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CZECH TESTING LABORATORIES ASSOCIATION - SDRUŽENÍ ČESKÝCH ZKUŠEBEN A LABORATORŮ

ASSOCIATION OF HIGH-VOLTAGE LABORATORIES- ČLEN ASOCIACE ZKUŠEBEN VYSOKÉHO NAPĚTÍ

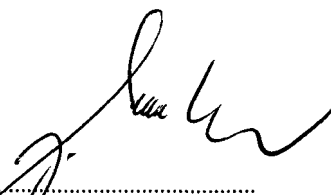


REPORT OF PERFORMANCE No.:

82-0679

Outdoor Current Instrument Transformer




Jarmir Mudra, PhD.

Brno: November 5, 1999

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TEST REPORT No: 82-0679

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Tested device: Outdoor Current Instrument Transformer

No. of pages: 4

Type designation:

CTSO 38

Kind of test:

Partial test

Test carried out in accordance with:
ČSN 35 1301
IEC 44-1; IEC 60-1; IEC 185+A1/1990
standards and regulations

Rated values:

Highest voltage for the equipment
 $U_m = 38.5 \text{ kV AC}$

Testing required by:

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

Order number:

KPB 199/0298 as of Nov. 01, 1999

Tested sample registration numbers:
399-401/99
prod. No. KPB 003668; 003669; 003670

Atmospheric conditions:

Air temperature: 21.0°C
Air pressure: 1022.7 hPa
Air humidity: 52% (100%)

Manufacturer of the products:

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

The test rep. includes:

No. of text pages: 4
Charts:
Diagrammes:
Drawings:
Pictures:
Appendices:

Distribution list:

IVEP ŘZ 1x
KPB 2x
IVEP-archives: 1x

Samples for testing delivered on:

November 01, 1999

Testing result:

The type CTSO 38 current instrument transformers of outdoor design, manufactured by the company
KPB INTRA, s.r.o.

have passed

the impulse insulation and AC insulation tests, as well as the partial discharge testing as required by the
ČSN 35 1301/1997 and IEC 185/1990 standards.

Date of test:

Nov. 04 and 05, 1999

Testing persons:

Ing. Jaromír Mudra, CSc.,
Mr. Ladislav Dvořák

Manager of the test laboratory

Ing. Jaromír Mudra, CSc.





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Transformer of Outdoor Design

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1. Introduction

Based on test order No. 199/0298 issued by KPB INTRA, s.r.o., insulation tests by impulse and AC voltage and measurement of partial discharges have been carried out on 3 pcs of CTSO 38 type current instrument transformers, on Nov. 04 and 05, 1999, at the medium/high voltage test laboratory of IVEP a.s. Brno, Czech Republic.

2. Testing Devices

Impulse generator 1.2 MV; Haefely; 1.2/50 μ s; 30 kJ; arranged for testing voltage of 600 kV

Two-beam impulse oscilloscope Haefely; type 72 E

Impulse peak V-meter Haefely; type 64 M

Transformer cascade 500 kV; 150 kVA; manufactured by Siemens

Capacitive voltage divider 600 kV; Haefely; with peak V-meters Trüb-Täuber

Equipment for artificial rain generation, manufactured by IVEP; rain nozzles of 0.5 mm diameter, rain incidence angle 45° to 90° (in accordance with the stipulations of the Czech standard ČSN IEC 60-1)

Partial discharge detector Tettex 6124, with accessories to up to 100 kV

AC voltage source with voltage level up to 5 kV, manufactured by STS Opava, inventory No. 00536

3. Scope of the Insulation Tests

Outdoor current instrument transformers used for the installation in power systems of highest voltage of $U_m = 38.5$ kV have the following insulation tests prescribed by the ČSN 35 1301 standard:

3.1 Lightning impulse test on primary winding, using test voltage of 1.2/50 μ s, conformably to the stipulations of the ČSN 35 1301 standard, Art. 14.2., appendix No. NA2, chart II.A, using 15 positive and 15 negative lightning impulses of 180 kV peak voltage. The test voltage is applied across interconnected P1 and P2 primary terminals. All terminals of the secondary winding and the transformer body/frame are earthed.

