

Test report: H13-70001

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LQF-708-02
Review No:06

EPIL TEST REPORT

Project No.: H13-70001

Equipment under Test: MV Capacitor

Model	: PK 400/11.56 EDRI
Serial Number	: PK-T-t-11.56-1
Rated Voltage	: 11.56 kV
Rated Output	: 400 kVAR
Rated Capacitance	: 9.53 μ F
Rated Frequency	: 50 Hz
Rated Current	: 34.61 A
Insulation Level	: 28/95 kV
Temperature Category	: -40/55°C

Manufactured by: Parto khazen Co.

Applicant: Parto khazen Co.



Trade Mark:

Tested According to: IEC 60871-1:2014, Client Request

Testing Date: 26-May-2021 Issue Date: 08-June-2021

Test Result: See pages 5 to 10

No. of Pages: 17

Prepared and Tested by: Test Engineer
E. Ranjbar

Verified by: Technical Manager
H. Jahangir

Chief Executive Officer
S. M. Mirsadri

Approved:

Engineering Deputy of
Test and Inspection
Prof. B. Vahidi

EPIL
Technical Department
ISO IEC 17025
Accredited Lab

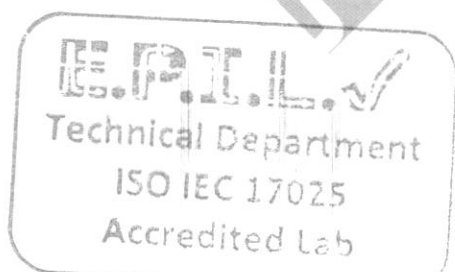
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1. GENERAL INFORMATION

1.1. Product Information

Equipment Under Test	: MV Capacitor
Manufacturer	: Parto khazen Co.
Model	: PK 400/11.56 EDRI.
Serial Number	: PK-T-t-11.56-1
Rated Voltage	: 11.56 kV
Rated Output	: 400 kVAR
Rated Capacitance	: 9.53 μ F
Rated Frequency	: 50 Hz
Insulation Level	: 28/95 kV
Temperature Category	: -40/55°C
Normative document	: IEC 60871-1:2014, Client Request

1.2. Client Information

Applicant	: Parto khazen Co.
Telephone	: +98-21-88882956
Fax	: +98-21-88882959



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1.3. Tests Performed

Test	Test According to	Result
Capacitance Measurement	Client request	Passed
Measurement of the Tangent of the Loss Angle ($\tan \delta$) of the Capacitor	Client request	Performed
Voltage Test between Terminals	IEC 60871-1	Passed
AC Voltage Test between Terminals and Container (Routine Test)	IEC 60871-1	Passed
Sealing Test	IEC 60871-1	Passed
AC Voltage Test between Terminals and Container (Type Test)*	IEC 60871-1	Passed

* The test is performed only in dry condition. It is responsibility of the manufacturer to supply a separate type test report showing that the bushing will withstand the wet test voltage for 1 min.

1.4. Test Results and Descriptions:

See pages 5 to 10.



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2. PERFORMANCE and RESULTS of TESTS

2.1 Capacitance Measurement

2.1.1 Test data

Equipment Under Test (EUT)	: MV Capacitor
Manufacturer	: Parto khazen Co.
Location	: Parto khazen Co.
Date	: 26-May-2021
Test Expert	: Mr. Ranjbar
Normative Document	: IEC 60871-1:2014, Client Request

2.1.2 Ambient conditions

Ambient Temperature	: 23 °C
Relative Humidity	: 29.7 %

2.1.3 Performance of test

The capacitance is measured according to client request using a LCR meter e.g. at a low voltage.

2.1.4 Acceptance conditions of test


The capacitance shall not differ from the rated capacitance by more than -5 % to + 10 %.

