ivep

Inženýrsko - výrobní elektrotechnický podnik, a.s.

619 00 Brno, Videnska 117

TEST PROTOCOL No. 80 – 12908

CTS 38 Instrument Current Transformer

(testing station stamp)

(signature)
Ing. Jaromir Mudra, CSc.

In Brno on: 20 November 1997

	TEST PROTOCOL No. 80 – 12908 Test subject: Instrument current transformer	Page: 1 Number of pages: 8

Type: CTS 38	Test type: type Tested according to: CSN 35 1360	
Rated values: Rated prim. currents 50A;300A;600A Rated sec. current 5A Accuracy class 0.5 5P System highest voltage: 38 kV Overcurrent numbers < 5 < 10 Overcurrent factor n = 10 Insulation class E Rated frequency 50 Hz	Test customer: KPB INTRA s.r.o. Fucikova 860 685 01 Bucovice Order number: KPB INTRA 85/97 Sample registration numbers: Reg. No. 528 – 530/97 Serial No. KPB 3800001 to 3800003 Drawing No.: KPB – T – 01CTS38 Atmospheric conditions: Temperature: Pressure: Humidity:	
Product manufacturer: KPB INTRA s.r.o. Fucikova 860 685 01 Bucovice Samples delivered on: 19 September 1997	Protocol contains: Text pages: 8 Tables: 4 Oscillograms: Diagrams: Drawings: Photographs:	Table of distribution: KPB 2x IVEP RT 1x IVEP archive 1x

Test results:

CTS 38 instrument current transformers, produced by KPB INTRA s.r.o.

comply

with type test according to CSN 35 1360.

Test date: 5 November 1997	Tested by: Ing. Vlastimil Rada (signature)	Testing station chief: Ing. Jaromir Mudra, CSc. (stamp) (signature)

TEST PROTOCOL No. 80 – 12908
Test subject: Instrument current transformer CTS 38

Based on the order of KPB INTRA s.r.o. No. 85/97, a type test was performed at 3 pcs of instrument current transformers type CTS 38 pursuant to CSN 35 1360.

The transformers were made according to the assembly drawing KPB-T-01CTS38.

The type test was performed at these transformers:

Transformer CTS 38 - sample no. 529/97 - s. no. 3800001
300//5/5A, 10 VA, accuracy class 0.5 - n < 10
15 VA, accuracy class 5P - n = 10

Transformer CTS 38 - sample no. 530/97 - s. no. 3800002
50//5/5A, 10 VA, accuracy class 0.5 - n < 10
15 VA, accuracy class 5P - n = 10

Transformer CTS 38 - sample no. 528/97 - s. no. 3800003
600//5/5A, 10 VA, accuracy class 0.5 - n < 10
30 VA, accuracy class 5P - n = 10

Type test scope:
1. Correct terminal marking check
2. Accuracy measurement
3. Rated instrument security factor and overall error measurement
4. Insulation test by impulse voltage
5. Insulation test by alternate voltage
6. Test of thread insulation
7. Heating test
8. Short circuit test
9. Check of workmanship and completeness of equipment

1. Correct terminal marking check

The check of polarity of primary and secondary winding was performed using the indication instrument when measuring accuracy. The transformers comply with CSN 351360, Art. 120. Terminal designation complies with IEC 185.

2. Accuracy measurement

The test was performed using the compensation method with a bridge Hartmann Braun AG, system Keller, type MEWK, s. no. 6406857, verification sheet no. LPM/451/94.

