

Waters THE SCIENCE OF WHAT'S POSSIBLE.™	Installation Qualification Report		
Report No: TE82503-5-IQR	Iteration No: 00	SAP No: TE0082503QX	

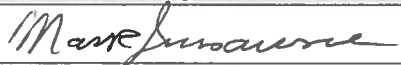
INSTALLATION QUALIFICATION REPORT

For the Injector / Seal Pack Tester (TE82503-5)

PREPARED BY

Name	Role	Signature	Date
Emma Pierce	Test Validation Engineer		14 Mar 2018

REVIEWED BY

Name	Role	Signature	Date
Mark Jussaume	Senior Test Engineer		14 MAR 2018

APPROVED BY

Name	Role	Signature	Date
Andre Kopoyan	Senior Operations Quality Engineer		16 Mar 2018

The "Prepared By" signature denotes that this document accurately describes the qualification activities.

The "Reviewed By" signature[s] denotes agreement with the description of the qualification activities.

The "Approved By" signature denotes that this document has been reviewed and approved for overall quality and completeness.

REVISION HISTORY

Version	Author	Summary of change
00	Emma Pierce	First document for approval

1.0 Purpose

The Injector / Seal Pack Tester (TE82503-5) is located at the Flextronics Contractor Manufacturer Site at WPPL, Singapore. The station can test completed 717 / 715 or Alliance injector sub-assemblies and individual seal packs of the following part numbers: WAT077-01, WAT077-02, WAT045540, WAT045559, WAT078949, WAT270576, 279000925, 279003915, 289001994, and 289012412. The two types of UUTs use different fixtures on which to mount the unit and are connected to the tester with different cables according to the test procedure. The cable type determines the set of specifications to which the UUT is compared.

This station (TE82503-5) is only used to test Alliance units and is not equipped with the necessary fixture to test 717 / 715 UUTs. The tester is equipped with a keypad, a display, and side mounted shelves. The test station is equipped with a designated In-line Degasser AF along with the appropriate tubing and fittings, the appropriate solvent containers, and a small graduated cylinder.

During the test, the UUT is mounted on the appropriate fixture and connected to the test station. The operator then begins the automated program to test seal wash, decay, down count, and seal width. During the seal wash test, the operator must empty the graduated cylinder and use it to measure the flow from the draw-off outlet. The operator confirms the outlet volume is within range and continues the test. The rest of the tests are automated. The test results are displayed on the screen individually and the final test results are displayed on the screen at the end of the test; there is no automatically generated test report.

This Installation Qualification is being performed as required by the Validation Assessment Form TE82503-26FEB2018-VAF, which can be found in the TE0082503QX directory.

2.0 Scope of Report

This Installation Qualification Report details the qualification activities undertaken for the Injector / Seal Pack Tester (TE82503-5) based on the requirements of the Installation Qualification Procedure 730004135, Ver. 00.

This Installation Qualification Report defines the documents used to qualify the Injector / Seal Pack Tester (TE82503-5).

3.0 Summary of Results - Statement of Fitness for Intended Use

The Injector / Seal Pack Tester was tested in accordance with the Installation Qualification Procedure 730004135, Ver. 00. All Test Scripts were performed and all objective evidence requirements have been met.

Waters now has the necessary documentation in place to ensure that the Injector / Seal Pack Tester complies with Waters' requirements, the latest relevant quality system regulations, and cGMP practices.

Following the approval of this Qualification Report, the Injector / Seal Pack Tester (TE82503-5) can be considered fully qualified and fit for intended use.

4.0 Glossary

The following definitions are used in this document:

Term	Explanation
A	Amperes
AC	Alternating Current
AF	Amorphous Fluoroplastic
CAL	Calibration
cGMP	Current Good Manufacturing Practice
DC	Direct Current
ECR	Engineering Change Request
EQID	Equipment Identification
Hz	Hertz
IQ(R)	Installation Qualification (Report)

Term	Explanation
N	No
N/A	Not Applicable
OESR	Operations Engineering Support Request
P/N	Part Number
PM	Preventative Maintenance
S/N	Serial Number
SAP	Enterprise Resource Planning Software
TSP	Test Specification and Procedure
UUT	Unit Under Test
VAC	Volts Alternating Current
VAF	Validation Assessment Form
WPPL	Waters Pacific Private Limited
Y	Yes

5.0 Training

The operators of the Injector / Seal Pack Tester (TE82503-5) were trained according to the Injector / Seal Pack Tester TSP WAT043815, Ver. 06. The executors of this qualification were trained according to the Installation Qualification Procedure 730004135, Ver. 00. Both training records are provided as Attachments 7.1 and 7.2, respectively.

6.0 Qualification Results

6.1 Test Script IQ-01: Associated Documentation Verification was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed Test Script Data Sheet is provided as Attachment 7.3.

6.1.1 The Injector / Seal Pack Tester TSP WAT043815, Ver. 06 was confirmed to be in SAP with a status of Ready, as evidenced below:

Document List After Selection 7 Hits							Waters
  Choose  Save  Thumbnails (Images)							THE SCIENCE OF WHAT'S POSSIBLE.™
Type	RevLev	Document	Vs	Description	Valid From	Change Number	Status text
TSP	00	WAT043815	00	INJECTOR/SEAL PACK TESTER	01/30/1998	ECO3125	RELEASE GENERAL
TSP	01	WAT043815	01	INJECTOR/SEAL PACK TESTER	04/16/1998	ECO3367	RELEASE GENERAL
TSP	02	WAT043815	02	INJECTOR/SEAL PACK TESTER	10/28/1999	ECO05600	RELEASE GENERAL
TSP	03	WAT043815	03	INJECTOR/SEAL PACK TESTER	04/11/2003	9103450	RELEASE GENERAL
TSP	04	WAT043815	04	INJECTOR/SEAL PACK TESTER	02/07/2006	9119652	RELEASE GENERAL
TSP	05	WAT043815	05	INJECTOR/SEAL PACK TESTER	11/12/2014	9193024	RELEASE GENERAL
TSP		WAT043815	06	INJECTOR/SEAL PACK TESTER			READY

6.1.2 The Injector / Seal Pack Tester Calibration Procedure WAT043816, Ver. 00, Rev. 01 was confirmed to be in SAP with a status of Release General, as evidenced below:

Document List After Selection 2 Hits							Waters
  Choose  Save  Thumbnails (Images)							THE SCIENCE OF WHAT'S POSSIBLE.™
Type	RevLev	Document	Vs	Description	Valid From	Change Number	Status text
MSC		WAT043816	01	CAL PROC., INJECTOR/SEAL PACK		9000280	ABANDON
TSP	01	WAT043816	00	CAL PROC., INJECTOR/SEAL PACK TESTER	01/25/1999	ECO4409	RELEASE GENERAL

6.1.3 Note that the Calibration Procedure is listed in SAP as a TSP document type; it should be a CAL document type. OESR #182429 was submitted to correct this upon revision of this document.

- 6.2 Test Script IQ-02: Site Verification was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed Test Script Data Sheet is provided as Attachment 7.4.
- 6.2.1 The ambient temperature and humidity were measured using a Hisamatsu TN-2500 Thermohygrograph, EQID #0418, and were determined to be within specification as defined by the 717 Plus Auto Sampler Performance Specification WAT078895, Ver. 00. The calibration record is provided as Attachment 7.5.
 - 6.2.2 The electrical supply voltage and frequency were measured using a Fluke 110 Multimeter, EQID #0245, and the electrical supply current was measured using a Kyoritsu 2033 AC / DC Clamp Meter, EQID #0280. All measurements were determined to be within specification as defined by the 717 Plus Auto Sampler Performance Specification WAT078895, Ver. 00. The calibration records for both measurement tools are provided as Attachments 7.6 and 7.7, respectively.
 - 6.2.3 The Test Station was confirmed to have more than the two (2) dedicated electrical outlets required.
 - 6.2.4 The space and test bench of the Injector / Seal Pack Tester (TE82503-5) were confirmed to have adequate space for testing and service. The bench was confirmed to be large and strong enough to support all test equipment. A picture of the Test Station work area is provided as Attachment 7.8.
- 6.3 Test Script IQ-03: Instrumentation Calibration Verification was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed script is provided as Attachment 7.9.
- 6.3.1 The Injector / Seal Pack Tester (TE82503-5) was confirmed to be in the onsite Calibration Master List with a six (6) month maintenance cycle. A copy of the relevant Master List page is provided as Attachment 7.10.
 - 6.3.2 The Test Station was confirmed to have been calibrated within this time frame. The most recent Calibration Record is provided as Attachment 7.11.
 - 6.3.3 The In-Line Degasser AF (EQID #PM00413) was confirmed to be in the Preventative Maintenance Master List with a six (6) month maintenance cycle. A copy of the relevant Master List page is provided as Attachment 7.12.
 - 6.3.4 The Degasser was confirmed to have received preventative maintenance within this time frame. The most recent Preventative Maintenance Record is provided as Attachment 7.13.
- 6.4 Test Script IQ-04: Software and Instrument Firmware Version was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed Test Script Data Sheet is provided as Attachment 7.14.
- 6.4.1 The Test Equipment Software version listed in Injector / Seal Pack Tester TSP WAT043815, Ver. 06 is Test Software 4.0 and was verified to match the version listed on the tester display. A picture of the display is provided as Attachment 7.15.
- 6.5 Test Script IQ-05: General Safety and Alarms was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed Test Script Data Sheet is provided as Attachment 7.16.
- 6.5.1 It was confirmed that there were no mechanical safety pinch points or sharp edges.
 - 6.5.2 An electrical safety test was performed using a Chroma 19032 Electrical Safety Analyzer, EQID #1492. The Injector / Seal Pack Tester and the designated In-Line Degasser AF were confirmed to pass an Electrical Safety Hi-Pot/Ground Continuity test. The calibration record is provided as Attachment 7.17.
 - 6.5.3 It was confirmed that the glass solvent bottle was secured. It was also confirmed that the plastic waste tank was secured under the test bench.
- 6.6 Test Script IQ-06: Functional Verification was performed according to Installation Qualification Procedure 730004135, Ver. 00. The completed Test Script Data Sheet is provided as Attachment 7.18.
- 6.6.1 The Alliance Seal Pack Assembly (P/N: 289012412) was chosen as the UUT for this Installation Qualification because it is one of the two functionally equivalent parts being added to the test system as specified in TE82503-26FEB2018-VAF.

