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(Power Engineering and Production, joint-stock company)



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CZECH TESTING LABORATORIES ASSOCIATION – SDRUŽENÍ ČESKÝCH ZKUŠEBEN A LABORATOŘÍ

ČLEN ASOCIACE ZKUŠEBEN VYSOKÉHO NAPĚTÍ – MEMBER OF THE MV TEST LABORATORIES ASSOCIATION

# **TEST REPORT No.:**

82-0793

Voltage Instrument Transformer of Outdoor Design, Type VPT 25



mu G

Dipl.-Ing. Jaromír Mudra,CSc.

Brno, on: Sept. 10, 2001

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IVGP	TEST REPORT No.: 8 Tested device: Voltage of Outdo	32-0793 Instrument Transformer or Design	Page No.: 1 No. of pages: 7	
Туре:		Kind of test:		
VPT 25		partial test Testing carried out in accordance with the following standards and regulations: ČSN 35 1302		
- Highest voltage for equipment U <sub>m</sub> = 25 kV AC		KPB INTRA, s.r.o. Fučíkova 860 685 01 Bučovice, Czech Republic		
		Order number:		
		KPB o 201/0479, as of Sept. 07, 2001		
		<b>Tested sample registration numbers:</b> 217/01 to 219/01 prod. No. KPB 007922, 007923 a 007927		
		Atmospheric condition		
		Air temperature: 21,0°C Air pressure: 1019.8 hPa Air humidity: 52% (100%)		
Manufacturer of the products: KPB INTRA, s.r.o. Fučíkova 860 685 01 Bučovice		The test rep. includes: Text pages: 7 Tables: Diagrammes: Drawings:	: Distribution list: IVEP ŘZ - 1x KPB - 2x IVEP-archives: 1x	
The samples for testing Sept. 03, 2001	were delivered on:	Appendices:		
The outdoor the requirements o	design, VPT 25 type, doubl manufactured by the com <b>have j</b> f insulation tests using imp	le-pole insulated voltage transfo pany KPB INTRA, s.r.o. <b>passed</b> ulse and AC voltage to ČSN 35	THE SCIANTO THE SCIANTO THE SCIANTO THE SCIENCE STREET STREET STREET STREET STREET STREET STREET STREET STREET STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO STREET SCIANTO S	
Date of the test:	Testing entineer: DiplIng. Jaromír Mudra, (	CSc., Manager of the	test laboratory:	



### 1. Introduction

During the period of Sept. 05 to 06, 2001, tests of insulation using impulse and AC test voltage were carried out on 3 pcs of outdoor design, VPT 25 type voltage instrument transformers at the MV test laboratory of IVEP a.s., based on the test order No. 201/04794 issued by the company KPB INTRA, s.r.o.

#### 2. Description of the tested instrument transformers

The VPT 25 type voltage instrument transformers are double-pole insulated devices, embedded in epoxi resin, with one primary and one secondary windings.

#### 2.1. Transformer nameplate data

Type VTP 25, manufactured by the company KPB INTRA s.r.o., ratio 22000/100 V; 25/50/125 kV, prod. year 2001; 500 VA, 50 Hz; to ČSN 35 1302

prod. No. 007922 -- reg. No. 217/01 prod. No. 007923 -- reg. No. 218/01 prod. No. 007929 -- reg. No. 219/01

# 3. Testing devices used during the test

Impulse generator 1.2 MV; Haefely; 1.2/50µs, 30 kJ; in a setup for 400 kV; inventory No. 00376/1 Two-beam impulse oscilloscope Haefely; type 72 E; inventory No. 00376/9 Impulse peak-to-peak V-meter Haefely; type 64 M; inventory No. 00932 Transformer cascade 500 kV; 150 kVA; Siemens; inventory No. 00077 Capacitive voltage divider 600 kV Haefely with peak-to-peak V-meters Trüb-Täuber, inventory No. 00038 Aritificial rain equipment IVEP; jets of 0.5 mm dia; impact angle of 45° to 90° (to ČSN IEC 60-1) AC power source up to 5 kV, STS Opava, inventory No. 00536 Motorgenerator MEZ. 220 V, 200 Hz; 74 A; inventory No. 00123

