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REPORT OF PERFORMANCE No: 80-12935

INDOOR INSTRUMENT VOLTAGE TRANSFOMERS TYPE VTS 12

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Brno, July 16 1998

ivep®	**TEST REPORT** No: 80 - 12935 Tested subject: VTS12 Instrument Voltage Transformers	Page No.:1 Number of pages: 7

TYPE: VTS 12	KIND OF TEST: type test TESTING ACC. TO: ČSN 35 1360, IEC 186
RATED VALUES: Rated primary voltage 6/√3kV 10/√3kV 11/√3kV Rated burden 50VA 15VA 100VA 100VA 100VA Accuracy class 0.5/6P 0.5/3P 1 Limit burden 500VA 400VA 500VA Highest system voltage 7.2kV 12 kV 12 kV 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 Z-980027 of Feb. 17, 1998 TESTED SPECIMEN REG. NUMBER: Reg. No. 075 to 077/98 245 to 246/98 Prod. No.001614 1200002 to 1200005 ENVIRONMENTAL CONDITIONS: TEMPERATURE: ATMOSPHERIC PRESSURE: AIR HUMIDITY:
PRODUCT MANUFACTURER KPB Intra, s.r.o. Fučíkova 860 685 01 Bučovice TESTED SPECIMENS DELIVERED ON: Feb. 26, 1998	THIS TEST REPORT INCLUDES: TEXT PAGES: 7 TABLES: 2 OSCILLOGRAMMES: DIAGRAMMES: DRAWINGS: PHOTOS:
	DISTRIBUTION LIST: KPB INTRA 3x IVEP ŘT 2x Archives 1x

TEST RESULT:

The instrument voltage transformers of VTS 12 type, manufactured by KPB INTRA, s.r.o, designed for 6/√3 kV, 10/√3 kV and 11/√3 kV

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with the type test requirements according to the ČSN 35 1360 and IEC 186.

DATE OF TEST: July 16, 1998	TEST PERFORMED BY: Vlastimil Rada	MANAGER OF TEST LAB. Jaromír Hadra, PhD.

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

Based on the Order No. KPB INTRA Z-98002, the type test of 5 pieces of instrument voltage transformers of VTS 12 type series (3600 V to 12 000 V) to the ČSN 35 1360 and IEC 186 standards was carried out.
The subject deals with single-pole, insulated, inductive instrument voltage transformers with rated transformer ratios of 6000/√3//100/√3/100/3V; 10000/√3//100/√3/100/3 V and 11000/√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 for equipment of 3.6 kV; 7.2kV and 12 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.

During the test the following rating plate data was verified:

VTS 12 instrument voltage transformer - rated voltage of 6000/√3V

Prod. No. 1200002
"a - n" winding - 50 VA, accuracy class 0.5
"da - dn" winding - 100 VA, accuracy class 6P

Prod. No. 1200003
"a - n" winding - 50 VA, accuracy class 0.5
insulation level - 7.2/22/60 kV

Prod. No. 001614
"a - n" winding - 50 VA, accuracy class 0.5
limit power load - 400 VA
temperature insulation class - E

VTS 12 instrument voltage transformer - rated voltage of 10000/√3V

Prod. No. 1200004
"a - n" winding - 50 VA, accuracy class 0.5
"da - dn" winding - 100 VA, accuracy class 6P
insulation level - 12/28/75 kV
limit power load - 400 VA
temperature insulation class - E

VTS 12 instrument voltage transformer - rated voltage of 11000/√3V

Prod. No. 1200005
"a - n" winding - 100 VA, accuracy class 1
insulation level - 12/28/75 kV

The type test was performed to the ČSN 35 1360 and IEC 186 requirements, in the scope, as follows:

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

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 ČSN 35 1360, Art. 120 requirements, the terminal markings conforms to the IEC 186 Publication, Clause 21.1.

2. 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 per cent of U_N, are given in table No. 1.

Table No.1

Transformer ratio	U_N	80%	100%	120%	P_N VA a-n
6000/√3//100/√3V Prod. No. 1200002	[%]	+0.41	+0.40	+0.40	12.5
	[´]	+0.5	+0.9	+1.0	
	[%]	-0.07	-0.075	-0.08	50
	[´]	+1.0	+1.0	+1.1	
6000/√3//100/√3V Prod. No. 1200003	[%]	+0.41	+0.40	+0.40	12.5
	[´]	+0.6	+0.8	+1.0	
	[%]	-0.07	-0.075	-0.08	50
	[´]	+1.0	+1.0	+1.1	
6000/√3//100/√3V Prod. No. 001614	[%]	+0.32	+0.33	+0.33	12.5
	[´]	+1.0	+1.0	+1.1	
	[%]	-0.32	-0.31	-0.32	50
	[´]	+1.9	+1.85	+2.0	
10000/√3//100/√3V Prod. No. 1200004	[%]	+0.12	+0.11	+0.09	12.5
	[´]	+1.0	+1.5	+2.1	
	[%]	-0.43	-0.44	-0.46	50
	[´]	-0.1	+0.4	+1.1	
11000/√3//100/√3V Prod. No. 1200005	[%]	+0.84	+0.84	+0.84	15
	[´]	+2.04	+2.15	+2.55	
	[%]	-0.37	-0.37	-0.38	100
	[´]	+9.4	+9.5	+9.7	