6.6.2 One (1) UUT (P/N: 289012412) was tested using the Injector / Seal Pack Tester (TE82503-5) with all tests passing. Pictures of the passing results are provided in order as Attachment 7.19.

6.7 This table provides a summary of each test script as performed according to 730004135, Ver. 00 along with the attachment location of all objective evidence. The table also indicates any deviation taken from the scripts during qualification.

Script or Section	Pass/Fail	Objective Evidence	Deviations
IQ-01	Pass	Attachment 7.3	None
IQ-02	Pass	Attachments 7.4 through 7.8	None
IQ-03	Pass	Attachments 7.9 through 7.13	None
IQ-04	Pass	Attachments 7.14 and 7.15	None
IQ-05	Pass	Attachments 7.16 and 7.17	None
IQ-06	Pass	Attachments 7.18 and 7.19	None

7.0 Attachments

- 7.1 Completed Operator Training Record WAT043815, Ver. 06
- 7.2 Completed Executor Training Records 730004135, Ver. 00
- 7.3 Completed Test Script IQ-01: Associated Document Verification
- 7.4 Completed Test Script IQ-02: Site Verification
- 7.5 Objective Evidence IQ-02: Hisamatsu TN-2500 Thermohygrograph (EQID #0418) Calibration Record
- 7.6 Objective Evidence IQ-02: Fluke 110 Multimeter (EQID #0245) Calibration Record
- 7.7 Objective Evidence IQ-02: Kyoritsu 2033 AC / DC Clamp Meter (EQID #0280) Calibration Record
- 7.8 Objective Evidence IQ-02: Picture of Test Station Work Area
- 7.9 Completed Test Script IQ-03: Instrument Calibration Verification
- 7.10 Objective Evidence IQ-03: Copy of Injector / Seal Pack Tester (TE82503-5) page in Calibration Master List
- 7.11 Objective Evidence IQ-03: Injector / Seal Pack Tester (TE82503-5) Calibration Record
- 7.12 Objective Evidence IQ-03: Copy of In-Line Degasser AF (EQID #PM00413) in Preventative Maintenance Master List
- 7.13 Objective Evidence IQ-03: In-Line Degasser AF (EQID #PM00413) Preventative Maintenance Record
- 7.14 Completed Test Script IQ-04: Software and Instrument Firmware Version
- 7.15 Objective Evidence IQ-04: Picture of Tester Display Showing Software Version
- 7.16 Completed Test Script IQ-05: General Safety and Alarms
- 7.17 Objective Evidence IQ-05: Chroma 19032 Electrical Safety Analyzer (EQID #1492) Calibration Record
- 7.18 Completed Test Script IQ-06: Functional Verification of UUT Part #289012412
- 7.19 Objective Evidence IQ-06: Pictures of Passing Test Results for UUT Part #289012412

8.0 Deviation from Test Equipment Qualification

There were no deviations generated during the execution of the Installation Qualification Procedure 730004135, Ver. 00.

Waters THE SCIENCE OF WHAT'S POSSIBLE.™	Installation Qualification Report		
Report No: TE82503-5-IQR	Iteration No: 00	SAP No: TE0082503QX	

9.0 References

The current approved versions of the following documents are referenced within this report:

Document Number	Document Title
730004135, Ver. 00	Installation Qualification Procedure
WAT043815, Ver. 06	Injector / Seal Pack Tester TSP
WAT043816, Ver. 00, Rev. 01	Injector / Seal Pack Tester Calibration Procedure
WAT078895, Ver. 00	717 Plus Auto Sampler Performance Specification
WAT046538, Ver. 09	Generic Electrical Safety Test Procedure
TE82503-26FEB2018-VAF	Validation Assessment Form for P/N: 289012412 Add
ECR #9221139	Engineering Change Request for P/N: 289012412 Add
OESR #182429	Operations Engineering Service Request for WAT043816 Document Type Error

Type	Syllabus ID	Syllabus	Course ID	Course	Attended	Freq	Expires	Score	Status
Requirement	MILTESTENG	Test Engineering	730001834-VER-03	Test Engineering Management Policy	6/9/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730001834-VER-02	New Test Equipment Development Procedure	6/12/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730001835-VER-05	Process Validation Procedure for Milford	6/9/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730001836-VER-01	Sustaining Test Equipment Procedure	6/13/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730001936-VER-03	Test Method Validation Protocol	6/14/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730002232-VER-03	Process Validation Master Plan - Milford	6/14/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730002738-VER-00	New Product Intro Process - Milford (WIDP)	6/14/2017	0			Completed
Requirement	MILTESTENG	Test Engineering	730004135-VER-00	Installation Qualification Protocol	6/13/2017	0			Completed
Requirement	MILMFGOPSALL	All Milford Manufacturing & Support Personnel	EHS0000-VER-02	EHS Policies	6/6/2017	12	6/6/2018		Completed
Requirement	MILMFGOPSALL	All Milford Manufacturing & Support Personnel	LCDHR01-REV-01	Sexual Harassment Policy	6/9/2017	12	6/9/2018		Completed
Requirement	MILMFGOPSALL	All Milford Manufacturing & Support Personnel	QA0002-REV-01	Good Manufacturing Practices	6/12/2017	0			Completed
Requirement	MILMFGOPSALL	All Milford Manufacturing & Support Personnel	QA0008-REV-01	Quality Management Systems	6/13/2017	0			Completed

Title: individual Training Form

Document No: 730002657

Version No: 00

Page 1 of 1

Training Type:	Read and Understood		
Name:	CHAN YEE HWA	Employee ID¹:	618056
Date of Training	07 MAR 2018		
Comments:	N/A		

Document Number	Title	Rev. #
730004135	Installation Qualification Protocol	00

	MANUFACTURING ENGINEER	7 MAR 2018
Employee's Signature	Title	Date
<u>N/A - Self trained ERP 09 MAR 2018</u>		
Trainer's Signature	Title	Date

¹ Without preceding "90"

Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 1 of 6

IQ Test name: Associated Documentation Verification		Test Script No.: IQ-01	
Equipment No./ID: TE82503-5		Equipment Name: Injector / Seal Pack Tester	
Installation Site: Flextronics: WPPL, Singapore			
Purpose: To verify that supporting documentation is available prior to the completion of qualification. Test execution: List all applicable documents (Preventive Maintenance, Calibration, Operating Procedures, Test Specification Procedures, Manufacturing Procedures, etc.) under the Document type header and then complete the table below. If applicable documents are unavailable state why in the comments section. All applicable documents must be in either Ready, Pre-Rel-Prod, or Release General state in SAP. Enter N/A for any parameter or cell that is not used or not applicable. Objective evidence: Completed Test Script Data Sheet SAP Screen shot of below available document(s)			
Document Type	Title; Doc. No.; Revision/Version No.	Status in SAP	Initial & Date
TSP	Injector / Seal Pack Test Procedure WAT043815, Ver. 06	READY	YH 07 MAR 18
TSP	Injector / Seal Pack Tester Calibration Procedure WAT043816, Ver. 00	RELEASE GENERAL	YH 07 MAR 18
Comments: N/A <i>Ogk</i> 07 MAR 18			
Overall Test Conclusion: ☒ Pass ☐ Fail			

Copy this Test Script as needed

Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-102
 Iteration No.: 00
 Attachment: 7.3 Page: 1 of 1

Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 2 of 6

IQ Test name: Site Verification			Test Script No.: IQ-02	
Equipment No./ID: TE82503-5		Equipment Name: Injector / Seal Pack Tester		
Installation Site: Flextronics: WPPL, Singapore				
Purpose: To verify the location in which the test equipment is to be installed is suitable for use. Test execution: List any additional applicable environmental parameters in the Parameters column. Using the applicable equipment documentation, define the specifications in the Acceptance Criteria column, as appropriate. 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. Objective evidence: Completed Test Script Data Sheet. Photo(s) of the work area, if applicable. Copies of calibration certificates for gauges or meters used for measurement, if applicable.				
Parameters	Acceptance criteria	As found	Pass/Fail	Initial & Date
Ambient Temperature	4 – 40 °C	25 °C	PASS	YH 07 MAR 18
Relative Humidity	≤ 80% non condensing	57	PASS	YH 07 MAR 18
Workspace	Adequate space for testing and service	Adequate space for testing and service	PASS	YH 07 MAR 18
Test Station Bench	Large and strong enough to support all equipment	Large and strong enough for support all equipment	PASS	YA 07 MAR 18
Electrical Supply	47 – 63 Hz 85 – 130 VAC, ≤ 6 A 186 – 265 VAC, ≤ 3 A	60.01 Hz 238.7 VAC, 0.41 A	PASS	YH 07 MAR 18
Electrical Outlets	≥ 2	4	PASS	YH 07 MAR 18
Network Available	N/A	N/A	N/A	N/A
Comments: Temp, humidity, and electrical supply specified in WAT078895, Ver. 00 Temp and humidity measured by EA10 0418 (calibrated on 15 JAN 2018) Electrical supply measured by EA10 0245 (calibrated on 5 JAN 2018) Electrical current measured by EA10 0280 (calibrated on 26 JUL 2017)				
Overall Test Conclusion: ☒ Pass ☐ Fail				

Copy this Test Script as needed

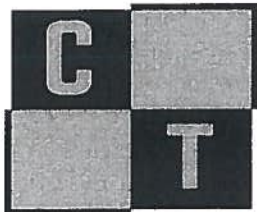
Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-10R
 Iteration No.: 00
 Attachment: 7.4 Page: 1 of 1



CALTEK PTE. LTD.

23 Tagore Lane, #04-08/09/10/11 Tagore 23 Warehouse, Singapore 787601
Tel: (65) 64520300 Fax: (65) 64520500
Email: info@caltekgroup.com Website: www.caltekgroup.com

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER : CTT-111-1120-18	JOB NUMBER : CTJ18-1117
RECEIVED DATE : 08-Jan-18	ISSUE DATE : 16-Jan-18

INSTRUMENT : THERMOHYGROGRAPH	Ambient Temperature : (23 ± 5) °C
MANUFACTURER : HISAMATSU MFG. CO.	Relative Humidity : (55 ±10) % r.h.
MODEL NO : TN-2500	Date of Calibration : 15-Jan-18
PART NO : -	Recommended Due Date : 15-Jan-19
SERIAL NO : 5650	Instrument Code : CT3260
CUSTOMER : FLEXTRONICS MANUFACTURING (SINGAPORE) PTE LTD.	Range : -
	Asset/Tag/Id/Code : ----
	Page No : 1 of 3
	Status : As Found
	JR No : JR-8567

The described instrument has been calibrated at Caltek laboratory under the ambient conditions stated above.

This certificate provides traceability of measurement to the International System of Units (SI) and/or to units of measurement realised at the National Metrology Centre (NMC), Singapore or other recognized national metrology institutes.

The calibration method was carried out according to In-house Technical Calibration Procedure CTTM-T10-2007, as guide.

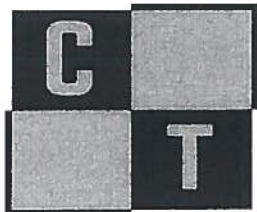
S.No.	REFERENCE INSTRUMENT(S)	SERIAL NO	DUE DATE
1.	Reference Sensors	(60813824/60562343)/ (S10/34910001/35250025)	16-Aug-18

REVIEWED & ACCEPTED
SIGN: CHANG MEI LAN 
DATE: 18 JAN 18
REMARKS: FID 0418
BENNETT CHEONG CHUAN NIN 

Calibrated by : Anoop Ummappilly EMP ID : 1039 	Approved by : Siva EMP ID : NA 
--	--

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing Laboratory.

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.5 Page: 1 of 3



CALTEK PTE. LTD.

23 Tagore Lane, #04-08/09/10/11 Tagore 23 Warehouse, Singapore 787601
Tel: (65) 64520300 Fax: (65) 64520500
Email: info@caltekgroup.com Website: www.caltekgroup.com

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER : CTT-111-1120-18

JOB NUMBER : CTJ18-1117

ISSUE DATE : 16-Jan-18

PAGE NUMBER : 2 of 3

RESULTS OF CALIBRATION :

1. The expanded uncertainty of measurement associated with the calibration is estimated at a confidence level of approximately 95 % with a coverage factor of $k=2.00$.
2. The results of calibration are given on the attached calibration data sheet(s).
3. The user should determine the suitability of the instrument for its intended use.
4. No Adjustments done.

Calibration Results:RELATIVE HUMIDITY MEASUREMENT @ FIXED TEMPERATURE OF 21°C

Mean Reference Reading	Mean Instrument Reading - Before Adjustment	Error	Expanded Uncertainty
%rh	%rh	%rh	%rh
23.8	23.0	-0.8	3.5
40.5	40.0	-0.5	3.5
60.5	60.0	-0.5	3.5
80.9	80.0	-0.9	3.5
87.7	86.0	-1.7	3.5

Calibrated by :

Anoop Ummappilly

EMP ID : 1039

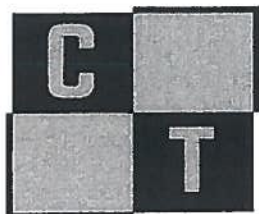
Approved by :

Siva

EMP ID : NA

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing Laboratory.

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.5 Page: 2 of 3



CALTEK PTE. LTD.

23 Tagore Lane, #04-08/09/10/11 Tagore 23 Warehouse, Singapore 787601
Tel: (65) 64520300 Fax: (65) 64520500
Email: info@caltekgroup.com Website: www.caltekgroup.com

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER :	CTT-111-1120-18	JOB NUMBER	: CTJ18-1117
ISSUE DATE	: 16-Jan-18	PAGE NUMBER	: 3 of 3

Calibration Results: TEMPERATURE MEASUREMENT @ NOMINAL RELATIVE HUMIDITY OF 50%r.h.

Mean Reference Reading	Mean Instrument Reading - Before Adjustment	Error	Expanded Uncertainty
°C	°C	°C	°C
16.3	16.0	-0.3	1.0
18.3	18.0	-0.3	1.0
22.2	22.0	-0.2	1.0
27.3	27.0	-0.3	1.0
30.3	30.0	-0.3	1.0

Calibrated by :

Anoop Ummappilly

EMP ID : 1039

Approved by :

Siva

EMP ID : NA

This certificate may not be reproduced other than in full, except with the prior written approval of the issuing Laboratory.

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.5 Page. 3 of 3



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

CALIBRATION CERTIFICATE

Ref. No. : FMS / 1395

Page : 1 of 5

Customer : Flextronics Manufacturing (Singapore) Pte Ltd
Address : 1 Kallang Place
Singapore 339211

REVIEWED & ACCEPTED
SIGN: <u>CHANG MEI LAN</u>
DATE: <u>12 JAN 18</u>
REMARKS: <u>EQID 0245</u>
<u>f Mond Shamsul 12 Jan 18</u>

Equipment ID : 0245
Description : Multimeter
Model : 110
Manufacturer : Fluke
Serial No. : 85730619

Co-ordinator : Neo Hui Hui
Telephone : 6543 2855
Ext : 207

Date Calibrated : 05 Jan 2018
Next Due Date : 05 Jan 2019
Location : Metrology Room

Temperature : (23 ± 1) °C
Humidity : (35 ~ 55) %rh

The above instrument has been tested in general accordance with its manufacturer's published specifications and Performance Test Procedure in Calibration Information PN1608592.

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 9001:2008.

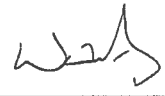
Conformance terms of "In Tolerance" and "Out of Tolerance" used in this certificate are determined by comparison of measured values against warranted specifications and do not take measurement uncertainties into account.

Test Performed By


Chia Mu En, Andrew
Engineer



Approved By


Wen Tai Chung
Manager, Technical Services
08-Jan-2018

nhh

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.6 Page: 1 of 5

Note : This Certificate and the attached measurement report shall not be reproduced wholly or in parts without the prior consent of the laboratory.



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Page : 2 of 5

Date : 05 Jan 2018

Reference : FMS / 1395

Description : Multimeter

Model : 110

Manufacturer : Fluke

Serial Number : 85730619

Measuring Instruments used in this performance test :-

Instrument	Serial No. (Cal Report No.)	Eqpt ID	Due Date	Remarks
CALIBRATOR (WITH SCOPE OPT)	9225001 (EL005923)	S0348	21 Sep 2018	

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] = [UUT Reading] - [True Value] {Reference: Int Volcab in Metrology JCGM 200:2008}
- [Correction] - If shown, is computed as [Correction] = [True Value] - [UUT Reading].
Correction is used to apply to the UUT reading (add) to give a true reading.