2.1.5 Result of test

Table 1. Result of EUT capacitance measurement

Measured capacitance(μ F)	Rated Capacitance(μ F)	Tolerance %
9.47	9.53	0.63

✓ Passed


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2.2 Measurement of the Tangent of the Loss Angle ($\tan \delta$) of the Capacitor

2.2.1 Test data

Equipment Under Test (EUT)	: MV Capacitor
Manufacturer	: Parto khazen Co.
Location	: Parto khazen Co.
Date	: 26-May-2021
Test Expert	: Mr. Ranjbar
Normative Document	: Client Request

2.2.2 Ambient conditions

Ambient Temperature	: 23 °C
Relative Humidity	: 29.7 %

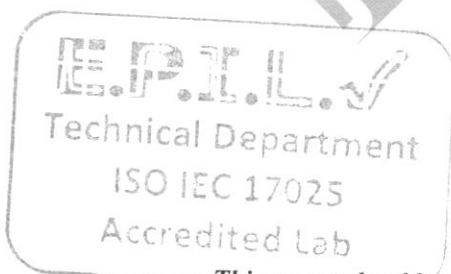
2.2.3 Performance of test

The tangent of the loss angle is measured according to client request using a LCR meter e.g. at a low voltage. The requirements regarding capacitor losses shall be agreed upon between manufacturer and purchaser.

2.2.4 Result of Test

Measured tangent of the loss angle ($\tan \delta$): 6.1×10^{-4}

✓ Performed



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2.3 Voltage Test between Terminals

2.3.1 Test data

Equipment Under Test (EUT)	: MV Capacitor
Manufacturer	: Parto khazen Co.
Location	: Parto khazen Co.
Date	: 26-May-2021
Test Expert	: Mr. Ranjbar
Normative Document	: IEC 60871-1:2014

2.3.2 Ambient conditions

Ambient Temperature	: 23 °C
Relative Humidity	: 29.7 %

2.3.3 Performance of test

The test has been performed according to clause 9 of IEC 60871-1 by applying DC voltage between terminals with a duration of 10 s.

2.3.4 Acceptance conditions of test

During the test, neither puncture nor flashover shall occur.

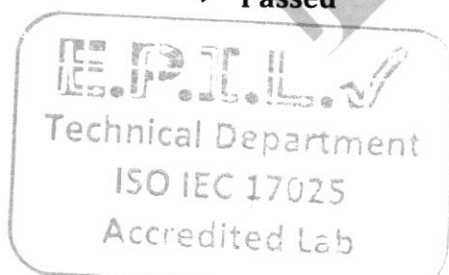
2.3.5 Result of Test

Table 2 shows the results of the test.

Table 2. Result of voltage test between terminals

Applied voltage (kV)	Duration (s)	Result of test
46.5	10	passed

✓ Passed



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2.4 AC Voltage Test between Terminals and Container (Routine Test)

2.4.1 Test data

Equipment Under Test (EUT)	: MV Capacitor
Manufacturer	: Parto khazen Co.
Location	: Parto khazen Co.
Date	: 26-May-2021
Test Expert	: Mr. Ranjbar
Normative Document	: IEC 60871-1:2014, Client Request

2.4.2 Ambient conditions

Ambient Temperature	: 23 °C
Relative Humidity	: 29.7 %

2.4.3 Performance of test

The EUT (with two terminals insulated from the container) is subjected to a test voltage according to clause 18.1 of IEC 60871-1 between the terminals (joined together) and the container for a duration of 10 s. also, according to client request a

2.4.4 Acceptance conditions of test

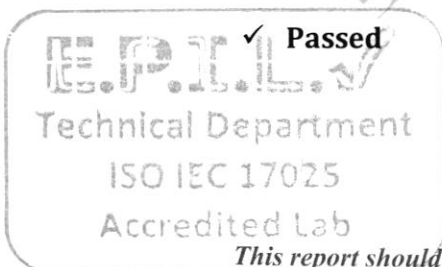
During the test, neither puncture nor flashover shall occur.

2.4.5 Result of Test

Table 3. Result of AC voltage test between terminals and container (routine test)

Applied voltage (kV)	Duration (s)	Result of test
28	10	passed
50*	10*	Passed*

* The test at higher voltage (50 kV) rather than the standard test value (28 kV) is performed according to client request.



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2.5 Sealing Test

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2.5.1 Test data

Equipment Under Test (EUT) : MV Capacitor
Manufacturer : Parto khazen Co.
Location : Parto khazen Co.
Date : 26-May-2021
Test Expert : Mr. Ranjbar
Normative Document : IEC 60871-1:2014

2.5.2 Ambient conditions

Ambient Temperature : 23 °C
Relative Humidity : 29.7 %

2.5.3 Performance of test

The test has been performed according to clause 12 of IEC 60871-1. Unenergized capacitor is heated for 2 hours while all parts of the EUT reach a temperature of 75 °C.

