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Document # 730004135

Version # 03

Installation Qualification Protocol

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WORK INSTRUCTION

Test Script #	IQ-02	IQ Test Name:	Site Verification
Equipment #	TE82817-2	Equipment Name:	PCM II Final Test Station
Installation Site: Waters Singapore Contract Manufacturing, CEI Singapore			
Purpose: To verify the location in which the test equipment is to be installed is suitable for use.			
Test Execution: - List additional applicable parameters in the Parameters column. Rows may be added as needed. - Using the applicable equipment documentation, define the specification(s) in the Acceptance Criteria column. - Verify and/or measure the applicable parameters and complete the Table below. Do not delete any of the listed defined parameters. Enter N/A for any parameter or cell that is not used or applicable. The reason for why the parameter is not used or applicable shall be explained within the corresponding Installation Qualification Report.			
Objective Evidence: - Completed IQ-02 Test Script Data Sheet - Photo(s) of the work area, as applicable - The source of each Acceptance Criterion shall be referenced in the IQR if stored in SAP. If not in SAP objective evidence specifying the Acceptance Criterion shall be provided in or as an attachment to the IQR. - Copies of calibration certificates for measurement tools, if applicable			
Parameters	Acceptance Criteria	As Found	Pass/Fail
Ambient Temperature	0 °C to 40 °C	23-30	Pass
Relative Humidity	20 % to 80 %, Non-Condensing	50-100	Pass
Electrical Supply	100 VAC to 240 VAC, 50 Hz/60 Hz ±5%	239 VAC / 60 Hz	Pass
Electrical Outlets	Minimum of 4 dedicated outlets	10	Pass
Network Available	Minimum of 1 dedicated network	2	Pass
Workspace	The system has sufficient room for the test station, UUT and service		Pass
Test Station Bench	The Test Station Bench is large and strong enough to support the station		Pass
Comments: - Ambient temperature/humidity measured using a Temperature/Humidity Meter - Electrical supply measured using a Multimeter Note: If the electrical supply range or tolerance is not specified for voltage and/or frequency, a tolerance of ±5% may be used in accordance with ANSI C84.1 – Voltage Tolerance Standard.			
Overall Test Conclusion		Document No.: _____ Iteration No.: _____ Attachment: _____ Page: _____ of _____	
☒ Pass ☐ Fail			

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Template 730000483 V08

Test Script #	IQ-02	IQ Test Name:	Site Verification
Equipment #	TE82818-2	Equipment Name:	TCM II Final Test Station
Installation Site: Waters Singapore Contract Manufacturing, CEI Singapore			
Purpose: To verify the location in which the test equipment is to be installed is suitable for use. Test Execution: - List additional applicable parameters in the Parameters column. Rows may be added as needed. - Using the applicable equipment documentation, define the specification(s) in the Acceptance Criteria column. - Verify and/or measure the applicable parameters and complete the Table below. Do not delete any of the listed defined parameters. Enter N/A for any parameter or cell that is not used or applicable. The reason for why the parameter is not used or applicable shall be explained within the corresponding Installation Qualification Report. Objective Evidence: - Completed IQ-02 Test Script Data Sheet - Photo(s) of the work area, as applicable - The source of each Acceptance Criterion shall be referenced in the IQR if stored in SAP. If not in SAP objective evidence specifying the Acceptance Criterion shall be provided in or as an attachment to the IQR. - Copies of calibration certificates for measurement tools, if applicable			
Parameters	Acceptance Criteria	As Found	Pass/Fail
Ambient Temperature	0 °C to 40 °C	23-30 °C	Pass
Relative Humidity	20 % to 80 %, Non-Condensing	50-100 %	Pass
Electrical Supply	100 VAC to 240 VAC, 50 Hz/60 Hz ±5%	239VAC / 60Hz	Pass
Electrical Outlets	Minimum of 4 dedicated outlets	10	Pass
Network Available	Minimum of 1 dedicated network	2	Pass
Workspace	The system has sufficient room for the test station, UUT and service		Pass
Test Station Bench	The Test Station Bench is large and strong enough to support the station		Pass
Comments: - Ambient temperature/humidity measured using a Temperature/Humidity Meter - Electrical supply measured using a Multimeter Note: If the electrical supply range or tolerance is not specified for voltage and/or frequency, a tolerance of ±5% may be used in accordance with ANSI C84.1 – Voltage Tolerance Standard.			
Overall Test Conclusion		Document No.: _____	
☒ Pass ☐ Fail		Iteration No.: _____ Attachment: _____ Page: ____ of ____	

