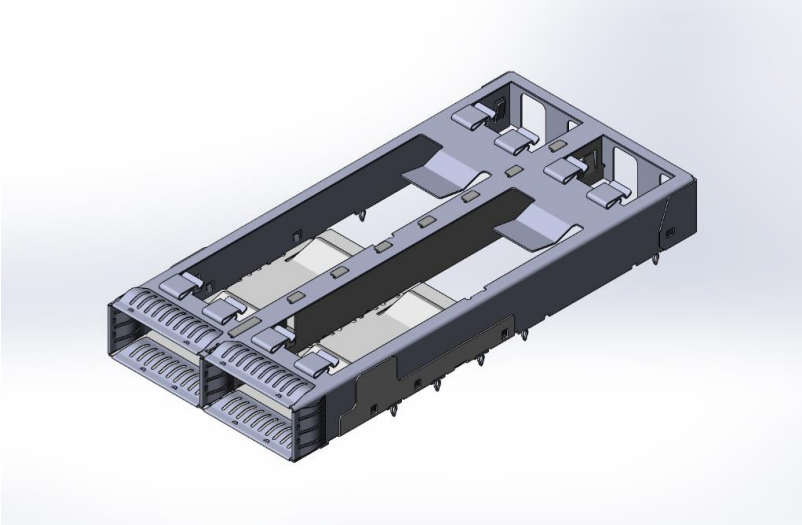
| | |
|---|---|
| Project Number: Design Qualification Test Report | Tracking Code: 2562737_Report_Rev_1 |
| Requested by: Michael Menkhaus | Date: 6/23/2021 |
| Part #: QSFPC-DD-1-2-S-F | Tech: Peter Chen |
| Part description: QFSPC | Qty to test: 20 |
| Test Start: 12/3/2020 | Test Completed: 1/25/2021 |



# DESIGN QUALIFICATION TEST REPORT

## QFSPC
## QSFPC-DD-1-2-S-F

## REVISION HISTORY

| DATA | REV.NUM. | DESCRIPTION | ENG |
|---|---|---|---|
| **6/17/2021** | **1** | **Initial Issue** | **PC** |

## CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.



### SCOPE

To perform the following tests: Design Qualification test. Please see test plan.

### APPLICABLE DOCUMENTS

Standards: EIA Publication 364

### TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
4) The automated procedure is used with aqueous compatible soldering materials.
5) Any additional preparation will be noted in the individual test sequences.
6) Solder Information: Lead free
7) Samtec Test PCBs used: PCB-110870-TST/ PCB-110871-TST.

# FLOWCHARTS

## Normal Force

Group 1
QSFPC-DD-1-2-S-F

8 Contacts Minimum
Top S Springs

| Step | Description |
| --- | --- |
| 1. | Normal Force (1)<br>Deflection = 0.030 "<br>Expected Force at Max Deflection = 800 g |

Group 2
QSFPC-DD-1-2-S-F

8 Contacts Minimum
Bottom Of Cage Tabs

| Step | Description |
| --- | --- |
| 1. | Normal Force (1)<br>Deflection = 0.049 "<br>Expected Force at Max Deflection = 800 g |

(1) Normal Force = EIA-364-04

## Pull/Shear

Group 1
QSFPC-DD-1-2-S-F

10 Assemblies

| Step | Description |
| --- | --- |
| 1. | Connector Pull<br>*Note: Use 0.041" PTH ENIG PCB* |

Group 2
QSFPC-DD-1-2-S-F

10 Assemblies

| Step | Description |
| --- | --- |
| 1. | Connector Pull<br>*Note: Use 0.041" PTH HASL PCB* |