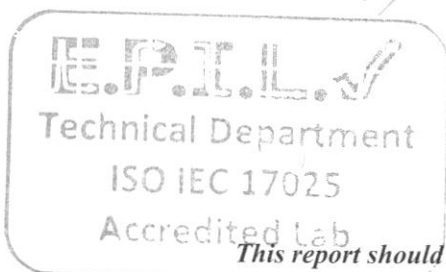
2.5.4 Acceptance conditions of test

No leakage shall occur during the test.

2.5.5 Result of Test

The EUT was tested according to IEC 60871-1 and it passed the test.

✓ **Passed**



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2.6 AC Voltage Test between Terminals and Container (Type Test)

2.6.1 Test data

Equipment Under Test (EUT)	: MV Capacitor
Manufacturer	: Parto khazen Co.
Location	: Parto khazen Co.
Date	: 26-May-2021
Test Expert	: Mr. Ranjbar
Normative Document	: IEC 60871-1:2014

2.6.2 Ambient conditions

Ambient Temperature	: 23 °C
Relative Humidity	: 29.7 %

2.6.3 Performance of test

The EUT (with two terminals insulated from the container) is subjected to a test voltage according to clause 18.1 of IEC 60871-1 between the terminals (joined together) and the container for a duration of 60 s.

2.6.4 Acceptance conditions of test

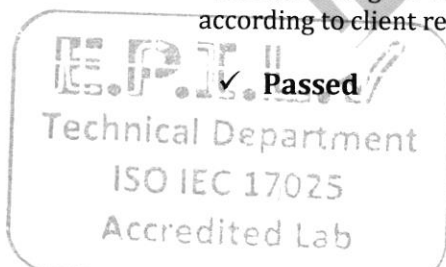
During the test, neither puncture nor flashover shall occur.

2.6.5 Result of Test

Table 4. Result of AC voltage test between terminals and container (type test)

Applied voltage (kV)	Duration (s)	Result of test
28	60	passed
50*	60*	Passed*

* The test at higher voltage (50 kV) rather than the standard test value (28 kV) is performed according to client request.