Test Performed By

Chia Mu En, Andrew

Document No.: TE82503-5-10R

Iteration No.: 00

Attachment: 7.6 Page: 2 of 5



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Date : 05 Jan 2018

Ref. No. : FMS / 1395

Page : 3 of 5

Test			Specified Limits		Results	Comments
AC Voltage Test						
Range (V)	Freq (Hz)	Input (V)	Min (V)	Max (V)	Reading (V)	
6	50	300 m	0.294	0.306	0.301	
6	500	300 m	0.294	0.306	0.301	
6	50	5	4.947	5.053	5.006	
6	500	5	4.947	5.053	5.003	
60	500	50	49.47	50.53	50.27	
600	500	600	593.7	606.3	602.4	
Frequency Test						
Voltage : 5 V						
Range (kHz)		Input (kHz)	Min (kHz)	Max (kHz)	Reading (kHz)	
50		50	49.93	50.07	49.98	
DC Voltage Test						
Range (V)		Input (V)	Min (V)	Max (V)	Reading (V)	
6		0	-0.002	0.002	0.000	
6		5	4.963	5.037	5.002	
60		-50	-50.37	-49.63	-50.06	
600		600	595.6	604.4	600.5	
Continuity Test						
Beeper On @ 20 Ω			Pass / Fail		Passed	
Beeper Off @ 250 Ω			Pass / Fail		Passed	
Resistance Test						
Range (Ω)		Input (Ω)	Min (Ω)	Max (Ω)	Reading (Ω)	
600		0	-0.2	0.2	0.2	
600		500	495.3	504.7	500.1	
6 k		5 k	4.954 k	5.046 k	4.999 k	
60 k		50 k	49.54 k	50.46 k	49.97 k	
600 k		500 k	495.4 k	504.6 k	500.2 k	
6 M		5 M	4.954 M	5.046 M	5.000 M	
40 M		30 M	29.52 M	30.48 M	30.01 M	

Test Performed By

Chia Mu En, Andrew

Document No.: TE82503-5-1DR
 Iteration No.: 00
 Attachment: 7.6 Page: 3 of 5



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Date : 05 Jan 2018

Ref. No. : FMS / 1395

Page : 4 of 5

Test		Specified Limits		Results	Comments
Diode Test					
Range (V)	Input (V)	Min (V)	Max (V)	Reading (V)	
2.2	2	1.980	2.020	2.001	
Capacitance Test					
Range (nF)	Input (nF)	Min (nF)	Max (nF)	Reading (nF)	
1000	800	783	817	800	

Test Completed					

Test Performed By

Chia Mu En, Andrew

Document No.: TE82503-5-1AR

Iteration No.: 00

Attachment: 7.6 Page: 4 of 5



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Date : 05 Jan 2018

Ref. No. : FMS / 1395

Page 5 of 5

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
AC Voltage Generation	33 ~ 329.999 mV	45 Hz ~ 10 kHz	0.0058 % + 23 μV
	3.3 ~ 32.9999 V	45 Hz ~ 10 kHz	0.05 % + 693 μV
	33 ~ 329.999 V	45 Hz ~ 1 kHz	0.06 % + 8 mV
	330 ~ 1000 V	45 Hz ~ 1 kHz	0.06 % + 92 mV
Frequency Generation	1.2 ~ 11.999 kHz		29 ppm + 1 mHz
DC Voltage Generation	0 ~ 32.99999 V		0.0058 % + 50 μV
	30 ~ 329.9999 V		0.0064 % + 500 μV
	100 ~ 1000 V		0.0064 % + 1.5 mV
Resistance Generation	330 ohm ~ 1.09999 kΩ		0.17 % + 0.07 Ω
	3.3 ~ 10.9999 kΩ		0.010 % + 0.7 Ω
	33 ~ 109.999 kΩ		0.013 % + 7 Ω
	330 kΩ ~ 1.09999 MΩ		0.017 % + 63 Ω
	3.3 ~ 10.9999 MΩ		0.07 % + 635 Ω
	11 ~ 32.9999 MΩ		0.12 % + 635 Ω
Capacitance Generation	0.33 ~ 1.0999 μF		0.29 % + 1.2 nF

Chia Mu En, Andrew

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.6 Page: 5 of 5



Techsystems Services & Integration Asia Pte Ltd

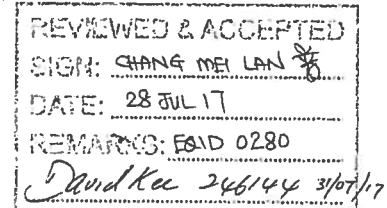
2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913
T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com
[Co Reg No: 199202282R | GST Reg No: M2-0106585-2]

CALIBRATION CERTIFICATE

Ref. No. : FMS / 1201

Page : 1 of 4

Customer : Flextronics Manufacturing (Singapore) Pte Ltd
Address : 1 Kallang Place
Singapore 339211



Equipment ID : 0280
Description : AC / DC Clamp Meter
Model : 2033
Manufacturer : Kyoritsu
Serial No. : 66386

Co-ordinator : Neo Hui Hui
Telephone : 6543 2855
Ext : 207

Date Calibrated : 26 Jul 2017
Next Due Date : 26 Jul 2018
Location : Metrology Room

Temperature : (23 ± 1) °C
Humidity : (35 ~ 55) %rh

The above instrument has been tested in general accordance with its manufacturer's published specifications and in-house procedure TS-24.

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 Adjustment Done : ☐ Yes / ☒ No
As Left : In Tolerance

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 9001:2008.

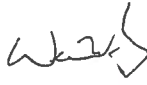
Conformance terms of "In Tolerance" and "Out of Tolerance" used in this certificate are determined by comparison of measured values against warranted specifications and do not take measurement uncertainties into account.

Test Performed By


Lim Wen Yong, Henry
Engineer



Approved By


Wen Tai Chung
Manager, Technical Services
26-Jul-2017

nhh

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.7 Page: 1 of 4

Note : This Certificate and the attached measurement report shall not be reproduced wholly or in parts without the prior consent of the laboratory



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Page : 2 of 4

Date : 26 Jul 2017

Reference : FMS / 1201

Description : AC / DC Clamp Meter

Model : 2033

Manufacturer : Kyoritsu

Serial Number : 66386

Measuring Instruments used in this performance test :-

Instrument	Serial No.	Eqpt ID	Due Date	Remarks
CALIBRATOR (WITH SCOPE OPT)	9225001	S0348	21 Sep 2017	
50 TURN CURRENT COIL	S0354	S0354	Calibration Not Required	

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 $[Deviation] = [UUT Reading] - [True Value]$ (Reference: Int Volcab in Metrology JCGM 200:2008)
- [Correction] - if shown, is computed as $[Correction] = [True Value] - [UUT Reading]$.
Correction is used to apply to the UUT reading (add) to give a true reading.

Test Performed By

Lim Wen Yong, Henry

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.7 Page: 2 of 4



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913
T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com
[Co Reg No: 199202282R | GST Reg No: M2-0106585-2]

MEASUREMENT REPORT

Date : 26 Jul 2017

Ref. No. : FMS / 1201

Page : 3 of 4

Test	Specified Limits	Results	Comments
------	------------------	---------	----------

DC Current Test

Range (A)	Input (A)	Min (A)	Max (A)	Reading (A)
40	10	9.86	10.14	10.01
40	30	29.66	30.34	30.03
300	100	98.1	101.9	100.2
300	200	196.6	203.4	200.8
300	300	291.0	309.0	298.5

AC Current Test

Frequency : 50 Hz

Range (A)	Input (A)	Min (A)	Max (A)	Reading (A)
40	10	9.86	10.14	10.03
40	30	29.66	30.34	30.13
300	100	98.1	101.9	100.5
300	200	196.6	203.4	201.1
300	300	289.5	310.5	298.0

Test Completed

Test Performed By

Lim Wen Yong, Henry

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.7 Page: 3 of 4



Techsystems Services & Integration Asia Pte Ltd

2 Loyang Lane #06-03 | Loyang Industrial Estate | Singapore 508913

T: +65 6543 2855 | F: +65 6543 1329 | W: www.tsiasia.com

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

MEASUREMENT REPORT

Date : 26 Jul 2017

Ref. No. : FMS / 1201

Page 4 of 4

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
DC Current Generator	0 ~ 11 A		0.069 % + 381 μA
AC Current Generator	33 ~ 329.99 mA	45 Hz ~ 1 kHz	0.10 % + 35 μA
	0.33 ~ 2.19999 A	45 Hz ~ 1 kHz	0.12 % + 346 μA
	2.2 ~ 11 A	45 ~ 65 Hz	0.06 % + 2309 μA


Lim Wen Yong, Henry

Document No.: TE82503-5-1AR
Iteration No.: 00
Attachment: 7.7 Page: 4 of 4



Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 3 of 6

IQ Test name: Instrumentation Calibration Verification				Test Script No.: IQ-03	
Equipment No./ID: TE82503-5			Equipment Name: Injector / Seal Pack Tester		
Installation Site: Flextronics: WPPL, Singapore					
Purpose: To verify that all critical instruments are in the calibration system and calibrated or a preventive maintenance has been performed, as appropriate. Test execution: List all critical instruments/components and/or sub-systems (System, TUV, Sample Manager, BSM, Column Manager, Test Solutions, Meters, Gauges, Scales, etc.) in the Description column and complete the table below. Verify that all critical instruments have had a preventive maintenance and/or calibration performed, in accordance with the PM and/or Calibration procedures, and have been included in the preventive maintenance/calibration schedule. For test solutions note the expiration date. Enter N/A for any parameter or cell that is not used or applicable. Objective evidence: Completed Test Script Data Sheet Copies of calibration and/or maintenance certificates.					
Description	Waters P/N and Asset No.	Serial Number	Last Cal/PM Performed Date	PM Cal/Due / Expiration Date	Initial & Date
Injector / Seal Pack Tester	TE82503-5	N/A	03 MAR 2018	03 SEP 2018	YH 07 MAR 18
Waters In-line Degasser AF	186001273	F100G2563M	15 SEP 2017	15 MAR 2018	YH 07 MAR 18
Comments: N/A 07 MAR 2018					
Overall Test Conclusion: ☒ Pass ☐ Fail					