CEI-FRM-MFG-10-R01
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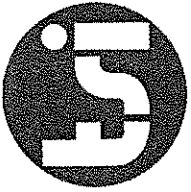
S/N	Location	Tooling/Equipment	Serial number	Frequency	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	WA FINAL TEST	ASO TESTING STATION	TE82865-2	Quarterly			✓			✓			✓			✓
2	WA FINAL TEST	CPSO TESTING STATION	TE82865-5	Quarterly			✓			✓			✓			✓
3	WA FINAL TEST	CPSO TESTING STATION	TE82865-6	Quarterly			✓			✓			✓			✓
4	WA FINAL TEST	PCM II TESTING STATION	TE82817 - 2	Quarterly											✓	
5	WA FINAL TEST	TCM II TESTING STATION	TE82818 - 2	Quarterly											✓	
N/A 13 Nov 2019																

Prepared by: Clement Leong 

Date: 12 Nov 2019

Approved by: Lai Mui Khin 

Date: 12 Nov 2019



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[Co Reg No: 199202282R | GST Reg No: M2-0106585-2]

CALIBRATION CERTIFICATE

Ref. No.

: CEI / 2335

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Customer

: CEI Limited

REVIEWED & APPROVED

Address

: 2 Ang Mo Kio Ave 12
Singapore 569707

Name / Dept : Leo Nai Kian / EQM

Signature / Date : [Signature] / 17 MAY 2019

Description

: Multimeter

Model

: 117

Co-ordinator : Neo Hui Hui

Manufacturer

: Fluke

Telephone : 6543 2855

Serial No.

: 37781258WS

Ext : 207

Date Calibrated

: 13 May 2019

Next Due Date

: 13 May 2020

Temperature : $(23 \pm 1) ^\circ\text{C}$

Location

: Metrology Room

Humidity : $(35 \sim 55) \% \text{rh}$

The above instrument has been tested in general accordance with its manufacturer's published specifications and Performance Test Procedure in Calibration Information, Sep 2006, Rev. 1, 10/08.

The measurement report attached to this certificate indicates all the test results obtained at the time of testing.

The intended use of the instrument shall be ascertained based on the end user's requirement.

Recalibration interval was determined based on end user's requirements.

As Found :

☒ In / ☐ Out Tolerance

As Left :

In Tolerance

Adjustment Done : ☐ Yes / ☒ No

The measurement standards are traceable to SI Units through National Metrology Centre (NMC), Singapore; National Institute of Standards and Technology (NIST), USA; National Physical Laboratory (NPL), UK or other recognised National Standard Laboratories.

The Laboratory's Quality System is in accordance with the Quality Standard ISO 9001:2015.

Conformance terms of "In Tolerance" and "Out of Tolerance" used in this certificate are determined by comparison of measured values against warranted specifications and do not take measurement uncertainties into account.