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3. FIGURES

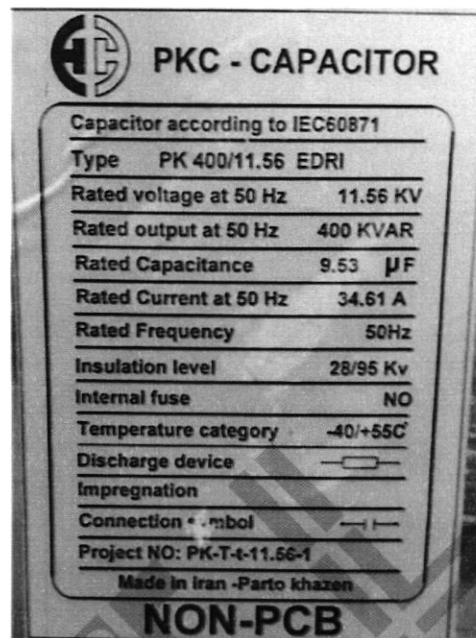


Figure 1: Nameplate of equipment under test

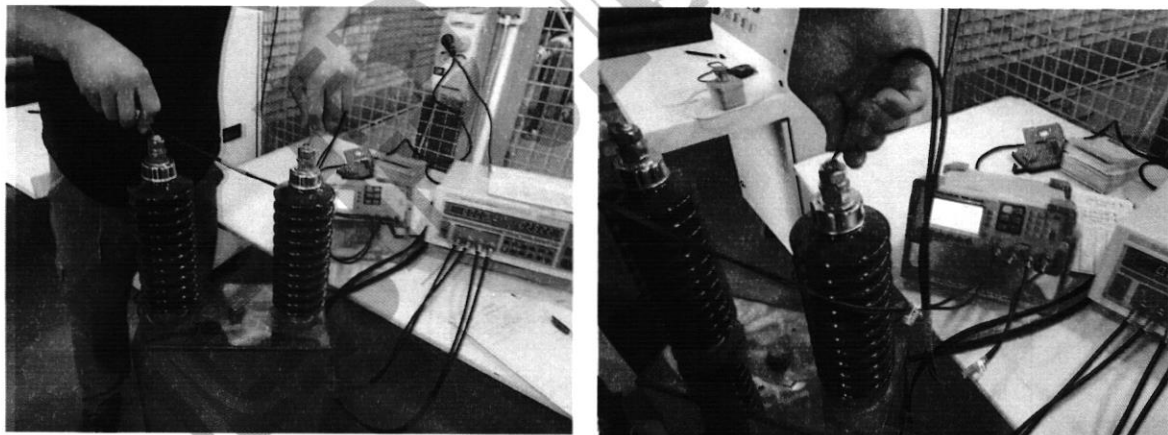


Figure 2: Measurement of capacitance and $\tan \delta$ at ambient temperature

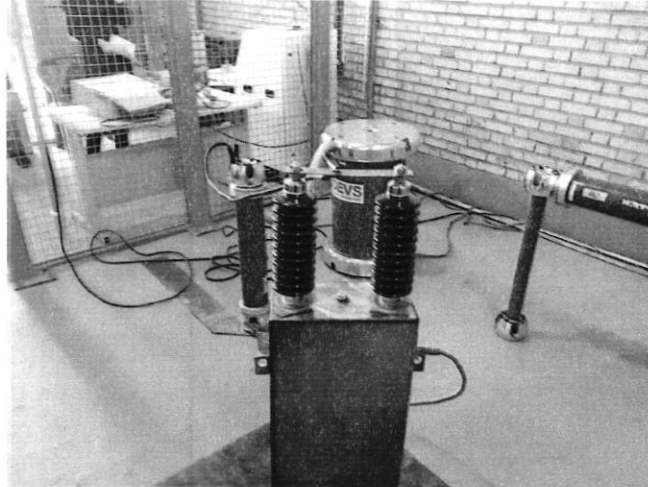


Figure 3: AC voltage test between terminals and container



Figure 4: Voltage test between terminals

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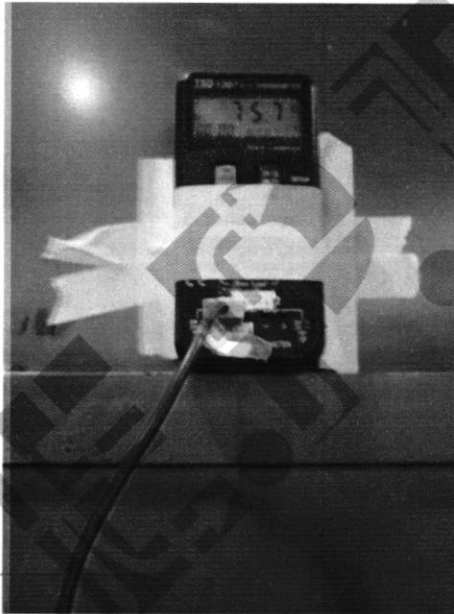
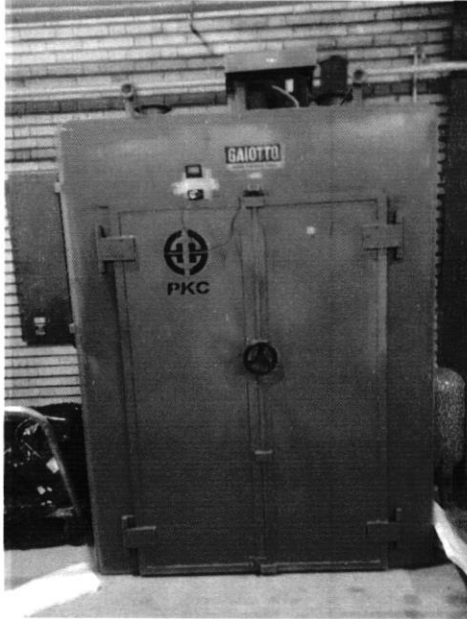


Figure 5: Sealing test

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Energy & Power Industries Laboratories Co.(J.S.)