Furthermore, these following instruments were used:

Measuring transformer of current - producer Tettex, type 4724,
s. no. 113033, verification sheet
no. CM 114/1/128/95

Current load: producer Hartman & Braun AG, type NBKa,
s. no. 3154031, verification sheet no. LPM/451/94

Accuracy measurement was performed according to CSN 35 1360, Art. 61, 71.
The measured values of current and angle errors before and after the short circuit test are stated in the following tables.
Table No. 1 - Measuring transformer of current CTS 38 - sample no. 529/97
Transfer 300//5/5 A, 10 VA - accuracy class 0.5
15 VA - accuracy class 5 P

	I_N	10%	20%	100%	120%	P_N VA
Winding 1S1-1S2	ε_I [%]	+0.16	+0.19	+0.24	+0.24	2.5
	δ_I [']	+ 18.5	+14.2	+7.1	+6.5	
	ε_I [%]	-0.42	-0.30	-0.07	-0.04	10
	δ_I [']	+20.0	+14.2	+4.5	+3.5	
After short circuit test	ε_I [%]	+0.17	+0.18	+0.23	+0.23	2.5
	ε_I [%]	+17.5	+14.0	+7.0	+6.3	
	ε_I [%]	-0.43	-0.29	-0.06	-0.03	10
	δ_I [']	+20.2	+14.5	+4.6	+3.6	
Winding 2S1-2S2	ε_I [%]			-0.23		7.5
	δ_I [']			+3.0		
	ε_I [%]			-0.35		15
	δ_I [']			+2.1		
After short circuit test	ε_I [%]			-0.22		7.5
	δ_I [']			+3.3		
	ε_I [%]			-0.37		15
	δ_I [']			+2.4		

Table No. 2 - Measuring transformer of current CTS 38 - sample no. 530/97
Transfer 50//5/5 A, 10 VA - accuracy class 0.5
15 VA - accuracy class 5 P

	I_N	10%	20%	100%	120%	P_N VA
Winding 1S1-1S2	ε_I [%]	-0.07	-0.08	-00.08	-0.08	2.5
	δ_I ['1	+8.0	+6.5	+3.5	+6.0	
	ε_I [%]	-0.33	-0.29	-0.19	-0.20	10
	δ_I ['1	+10.0	+7.0	+2.0	+3.1	
After short circuit test	ε_I [%]	-0.08	-0.09	-0.09	-0.09	2.5
	ε_I [%]	+8.2	+6.3	+3.6	+6.7	
	ε_I [%]	-0.32	-0.30	-0.18	-0.21	10
	δ_I ['1	+10.2	+8.0	+2.02	+3.2	
Winding 2S1-2S2	ε_I [%]			-0.46		7/5
	δ_I ['1			+11.1		
	ε_I [%]			-0.59		15
	δ_I ['1			+9.0		
After short circuit test	ε_I [%]			-0.47		7.5
	δ_I ['1			+11.3		
	ε_I [%]			-0.57		15
	δ_I ['1			+9,6		

Table No. 3 - Measuring transformer of current CTS 38 - sample no. 528/97
Transfer 600//5/5 A, 10 VA - accuracy class 0.5
15 VA - accuracy class 5 P

	I_N	10%	20%	100%	120%	P_N VA
Winding 1S1-1S2	ε_I [%]	+0.22	+0.23	+0.26	+0.26	2.5
	δ_I ['1	+16.0	+12.0	+5.5	+5.1	
	ε_I [%]	-032	-0.22	0.00	+0.02	10
	δ_I ['1	+16.5	+11.9	+3.0	+2.1	
After short circuit test	ε_I [%]	+0.21	+0.22	+0.27	+0.27	2.5
	ε_I [%]	+16.2	+12.3	+5.7	+5.3	
	ε_I [%]	-0.31	-0.22	+0.01	+0.03	10
	δ_I ['1	+16.7	+11.8	+2.9	+2.3	
Winding 2S1-2S2	ε_I [%]			-0.19		15
	δ_I ['1			+1.9		
	ε_I [%]			-0.29		30
	δ_I ['1			+1.2		
After short circuit test	ε_I [%]			-0.18		15
	δ_I ['1			+2.0		
	ε_I [%]			-0.28		30
	δ_I ['1			+1.3		

Measuring transformers of current type CTS 38 sample No. 528/97 - 530/97 comply with CSN 35 1360 and the measured values of current and angle errors comply with the label data of accuracy classes before and after performing the short circuit test.