## 4. Scope of the insulation tests

The standard ČSN 35 1302 specifies the following insulation tests to be carred out on outdoor voltage instrument transformers to be used in systems with the highest voltage of  $U_m = 25 \text{ kV}$ :

**4.1 Test of primary winding using impulse voltage of** 1.2/50  $\mu$ s to the stipulations of the ČSN 35 1302 standard, section 13.2., appendix No. NA2, table III.A. In this test the transformer is subjected to the effects of 15 positive and 15 negative lightning impulses of a peak value of 125 kV. The test voltage is first applied to the <u>A</u> terminal while the <u>B</u>, <u>b</u> and <u>PE</u> terminals are earthed, the <u>a</u> terminal is insulated from the earth and then the voltage is applied to the <u>B</u> terminal while the <u>A</u>, <u>a</u> and <u>PE</u> terminals are earthed, and the <u>b</u> terminal is insulated from the earth.

**4.2 Test of primary winding using dry AC test voltage** to ČSN 35 1302, section 16, appendix No. NA2, table III A, with one-minute short-time AC withstand voltage of 50 kV (rms value).

#### 4.2.1. Test using the applied voltage

The test voltage of ~  $U_s = 50 \text{ kV/50 Hz}$  (rms value) is applied for 1 minute to the mutually interconnected terminals <u>A, B;</u> the <u>a, b</u> and <u>PE</u> terminals and the transformer frame are earthed.

#### 4.2.2. Test of interturn insulation

The testing voltage of  $\sim U_s = 50 \text{ kV}/200 \text{ Hz}$  (rms value) is applied for 30 seconds first to the <u>A</u> terminal whilst the <u>B</u>, <u>b</u> and <u>PE</u> terminals are earthed, and the <u>a</u> terminal is insulated from the earth. Thereafter the test voltage is applied to the <u>B</u> terminal, in the same way as in the previous case, and the <u>A</u>, <u>a</u> and <u>PE</u> terminals as well as the frame are earthed; the <u>b</u> terminal being insulated from the earth.

**4.3 Insulation tests of the secondary winding,** to ČSN 35 1302, section 17, using one-minue short-time AC withstand voltage of 3 kV/50 Hz (rms value), with insulated primary terminals <u>A</u> and <u>B</u>. The test voltage is applied to:

ivep	TEST REPORT No.: 82-0793 Tested device: VPT 25 Type, Outdoor Design	Page No.:	3	
			No. of pages:	7
<b>4.3.1.</b> the secondary insulated, and	terminal <u>a;</u> the second secondary the <u>PE</u> terminal with the frame are	terminal <u>b</u> along with the earthed;	primary terminal	s <u>A, B</u> is
<b>4.3.2.</b> the secondary insulated, and	r terminal <u>b</u> the second secondar the <u>PE</u> terminal with the frame are	y terminal <u>a</u> along with th earthed.	ne primary termii	nals <u>A, B</u> is
<b>4.4 Test of outer in</b> standard, se	sulation using AC voltage, in wet ction 14, appendix NA2, table III A,	t conditions (under rain and to IEC 60-1, section	i), to the ČSN 35 8.1,	1302
<ul> <li>4.4.1. one-minute sl to the interce the frame ar</li> <li>4.4.2. shot-time AC The test volta</li> </ul>	nort time AC withstand voltage of 5 onnected primary terminals <u>A</u> and e earthed. withstand voltage of 50 kV/200 Hz age is applied to:	50 kV/50 Hz (rms value). <u>B. A</u> ll other terminals of z/30 s (rms value)	The test voltage the secondary v	e is applied <i>v</i> inding and
4.4.2.1. the primary is insulated f 4.4.2.2. the primary is insulated f	terminal <u>A;</u> the <u>B</u> , <u>b</u> and <u>PE</u> termin rom the earth; terminal <u>B.</u> The <u>A</u> , <u>a</u> and <u>PE</u> termin rom the earth.	hals as well as the frame nals along with the frame	are earthed; the are earthed, the	<u>a</u> terminal <u>b</u> terminal
4.5. Informative tes	ts based on the customer wish			
<ul> <li>4.5.1. Informative te conditions.</li> <li>4.5.2. Informative te 4.5.3. Verification of</li> </ul>	st of outer insulation, using increas st of flashover impulse voltage in ra the withstand AC test voltage on tra	sed level of AC test volat iny conditions. ansformer insulation, in r	tge of 75 kV/50 l ainy conditions.	Hz, in rainy
The symbols used in the report:				
~U <sub>m</sub> - highest voltag +U, -U – rated with polarity (peak value) and with satisfactory	e for equipment (rms value) stand voltage of the 1,2/50µs ligh ). The writing 15/0 means 15 impt result.	ntning impulse wave, of ulses applied to the teste	both positive an d device, withou	d negative t flashover
~U <sub>s</sub> – rated short-time AC withstand voltage (rms value), in dry conditions; 50 Hz (200 Hz) ~U <sub>d</sub> – rated short-time AC withstand voltage, applied in conditions of artificial rain; 200 Hz (rms value) ~U <sub>i</sub> - short-time AC power frequency voltage of 3kV/50 Hz/1 minute (rms value) + U <sub>p</sub> , - U <sub>p</sub> , ~ U <sub>p</sub> – break-through or flashover voltage ~ U <sub>vd</sub> – withstand AC voltage under rain				
5. <u>The test results</u>				
<ul> <li>5.1 The VPT 25 Voltage Instrument Transformer</li> <li>U<sub>m</sub> = 25 kV; production number 007922; registration number 217/01; to ČSN 35 1302; transformer ratio</li> <li>22000/100 V, 25/50/125 kV, 500 VA, production year 2001</li> </ul>				
5.1.1. Test of primary winding using impulse voltage				
<b>5.1.1.1.</b> The <u>A</u> term earthed, the <u>a</u> termi +U = 125 kV/1	minal is connected with the test v nal is insulated from the earth. 5 impulses/0 -	voltage, the <u>B, b, PE</u> ter test result: satisfactory	rminals and the	frame are
<b>5.1.1.2</b> The <u>B</u> termination termination $\pm termination + U = 125 kV/2$	nal is connected with the test vol I is insulated from the earth. 15 impulses/0	ltage, the <u>A, a, PE</u> te test result: satisfactory	rminals and the	frame are

