

# TEST REPORT

No 1271-2,2

Project No.:TI/0328-160831-1

Sample Test Report For Capacitor Banks (4\*25 kVAR)  
(Part 2)

Manufactured by **Parto Khazen Co.**

According to IEC 60831-1 and 2

Karaj, 04-09-2007

By order of **Moavenate Nezarat Bar Tozie Co. (T.R.E.C.)**,  
Tehran, Iran

No. of pages

13

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*This test report does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by E.P.I.L. is not the responsibility of E.P.I.L.*

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## 1. GENERAL INFORMATION

### 1.1 Product Information

Equipment under test	: Capacitor Bank (4*25 kVAR)
Rated voltage	: 400 V
Rated power	: 100 kVAR
Rated frequency	: 50 Hz
Normative document	: IEC 60831-1 & 2
Total of this part	: 214
Sampling method	: AQL

### 1.2 Client Information

Applicant	: Moavenate Nezarat Bar Tozie Co.
Manufacturer	: Parto Khazen Co. (PKC)
Contact person from applicant	: Mr. Sajadi, Mr. Samadi
Telephone	: +98 – 21 – 88882956-8
Fax	: +98 – 21 – 88882959
Address(office)	: At the corner of Sarv Alley, Shiraz Jonubi St., Mollasadra Ave., Tehran, Iran.

### 1.3 Manufacturer Information

Engineer of manufacture	: Mr. Joharzadeh
Telephone	: +9821 –88882956
Address(office)	: No.14, 2th Floor, First Alley, Gandhi St.,Tehran, Iran

### 1.4 Tests Performed

Measurment Of The Capacitance And Tangent Of The Loss Angle ( $\tan \delta$ )

Voltage Test Between Terminals

Voltage Test Between Terminals And Container

Lightning Impulse Test Between Terminals And Container

Sealing Test

Test Of Internal Discharge Device

Destruction Test

IP22

Parto Khazen:14/08/2007

E.P.I.L:15/08/2007

### 1.5 Results Of Tests

Passed

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## 2 PERFORMANCE AND RESULTS OF TESTS

### 2.1 Measurement Of The Capacitance And Tangent Of The Loss Angle ( $\tan \delta$ )

#### 2.1.1 Test data

Equipment under test (EUT)	: Capacitor Bank (4*25 kVAR), 400 V
Location	: P.K.C. and E.P.I.L.
Engineer of EPIL	: Mr. Dezfulian
Engineer of Manufacture	: Mr. Joharzadeh (in Parto Khazen)
Normative document	: IEC 60831-1 clause 7 & 8

#### 2.1.2 Ambient conditions

Ambient temperature	: 22.4 °C
Relative humidity	: 35 %
Atmospheric pressure	: 86.5 kPa

#### 2.1.3 Procedure of test

The test was done according to IEC 60831-1 clause 7 and 8, and with the calibrated RLC meter.

#### 2.1.4 Acceptance conditions of test

Test was conducted according to agreement between Parto Khazen Co. and T.R.E.C.  
To this agreement:

1.  $\tan \delta$  for  $f = 50\text{Hz}$  should not be more than  $5 \cdot 10^{-4}$  and for  $f = 1\text{kHz}$  should not be more than  $50 \cdot 10^{-4}$
2.  $250 \mu\text{F} - 5\% \leq \text{capacitance} \leq 250 \mu\text{F} + 10\%$ .

#### 2.1.5 Result of test

Number of tested samples in PKC:  
5 Capacitor banks (20 Capacitors)

Number of tested samples in EPIL:  
1 Capacitor banks (4 Capacitors)

The test was done according to IEC 60831-1 at two frequencies ( $f = 50\text{ Hz}$ ,  $f = 1\text{ kHz}$ ) and they passed the test.

