



RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING

ICMET CRAIOVA ROMANIA

"Ovidiu Rarinca" HIGH POWER LABORATORY - LMP E R C A R E

200515-CRAIOVA Calea Bucuresti Nr. 144 ROMANIA

Phone: +40 351 402427; Fax: +40 251 415482; +40 351 404888

E-mail: lmp@icmet.ro



TEST REPORT No. 9602 / 02.02.2006

SR EN ISO / CEI 17025 : 2001
CERTIFICAT DE ACREDITARE
Nr. 004 - L

Tested product: 36 kV/ 50 A - back-up fuses
Test: Breaking capacity in test duties 1, 2 and 3
Test method: According to IEC 60282-1/2002, clause 6.6
Test date: February 01-07, 2006
Test result: Passed the test

Head of LMP:
Dr. Eng. George Curcanu



Responsible for quality assurance:
Eng. Constantin Ilinca



Responsible for test group:
Eng. Constantin Iancu

Responsible for test:
Eng. Constantin Iancu
Eng. Alin Dinda

Test witnesses: Eng. Uroš Kovač and Eng. Branko Pesan from ETI Elektroelement d.d

Report has 24 pages and it is edited in 4 copies from which 3 copies for customer.

Note:

1. Publication or reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without laboratory and RENAR writing approval.
2. Results refer to test product only.
3. Accreditation of the laboratory or any of its Test Reports issued under accreditation regime do not constitute or do not imply themselves an approval of the product by RENAR which gave the accreditation or any other body.

P101-01ae

CUSTOMER: ETI Elektroelement d.d.
Obrezija 5, 1411 Izlake, Slovenia

MANUFACTURER: ETI Elektroelement d.d.
Obrezija 5, 1411 Izlake, Slovenia

IDENTIFICATION OF APPARATUS

Type	VV-THERMO
Serial number/year	0000353937, 0000353938, 0000353939, 0000353941, 0000353942, 0000353945, 0000353947, 0000353948
Technical specification / Drawing	- / 365.103.T65
Order no.:	Contract No. 3173/ 29.11.2005
Product receiving's date:	25.01.2006
Product condition at receiving	New.

PERFORMANCES ESTABLISHED BY PRODUCER

Rated voltage	[kV]	36
Rated current	[A]	50
Rated frequency	[Hz]	50
Rated breaking capacity		
Breaking current I_1	[A]	16000
Breaking current I_2	[A]	3000
Breaking current I_3	[A]	250
Maximum switching-voltage	[kV]	112

TEST PROGRAM

1. Test duty 1

- Calibration test at $I_1 = 16 \text{ kA}$
- Three verifications of operation tests in test duty 1 at parameters: $I_1 = 16 \text{ kA}$, $U_r = 31.32 \text{ kV}$; $U_c = 62 \text{ kV}$, rate of rise = $0.57 \text{ kV}/\mu\text{s}$, $\rho = 40^\circ \div 65^\circ$ (for 1 piece) and $\rho = 65^\circ \div 90^\circ$ (for two pieces)

2. Test duty 2

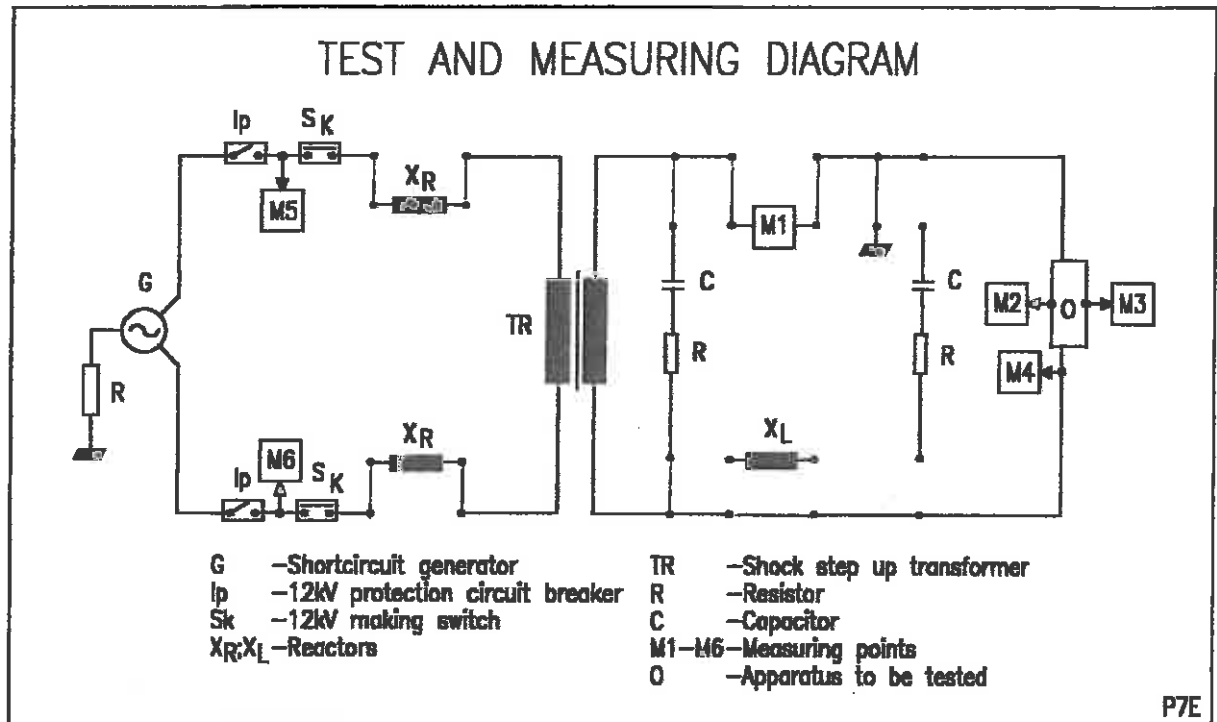
- Calibration test at $I_2 = 3000 \text{ A}$
- Three verifications of operation tests in test duty 2 at parameters: $I_2 = 3000 \text{ A}$, $U_r = 31.32 \text{ kV}$; $U_c = 66 \text{ kV}$, rate of rise = $0.203\text{--}0.152 \text{ kV}/\mu\text{s}$, $\varphi = 0^\circ \div 20^\circ$.

