TEST REPORT

Tests Performed: *Temperature Rise*
Project No.: *TI-2091-I61869-3*
Equipment Under Test: *Inductive Voltage Transformer*

Model/Type	*RU-12*
S/N	*9301420030/a*
Rating	*20/√3 kV; 100/√3 V; 100/√3 V; 100/3 V*
Burden	*1a:1b 10 VA, 2a:2b10 VA, 3a:3b 10 VA*
Insulation class	*A*

Manufactured by:

PARS SHAR B.C.

Address: No.2, 8th Alley, Behrouz St, Mohseny Square, Tehran, Iran.

Applicant:

PARS SHAR B.C.

Tested According to: *IEC 61869-3 (2011)*

Issue Date: *28-Sep-2014*

No. of pages: *10*

Prepared by: Test Engineer
M. Javadzadeh

Verified by: Technical Manager
S. M. Mirfallah

Approved by:

Vice President of CEO
S. M. Mirsadri

Engineering Deputy of Test and Inspection
Prof. B. Vahidi

CONTENTS

1. GENERAL INFORMATION

1.1 Product Information

Equipment Under Test	: MV inductive voltage transformer
Model/Type	: RU-12
Rating(s)	: 20/√3 kV; 100/√3 V; 100/√3 V; 100/3 V
Winding material	: Copper
Burden	: 10 VA/ 10 VA/ 10 VA
Accuracy class	: (1a-1b : 0.2+3P), (2a-2b : 0.2+3P)
Normative document	: IEC 61869-3 (2011), IEC 61869-1(2007)

1.2 Client Information

Applicant	: PARS SHAR B.C.
Telephone	: +98 21 22907709
Address	: No.2, 8th Alley, Behrouz St, Mohseny Square, Tehran, Iran.
Contact person	: Mr. Amin

1.3 Tests Performed

Temperature Rise Test	21-Sep-2014

1.4 Results of Tests

See Pages 4 – 5.

2. PERFORMANCE AND RESULTS OF TESTS

2.1. Temperature Rise Test

2.1.1 Test data

Location	: E.P.I.L.
Date	: 021-Sep-2014
Engineer of EPIL	: M. Javadzadeh
Normative document	: IEC 61869-3

2.1.2 Ambient Condition

Ambient air temperature	: 27°C

2.1.2 Test Devices

High voltage transformer	: 100 kV/ 2A
Temperature recorder	: JUMO LOGOSCREEN
Sensors	: Thermocouple type K
DC Resistance measurement	: OMICRON CPC 100, FLUKE
Measurements	: FLUKE

2.1.3 procedure of test

Clause 7.2.2 of IEC 61869-3(2011) shall be applied.

When there is more than one secondary winding, the test shall be made with the appropriate rated burden connected to each secondary winding, unless otherwise agreed between manufacturer and purchaser. The residual voltage winding shall be loaded in accordance with 6.4.1.
The voltage transformer shall be mounted in a manner representative of the mounting in service. However, because the position of the voltage transformer in each switchgear can be different, the manufacturer shall decide the configuration of the test arrangement.
All voltage transformers irrespective of voltage factor and time rating shall be tested at 1,2 times the rated primary voltage.
The temperature rise of windings shall, when practicable, be measured by the increase in resistance method, but for windings of very low resistance, thermocouples may be employed. The temperature rise of parts other than windings may be measured by thermometers or thermocouples. Instrument transformers shall be considered to have attained a steady-state temperature when the rate of temperature rise does not exceed 1 K/h.
Applied primary voltage: 14 kV
Burdens: 10 VA/ 10 VA/ 10 VA
Type of load : Resistive

2.1.4 Acceptance conditions of test

The temperature-rise of windings, magnetic circuits and any other parts of instrument transformers shall not exceed the appropriate value given in Table 5 of IEC 61869-1 (2007), when operating under the specified rated condition. The temperature rise of the windings is limited by the lowest class of insulation either of the winding itself or of the surrounding medium in which it is embedded.