**PASSED**

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## 2.2 Voltage Test Between Terminals

### 2.2.1 Test data

Equipment under test (EUT)	: Capacitor Bank (4*25 kVAR), 400 V
Location	: P.K.C. & E.P.I.L.
Engineer of EPIL	: Mr. Dezfulian
Engineer of Manufacture	: Mr. Joharzadeh (in Parto Khazen)
Normative document	: IEC 60831-1 clause 9

### 2.2.2 Ambient conditions

Ambient temperature	: 22.4 °C
Relative humidity	: 35 %
Atmospheric pressure	: 86.5 kPa

### 2.2.3 Procedure of test

According to IEC 831-1 The capacitors has been tested with  $2.15U_n$  for 2 s and the test was applied between two terminals short-circuited and third terminal.

### 2.2.4 Acceptance conditions of test

During the test , no permanent puncture or flashover shall occur.

### 2.2.5 Result of test

Number of tested samples in PKC:  
5 Capacitor banks (20 Capacitors)

Number of tested samples in EPIL:  
1 Capacitor banks (4 Capacitors)

The test was done according to IEC60831-1 and they passed the test.

✓ **PASSED**

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## 2.3 Voltage Test Between Terminals And Container

### 2.3.1 Test data

Equipment under test (EUT)	: Capacitor Bank (4*25 kVAR), 400 V
Location	: P.K.C. and E.P.I.L.
Engineer of EPIL	: Mr. Dezfulian
Engineer of Manufacture	: Mr. Joharzadeh (in Parto Khazen)
Normative document	: IEC 60831-1 clause 10

### 2.3.2 Ambient conditions

Ambient temperature	: 22.4 °C
Relative humidity	: 35 %
Atmospheric pressure	: 86.5 kPa

### 2.3.3 Procedure of test

3 kV AC voltage was applied between terminals jointed together and the container for 10 s.

### 2.3.4 Acceptance conditions of test

During the test, neither puncture nor flashover shall occur.

### 2.3.5 Result of test

Number of tested samples in PKC:  
5 Capacitor banks (20 Capacitors)

Number of tested samples in EPIL:  
1 Capacitor banks (4 Capacitors)

The test was done according to IEC 60831-1 and they passed the test.

✓ **PASSED**

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## 2.4 Lightning Impulse Test Between Terminals And Container

### 2.4.1 Test data

Equipment under test (EUT)	: Capacitor Bank (4*25 kVAR), 400 V
Location	: E.P.I.L.
Engineer of EPIL	: Mr. Dezfulian
Normative document	: IEC 60831-1 clause 15

### 2.4.2 Ambient conditions

Ambient temperature	: 22.4 °C
Relative humidity	: 35 %
Atmospheric pressure	: 86.5 kPa

### 2.4.3 Procedure of test

Three impulses(1.2/50  $\mu$ s) of positive polarity followed by three impulses of negative polarity was applied between terminals jointed together and the container.

Wave shape : 1.2/50  $\mu$ s

Peak value :15 kV

### 2.4.4 Acceptance conditions of test

During the test, no disruptive discharge shall occur.

### 2.4.5 Result of test

This test was done only in EPIL

The test was done according to IEC 60831-1 clause 15 and it passed the test.

✓ **PASSED**

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## 2.5 Sealing Test

### 2.5.3 Test data

Equipment under test (EUT) : Capacitor Bank (4\*25 kVAR), 400 V  
Location : P.K.C. and E.P.I.L.  
Engineer of EPIL : Mr. Dezfulian  
Engineer of Manufacture : Mr. Joharzadeh (in Parto Khazen)  
Normative document : IEC 60831-1 clause 12

### 2.5.2 Ambient conditions

Ambient temperature : 22.4 °C  
Relative humidity : 35 %  
Atmospheric pressure : 86.5 kPa

### 2.5.3 Procedure of test

The test was done according to IEC60831-1 clause 12

### 2.5.4 Acceptance conditions of test

No leakage shall occur.