3.2 AC voltage test on primary winding, in dry conditions, as defined by the ČSN 35 1301 standard, Art. No. 17, appendix No. NA2, chart II A, using one-minute short time AC withstand testing voltage of 80 kV/50 Hz (rms value). The testing voltage is applied to interconnected P1 and P2 primary terminals, while all the terminals of the secondary winding and the transformer body/frame are earthed.

3.3 Measurement of partial discharges, as defined by the ČSN 35 1301 standard, Art. 17.1, and IEC 44-4 standard, with test duration of 1 minute and AC testing voltage of $1.1 U_m$ ($Q < 250$ pC), and $1.1/\sqrt{3} U_m$ ($Q < 50$ pC) after having reduced the voltage to $1.3 U_m / 10$ s. The testing voltage is applied to the interconnected P1 and P2 primary terminals, with all the terminals of secondary winding and the transformer body/frame earthed.

3.4 Insulation voltage testing across the secondary windings, as defined by the ČSN 35 1301 standard, Art. No. 10.3; 10.4 and 18, using one-minute short-time AC withstand voltage of 3 kV/50 Hz (rms value), with insulated P1 and P2 primary terminals. During this test the test voltage is applied to:

3.4.1. interconnected 1S1 and 1S2 secondary terminals. All other secondary terminals and the transformer body/frame are earthed;

3.4.2. interconnected 2S1 and 2S2 secondary terminals. All other secondary terminals and the transformer body/frame are earthed.

3.5 Inter-turn insulation test, to ČSN 35 1301, Art. 19 and 10.5, using one-minute short-time AC testing voltage of 4.5 kV/50 Hz (peak value). This test is carried through when measuring the transformer error, with the corresponding test results registered in the type test report No. 80-12981.

3.6 AC Voltage testing of transformer external insulation in rainy conditions, to ČSN 35 1301 standard, Art. No. 15, appendix NA2, chart No. II A, and to the IEC 60-1, Art. No. 8.1, using one-minute short-time AC withstand voltage of 80 kV/50 Hz (rms value). In this test the test voltage is applied to interconnected P1 and P2 primary terminals, with all the secondary terminals connected with the transformer body/frame and earthed.



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Symbols Used:

$\sim U_m$ - highest voltage of the device (rms value)

+U, -U – rated value of lightning impulse voltage of 1.2/50 μ s, with both the positive and negative polarity (peak value)

The record „15/0“ denotes 15 impulses applied, without flashover, and satisfactory result of the test.

$\sim U_s$ – rated short-time power frequency (50 Hz) AC withstand voltage (rms value), in dry testing conditions.

$\sim U_d$ – rated short-time power frequency (50 Hz) withstand voltage (rms value), in wet testing conditions (under artificial rain)

$\sim U_i$ - short-time AC power frequency test voltage of 3kV/50 Hz/1 minute (rms value)

Q - the amplitude of partial discharges

4. Results of the Test

4.1 Tested device: current instrument transformer, type CTSO 38,

U_m = 38.5 kV, production number 003668, registration number 399/99, manufactured to IEC 185 10/5/5 A; 38.5/80/180 kV; 6.3/16kA, year of manufacture: 1999