TEST REPORT No.: 82-0793 Tested device: VPT 25 Type, Out		utdoor Design	Page No.:	4		
		I ransformer	No. of pages:	7		
5.1.1.3. The <u>A</u> term earthed, the <u>a</u> termina - U = 125 kV	ninal is connected to the test volt al is insulated from the earth. V/15 impulses/0	age, the <u>B, b, PE</u> termina - test result: satisfactory	ils as well as the	frame are		
5.1.1.4 The <u>B</u> terminal is connected to the test voltage, the <u>A, a, PE</u> terminals and the frame are earthed, the <u>b</u> terminal is insulated from the earth.						
-0 = 125  kV	/15 impulses/0	- test result: satisfactory				
<b>5.1.2. Test of prima</b> 5.1.2.1. Test using to as well as the	<b>5.1.2. Test of primary winding using AC test</b> voltage, in dry conditions 5.1.2.1. Test using test voltage applied to the interconnected <u>A</u> and <u>B</u> terminals; the <u>a</u> , <u>b</u> and <u>PE</u> terminals					
~U <sub>s</sub> = 50 k <sup>×</sup>	V/50 Hz/ 1 minute	- test result: satisfactory				
5.1.2.2. Interturn ins 5.1.2.2.1. The <u>A</u> to earthed, the a termina	sulation test erminal is connected to the test al is insulated from the earth.	voltage, the <u>B, b, PE</u> te	erminals and the	frame are		
$\sim U_s = 50$ 5.1.2.2.2. The <u>B</u> terminal is insul	kV/200 Hz/30 sec. minal is connected to the test volt	<ul> <li>test result: satisfactory age, the <u>A, a, PE</u> terminals</li> </ul>	and the frame a	re earthed,		
$\sim U_s = 50$	kV/200 Hz/30 sec.	- test result: satisfactory				
5.1.3. Insulation to	ests of the secondary winding					
5.1.3.1. The <u>a</u> term	inal is connected to the test voltage	ge, the <u>PE</u> terminal and the	e frame are earth	ed, the <u>A,</u>		
$\underline{B}$ and $\underline{b}$ terminals are ~ U <sub>i</sub> = 3,0 kV/	insulated from the earth. /50 Hz/1 minute	- test result: satisfactory				
5.1.3.2. The <u>b</u> ter A. B and <u>a</u> terminals $=$	minal is connected to the test vo are insulated from the earth.	Itage, the <u>PE</u> terminal and	the frame are e	arthed, the		
$\sim 0_i = 3,0 \text{ kV}$		- test result: satisfactory				
5.1.4. Test of oute 5.1.4.1. The test vo	er insulation using AC test volta bltage is applied to interconnected are earthed	age under rainy condition I terminals <u>A</u> and <u>B;</u> the <u>a</u> ,	s <u>b</u> and <u>PE</u> termin	als as well		
$\sim U_d = 50 \text{ k/}$	V/50 Hz/1 minute	- test result: satisfactory				
5.1.4.2. The <u>A</u> term are earthed, $\sim U_d = 50 \text{ k}$	ninal is connected to the test volution the test volution the section of the sect	tage, the <u>B</u> , <u>b</u> and <u>PE</u> term ne earth. - test result: satisfactory	minals as well as	the frame		
5.1.4.3. The <u>B</u> term earthed, the $\sim U_d = 50 \text{ k}$	minal is connected to the test vo <u>b</u> terminal is insulated from the e v/200 Hz/30 sec.	oltage, the <u>A, a and PE</u> te arth. - test result: satisfactory	erminals and the	frame are		
<b>5.2. The VPT 25 vo</b> U <sub>m</sub> = 25 kV, 22000/100 V; 25/5	b <b>ltage instrument transformer</b> production number 007923, reg 0/125 kV, 500 A; production year	.No. 218/01, to ČSN 35 2001	1302, transform	er ratio of		
<b>5.2.1. Test of imput</b> 5.2.1.1. The <u>A</u> term the <u>a</u> terminal is insu +U = 125 kV/1	<b>Ise voltage applied on primary</b> ninal is connected to the test volta ulated from the earth. 15 impulses/0	winding lge, the B <u>, b, PE</u> terminals - test result: satisfactory	and the frame a	e earthed,		
5.2.1.2 The <u>B</u> termin the <u>b</u> terminal is insula	nal is connected to the test voltage ated from the earth.	ge, the <u>A, a, PE</u> terminals	and the frame a	e earthed,		