**FLOWCHARTS Continued**

## Compliant Pin Buckling

*Note: Use Starrett press in the test lab for all pressing into boards.*

| Group 1<br>QSFPC-DD-1-2-S-F<br><br>20 Assemblies<br>HASL 0.039" PTH | | Group 2<br>QSFPC-DD-1-2-S-F<br><br>20 Assemblies<br>HASL 0.043" PTH | |
| --- | --- | --- | --- |
| **Step** | **Description** | **Step** | **Description** |
| 1. | Measure PTH Diameter<br>*Note: Measure PTH diameters on 1 piece of HASL 0.039" PCB.* | 1. | Measure PTH Diameter<br>*Note: Measure PTH diameters on 1 piece of HASL 0.043" PCB.* |
| 2. | Press Connectors<br>*Note: Press 20 pieces of QSFPC-DD-1-2-S-F into HASL 0.039" PCBs using Starrett press in the test lab and CAT-PT-FQSFP-DD-02-02.* | 2. | Press Connectors<br>*Note: Press 20 pieces of QSFPC-DD-1-2-S-F into HASL 0.043" PCBs using Starrett press in the test lab and CAT-PT-FQSFP-DD-02-02.* |
| 3. | Visual Inspection<br>*Note: Check cage straightness and press fit pin collapsing.* | 3. | Visual Inspection<br>*Note: Check cage straightness and press fit pin collapsing.* |
| 4. | Cross Section Connectors<br>*Note: Cross section 1 connector and take pictures of each press fit pin in the PTH.* | 4. | Cross Section Connectors<br>*Note: Cross section 1 connector and take pictures of each press fit pin in the PTH.* |

# FLOWCHARTS Continued

## Insertion/Retention/Hole Conditioning

| Group 1<br>QSFPC-DD-1-2-S-F<br>30 Contacts Minimum<br>HASL 0.039" PTH<br>*Note: Use Starrett press for each insertion/extraction.* | | Group 2<br>QSFPC-DD-1-2-S-F<br>30 Contacts Minimum<br>HASL 0.043" PTH<br>*Note: Use Starrett press for each insertion/extraction.* | | Group 3<br>QSFPC-DD-1-2-S-F<br>30 Contacts Minimum<br>ENIG 0.039" PTH<br>*Note: Use Starrett press for each insertion/extraction.* | | Group 4<br>QSFPC-DD-1-2-S-F<br>30 Contacts Minimum<br>ENIG 0.043" PTH<br>*Note: Use Starrett press for each insertion/extraction.* | |
|---|---|---|---|---|---|---|---|
| **Step** | **Description** | **Step** | **Description** | **Step** | **Description** | **Step** | **Description** |
| 1. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.039" HASL PTH.*<br>*Note: Pin 1* | 1. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.043" HASL PTH.*<br>*Note: Pin 1* | 1. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.039" ENIG PTH.*<br>*Note: Pin 1* | 1. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.043" ENIG PTH.*<br>*Note: Pin 1* |
| 2. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.039" HASL PTH.*<br>*Note: Pin 1*<br>*Note: EIA-364-29* | 2. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.043" HASL PTH.*<br>*Note: Pin 1*<br>*Note: EIA-364-29* | 2. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.039" ENIG PTH.*<br>*Note: Pin 1*<br>*Note: EIA-364-29* | 2. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.043" ENIG PTH.*<br>*Note: Pin 1*<br>*Note: EIA-364-29* |
| 3. | Cycles<br>Quantity = 1 Cycles<br>*Note: Pin 2* | 3. | Cycles<br>Quantity = 1 Cycles<br>*Note: Pin 2* | 3. | Cycles<br>Quantity = 1 Cycles<br>*Note: Pin 2* | 3. | Cycles<br>Quantity = 1 Cycles<br>*Note: Pin 2* |
| 4. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.039" HASL PTH.*<br>*Note: Pin 3* | 4. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.043" HASL PTH.*<br>*Note: Pin 3* | 4. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.039" ENIG PTH.*<br>*Note: Pin 3* | 4. | Insertion Force<br>*Note: Measure insertion force for 1 pin into 0.043" ENIG PTH.*<br>*Note: Pin 3* |
| 5. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.039" HASL PTH.*<br>*Note: Pin 3*<br>*Note: EIA-364-29* | 5. | Retention Force<br>*Note: EIA-364-29*<br>*Note: Measure extraction force for 1 pin out of 0.043" HASL PTH.*<br>*Note: Pin 3* | 5. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.039" ENIG PTH.*<br>*Note: Pin 3*<br>*Note: EIA-364-29* | 5. | Retention Force<br>*Note: Measure extraction force for 1 pin out of 0.043" ENIG PTH.*<br>*Note: Pin 3*<br>*Note: EIA-364-29* |
| 6. | Hole Integrity<br>*Note: Check for distortion of the PTH according to EIA-364-96* | 6. | Hole Integrity<br>*Note: Check for distortion of the PTH according to EIA-364-96* | 6. | Hole Integrity<br>*Note: Check for distortion of the PTH according to EIA-364-96* | 6. | Hole Integrity<br>*Note: Check for distortion of the PTH according to EIA-364-96* |