Measuring winding with the 6 000/√3//100/√3 V and 10 000/√3//100/√3 V transformer ratio corresponds with the requirements for 0.5 accuracy class.
Measuring winding with the 11 000/√3//100/√3 V transformer ratio corresponds with the requirements for 1 accuracy class.
Other combinations of accuracy classes and rated powers 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	5%	100%	190%	P_N VA da- dn	P_N VA a-n
6000/√3//100/3 V Prod.No. 1200002	[%]	+0.30	+0.45	+0.25	25	0
	[´]	+21.0	+20.0	+28.50		
	[%]	-0.11	+0.05	-0.18	25	50
	[´]	+19.0	+18.0	+30.0		
	[%]	-2.90	-2.70	-3.0	100	50
	[´]	+79.6	+72.8	+85.0		
	[%]	-2.50	-2.30	-2.60	100	0
	[´]	+75.0	+74.8	+78.0		
10000/√3//100/3 V Prod.No. 1200004	[%]	+0.45	+0.70	-0.21	25	0
	[´]	+9.5	+ 8.7	+38.0		
	[%]	-0.02	+0.23	-0.69	25	50
	[´]	+6.0	+4.8	+34.2		
	[%]	-1.14	-1.37	-2.34	100	50
	[´]	+28.3	+24.3	+53.7		
	[%]	-1.61	-0.90	-1.90	100	0
	[´]	+24.3	+28.8	+57.5		

Residual winding with 6000/√3//100/3V transformer ratio . corresponds with the requirements on 6P accuracy class, and the residual winding of 10 000/√3//100/3 V ratio correspond with that for the 3P accuracy class.

3. Interturn voltage test

This test was performed with AC voltage of 200 Hz, applied to the transformer primary side of transformers prod. No.1200003 to 1200005, for a time period of 30 seconds - see test report No. 82-0619. The transformers correspond with the ČSN 35 1360, Art. 125 and IEC 186, Art. 9.2.2. and Art. 16 requirements.

4. Impulse test

This test was performed with transformers prod. No. 1200003 to 1200005 with the 1.2/50μs lightning-impulse, with 15 impulses of positive and negative polarity - see test report No. 82-0619. The transformers did comply with the ČSN 35 1360, Art. 123 and IEC 186, Art. 13 requirements.

5. Power frequency withstand test

This test was performed with 2 kV AC testing voltage, as defined by the ČSN 35 1360 standard and with 3 kV AC testing voltage, as defined by the IEC 186 Art. 9.2.2. standard, by applying the voltage between the following transformer parts:

a) between the measuring and the secondary residual voltage windings
b) between the secondary windings and earthed frame
c) between the primary terminal which is earthed in service

The transformers prod. No. 1200003 to 1200005 and 001614 did comply with performed tests.

6. Temperature rise test

This test was performed with transformer prod. No. 001614 and 1200004 for primary voltages 6/√3 kV and 10/√3 kV conformably the ČSN 35 1360 requirements,Art. 126 and IEC 186 requirements, Art.11

a) Test with 400 VA limit power load, cos φ = 1, on the "a-n" winding. The "da-dn" winding was not exposed to load.

Measured temperature rise:

	6/√3kV	10/√3 kV
"A-N" primary winding	55.8°C	47.2°C
"a-n" measuring winding	63.2°C	45.2°C
"da-dn" residual winding	62.0°C	33.0°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:

	$6/\sqrt{3}$kV	$10/\sqrt{3}$ kV
"A-N" primary winding	47.4°C	37.7°C
"a-n" measuring winding	48.7°C	42.0°C
"da-dn" residual winding	49.4°C	32.2°C

Ambient temperature t = 22°C

The measured temperature rise values comply with the ČSN 35 1360 requirements, Art. 126 and IEC 186 requirements, Art.11 for the "E" class of insulation.

7. 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 prod.No. (prim. voltage)	$1,2U_m$	$1,2U_m/\sqrt{3}$
001614 ($6/\sqrt{3}$ kV)	2 pC	1 pC
1200002 ($6/\sqrt{3}$ kV)	48 pC	1 pC
1200004 ($10/\sqrt{3}$ kV)	49 pC	1 pC
1200005 ($11/\sqrt{3}$ kV)	20 pC	1 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 kV, in both the impedance earthed and the effectively-earthed neutral systems.

8. Short-circuit withstand capability test

The test was performed to IEC 186 standard, Art.12 see test report No. 88-0158.

After finishing the test the tested transformers did not exhibit any visual damage and complied with all the repeated testing requirements.

9. Summary:

All the tested instrument transformers of VTS 12 type, manufactured by KPB Intra, have passed the type test to ČSN 35 1360 and IEC 186 standards.