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ivep	TEST REPORT No.: 82-0793 Tested device: VPT 25 Type, Outdoor Design Voltage Instrument Transformer		Page No.: 5
5.2.1.3. The <u>A</u> term the <u>a</u> terminal is insula - U = 125 k	inal is connected to the test vo ated from the earth. //15 impulses/0	Itage, the <u>B, b, PE</u> termina - test result: satisfactory	I and the frame are earthed,
5.2.1.4 The <u>B</u> termin the <u>b</u> terminal is insul	nal is connected to the test volt ated from the earth.	age, the <u>A, a, PE</u> terminals	s and the frame are earthed,
- U = 125 kV	/15 impulses/0	- test result: satisfactory	
5.2.2. Test of prim 5.2.2.1. Test using t as well as the ∼U <sub>s</sub> = 50 k\	ary winging using AC test vol est voltage applied to the interc frame are earthed. V/50 Hz/ 1 minute	Itage in dry conditions connected <u>A</u> and <u>B</u> terminal - test result: satisfactory	ls; the <u>a, b</u> and <u>PE</u> terminals
5.2.2.2. Inter-turn ins 5.2.2.2.1. The <u>A</u> te earthed, the <u>a</u> termina $\sim U_s = 50$ 5.2.2.2.2. The <u>B</u> terr	sulation test erminal is connected to the te I is insulated from the earth. kV/200 Hz/30 sec. minal is connected to the test vo	st voltage, the <u>B, b, PE</u> to - test result: satisfactory bltage, the <u>A, a, PE</u> terminals	erminals and the frame are sand the frame are
the <u>b</u> terminal is insul ∼ U <sub>s</sub> = 50	ated from the earth. kV/200 Hz/30 sec.	- test result: satisfactory	
<b>5.2.3. insulation t</b> 5.2.3.1. The <u>a</u> termi <u>B</u> and <u>b</u> terminals are ~ U <sub>i</sub> = 3,0 kV/	ests of the secondary winding inal is connected to the test volt insulated from the earth. 50 Hz/1 minute	<b>g</b> tage, the <u>PE</u> terminal and th - test result: satisfactory	he frame are earthed, the $A$ .
5.2.3.2. The <u>b</u> ter <u>A, B</u> and <u>a</u> terminals a ~ U <sub>i</sub> = 3,0 kV/	minal is connected to the test v are insulated from the earth. 50 Hz/1 minute	voltage, the <u>PE</u> terminal and - test result: satisfactory	d the frame are earthed, the
<b>5.2.4. Test of oute</b> 5.2.4.1. The test vo as the frame ~ U <sub>d</sub> = 50 k\	er insulation using AC test vol Itage is applied to interconnecte are earthed. //50 Hz/1 minute	Itage, under rainy conditio ed terminals <u>A</u> and <u>B;</u> the <u>a</u> - test result: satisfactory	ons , <u>b</u> and <u>PE</u> terminals as well
5.2.4.2. The <u>A</u> tern are earthed, ~ U <sub>d</sub> = 50 k\	ninal is connected to the test vertice to the test vertice the <u>a</u> terminal is insulated from //200 Hz/30 sec.	bltage, the <u>B</u> , <u>b</u> and <u>PE</u> ter the earth. - test result: satisfactory	rminals as well as the frame
5.2.4.3. The <u>B</u> terr earthed, the ~ U <sub>d</sub> = 50 k\	minal is connected to the test <u>b</u> terminal is insulated from the //200 Hz/30 sec.	voltage, the <u>A</u> , <u>a</u> and <u>PE</u> t earth. - test result: satisfactory	terminals and the frame are
<b>5.3. The VPT 25 v</b> U <sub>m</sub> = 25 kV, pi ratio 22000/100 V;	oltage instrument transforme roduction number 007927, regi 25/50/125 kV, 500 A, productio	e <b>r</b> istration number 219/01; to n year 2001	ČSN 35 1302; transformer
<b>5.3.1. Test of prima</b> 5.3.1.1. The <u>A</u> term the <u>a</u> terminal is insu +U = 125 kV/1	a <b>ry winding using impulse tes</b> inal is connected to the test vol ulated from the earth. 5 impulses/0	t voltage tage, the B <u>, b, PE</u> terminals - test result: satisfactory	s and the frame are earthed,