Copy this Test Script as needed

Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-10R
 Iteration No.: 00
 Attachment: 7.9 Page: 1 of 1

S/N	Equipment ID	Equipment Description	Manufacturer	Model	Equipment Serial Number	Interval	Calibration Date	Due Date	Vendor	Equipment Owner	Customized Equip	Customer ID	Customer	Location	Active
1	0196	Digital Thermometer with Probe (K Type)	Fluke	51 II	89280141	12 Months	24-Jul-17	18-Jul-18	TSIA	Joel Mamalateo Dedivo	N	NA	Waters	5th Floor	Y
2	0206	Electronic Weigh Balance	AND	IR200	12105757	06 Months	18-Sep-17	18-Mar-18	Ming Deng	Joel Mamalateo Dedivo	N	98091	Waters	Waters - Production	Y
3	0207	Column Heater	Waters	WAT091727	M03C1H0015R	12 Months	04-Apr-17	04-Apr-18	Internal	Joel Mamalateo Dedivo	Y	81008	Waters	Waters 5th Floor	Y
4	0208	Column Heater	Waters	WAT091727	B01C1H0203R	12 Months	04-Apr-17	04-Apr-18	Internal	Joel Mamalateo Dedivo	Y	81009	Waters	Waters 5th Floor	Y
5	0209	Column Heater	Waters	WAT091727	D01C1H0128R	12 Months	14-Feb-18	14-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81010	Waters	Waters - Production	Y
6	0210	Column Heater	Waters	WAT091727	K01C1H0938R	12 Months	14-Feb-18	14-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81011	Waters	Waters - Production	Y
7	0211	Column Heater	Waters	WAT091727	B01C1H0551R	12 Months	14-Feb-18	14-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81012	Waters	Waters - Production	Y
8	0212	Column Heater	Waters	WAT091727	F01C1H0528R	12 Months	14-Feb-18	14-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81013	Waters	Waters - Production	Y
9	0213	Column Heater	Waters	WAT091727	F01C1H0551R	12 Months	13-Feb-18	13-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81014	Waters	Waters - Production	Y
10	0216	Electronic Weigh Balance	AND	IR200	12104004	06 Months	18-Sep-17	18-Mar-18	Ming Deng	Joel Mamalateo Dedivo	N	99038	Waters	Waters - Production	Y
11	0217	Electronic Weigh Balance	AND	IR200	12103279	06 Months	18-Sep-17	18-Mar-18	Ming Deng	Joel Mamalateo Dedivo	N	99018	Waters	Waters - Production	Y
12	0219	Temperature Control Module	Waters	WAT091728	J09TC1H0607R	12 Months	24-Jan-18	24-Jan-19	Internal	Joel Mamalateo Dedivo	Y	81024	Waters	Waters 5th Floor	Y
13	0220	Temperature Control Module	Waters	WAT091728	N15XMM4884M	12 Months	26-Jan-18	26-Jan-19	Internal	Joel Mamalateo Dedivo	Y	81030	Waters	Waters 5th Floor	Y
14	0221	1500 Series Pump Final Test Station	Waters	Pump	TE82705-2	06 Months	24-Nov-17	24-Mar-18	Internal	Joel Mamalateo Dedivo	Y	TE82705-2	Waters	Waters - Production	Y
15	0222	515 Final Test Station	Waters	Pump	TE82534	06 Months	24-Nov-17	24-Mar-18	Internal	Joel Mamalateo Dedivo	Y	TE82534	Waters	5th Floor	Y
16	0223	HPMV Tester	Waters	NA	TE82625-1	06 Months	18-Jan-18	18-Jul-18	Internal	Joel Mamalateo Dedivo	Y	TE82625-1	Waters	Waters - Production	Y
17	0224	2600 Pump Head Tester	Waters	NA	TE82519	06 Months	01-Dec-17	01-Jun-18	Internal	Joel Mamalateo Dedivo	Y	TE82519	Waters	5th Floor	Y
18	0225	Injector Seal Pack Tester	Waters	TE82503-4	TE82503-4	06 Months	18-Jan-18	18-Jul-18	Internal	Joel Mamalateo Dedivo	Y	TE82503-4	Waters	Waters - Production	Y
19	0226	Electronic Weigh Balance	AND	IR200	12115717	06 Months	18-Sep-17	18-Mar-18	Ming Deng	Joel Mamalateo Dedivo	N	98913	Waters	Waters - Production	Y
20	0228	Temperature Control Module	Waters	WAT091728	H01TC1H643M	12 Months	23-Jan-18	23-Jan-19	Internal	Joel Mamalateo Dedivo	Y	81029	Waters	Waters 5th Floor	Y
21	0230	Temperature Control Module	Waters	WAT091728	G01TC1H653M	12 Months	24-Jan-18	24-Jan-19	Internal	Joel Mamalateo Dedivo	Y	81026	Waters	Waters 5th Floor	Y
22	0231	Temperature Control Module	Waters	WAT091728	N15XMM6882M	12 Months	04-Apr-17	04-Apr-18	Internal	Joel Mamalateo Dedivo	Y	81027	Waters	Waters 5th Floor	Y
23	0232	Temperature Control Module	Waters	WAT091728	MX5DIN2250R	12 Months	04-Apr-17	04-Apr-18	Internal	Joel Mamalateo Dedivo	Y	81028	Waters	Waters 5th Floor	Y
24	0233	Column Heater	Waters	WAT038040	H01C1H0432M	12 Months	13-Feb-18	13-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81020	Waters	Waters - Production	Y
25	0234	Column Heater	Waters	WAT038040	M06C1H0910M	12 Months	13-Feb-18	13-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81021	Waters	Waters - Production	Y
26	0235	Column Heater	Waters	WAT038040	H01C1H0433M	12 Months	13-Feb-18	13-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81022	Waters	Waters - Production	Y
27	0236	Column Heater	Waters	WAT038040	MXGDM7863M	12 Months	15-Feb-18	15-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81018	Waters	Waters - Production	Y
28	0237	Column Heater	Waters	WAT038040	L97C1H0711M	12 Months	15-Feb-18	15-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81019	Waters	Waters 5th Floor	Y
29	0238	Column Heater	Waters	WAT038040	MXGDM0944M	12 Months	04-Apr-17	04-Apr-18	Internal	Joel Mamalateo Dedivo	Y	81017	Waters	Waters 5th Floor	Y
30	0239	Column Heater	Waters	WAT038040	N15XMM5993M	12 Months	15-Feb-18	15-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81023	Waters	Waters - Production	Y
31	0244	Column Heater	Waters	WAT038040	MXGDM7867M	12 Months	15-Feb-18	15-Feb-19	Internal	Joel Mamalateo Dedivo	Y	81016	Waters	Waters - Production	Y
32	0245	Digital Multimeter	Fluke	110	85730619	12 Months	05-Jan-18	05-Jan-19	TSIA	Joel Mamalateo Dedivo	N	96263	Waters	Waters - Production	Y
33	0246	Digital Multimeter	Fluke	179	90240892	12 Months	31-Jan-18	31-Jan-19	TSIA	Joel Mamalateo Dedivo	N	91368	Waters	Waters - Production	Y
34	***0249	Electrical Safety Analyzer	Quadtech	Guardian 6000	5017655	12 Months	10-Jan-18	10-Jan-19	Micro Precision	Joel Mamalateo Dedivo	N	95037	Waters	Waters 5th Floor	Y
35	0250	Pressure Calibrator	Americk	APC10K-GINDG	90093205	12 Months	12-Sep-17	12-Sep-18	SGS	Joel Mamalateo Dedivo	N	WT-TE4131	Waters	5th Floor	Y
36	0259	Injector Seal Pack Tester	Waters	TE82503-5	TE82503-5	06 Months	02-Sep-18	02-Sep-18	Internal	Joel Mamalateo Dedivo	Y	TE82503-05	Waters	Waters - Production	Y
37	0278	Electronic Weigh Balance	AND	IR200	12310922	06 Months	18-Sep-17	18-Mar-18	Ming Deng	Joel Mamalateo Dedivo	N	95206	Waters	Waters - Production	Y
38	0279	High Voltage Probe	Fluke	80K-6	89200011	12 Months	13-Sep-17	13-Sep-18	SGS	Joel Mamalateo Dedivo	N	NA	Waters	5th Floor	Y
39	0280	Clamp Meter	Kyoritsu	2033	66386	12 Months	26-Jul-17	26-Jul-18	TSIA	Joel Mamalateo Dedivo	N	NA	Waters	Waters - Production	Y
40	0311	Temperature Control Module	Waters	WAT091728	E07TCM435R	12 Months	24-Jan-18	24-Jan-19	Internal	Joel Mamalateo Dedivo	Y	81033	Waters	Waters 5th Floor	Y
41	***0360	Electrical Safety Analyzer	Quadtech	Guardian 6000	6069766	12 Months	04-Dec-17	04-Dec-18	Micro Precision	Joel Mamalateo Dedivo	N	NA	Waters	Waters 5th Floor	Y
42	0430	Pneumometer	Keithley	485	310788	12 Months	17-Apr-17	17-Apr-18	Keysight Technologies	Joel Mamalateo Dedivo	N	NA	Waters	Waters 5th Floor	Y
43	***0432	Electrical Safety Analyzer	Quadtech	Guardian 6000 Plus	08280865	12 Months	13-Oct-17	13-Oct-18	Micro Precision	Joel Mamalateo Dedivo	N	NA	Waters	Waters - Production	Y
44	0458	Auto Pressure (Flowcell Tester)	Waters	NA	TE-92475-2	12 Months	11-Apr-18	11-Apr-18	Internal	Joel Mamalateo Dedivo	Y	NA	Waters	5th Floor	Y
45	0481	Liquid	Particle Measuring Systems	E20P	51053	12 Months	18-Aug-17	18-Aug-18	Particle Measuring Systems	Joel Mamalateo Dedivo	N	NA	Waters	5th Floor	Y
46	0497	Electronic Weigh Balance	AND	IR200	12326186	06 Months	15-Jan-18	15-Jul-18	Ming Deng	Joel Mamalateo Dedivo	N	96610	Waters	Waters - Production	Y