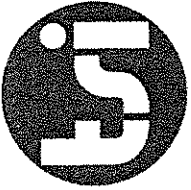
Test Performed By

[Signature]
Liu Yu Tian
Associate Engineer

Approved By

[Signature]
Lim Beng Soon
Senior Manager
13-May-2019

nsh



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MEASUREMENT REPORT

Date : 13 May 2019
Reference : CEI / 2335
Description : Multimeter
Model : 117
Manufacturer : Fluke
Serial Number : 37781258WS

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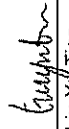
Measuring Instruments used in this performance test :-

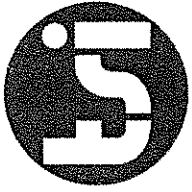
Instrument	Serial No. (Cal Report No.)	Eqpt ID	Due Date	Remarks
CALIBRATOR (WITH SCOPE OPT)	9225001 (EL006886)	S0346	03 Aug 2019	

Legend and Explanations for Measurement Report:

[*] - if shown next to the result recorded, it means the reading is out of the specified limits
[Deviation] - if shown, is computed as [Deviation] = [UT Reading] - [True Value] (Reference: Int Vocab in Metrology JCGM 200:2008)
[Correction] - if shown, is computed as [Correction] = [True Value] - [UT Reading].
Correction is used to apply to the UUT reading (add) to give a true reading.

Test Performed By


Liu Yif Tian



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MEASUREMENT REPORT

Date : 13 May 2019 Ref. No. : CEI / 2335 Page : 3 of 6

Test Specified Limits Results Comments

Resistance Test

Range (Ω)	Input (Ω)	Min (Ω)	Max (Ω)	Reading (Ω)
600.0	0.0	0.0	0.2	0.1
600.0	500	495.3	504.7	500.2
6.000 k	5 k	4.954 k	5.046 k	5.000 k
60.00 k	50 k	49.54 k	50.46 k	50.01 k
600.0 k	500 k	495.4 k	504.6 k	500.1 k
6.000 M	5 M	4.954 M	5.046 M	4.998 M
40.00 M	10 M	9.48 M	10.52 M	10.00 M
40.00 M	30 M	28.48 M	31.52 M	29.92 M

Continuity Test

Beeper On at 20 Ω	Pass / Fail	Pass
Beeper Off at 250 Ω	Pass / Fail	Pass

AC Voltage Test

Range (V)	Input (V)	Freq (Hz)	Min (V)	Max (V)	Reading (V)
6.000	5	45	4.947	5.053	4.994
6.000	5	1 k	4.897	5.103	5.005
60.00	50	45	49.47	50.53	49.94
60.00	50	1 k	48.97	51.03	50.00
600.0	600	45	593.7	606.3	599.3
600.0	600	1 k	587.7	612.3	601.8

Frequency Test

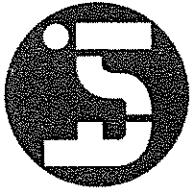
Range (V)	Input (V)	Freq (Hz)	Min (Hz)	Max (Hz)	Reading (Hz)
6.000	2	50 k	49.93 k	50.07 k	50.00 k

DC Voltage Test

Range (V)	Input (V)	Min (V)	Max (V)	Reading (V)
6.000	0	-0.002	0.002	0.000
6.000	5	4.973	5.027	4.997
60.00	50	49.73	50.27	49.98
600.0	600	596.8	603.2	599.7
600.0	-600	-603.2	-596.8	-599.7

Test Performed By


Liu Yu Hian



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MEASUREMENT REPORT

Date : 13 May 2019

Ref. No. : CEI / 2335

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Test	Specified Limits	Results	Comments
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AC Millivolts Test

Range (V)	Input (V)	Freq (Hz)	Min (V)	Max (V)	Reading (V)
600.0 m	6 m	45	5.6 m	6.4 m	6.2 m
600.0 m	600 m	1 k	587.7 m	612.3 m	600.3 m

DC Millivolts Test

Range (V)	Input (V)	Min (V)	Max (V)	Reading (V)
600.0 m	10 m	9.7 m	10.3 m	10.0 m
600.0 m	600 m	596.8 m	603.2 m	599.8 m

Diode Test

Range (V)	Input (V)	Min (V)	Max (V)	Reading (V)
2.000	1.9	1.881	1.919	1.899

Capacitance Test

Range (F)	Input (F)	Min (F)	Max (F)	Reading (F)
1000 n	Open	0 n	2 n	1 n
9999 μ	900 μ	881 μ	919 μ	900 μ
10.00 μ	9 μ	7.19 μ	10.82 μ	9.00 μ