ived	TEST REPORT No.: 82-0793 Tested device: VPT 25 Type, Outdo	Dutdoor Design	List :	6
	voltage institutier	it fransionnei	Počet listů:	7
5.3.1.2 The <u>B</u> termi the <u>b</u> terminal is insula + U = 125 kV 5.3.1.3. The <u>A</u> term earthed, the <u>a</u> termina - U = 125 kV	nal is connected to the test volt ited from the earth. //15 impulses/0 inal is connected to the test vo l is insulated from the earth. //15 impulses/0	tage, the <u>A, a, PE</u> terminals - test result: satisfactory oltage, the <u>B, b, PE</u> termina - test result: satisfactory	and the fram	e are earthed, the frame are
5.3.1.4 The <u>B</u> termin the <u>b</u> terminal is insula - U = 125 kV	al is connected to the test volta ted from the earth. /15 impulses/0	age, the <u>A, a, PE</u> terminals - test result: satisfactory	and the fram	e are earthed,
5.3.2. Test of prima 5.3.2.1. Test using te as well as the ~U <sub>s</sub> = 50 k\	<b>ry winding using AC test volt</b> est voltage applied to the interce frame are earthed. //50 Hz/ 1 minute	tage, in dry conditions onnected <u>A</u> and <u>B</u> terminals - test result: satisfactory	s; the <u>a</u> , <u>b</u> and	d <u>PE</u> terminals
5.3.2.2. Interturn inst 5.3.2.2.1. The <u>A</u> te earthed, the <u>a</u> termina $\sim U_s = 50$ 5.3.2.2.2. The <u>B</u> term the <u>b</u> terminal is insula $\sim U_s = 50$	ulation test erminal is connected to the test I is insulated from the earth. kV/200 Hz/30 sec. ninal is connected to the test vo ated from the earth. kV/200 Hz/30 sec.	st voltage, the <u>B, b, PE</u> te - test result: satisfactory oltage, the <u>A, a, PE</u> terminals - test result: satisfactory	erminals and	the frame are le are earthed,
5.3.3. Insulation te	ests of the secondary winding	1		
5.3.3.1. The <u>a</u> termi <u>B</u> and <u>b</u> terminals are ~ U <sub>i</sub> = 3,0 kV/s	nal is connected to the test volt insulated from the earth. 50 Hz/1 minute	age, the <u>PE</u> terminal and the - test result: satisfactory	e frame are e	arthed, the <u>A,</u>
5.3.3.2 <b>.</b> The <u>b</u> terr A, <u>B</u> and <u>a</u> terminals a ~ U <sub>i</sub> = 3,0 kV/s	minal is connected to the test v are insulated from the earth. 50 Hz/1 minute	voltage, the <u>PE</u> terminal and - test result: satisfactory	the frame ar	e earthed, the
<b>5.3.4. Test of outer</b> 5.3.4.1. The test vol as the frame ~ U <sub>d</sub> = 50 kV	<b>insulation using AC test volt</b> tage is applied to interconnecte are earthed. //50 Hz/1 minute	<b>age under rainy conditions</b> ed terminals <u>A</u> and <u>B;</u> the <u>a</u> , - test result: satisfactory	<b>s</b> . <u>b</u> and <u>PE</u> ter	minals as well
5.3.4.2. The <u>A</u> term are earthed, $\sim U_d = 50 \text{ kV}$	ninal is connected to the test vo the <u>a</u> terminal is insulated from //200 Hz/30 sec.	bitage, the <u>B</u> , <u>b</u> and <u>PE</u> ten the earth. - test result: satisfactory	minals as we	l as the frame
5.3.4.3. The <u>B</u> terr earthed, the ~ U <sub>d</sub> = 50 kV	ninal is connected to the test v <u>b</u> terminal is insulated from the //200 Hz/30 sec.	voltage, the <u>A, a and PE</u> te earth. - test result: satisfactory	erminals and	the frame are
5.4.1. Informative tes 5.4.1. Informative te voltage was The test volt earthed, the ~ U <sub>d</sub> = 0 to 7	ests according to the customer set of the transformer outer insu- being gradually increased to up tage was applied to the <u>A</u> ter <u>a</u> terminal was insulated from th 75 kV/50 Hz/- creeping discharg	<b>r's wish</b> ulation using increased level to 75 kV/50 Hz. minal, the <u>B, b</u> and <u>PE</u> term he earth. les in between the <u>A</u> and <u>B</u> t	of AC test vo minals and th terminals.	tage. The test