FLEXTRONICS

Calibration Record Template For Waters Manufactured Equipment

CALIBRATION/REPAIR RECORD FOR WATERS T.E. TESTER

TODAY'S DATE : 02/03/18 DUE DATE : 01/09/17 CAL. FREQUENCY: Half Yearly

NEXT CAL. DATE: 02/09/18 TECHNICIAN: 246394 CALIBRATION : (YES) / NO (CIRCLE ONE)

REPAIR: YES / (NO) (CIRCLE ONE)

T.E. TESTER# : TE82503-05

SYSTEM NAME : Injector Seal Pack Tester

TESTER NAME : Injector Seal Pack Tester

LOCATION : 5th Floor, Kallang Place (Production area)

CALIBRATION ADJUSTMENT MADE YES / (NO) (CIRCLE ONE IF OUTSIDE THE SPECIFIED TOLERANCE OF CALIBRATION. SEND OUT "OUT OF CALIBRATION NOTICE")

EQUIPMENT USED	SERIAL #	CAL. DATE	CAL.DUE DATE
<u>Ametek Pressure Calibrator</u>	<u>9093205</u>	<u>12/09/17</u>	<u>12/09/18</u>
	<u>End of data</u>		

Procedure Step #	Expected	Actual	Adjustment Made
<u>2.12</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>Transducer 1</u>	<u>5000 PSI (± 50 PSI)</u>	<u>5008</u>	<u>NA</u>
<u>Transducer 2</u>	<u>5000 PSI (± 50 PSI)</u>	<u>5014</u>	<u>NA</u>
	<u>End of data</u>		

NOTES:

EQID : 0259

CALIBRATION REPORT : 792

CALIBRATION PROCEDURE : WAT-RW-SS500001 (WAT043816)

WAT-RW-SKI02546 Rev B

REVIEWED & ACCEPTED
SIGN: <u>Mohd Shamsul</u>
DATE: <u>06 Mar 18</u>
REMARKS: <u>E81D 1259</u>
<u>Mohd Shamsul 06 Mar 18</u>

Document No.: TE82503-5-WAR
Iteration No.: 00
Attachment: 7.11 Page: 1 of 1

PREVENTIVE MAINTENANCE MASTER LIST

MONTH / YEAR: MARCH 2018

S#	WORK ORDER ID	EQUIPMENT ID	DESCRIPTION	EQUIPMENT SN. (IF ANY)	CUSTOMER EQUIPMENT ID (IF ANY)	EQUIPMENT OWNER	DEPARTMENT	FLOOR	LOCATION	PRODUCT	PM PROCEDURE	INITIAL DATE	FREQUENCY								REMARK	
													DAILY (Y/N)	WEEKLY (Y/N)	BIWEEKLY (Y/N)	MONTHLY (Y/N)	BI-MONTHLY (Y/N)	QUARTERLY (Y/N)	HALF YEARLY (Y/N)	YEARLY (Y/N)		OTHERS (Y/N)
1	WO 00746	PA 00409	2500 Pump Tri. Tester	TE 82516-1	TE 82516-1	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	WAT-RW- SK200106	24-Feb-10	N	N	N	N	N	N	N	N	N	N/A
2	WO 00767	PA 00401	2500 Pump Tri. Tester	TE 82516-4	TE 82516-4	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	WAT-RW- SK200106	24-Feb-10	N	N	N	N	N	N	N	N	N	WO 00778 Date: 21 02/13 WO 02176 Date: 11 05/15
3	WO 00748	PA 00402	2500 Pump Tri. Tester	TE 82516	TE 82516	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	WAT-RW- SK200106	24-Feb-10	N	N	N	N	N	N	N	N	N	N/A
4	WO 00769	PA 00403	2500 Keypad LCD Tester	TE 82516	TE 82516	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Front Panel Station	Waters	WAT-RW- SK200281	24-Feb-10	N	N	N	N	N	N	N	N	N	N/A
5	WO 00770	PA 00404	2500 Ground/Current Drive Alignment Station	TE 82519	TE 82519	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Cavalier Station	Waters	WAT-RW- SK200297	24-Feb-10	N	N	N	N	N	N	N	N	N	WO 01597 Date: 20 01/14 Equipment Return Customer
6	WO 00771	PA 00405	Phosbus Tri. Tester (Vacuum Degasser)	TE 82511-1	TE 82511-1	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Heater Cooler Station	Waters	WAT-RW- SK200104	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
7	WO 00772	PA 00406	2500/2700 Sizing Drive Tester	TE 82516	TE 82516	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Car Plate Syringe Drive Station	Waters	WAT-RW- SK200248	24-Feb-10	N	N	N	N	N	N	N	N	N	WO 05116 Date: 17 05/17
8	WO 00773	PA 00407	0 Reg. Bush Leak Tester	TE 82626	TE 82626	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Car Plate Syringe Drive Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	WO 02758 Date: 15 01/16 WO 03910 Date: 19 12/17 Routine Preventive Maintenance
9	WO 00774	PA 00408	In Line Degasser	NIWGT482118	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	WO 01571 Date: 03 12/13 WO 02177 Date: 11 05/15
10	WO 00775	PA 00409	In Line Degasser	LOD402167N1	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
11	WO 00776	PA 00410	In Line Degasser	MD0021645M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Injection Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	WO 017254 Date: 26 06/13
12	WO 00777	PA 00411	In Line Degasser	F00021565M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Pump Tri. Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
13	WO 00778	PA 00412	In Line Degasser	MD0021641M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Alliance HPAT Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
14	WO 00779	PA 00413	In Line Degasser	F00021513M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	Alliance Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
15	WO 00780	PA 00414	In Line Degasser	MD0021646M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	1527 1515 515 Pump Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
16	WO 00781	PA 00415	In Line Degasser	MD0021641M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	1521 1515 515 Pump Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
17	WO 00782	PA 00416	In Line Degasser	F00021625M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	BSM GSM Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
18	WO 00783	PA 00417	In Line Degasser	MD0021641M	N/A	Joel Namasileo Debiyo	Test Engineering	5th	BSM GSM Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
19	WO 00784	PA 00418	August's Asimbi Tester	TE 82000-2	TE 82000-2	Joel Namasileo Debiyo	Test Engineering	5th	BSM GSM Station	Waters	WAT-RW- SK200114	24-Feb-11	N	N	N	N	N	N	N	N	N	WO 03517 Date: 17 05/17
20	WO 00785	PA 00419	August's Asimbi Tester	TE 82000-1	TE 82000-1	Joel Namasileo Debiyo	Test Engineering	5th	BSM GSM Station	Waters	WAT-RW- SK200114	24-Feb-11	N	N	N	N	N	N	N	N	N	WO 03518 Date: 17 05/17
21	WO 00786	PA 00420	515 Barrel Assembly Tester	TE 82051	TE 82051	Joel Namasileo Debiyo	Test Engineering	5th	1521 1515 515 Pump Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A
22	WO 00787	PA 00421	Pump Machine Run In Module	TE 82013	TE 82013	Joel Namasileo Debiyo	Test Engineering	5th	1521 1515 515 Pump Station	Waters	SKW-RW- SK200015	24-Feb-11	N	N	N	N	N	N	N	N	N	N/A

FLEXTRONICS

Functional Tester Preventive Maintenance Checklist

PROJECT NO: WAT279000925

DESCRIPTION: In line degasser

EQID NO : PM 00413

STATION	Injector	
DONE BY	246394 R	
DATE	15 Sep 17	NA
REVIEWED BY	246154 R	
DATE	15 Sep 17	

* For Miscellaneous Equipments, please write descriptions on remark column

A) DOMESTIC CLEANING	TICK IF DONE	REMARKS
In line degasser (SIN: F10DG2553M)	✓	NA
End of data		

For Miscellaneous cables please write descriptions on remark column and tick on Good/Bad column where applicable.