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon $TC^2$, computer controlled test stand with a deflection measurement system accuracy of 5 µm (0.0002”).
9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of ± 0.2%.
10) The nominal deflection rate shall be 5 mm (0.2”)/minute.
11) Unless otherwise noted a minimum of five contacts shall be tested.
12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
13) The system shall utilize the $TC^2$ software in order to acquire and record the test data.
14) The permanent set of each contact shall be measured within the $TC^2$ software.
15) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a printout will be stored with the Tracking Code paperwork.

### Pull/ Shear.

Pull the QSFPC from the PCB until sheared.

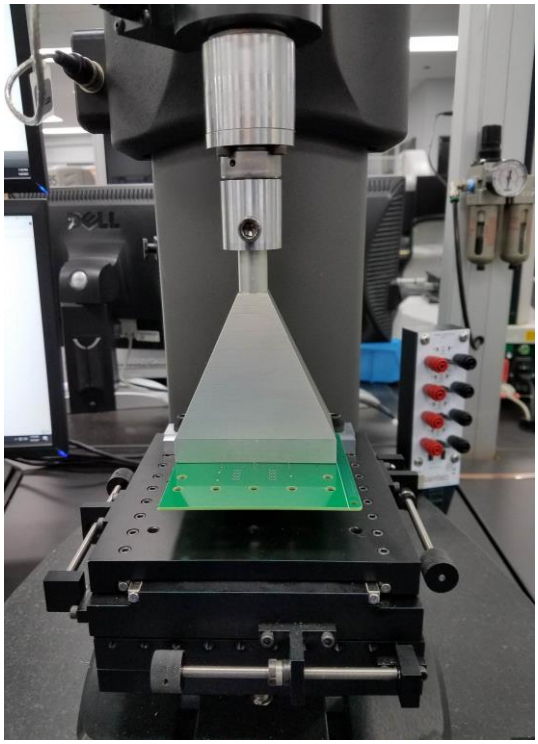


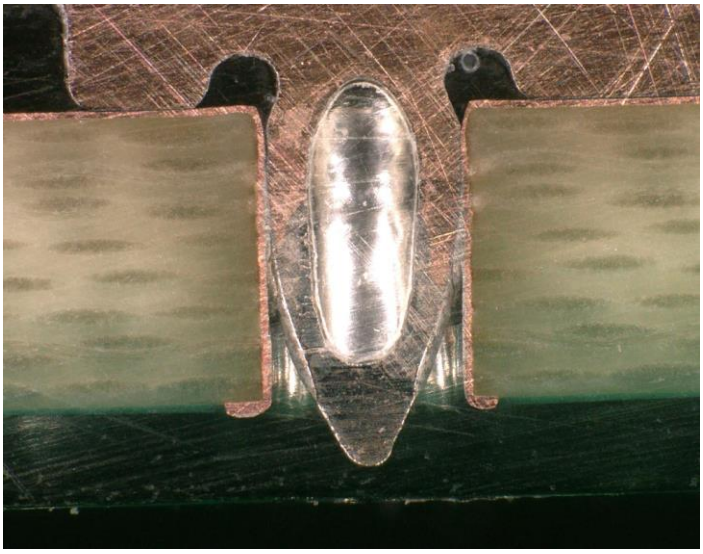
Fig. 1

## ATTRIBUTE DEFINITIONS

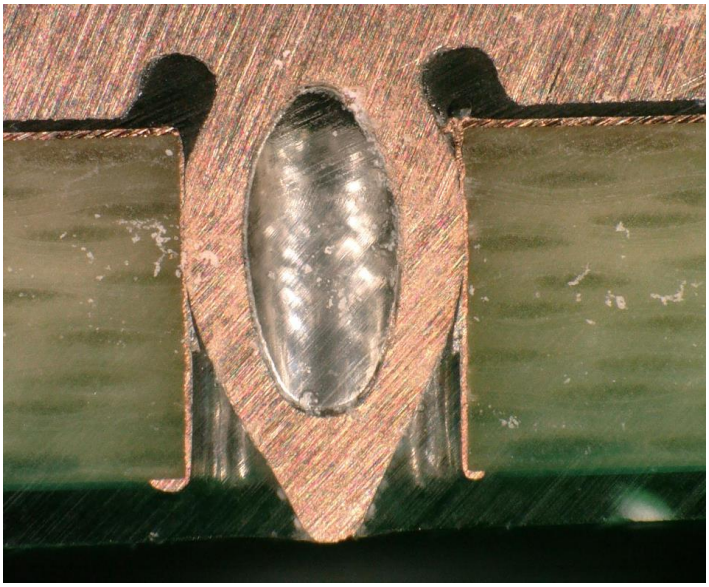
The following is a brief, simplified description of attributes.

### Compliant Pin Buckling Picture

**HASL-0.039"**



**HASL-0.043"**



# RESULTS

## Normal Force

**Top of S Springs -0.030 inch deflection**

- **Initial**
  - **Min ---------- 1.22 Lbs**
  - **Max ---------- 1.56 Lbs**