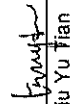
DC Current Test

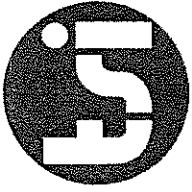
Range (A)	Input (A)	Min (A)	Max (A)	Reading (A)
10.00	10	9.87	10.13	10.00

AC Current Test

Range (V)	Input (A)	Freq (Hz)	Min (A)	Max (A)	Reading (A)
6.000	5.0	45	4.922	5.078	4.998

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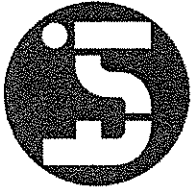
MEASUREMENT REPORT

Date : 13 May 2019 Ref. No. : CEI / 2335 Page : 5 of 6

Test	Specified Limits		Results	Comments
Auto-V LoZ Test				
Input (V)	Freq (Hz)	Min (V)	Max (V)	Reading (V)
0.5	45	0.2	0.8	0.5
0.5	0	0.2	0.8	0.5
500	500	489.7	510.3	497.9
Volt Alert Test				
At Hi Range. Beeper and Red LED on at 10 V, 60 Hz		Pass / Fail		Pass
At Lo Range. Beeper and Red LED on at 30 V, 60 Hz		Pass / Fail		Pass
***** Test Completed				

Test Performed By


Liu Yujian



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MEASUREMENT REPORT

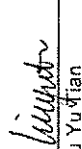
Date : 13 May 2019

Ref. No. : CEI / 2335

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The Expanded Uncertainties of measurement (excluding the uncertainties of the Unit Under Test) for the results given in this report, with a confidence level of approximately 95% at Coverage Factor $k = 2$, are as follows:

Parameters	Range	Uncertainty
Resistance Generation	0 ~ 10.99 Ω	0.014 % + 0.01 Ω
	330 Ω ~ 1.09999 k Ω	0.017 % + 0.07 Ω
	3.3 ~ 10.9999 k Ω	0.010 % + 0.7 Ω
	33 ~ 109.999 k Ω	0.013 % + 7 Ω
	330 k Ω ~ 1.09999 M Ω	0.017 % + 63 Ω
AC Voltage Generation	3.3 ~ 10.9999 M Ω	0.07 % + 635 Ω
	11 ~ 32.9999 M Ω	0.12 % + 635 Ω
	1 ~ 32.999 mV	0.4 % + 23 μ V
	0.33 ~ 3.29999 V	0.03 % + 69 μ V
	3.3 ~ 32.9999 V	0.05 % + 693 μ V
Frequency Generation	33 ~ 329.999 V	0.06 % + 8 mV
	330 ~ 1000 V	0.06 % + 92 mV
	12 ~ 119.99 kHz	29 ppm + 17 mHz
	10 ~ 45 Hz	
	45 Hz ~ 10 kHz	
DC Voltage Generation	45 Hz ~ 10 kHz	
	45 Hz ~ 1 kHz	
	45 Hz ~ 1 kHz	
	45 Hz ~ 1 kHz	
	45 Hz ~ 1 kHz	
Capacitance Generation	30 ~ 329.9999 V	
	100 ~ 1000 V	
	0 ~ 329.9999 mV	0.0069 % + 3 μ V
	0 ~ 3.299999 V	0.0058 % + 6 μ V
	0 ~ 32.99999 V	0.0058 % + 50 μ V
DC Current Generation	30 ~ 329.9999 V	0.0064 % + 500 μ V
	100 ~ 1000 V	0.0064 % + 1.5 mV
	3.3 ~ 10.999 μ F	0.4 % + 11.6 nF
	300 μ F ~ 1.1 mF	1.2 % + 346 nF
	0 ~ 11 A	0.069 % + 381 μ A
AC Current Generation	2.2 ~ 11 A	0.06 % + 2309 μ A
	45 ~ 65 Hz	


Liu Yu Tian