2.1.5 Result of test

Table 1: Temperature rise by thermocouples

sensor	location of sensor	Final Temperature(°C)	Temperature rise (K)	Temperature rise limits(K)	RESULT
1	Body	29.9	2.5	-	OK
2	Body	32	5	-	OK
3	Terminal 1a	32.5	5.5	50	OK
4	Terminal 2a	33	6	50	OK
5	Terminal 3a	33	6	50	OK

Table 2: Temperature rise of windings by DC resistance measurement

Winding	R_1 = Cold resistance	R_2 = Hot resistance	T_2 = Final Temperature(°C)	Temperature rise (K)	Temperature rise limits(K)	RESULT
MV	5.34 kΩ	5.50 kΩ	35	8	60	OK
1a-1b	316.8 mΩ	337 mΩ	43	15	60	OK
2a-2b	358.2 mΩ	377 mΩ	41	13	60	OK
3a-3b	317.7 mΩ	335 mΩ	42	14	60	OK

T_1= 27 °C

$T_2= (R_2/R_1)(235+T_1)-235$

Test was done according to IEC 61869-3.

✓ **PASSED**

3. FIGURES:

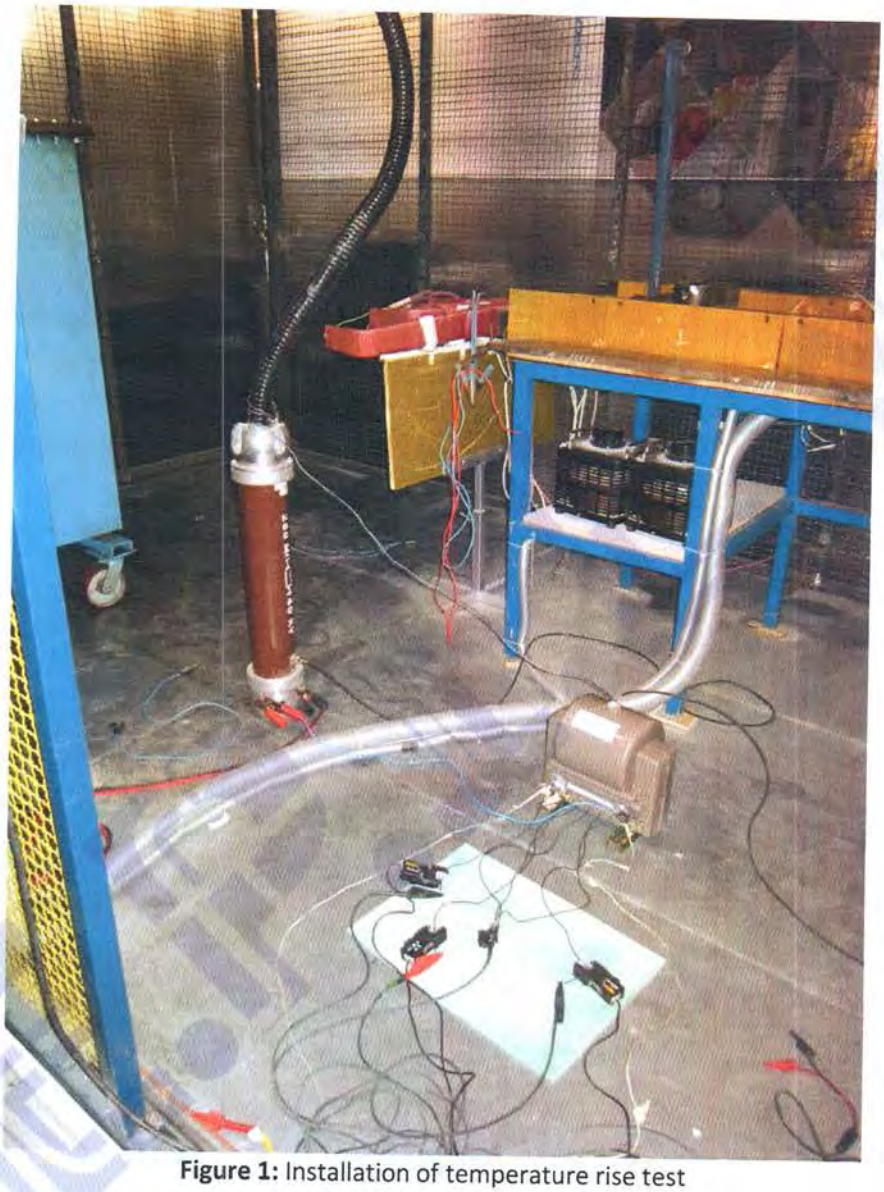

Figure 1: Installation of temperature rise test

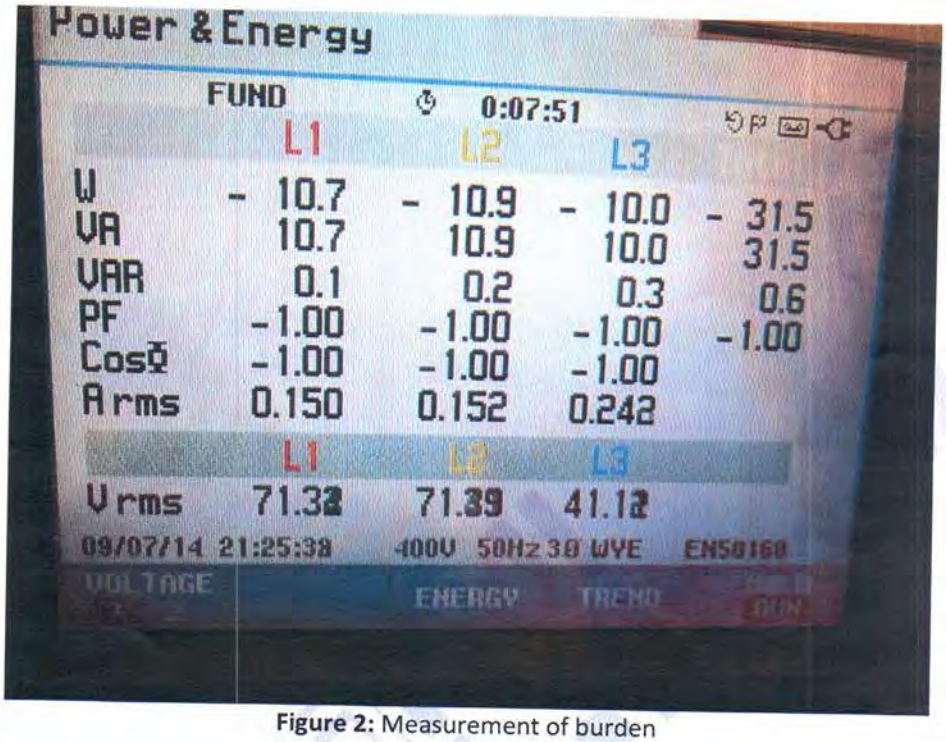

Figure 2: Measurement of burden

Figure 3: Front view of EUT

Figure 4: Measurement of DC resistance of windings

Figure 5: Marking

4. ANNEX

Table 5 – Limits of temperature rise for various parts, materials and dielectrics of instrument transformers

Part of instrument transformers	Temperature-rise limit K
1 Oil-immersed instrument transformers	
– top oil	50
– top oil, hermetically sealed	55
– winding average	60
– winding average, hermetically sealed	65
– other metallic parts in contact with oil	as for winding
2 Solid or gas insulated instrument transformers	
– winding (average) in contact with insulating materials of the following classes[a]:	
• Y	45
• A	60
• E	75
• B	85
• F	110
• H	135
– other metallic parts in contact with the above insulating material classes	as for windings
3 Connection, bolted or the equivalent	
– Bare-copper, bare-copper alloy or bare-aluminium alloy	
• in air	50
• in SF_6	75
• in oil	60
– Silver-coated or nickel-coated	
• in air	75
• in SF_6	75
• in oil	60
– Tin-coated	
• in air	65
• in SF_6	65
• in oil	60
[a] Insulating class definitions according to IEC 60085.	

Annex 1: Temperature rise limits