B) CHECK CONDITION OF CABLES/CONNECTOR	GOOD	BAD	REMARKS
Tubing from methanol to degasser	✓		
Tubing to tester	✓		NA
A/C power supply cable	✓		
End of data			

* Please indicate any additional measurements need to be taken below. Mandatory ONLY for "EARTH" Grounding.

C) POWER SOCKET OUTLET "EARTH" MEASUREMENT	READING (OHMS)	REMARKS
1) POWER SOCKET OUTLET "EARTH" TO TESTER CASING (< 1 OHMS)	0.40	NA
End of data		

*Please indicate Test Software Name and Version use below

D) TEST SOFTWARE VERIFICATION	REVISION	REMARKS
NA	NA	NA
NA	NA	NA

* Please indicate Tester Name below

E) TEST VERIFICATION	TICK WHERE APPLICABLE	REMARKS
Injector (TE B2503-05)	PASS	NA
End of data	FAIL	

STANDARD REFERENCE EQUIPMENT USED :

TYPE	SERIAL NUMBER	CAL DUE DATE
Fluke 179 (multimeter)	90240092	22 Feb 18
End of data		

COMMENTS (IF ANY)

NA

SKW-RW-SKR00036 Rev C

Document No.: TE82503-5-10R
 Iteration No.: 00
 Attachment: 7.13 Page: 1 of 1

Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 4 of 6

IQ Test name: Test Software and Instrument Firmware Version			Test Script No.: IQ-04	
Equipment No./ID: TE82503-5		Equipment Name: Injector / Seal Pack Tester		
Installation Site: Flextronics: WPPL, Singapore				
Purpose: To verify that the installed firmware/software is correct per the applicable design/operational documents (TSP, ASP, MPR, BOM, and/or other Design documents). Test execution: List all critical instruments/components and/or sub-systems that require software and/or firmware in the Description column. List the associated required software/firmware version, as defined in the applicable design/operational documents, in the Acceptance criteria column. Verify that the software/firmware version on the Test Equipment match the acceptance criteria and are identical. Enter N/A for any parameter or cell that is not used or applicable. Objective evidence: Completed Test Script Data Sheet Identify the applicable design/operational document that defined the required software/firmware version(s) in the associated Installation Qualification Report.				
Description	Acceptance criteria	As found	Pass/Fail	Initial & Date
Test Equipment Software	Version: 4.0	Version: 4.0	PASS	YH 07 MAR 2018
Comments: Software version specified in WAT043815, Ver. 06 This station does not download instrument firmware				
Overall Test Conclusion: ☒ Pass ☐ Fail				

Copy this Test Script as needed

Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-10R
 Iteration No.: 00
 Attachment: 7.14 Page: 1 of 1



Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 5 of 6

IQ Test name: General Safety and Alarms		Test Script No.: IQ-05	
Equipment No./ID: TE82503-5		Equipment Name: Injector / Seal Pack Tester	
Installation Site: Flextronics: WPPL, Singapore			
Purpose: To verify that the test equipment can operate in a safe manner, within its designated location. Test List any additional safety related conditions or alarms in the Safety Inspection column. List the associated safety requirement/specification in the Acceptance Criteria column. Perform an inspection/test of the equipment to assess its safety related conditions. Enter N/A for any parameter or cell that is not used or applicable. Objective evidence: Completed Test Script Data Sheet Photo of the secured glass bottles and/or tanks, if applicable			
Safety Inspection	Acceptance criteria	Pass/Fail	Initial & Date
Mechanical Safety/ Pinch Points/Sharp Edges	None Found	PASS	07 MAR 2018 YH
Electrical Safety Hi Pot/Ground Continuity	Passed per test specification WAT046538	PASS	07 MAR 2018 YH
Glass Bottles are secure	Secure	PASS	07 MAR 2018 YH
Tanks are secure	Secure	PASS	07 MAR 2018 YH
Comments: Tester passed Hi-Pot test using Eq ID 1492 (calibrated 09 NOV 2017) Added zero to date "09" Exp 16 Mar 2018			
Overall Test Conclusion: ☒ Pass ☐ Fail			

Copy this Test Script as needed

Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-10R
 Iteration No.: 00
 Attachment: 7.16 Page: 1 of 1

Certificate of Calibration

Date: November 09, 2017

Cert No. 512200813106568

Customer:

FLEXTRONICS MANUFACTURING (SINGAPORE) PTE. LTD.
NO.1 KALLANG PLACE SINGAPORE 339211

Work Order #: SG-11006711

MPC Control #: 19032G000182
Asset ID: 1492
Gage Type: ELECTRICAL SAFETY ANALYZER
Manufacturer: CHROMA
Model Number: 19032
Size: N/A
Temp/RH: 22.5°C / 44 %
Location: Calibration performed at MPC facility

Serial Number: 19032G000182
Department: N/A
Performed By: SENGTHYE CHEW
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: November 09, 2017
Cal. Interval: 12 MONTHS
Cal. Due Date: November 09, 2018

Calibration Notes:

Please refer to the attached calibration data. (2 pages).

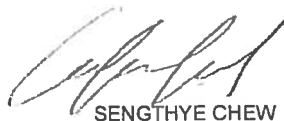
Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AP4205	MULTIMETER	3458A	2823A17096	HEWLETT PACKARD	Aug 10, 2018	512200813159474
DD2799	PRECISION HV METER	4700	019419	VITREK	Dec 4, 2017	222008122796840
CA8100	DECADE RESISTANCE BOX	2793	00060U	YOKOGAWA	May 26, 2018	512200812859599
CH4975	HIGH RESISTANCE DECADE BOX	N/A	N/A	N/A	Aug 24, 2018	512200812995468
CH2775	SYNTHESIZED FUNCTION GENERATOR	3325B	2847A09652	HEWLETT PACKARD	Nov 28, 2017	512200813148305
CN2593	UNIVERSAL COUNTER	53132A	KR91200136	HEWLETT PACKARD	Mar 7, 2018	512200812749000
CH2324	CURRENT SHUNT	34330A	0804	AGILENT	Sep 7, 2018	512200813018499

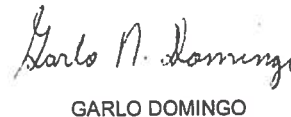
Procedures Used in this Event

Procedure Name	Description
CHROMA 19032/19032-P	Electrical Safety Analyzer Manual

Calibrating Technician:


SENGTHYE CHEW

QC Approval:


GARLO DOMINGO

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2005, ANSI/NCSL Z540-1:1994, ANSI/NCSL Z540 3:2008, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

Document No.: TE82503-5-10R
Iteration No.: 00
Attachment: 7.17 Page: 1 of 3

REVIEWED & ACCEPTED SIGN: <u>CHANG MEI LAN</u> DATE: <u>13 NOV 17</u> REMARKS: <u>EQID 1492</u> <u>Shamsul 14 Nov 17</u>



Chroma 19032 Electrical Safety Analyzer

Procedure: CHROMA 19032/19032-P
 ID Number: 19032G000182
 Asset Number: 1492

Order Number: 5G-11006711
 Serial Number: 19032G000182
 Calibration Date: November 9, 2017

AC Voltage Accuracy (@60 Hz)

Range	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
0.5 to 5 kV	1.000 kV	0.986 kV	0.998 kV	0.998 kV	1.015 kV	PASS	0.0027 kV
0.5 to 5 kV	1.350 kV	1.332 kV	1.346 kV	1.346 kV	1.368 kV	PASS	0.0034 kV
0.5 to 5 kV	2.000 kV	1.976 kV	1.995 kV	1.995 kV	2.025 kV	PASS	0.0046 kV
0.5 to 5 kV	2.400 kV	2.372 kV	2.395 kV	2.395 kV	2.429 kV	PASS	0.0053 kV
0.5 to 5 kV	3.000 kV	2.966 kV	2.992 kV	2.992 kV	3.035 kV	PASS	0.0065 kV
0.5 to 5 kV	4.000 kV	3.956 kV	3.985 kV	3.985 kV	4.045 kV	PASS	0.0083 kV
0.5 to 5 kV	5.000 kV	4.946 kV	4.980 kV	4.980 kV	5.055 kV	PASS	0.010 kV

DC Voltage Accuracy

Range	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
0.5 to 6 kV	1.000 kV	0.985 kV	1.000 kV	1.000 kV	1.016 kV	PASS	0.0029 kV
0.5 to 5 kV	1.900 kV	1.876 kV	1.899 kV	1.899 kV	1.925 kV	PASS	0.0046 kV
0.5 to 6 kV	2.000 kV	1.975 kV	1.999 kV	1.999 kV	2.026 kV	PASS	0.0048 kV
0.5 to 5 kV	2.400 kV	2.371 kV	2.400 kV	2.400 kV	2.430 kV	PASS	0.0055 kV
0.5 to 6 kV	3.000 kV	2.965 kV	2.997 kV	2.997 kV	3.036 kV	PASS	0.0066 kV
0.5 to 6 kV	4.000 kV	3.955 kV	3.996 kV	3.996 kV	4.046 kV	PASS	0.009 kV
0.5 to 6 kV	5.000 kV	4.945 kV	4.995 kV	4.995 kV	5.056 kV	PASS	0.010 kV
0.5 to 6 kV	6.000 kV	5.935 kV	5.994 kV	5.994 kV	6.066 kV	PASS	0.012 kV

AC Current Accuracy (@60 Hz)