Other combinations of accuracy classes and rated outputs with measuring windings must comply with the valid regulations for official verification of measuring transformers of current.

3. Rated instrument security factor and overall error measurement
For the measuring, the indirect method according to CSN 35 1360 Art. 170b, 108e was used.
The values of instrument security factors and overall errors are stated in Table No. 4.

Table No. 4

Type	Sample no.	Transfer/sec. winding	Load	Instrument security factor	Overall error
CTS 38	529/97	300//5/5 A 1S1-1S2 2S1-2S2	10 VA 15 VA	8.3	0.64 %
CTS 38	530/97	50//5/5 A 1S1-1S2 2S1-2S2	10 VA 15 VA	3.0	0.24 %
CTS 38	528/97	600//5/5 A 1S1-1S2 2S1-2S2	10 VA 30 VA	8.1	0.56 %

Measuring transformers of current type CTS 38, sample no. 528/97 - 530/97 comply with the label data of sizes of instrument security factors and overall errors pursuant to CSN 35 1360.

4. Insulation test by impulse voltage

The test was performed according to CSN 35 1360, Art. 110. Test samples No. 528/97 - 530/97 complied with 5 impulses of positive and negative polarity of voltage 180 kV without flashover.
The description and results of the test are stated in the protocol of IVEP Brno No. 82-0590.

5. Insulation test by alternate voltage

a) Test of insulation between the primary and secondary winding

The test was performed according to CSN 351360 Art. 112 using test alternate voltage 80 kV/1 min at samples no. 528/97 - 530/97 with satisfactory results. The description and the results of the test are stated in the protocol of IVEP Brno No. 82-0590.

b) Insulation test of secondary windings with alternate voltage

The test was performed using the test source inv. no. 00770, with alternate voltage 2 kV for a period of 1 minute between the secondary windings mutually and between the secondary windings and the grounded parts.
Test samples No. 528/97 - 530/97 passed this test.

After the short circuit test performed in IVEP Brno, the aforementioned insulation tests with alternate current were repeated with decreased values corresponding to 90 % of test voltages.
The tested samples complied with the requirements of CSN 35 1360.

6. Test of thread insulation

At test samples 528/97 - 530/97, the test was performed with 120 % of the rated primary current for a period of 1 minute.
The test voltage at the open secondary winding was measured with peak voltmeter and capacity divider type SME 2. The tested samples of measuring transformers of current complied with the requirements of CSN 35 1360 Art. 114 before and after the short circuit test.

8. Heating test
The test was performed at test sample no. 528/97, transfer 600//5/5 A at 120 % of the rated current and rated secondary loads of 10 VA and 30 VA cos $\beta = 1$.
The sizes of heating of secondary windings were determined from the increments of winding resistance. The temperature of the primary winding was measured using the electronic temperature gauge - Thermophil.
With the average ambient temperature of 23 °C, these values were measured:

Heating 1S1 - 1S2 - 22 °C
2S1 - 2S2 - 23 °C
Primary winding temperature 62 °C

The measured values of heating of secondary windings and the temperature of the primary winding comply with the requirements of CSN 35 1360, Art. 39 for insulation class E.

8. Short circuit test
The test was performed at samples No. 528/97 - 530/97 in the short circuit testing station of IVEP Brno (see the test protocol No. 88-0134).
Based on the repeated accuracy measurement, repeated insulation tests of primary and secondary windings, and the visual inspection of the surface of the transformer after the short circuit test, the test results according to CSN 35 1360 Art. 116 consider as sufficient.

10. Check of workmanship and completeness of equipment

The overall appearance and surface finish of the samples of measuring transformers of current is satisfactory and the data completeness on the label and the transformer equipment meets the requirements of CSN 35 1360.

CMI Prague will make a statement in personal negotiation with the customer concerning the design of the label and the location of the verification mark.