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4. ANNEX1: Calibration Certificate of the Testing Equipment

شرکت دانش بنیان
مهندسی سنجش کوشا
FLIGHT & ISO/IEC 17025 STANDARDS ACCREDITED LABS
Calibration & measurement Certificate / test report

Certificate No :	9900560-03	شماره گواهی :
Customer Name :	شرکت پرتو خاثرن	نام مشتری :
Equipment / Tools :	DIGITAL LCR METER	نام دستگاه :
Model :	GPS-3131B	مدل :
SerialNo:	3131B1508541	سریال :
Code :	R40	کد :
Manufacture :	GPS	سازنده :
Receipt Date :	1399/04/08	تاریخ پذیرش :
Calibration Date :	1399/04/30	تاریخ کالیبراسیون :
Issue Date :	1399/04/30	تاریخ صدور :
Due Date :		تاریخ انقضاء :

Traceability : The reference standards are traceably calibrated at an accredited calibration laboratory or a national metrology institute.

Ambient Condition : Temperature : (23±2)°C Humidity : (40±15)%

Method(s) : IDS331

Reference(s) :
 1- Standard Resistor Model SR1010 / 10 KOHM (C/N:9702173-07)
 2- Standard Resistor Model SR1010/ 100 KOHM (C/N:9702173-08)
 3-Precision Decade Capacitor Model 1413 (C/N:9702190-10)
 4- Decade Inductor Model 1491-G (C/N:9802146-01)
 5- Digital Multimeter Model 34401A (C/N:CEL/017/0025/01)

Uncertainty : The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor (k=2), providing a level of confidence of approximately 95%

Remarks :
 1- The test report or calibration certificate shall not be reproduced except in full, without written approval of the SKE laboratory.
 2- This certificate without the SKE laboratory stamp is not valid.

Accomplished by : 111
Approved by : محمد حسینی جمادی نیا
LAB.Stamp:

9900560-03
 تهران، خیابان آزادی، بعد از دانشگاه صنعتی شریف، روبروی بلوار استاد معین، بلوار شهید اکبری، کوی عباس شرقی، پلاک 9
 Tel:(+9821)66062854-5 Fax: (+9821)66017336 Email: info@sanjeshkoozha.ir Web: www.sanjeshkoozha.ir

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شرکت دانش بنیان
مهندسی سنجش کوشا
FLIGHT & ISO/IEC 17025 STANDARDS ACCREDITED LABS
Calibration & measurement Certificate / test report



REQUESTED PARAMETER AND RANGE

PARAMETER	REF. SETTING	UUT. READING	ERROR	EXP. UNC. (±)	
RESISTANCE TEST:					
@ 1 kHz	39.000 kΩ	39.00 kΩ	0.00 kΩ	0.0060 kΩ	
	47.000	47.00	0.00	0.0060 kΩ	
	56.000	56.00	0.00	0.0060 kΩ	
	68.000	68.00	0.00	0.0060 kΩ	
	82.000	82.00	0.00	0.0060 kΩ	
	120.000	119.86	- 0.14	0.0062 kΩ	
	150.000	149.84	- 0.16	0.0066 kΩ	
	220.000	219.48	- 0.52	0.0067 kΩ	
	270.000	269.58	- 0.42	0.0071 kΩ	
	330.000	327.50	- 2.50	0.0077 kΩ	
@ 120 Hz	470.00	469.7	- 0.3	0.060 kΩ	
	680.00	679.3	- 0.7	0.060 kΩ	
	1.0000 MΩ	998.4	- 1.6	0.060 kΩ	
	CAPACITANCE TEST:				
	@ 120 Hz	1.00000 μF	1.0003 μF	+0.0003 μF	0.0068 μF
		9.0726	9.075	+0.0024	0.073 μF
		120.750	120.42	- 0.330	0.91 μF
		1025.60	1026.5	+0.90	8.00 μF
	INDUCTANCE TEST:				
	@ 120 Hz	100.00 μH	100.8 μH	+0.8 μH	0.117 μH
1.3000 mH		1.2905 mH	- 0.0095 mH	0.0013 mH	
5.1000		5.104	+0.004	0.0051 mH	
6.6000		6.637	+0.037	0.0067 mH	
8.0000		7.999	- 0.001	0.0080 mH	
65.100		65.02	- 0.08	0.0653 mH	
FREQUENCY TEST:					
PARAMETER	UUT. VALUE	REF. READING	ERROR	EXP. UNC. (±)	
	100 Hz	100.01 Hz	- 0.01 Hz	0.60 Hz	
	120	120.02	- 0.02	0.60 Hz	
	1 kHz	1.000 kHz	0.000 kHz	0.60 kHz	
AC LEVEL TEST:	10	10.00	0.00	0.60 kHz	
	0.3 VAC	0.322 VAC	- 0.022 VAC	0.060 V	
	1.0	1.06	- 0.06	0.060 V	

توضیح: به درخواست مشتری پارامترها و نقاط ذکر شده کالیبره گردید.

