windings, for rated voltages within 2% to 190% of U_N, are given in table No. 2.

Table No. 2

Transformer ratio	U_N	2 %	5%	100%	190%	P_N VA da- dn	P_N VA a-n
10000/√3//100/3 V	[%]	-0.18	-0.12	-0.07	-0.10	12.5	0
	[´]	+9.50	+7.20	+6.70	+8.8		
	[%]	-0.45	-0.38	-0.32	-0.32	12.5	50
	[´]	+5.2	+3.6	+3.2	+5.2		
	[%]	-1.61	-1.41	-1.31	-1.35	50	50
	[´]	+25.0	+21.0	+21.3	+22.7		
	[%]	-1.22	-1.16	-1.06	-1.09	50	0
	[´]	+28.8	+24.6	+24.8	+26.7		
22000/√3//100/3 V	[%]	+0.98	+0.89	+1.06	+1.03	25	0
	[´]	+18.2	+15.2	+14.2	+16.6		
	[%]	+0.65	+0.53	+0.70	+0.68	25	50
	[´]	+15.8	+12.0	+11.0	+13.2		
	[%]	-1.57	-1.49	-1.31	-1.36	100	0
	[´]	+59.3	+53.1	+55.3	+58.0		
	[%]	-2.06	-1.86	-1.66	-1.68	100	50
	[´]	+63.5	+50.5	+52.3	+54.4		

Residual winding with 10000/√3//100/3V transformer ratio corresponds with the requirements on 3P accuracy class, and the residual winding of 22 000/√3//100/3 V ratio correspond with that for the 6P accuracy class.