### 2.5.5 Result of test

Number of tested samples in PKC:  
5 Capacitor banks (20 Capacitors)

Number of tested samples in EPIL:  
1 Capacitor banks (4 Capacitors)

After inspection no leakage detected and they passed the test.

✓ **PASSED**

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## 2.6 Test Of Internal Discharge Device.

### 2.6.1 Test data

Equipment under test (EUT) : Capacitor Bank (4\*25 kVAR), 400 V  
Location : P.K.C. and E.P.I.L.  
Engineer of EPIL : Mr. Dezfulian  
Engineer of Manufacture : Mr. Joharzadeh (in Parto Khazen)  
Normative document : IEC 60831-1 clause 11

### 2.6.2 Ambient conditions

Ambient temperature : 22.4 °C  
Relative humidity : 35 %  
Atmospheric pressure : 88.15 kPa

### 2.6.3 Procedure of test

The test was done according to IEC60831-1 clause 11.

### 2.6.4 Acceptance conditions of test

The discharge resistor shall be comply with the limitation express by formula that indicated in B.4.3 of IEC 60831-1.

### 2.6.5 Result of test

Number of tested samples in PKC:  
5 Capacitor banks (20 Capacitors)

Number of tested samples in EPIL:  
1 Capacitor banks (4 Capacitors)

The test was done according to IEC 60831-1 and average value of the internal discharge devices (resistors) for each phase was 180 kΩ.

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## 2.7 Destruction Test

### 2.7.1 Test data

Equipment under test (EUT) : Capacitor Bank (4\*25 kVAR), 400 V  
Location : E.P.I.L.  
Engineer of EPIL : Mr. Dezfulian  
Normative document : IEC 60831-1 clause 19

### 2.7.2 Ambient conditions

Ambient temperature : 22.4 °C  
Relative humidity : 35 %  
Atmospheric pressure : 86.5 kPa

### 2.7.3 Procedure of test

The test was done according to IEC60831-1 clause 19.

### 2.7.4 Acceptance conditions of test

The enclosure of capacitor shall be intact except that normal operation of a vent, or minor damage is permitted provided the following conditions are met:

- a) Escaping liquid may wet the outer surface but shall not fall in drops.
- b) The container of the capacitor may be deformed and damaged but not broken.
- c) Flames and/or fiery particles shall not be emitted from the openings.  
This may be checked by enclosing the capacitor in gauze (cheesecloth). Burning or scorching of the gauze is then considered to be a criterion of failure.
- d) The result of a dielectric test between terminals and container with 1500 v for 10 s shall be satisfactory.

### 2.7.5 Result of test

The test was done according to IEC 60831-1 clause 19 and it passed the test

✓ **PASSED**

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## 2.8 IP2X , Test For Protection Against Solid Foreign

### 2.8.1 Test data

Equipment under test (EUT) : Capacitor Bank (4\*25 kVAR), 400 V  
Location : E.P.I.L.  
Engineer of EPIL : Mr. Dezfulian  
Normative document : IEC 60529

### 2.8.2 Ambient conditions in E.P.I.L

Ambient temperature : 25.4 °C  
Relative humidity : 35 %  
Atmospheric pressure : 86.5 kPa

### 2.8.3 Instrument used for the test

Rigid sphere : 12.5<sup>+0.2</sup> mm diameter

### 2.8.4 procedure of test

The object probe is pushed against any openings of the enclosure with the force 1±10% N

### 2.8.5 Acceptance conditions of test

The protection is satisfactory if diameter of the probe does not pass through any opening.

### 2.8.6 Result of test

This test was done on one capacitor, because this is a type test.  
After the test the specimen was compliance with IEC 60529 and it passed the test

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## 2.9 IPX2, Test For Protection Against Water

### 2.9.1 Test data

Equipment under test (EUT) : Capacitor Bank (4\*25 kVAR), 400 V  
Location : E.P.I.L  
Engineer of EPIL : Mr.Dezfulian  
Normative document : IEC 60529

### 2.9.2 Ambient conditions in E.P.I.L

Ambient temperature : 25.4 °C  
Relative humidity : 35 %  
Atmospheric pressure : 86.5 kPa

### 2.9.3 Instrument used for the test

Drip box

### 2.9.4 Procedure of test

The test made by a device which produces a uniform flow of water drops over the whole area of the enclosure.