**Bottom of Cage Tabs -0.049 inch deflection**

- **Initial**
  - **Min ---------- 1.33 Lbs**
  - **Max ---------- 1.49 Lbs**

## Pull/Shear

**Use 0.041" PTH ENIG PCB**

- **Min ---------- 7.38 Lbs**
- **Max ----------17.82 Lbs**

**Use 0.041" PTH HASL PCB**

- **Min ---------- 6.04 Lbs**
- **Max ----------14.57 Lbs**

## Compliant Pin Insertion/Retention Force

**HASL-0.039"**

- **Initial**
  - **Insertion Force**
    - **Min ---------- 3.78 Lbs**
    - **Max---------- 6.38 Lbs**
  - **Retention Force**
    - **Min ---------- 0.42 Lbs**
    - **Max---------- 2.41 Lbs**
- **After 3 Cycles**
  - **Insertion Force**
    - **Min ---------- 4.47 Lbs**
    - **Max---------- 5.29 Lbs**
  - **Retention Force**
    - **Min ---------- 0.46 Lbs**
    - **Max---------- 2.47 Lbs**

**HASL-0.043"**

- **Initial**
  - **Insertion Force**
    - **Min ---------- 4.06 Lbs**
    - **Max---------- 5.77 Lbs**
  - **Retention Force**
    - **Min ---------- 0.58 Lbs**
    - **Max---------- 1.60 Lbs**
- **After 3 Cycles**
  - **Insertion Force**
    - **Min ---------- 0.53 Lbs**
    - **Max---------- 5.97 Lbs**
  - **Retention Force**
    - **Min ---------- 0.52 Lbs**
    - **Max---------- 1.91 Lbs**