Range	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
1 µA to 40 mA	0.250 mA	0.208 mA	0.246 mA	0.246 mA	0.293 mA	PASS	0.0080 mA
1 µA to 40 mA	0.500 mA	0.455 mA	0.497 mA	0.497 mA	0.545 mA	PASS	0.0084 mA
1 µA to 40 mA	1.000 mA	0.950 mA	0.996 mA	0.996 mA	1.050 mA	PASS	0.0094 mA
1 µA to 40 mA	2.000 mA	1.940 mA	1.995 mA	1.995 mA	2.060 mA	PASS	0.011 mA
1 µA to 40 mA	5.000 mA	4.910 mA	4.996 mA	4.996 mA	5.090 mA	PASS	0.017 mA
1 µA to 40 mA	10.000 mA	9.860 mA	9.996 mA	9.996 mA	10.140 mA	PASS	0.026 mA
1 µA to 40 mA	20.00 mA	19.76 mA	19.99 mA	19.99 mA	20.24 mA	PASS	0.045 mA
1 µA to 40 mA	35.00 mA	34.61 mA	34.98 mA	34.98 mA	35.39 mA	PASS	0.073 mA
1 µA to 40 mA	38.00 mA	37.58 mA	37.89 mA	37.89 mA	38.42 mA	PASS	0.079 mA

DC Current Accuracy

Range	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
0.1 µA to 12 mA	0.250 mA	0.236 mA	0.246 mA	0.246 mA	0.265 mA	PASS	0.0027 mA
0.1 µA to 12 mA	0.200 mA	0.186 mA	0.196 mA	0.196 mA	0.214 mA	PASS	0.0026 mA
0.1 µA to 12 mA	0.500 mA	0.483 mA	0.500 mA	0.500 mA	0.517 mA	PASS	0.0032 mA
0.1 µA to 12 mA	1.000 mA	0.978 mA	0.997 mA	0.997 mA	1.022 mA	PASS	0.0041 mA
0.1 µA to 12 mA	2.000 mA	1.968 mA	1.997 mA	1.997 mA	2.032 mA	PASS	0.0060 mA
0.1 µA to 12 mA	5.000 mA	4.938 mA	4.982 mA	4.982 mA	5.062 mA	PASS	0.012 mA
0.1 µA to 12 mA	10.000 mA	9.888 mA	9.989 mA	9.989 mA	10.112 mA	PASS	0.021 mA
0.1 µA to 12 mA	12.00 mA	11.87 mA	11.99 mA	11.99 mA	12.13 mA	PASS	0.025 mA

Insulation DC Voltage Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
0.050 kV	0.050 kV	0.044 kV	0.051 kV	0.051 kV	0.056 kV	PASS	0.0011 kV
0.500 kV	0.500 kV	0.485 kV	0.501 kV	0.501 kV	0.515 kV	PASS	0.0028 kV
1.000 kV	1.000 kV	0.975 kV	1.003 kV	1.003 kV	1.025 kV	PASS	0.0046 kV

Insulation Resistance Accuracy

Voltage Setting	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
100 V	0.100 MΩ	0.095 MΩ	0.100 MΩ	0.100 MΩ	0.105 MΩ	PASS	0.00094 MΩ
500 V	1.00 MΩ	0.95 MΩ	1.00 MΩ	1.00 MΩ	1.05 MΩ	PASS	0.0094 MΩ
500 V	10.0 MΩ	9.5 MΩ	10.0 MΩ	10.0 MΩ	10.5 MΩ	PASS	0.094 MΩ
500 V	100 MΩ	95 MΩ	100 MΩ	100 MΩ	105 MΩ	PASS	0.94 MΩ
500 V	1.00 GΩ	0.95 GΩ	1.00 GΩ	1.00 GΩ	1.05 GΩ	PASS	0.0094 GΩ
500 V	10.0 GΩ	9.5 GΩ	10.0 GΩ	10.0 GΩ	10.5 GΩ	PASS	0.094 GΩ
1000 V	1.00 MΩ	0.95 MΩ	1.00 MΩ	1.00 MΩ	1.05 MΩ	PASS	0.0094 MΩ
1000 V	10.0 MΩ	9.5 MΩ	10.0 MΩ	10.0 MΩ	10.5 MΩ	PASS	0.094 MΩ
1000 V	100 MΩ	95 MΩ	100 MΩ	100 MΩ	105 MΩ	PASS	0.94 MΩ
1000 V	1.00 GΩ	0.95 GΩ	1.00 GΩ	1.00 GΩ	1.05 GΩ	PASS	0.0094 GΩ
1000 V	10.0 GΩ	9.5 GΩ	9.7 GΩ	9.7 GΩ	10.5 GΩ	PASS	0.094 GΩ

Ground Bond AC Current Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
5.000 A	5.000 A	4.921 A	5.005 A	5.005 A	5.079 A	PASS	0.015 A
10.000 A	10.000 A	9.871 A	9.970 A	9.970 A	10.129 A	PASS	0.024 A
15.00 A	15.00 A	14.82 A	14.94 A	14.94 A	15.18 A	PASS	0.033 A
20.00 A	20.00 A	19.77 A	19.90 A	19.90 A	20.23 A	PASS	0.043 A
25.00 A	25.00 A	24.72 A	24.89 A	24.89 A	25.28 A	PASS	0.052 A
30.00 A	30.00 A	29.67 A	29.85 A	29.85 A	30.33 A	PASS	0.062 A

Resistance Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Upper Limit	Result	Uncertainty (±)
@ 10 A	300.0 mΩ	296.49 mΩ	300.5 mΩ	300.5 mΩ	303.51 mΩ	PASS	0.66 mΩ
@ 10 A	500.0 mΩ	494.49 mΩ	500.3 mΩ	500.3 mΩ	505.51 mΩ	PASS	1.0 mΩ
@ 25 A	100.0 mΩ	98.49 mΩ	100.8 mΩ	100.8 mΩ	101.51 mΩ	PASS	0.28 mΩ

Timer Accuracy Check

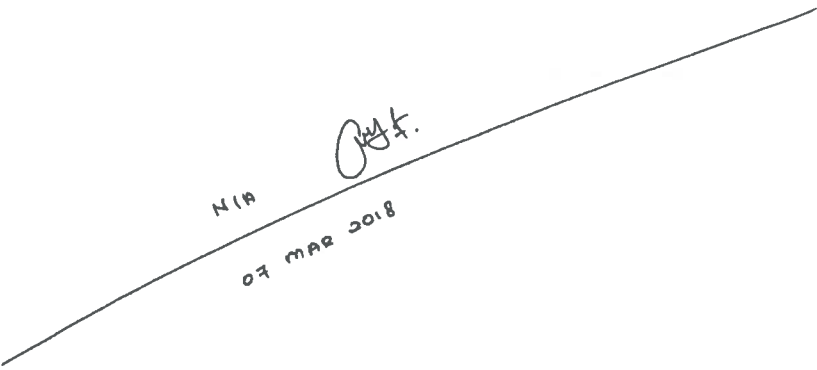
Nominal Value	As Found	As Left	Uncertainty (±)
2.00 s	2.00 s	2.00 s	0.0057 s
5.00 s	5.00 s	5.00 s	0.0057 s
10.00 s	10.01 s	10.01 s	0.0057 s

Title: Installation Qualification Procedure

Document No: 730004135

Version No: 00

Page 6 of 6

IQ Test name: Functional Verification		Test Script No.: IQ-06	
Equipment No./ID: TE82503-5		Equipment Name: Injector / Seal Pack Tester	
Installation Site: Flextronics: WPPL, Singapore			
Purpose: To verify that system transfer and/or qualification activities have not adversely affected system functionality.			
Test execution: One UUT shall be tested to verify that the test equipment functions as expected. If the system creates and/or tests more than one part number, the UUT to be tested per this Script should be a "worst case" product, and defined within the associated Installation Qualification Report. Enter N/A for any parameter or cell that is not used or applicable.			
Objective evidence: Completed Test Script Data Sheet Copy of the system Test Record for the UUT, if applicable.			
UUT Part Number/Serial Number	Acceptance criteria	Pass/Fail	Initial & Date
UUT Part Number: 289012412 UUT Serial Number: N/A ELP 09 MAR 2018	All required CTQ Specification measurements result in a Pass.	PASS	YH 07 MAR 2018
Comments: 			
Overall Test Conclusion: ☒ Pass ☐ Fail			

Copy this Test Script as needed

Waters Confidential

Template 730000483 V06

It is the responsibility of the user to verify they are using the current released version.

HARD COPY UNCONTROLLED UNLESS STAMPED, SIGNED AND DATED BY AUTHORISED PERSONNEL

Document No.: TE82503-5-10R
 Iteration No.: 10
 Attachment: 7.18 Page: 1 of 1

GRADUATE SHOULD HAVE
A MINIMUM OF 1.25 ML
PRESS 'ENTER' KEY TO
CONTINUE TESTING.



ALL TESTS PASSED!
DECAY COUNT IS 270
ALL TESTS PASSED!
DECAY = 0 PSI

SEAL WIDTH TEST
ALL TESTS PASSED!
ALL TESTS PASSED!
SEAL COUNT IS 76

ALL TESTS COMPLETE
ALL TESTS PASSED!
ALL TESTS PASSED!
DOWN COUNT WAS 43