The enclosure is tested for 2.5 min in each of four fixed positions of tilt.  
These positions are 15° on either side of the vertical in two mutually perpendicular planes.  
The total duration of the test is 10 min.

### 2.9.5 Acceptance conditions of test

After testing, the EUT shall be inspected for ingress of water according to conditions which is specified in clause 14.3 of IEC 60529.

### 2.9.6 Result of test

This test was done on one capacitor because this is a type test.  
The test was done according to IEC60529 and it passed the test.

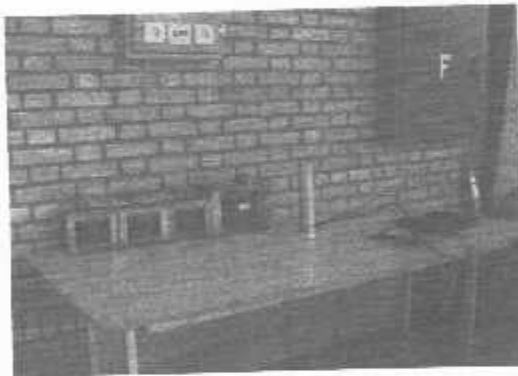
✓ **PASSED**

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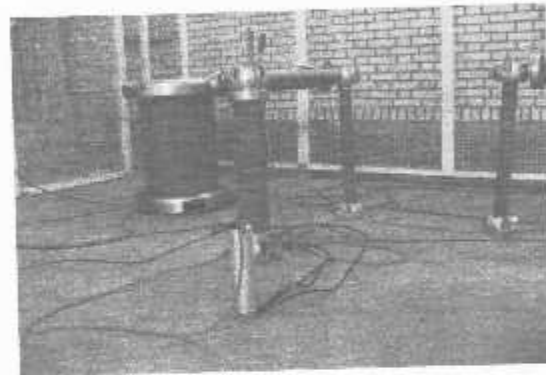
**Figures:**



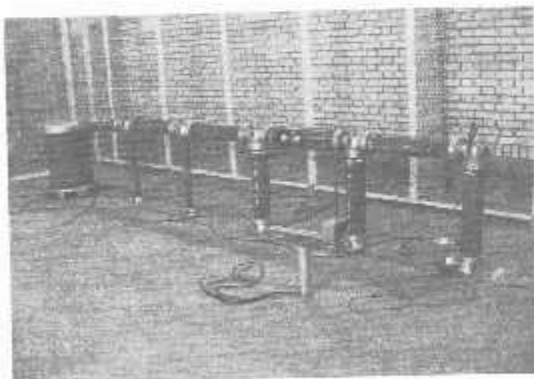
**Figure 1:** Measurement of the  $\tan \delta$



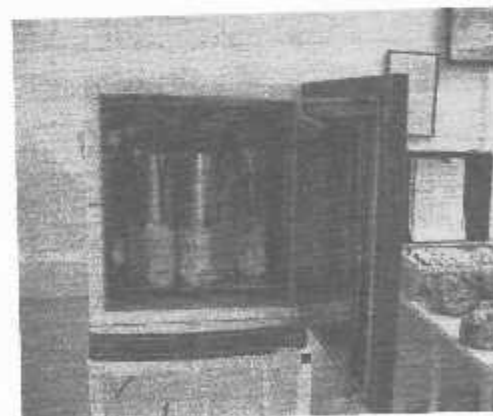
**Figure 2:** Voltage test between terminals



**Figure 3:** Voltage test between terminals and container



**Figure 4:** Lightning impulse test



**Figure 5:** Sealing test

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