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9900560-03

Abbreviations:

UUT : Unit Under Test

REF. : Reference

TOL. : Tolerance

EXP. UNC. : Expanded Uncertainty

Form No. SOP70002

Rev No 00

Rev Date Nov 2019


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FRG/702/11: شماره شناسی: 

REPORT NUMBER: ۲۴۸۰۰ د شماره سریال گواهی: **گواهی کالیبراسیون**
CERTIFICATE OF CALIBRATION

ISSUED BY LAKSAR CO REFERENCE STANDARD LABORATORY صادره از آزمایشگاه استاندارد مرجع شرکت لاکسر

شرکت لاکسر
LAKSAR CO
صفحه ۲ از ۲
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DATE OF CALIBRATION: 1399/04/16 تاریخ انجام کالیبراسیون:
DATE OF ISSUE: 1399/04/17 تاریخ صدور گواهی:
RE-CAL DATE: پیشنهادی
SUGGESTED CLIENT: درخواست مشتری

Uncertainty:
As reported in clause 6. The expanded uncertainty of measurement in this calibration from components of uncertainty of the reference standards is reported on "Uncertainty of Actual Reading" column. The expanded uncertainty of measurement in this calibration for report "Error" from components of reference standards, under calibration instrument and random effects during calibration is reported on "Uncertainty of Result" column. (Based on EA/04-02)

Results:
Calibration Range: 50 to 100 Degrees Celsius
Measuring Unit: Degrees Celsius

Actual Value (Reference)	UUC Reading Degrees Celsius	Error	Uncertainty of Result	Uncertainty of Actual Reading
50.025	50.1	0.075	+/-0.08	+/-0.02
60.062	60.1	0.038	+/-0.08	+/-0.02
70.023	70.1	0.077	+/-0.08	+/-0.02
80.014	80.1	0.086	+/-0.08	+/-0.02
100.027	100.2	0.173	+/-0.08	+/-0.02


First temp before cal		First temp after cal	
Act (°C)	UUC (°C)	Act (°C)	UUC (°C)
50.025	50.1	50.038	50.1


Standards Used


Manufacturer	Model	Description	Serial Number
Pico Technology Ltd.	PT10401	Reference Platinum Resistance Thermometer Data Acquisition	AMY45019
England	N/A	Working Reference Pt 100	PT 101
England	N/A	Working Reference Pt 100	PT 102
Hart Scientific, Inc.	7103	Micro Bath	A25378
MLW	UH16	Bath, Calibration	8069

Note(s):
Input Channel: T1
Earthed Junction
Immersion of under calibration thermocouple: 14 cm

Calibration Date: 07/06/2020
Date format is "mm/dd/yyyy" in Gregorian Calendar.


مركز ملی تأیید صلاحیت ایران
Reg. No: NACI 792
ISO / IEC 17025


برنامه کالیبراسیون
گواهی کالیبراسیون



1- این مدرک یک گواهی کالیبراسیون است.
2- استفاده کننده باید در فاصله زمانی معین نسبت به کالیبراسیون مجدد اقدام نماید.
3- هرگونه نسخه برداری از این گواهی باید بطور کامل و از تمامی صفحات باشد.
4- این گواهی بدون مهر مخصوص و هولوگرام آزمایشگاه صادر کننده فاقد اعتبار است.
5- عدم تطبیق دستور شماره گواهی با مدرک مرجع EA-402 مربوط به سازمان همکاری اروپا برای تأیید صلاحیت نماینده شده که با در نظر گرفتن هر چه پیشتر در بند 4.2 برای توزیع ژانرل با سطح اطمینان 95٪ شده باشد.

1- This document is a certificate of calibration and it is not a certificate of conformity.
2- The user must act in order to recalibrate during a specified period of time.
3- This certificate shall not be published or reproduced other than in full.
4- This certificate is not valid without special stamp & hologram of issuer laboratory.
5- The expanded uncertainty of measurement is estimated for accreditation in accordance with the reference document EA-402 related to European co-operation organization, with attention to coverage factor K=2 for normal distribution, providing a level of confidence of approximately 95%.