3. Test duty 3

- Calibration test at $I_3 = 250 \text{ A}$
- Two verifications of operation tests in test duty 3 at parameters: $I_3 = 250 \text{ A}$, $U_r = 36 \text{ kV}$.

The tests are performed according to own procedure PT 03.03.

TEST REPORT DOCUMENTATION	Oscillograms	11	; Tables	6	;
	Photos	1	; Drawings	5	;



DATA OF TESTING AND MEASURING CIRCUIT

Table 1

Test duty		1	2
Phases number		2	2
Source/ connection		G2 / Y	G2 / Y
Transformer/rate		TR 5, 6, 8, 9 / 2.67	TR4,5,6 / 3.21
Earthing	Source	600 Ω	600 Ω
	Apparatus	Net earthing connection	
Reactor	[m Ω]	25	880
Power factor		< 0.15	< 0.15
Load circuit	Reactor X [Ω]	-	-
	Resistor R [Ω]	-	-
	Capacitor [μ F]	-	-
	Power factor	-	-
T.R.V. adjustment	Capacitor [μ F]	0.4	0.2
	Resistor R [Ω]	75	100
M1 - Apparatus current		Shunt 20 kA/2 V	Shunt 2 kA/ 2 V
M2 - Recovery voltage – Capacitive divider 50 kV / 7 V			
M5 - Supply source voltage – Voltage transformer 15000 V / 100 V			

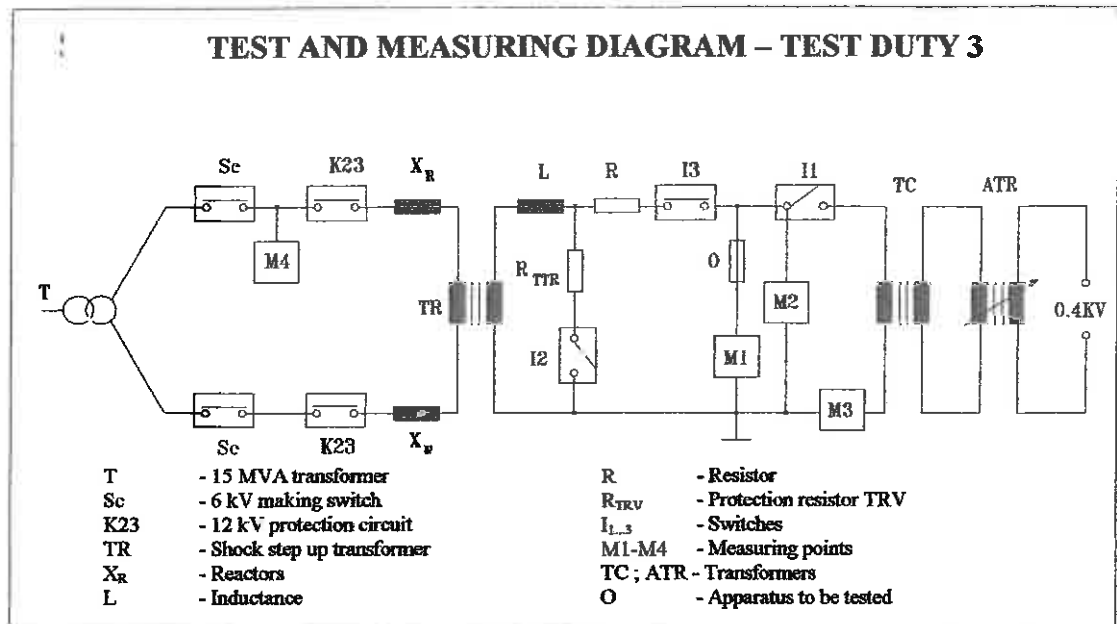


Table 2

Test duty		3
Phases number		2
Source/ connection		Network, 15 MVA transformer
Transformer/rate		TR 8, 9 / 8.56
Earthing	Source	-
	Apparatus	Net earthing connection
Reactor	[mΩ]	200
Power factor		< 0.15
Load circuit	Reactor L [H]	0.248
	Resistor R [Ω]	54.3
	Capacitor [μF]	-
	Power factor	0.5
T.R.V.	Capacitor [μF]	-
adjustment	Resistor R [Ω]	7434
M1 – Apparatus current – Current transformer 500A/1A		
M2 – Recovery voltage – Capacitive divider 400 pF / 400 nF		
M4 – Supply voltage – Voltage transformer 15000 V / 100 V		