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**5.4.2. Informative test of flashover impulse voltage in rainy conditions**, by gradually increased peakvalue voltage by  $\Delta U = 4 \text{ kV}$ 

The test voltage was applied to the <u>A</u> terminal, the <u>B</u>, <u>b</u> and <u>PE</u> terminals as well as the framw were earthed, the <u>a</u> terminal was insulated from the earth.

- 5.4.2.1. test sample registration number: 217/01, production number: 007922
  - + U = 125 to 164.4 kV without flashover
  - +  $U_p$  = 168.1 kV flashover along the surface in between the <u>A</u> and <u>B</u> outlets.
- 5.4.2.2. test sample registration number: 218/01, production number: 007923
  - + U = 125 to 156.1 kV without flashover
  - +  $U_p = 158,9 \text{ kV}$  flahover along the surface, in between the ribs of the <u>A</u> and <u>B</u> outlets.

# 5.4.2.3. test sample registration number: 219/01, production number: 007927

- + U = 125 to 160.0 kV without flashover
- +  $U_p$  = 163,8 kV flashover along the surface, in between the <u>A</u> and <u>B</u> outlets.
- 5.4.3. Verification of the withstand level of AC test voltage on the outer insulation, in rainy conditions

The test voltage was applied to the interconnected <u>A</u> and <u>B</u> terminals, the <u>a</u>, <u>b</u>, <u>PE</u> terminals as well as the frame were earthed.

 $\sim U_{vd}$  = 70 kV/50 Hz/1 minute

- test result: satisfactory

# 6. Conclusion, summary

The VPT 25 voltage instrument transformers of outdoor desing, manufactured by the company KPB INTRA, s.r.o., production numbers 007922, 007923 and 007927 have passed the impulse and AC voltage tests to ČSN 35 1302/1997.

10. IX. 2001