4.1.1. Test to primary winding using impulse test voltage

+ U = 180 kV/15/0

test result: satisfactory

- U = 180 kV/15/0

test result: satisfactory

4.1.2. Test to primary winding using AC test voltage, in dry conditions

$\sim U_s$ = 80 kV/50 Hz/1 minute

test result: satisfactory

4.1.3. Measurement of partial discharges

$\sim 1.1 U_m$ = 42.35 kV/50 Hz/1 minute/Q = 52pC

test result: satisfactory

$\sim 1.1/\sqrt{3} U_m$ = 24.45 kV/50 Hz/1 minute/Q = 28pC

test result: satisfactory

4.1.4. Insulation voltage test of insulation between the secondary windings

4.1.4.1. The 1S1 + 2S2 terminals connected to test voltage; the 2S1 + 2S2 + body/frame earthed

$\sim U_i$ = 3.0 kV/50 Hz/1 minute

test result: satisfactory

4.1.4.2. The 2S1 + 2S2 terminals connected to test voltage; the 1S1+ 1S2 + body/frame earthed

$\sim U_i$ = 3.0 kV/50 Hz/1 minute

test result

4.1.5. External insulation test using AC test voltage, under artificial rain

$\sim U_d$ = 80 kV/50 Hz/1 minute

test result: satisfactory

4.2 Tested device: current instrument transformer, type CTSO 38

U_m = 38.5 kV, production number 003669, registration number 400/99, manufactured to IEC 185, 200/1/1A; 38.5/80/180 kV; 25/63kA; year of manufacture: 1999

4.2.1. Test to primary winding using impulse test voltage

+ U = 180 kV/15/0

test result: satisfactory

- U = 180 kV/15/0

test result: satisfactory

4.2.2. Test to primary winding using AC test voltage, in dry conditions

$\sim U_s$ = 80 kV/50 Hz/1 minute

test result: satisfactory

4.2.3 Measurement of partial discharges

$\sim 1.1 U_m$ = 42.35 kV/50 Hz/1 minute/Q = 9 pC

test result: satisfactory

$\sim 1.1/\sqrt{3} U_m$ = 24.45 kV/50 Hz/1 minute/Q = 8 pC

test result: satisfactory



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4.2.4. Voltage insulation tests of insulation between the secondary windings

4.2.4.1. The 1S1 + 1S2 terminals connected to test voltage; the 2S1 + 2S2 + body/frame earthed.

$\sim U_i = 3.0 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

4.2.4.2. The 2S1 + 2S2 terminals connected to test voltage; the 1S1 + 1S2 + body/frame earthed

$\sim U_i = 3.0 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

4.2.5. Test of transformer external insulation, using AC test voltage, with testing under rainy conditions

$\sim U_d = 80 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

4.3. Current instrument transformer, type CTSO 38

$U_m = 38.5 \text{ kV}$, production number 003670, registration number 401/99, manufactured to IEC 185, 1250/5/5 A; 38.5/80/180 kV; 31.5/80 kA, year of manufacture: 1999

4.3.1. Test to primary winding using impulse test voltage

+ U = 180 kV/15/0

test result: satisfactory

- U = 180 kV/15/0

test result: satisfactory

4.3.2. Test to primary winding using AC test voltage, in dry conditions

$\sim U_s = 80 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

4.3.3. Measurement of partial discharges

$\sim 1.1 U_m = 42.35 \text{ kV/50 Hz/1 minute/Q} = 22 \text{ pC}$

test result: satisfactory

$\sim 1.1/\sqrt{3} U_m = 24.45 \text{ kV/50 Hz/1 minute/Q} = 18 \text{ pC}$

test result: satisfactory

4.3.4. Insulation voltage test of insulation between the secondary windings

4.3.4.1. The 1S1 + 2S2 terminals connected to test voltage; the 2S1 + 2S2 + body/frame earthed

$\sim U_i = 3.0 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

4.3.4.2. The 2S1 + 2S2 terminals connected to test voltage; the 1S1 + 1S2 + body/frame earthed

$\sim U_i = 3.0 \text{ kV/50 Hz/1 minute}$

test result

4.3.5. External insulation test using AC test voltage, under artificial rain

$\sim U_d = 80 \text{ kV/50 Hz/1 minute}$

test result: satisfactory

5. Summary

The current instrument transformers of CSTO 38 type, of outdoor design, manufactured by the company KPB INTRA, s.r.o., production numbers: 003668; 003669; 003670 have successfully passed the insulation tests using impulse and AC test voltage, and the measurement of partial discharges as described by the ČSN 35 1301/1997 and IEC 185+A1/1990 standards and recommendations.