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شماره شناسی: FRG/702/11



شماره سریال گواهی: ۲۳۸۸۰ د

گواهی کالیبراسیون
CERTIFICATE OF CALIBRATION

ISSUED BY LAKSAR CO REFERENCE STANDARD LABORATORY صادره از آزمایشگاه استاندارد مرجع شرکت لکسر

شرکت لکسر
LAKSAR CO
صفحه ۲ از ۲
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DATE OF CALIBRATION: 1399/04/16 تاریخ انجام کالیبراسیون
DATE OF ISSUE: 1399/04/17 تاریخ صدور گواهی
RE-CAL DATE: SUGGESTED CLIENT پیشنهادی
پیشنهادی

Issued for: شرکت پرتو خازن
Address: شهریار - شهرک صنعتی صفا دشت - هفتم شرقی
صادر جهت: آدرس:

Calibrated Instrument: (Digital Thermometer with Thermocouple Sensor)		ابزار کالیبره شده: (دماسنج دیجیتال ترموکوپلی)	
Manufacturer/S.N: TES/010607138	سازنده/شماره سریال ساخت	Description: Digital Thermometer, Res. 0.1 °C	مشخصات
Installation Location:	محل استقرار	Sensor's type: Type K Thermocouple	نوع حسگر
Model: 1307	مدل	Customer ID: R 50	شماره شناسایی مشتری/انبار

گزارش کالیبراسیون

- 1- Calibration Conditions:**
 - Ambient temperature: 23±2 Degree C دمای محیط
 - Ambient Humidity: Less than 55%RH رطوبت محیط
- 2-Calibration procedure:**

The procedure is based on guideline EURAMET Cg-8. The calibration is done by comparison method, reference sensors & equipment(s) which according to International Temperature Scale (ITS 90) are traceable to International references as stated in next item. All the reported results after Steady state conditions have been reached & actual values obtained from the average of two reference thermometers.

بر اساس راهنمای بین المللی EURAMET Cg-8 به روش تطبیق ای - با استفاده از حسگرها و تجهیزات (ای) مرجع که براساس مقیاس بین المللی دما (ITS 90) قابل ردیابی به مراجع بین المللی ذکر شده در بند زیر می باشد. نتایج حاصل از گزارش شده بعد از سرایت پایداری و مقادیر واقعی از میانگین دو حسگر مرجع به دست آمده است.
- 3- Traceability:**

This is to certify that the instrument has been examined and calibrated by Laksar calibration laboratory using accurately controlled temperature equipment(s).

این مدرک برای تصدیق این است که ابزار بوسیله تجهیزات (ای) تحت کنترل آزمایشگاه کالیبراسیون لکسر مورد کالیبراسیون قرار گرفته است.

All references are calibrated by calibration standards SIN 5536878 0006 which are traceable to NPL references by TEMPSENS CALIBRATION CENTER Laboratory

کلیه مراجع مورد استفاده توسط استاندارد ملی شماره سریال SPFFAY و ۰۰۰۶ TEMPSENS CALIBRATION CENTER به مراجع NPL قابل ردیابی هستند.
- 4-Vocabulary :**
 - Actual value: مقدار واقعی، دمای خوانده شده از روی نمایشگر مرجع
 - UUC Reading: مقدار خوانده شده، دمای خوانده شده از روی نمایشگر ابزار مورد کالیبراسیون

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۱- این مدرک یک گواهی کالیبراسیون است و گواهی اطلاق نیست.
 ۲- استفاده کننده باید در فاصله زمانی معین نسبت به کالیبراسیون مجدد اقدام نماید.
 ۳- هرگونه برداری از این گواهی باید بطور کاملی و از تمامی مشخصات باشد.
 ۴- این گواهی بدون مهر مخصوص و هولوگرام آزمایشگاه صادر کننده اعتبار است.
 ۵- عدم قطعیت متوسط اندازه گیری مطابق با مدرک مرجع EA-402 مربوط به سازمان همکاری اروپا برای تأیید صلاحیت صادره شده که با در نظر گرفتن ضریب پوشش 95٪ برای توزیع نرمال با سطح اطمینان 95٪ می باشد.

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 Not Valid Without Lab Stamp.