## RESULTS Continued

**ENIG-0.039"**

- **Initial**
  - **Insertion Force**
    - **Min ---------- 4.06 Lbs**
    - **Max---------- 5.77 Lbs**
  - **Retention Force**
    - **Min ---------- 0.82 Lbs**
    - **Max---------- 1.62 Lbs**
- **After 3 Cycles**
  - **Insertion Force**
    - **Min ---------- 0.53 Lbs**
    - **Max---------- 5.64 Lbs**
  - **Retention Force**
    - **Min ---------- 0.52 Lbs**
    - **Max---------- 1.61 Lbs**

**ENIG-0.043"**

- **Initial**
  - **Insertion Force**
    - **Min ---------- 2.76 Lbs**
    - **Max---------- 4.55 Lbs**
  - **Retention Force**
    - **Min ---------- 1.00 Lbs**
    - **Max---------- 2.72 Lbs**
- **After 3 Cycles**
  - **Insertion Force**
    - **Min ---------- 2.74 Lbs**
    - **Max---------- 4.70 Lbs**
  - **Retention Force**
    - **Min ---------- 1.19 Lbs**
    - **Max---------- 2.21 Lbs**

# DATA SUMMARIES

## NORMAL FORCE (FOR CONTACTS TESTED OUT THE HOUSING):

1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

**Top "S" Springs**

| | Force (lbs) |
| --- | --- |
| Minimum | 1.22 |
| Maximum | 1.56 |
| Average | 1.41 |

**Bottom Cage Tabs**

| | Force (lbs) |
| --- | --- |
| Minimum | 1.33 |
| Maximum | 1.49 |
| Average | 1.41 |

**Pull/Shear**

**Use 0.041" PTH ENIG PCB**

| | Force (lbs) |
| --- | --- |
| Minimum | 7.38 |
| Maximum | 17.82 |
| Average | 10.83 |

**Use 0.041" PTH HASL PCB**

| | Force (lbs) |
| --- | --- |
| Minimum | 6.04 |
| Maximum | 14.57 |
| Average | 8.41 |

## DATA SUMMARIES Continued

### Compliant Pin Insertion/Retention force:

**HASL 0.039" PTH**

| Cycle 1 | | Cycle 3 | |
|---|---|---|---|
| **Insertion Force Summary** | | **Insertion Force Summary** | |
| Minimum | 3.78 | Minimum | 4.47 |
| Maximum | 6.38 | Maximum | 5.29 |
| Average | 5.40 | Average | 4.91 |
| St. Dev. | 0.49 | St. Dev. | 0.44 |
| | | | |
| **Cycle 1** | | **Cycle 3** | |
| **Retention Force Summary** | | **Retention Force Summary** | |
| Minimum | 0.42 | Minimum | 0.46 |
| Maximum | 2.41 | Maximum | 2.47 |
| Average | 1.23 | Average | 1.23 |
| St. Dev. | 0.24 | St. Dev. | 0.10 |

**HASL 0.043" PTH**

| Cycle 1 | | Cycle 3 | |
|---|---|---|---|
| **Insertion Force Summary** | | **Insertion Force Summary** | |
| Minimum | 4.06 | Minimum | 0.53 |
| Maximum | 5.77 | Maximum | 5.97 |
| Average | 4.94 | Average | 4.47 |
| St. Dev. | 0.50 | St. Dev. | 0.67 |
| | | | |
| **Cycle 1** | | **Cycle 3** | |
| **Retention Force Summary** | | **Retention Force Summary** | |
| Minimum | 0.58 | Minimum | 0.52 |
| Maximum | 1.60 | Maximum | 1.91 |
| Average | 1.18 | Average | 1.01 |
| St. Dev. | 0.21 | St. Dev. | 0.23 |

## DATA SUMMARIES Continued

**ENIG 0.039" PTH**

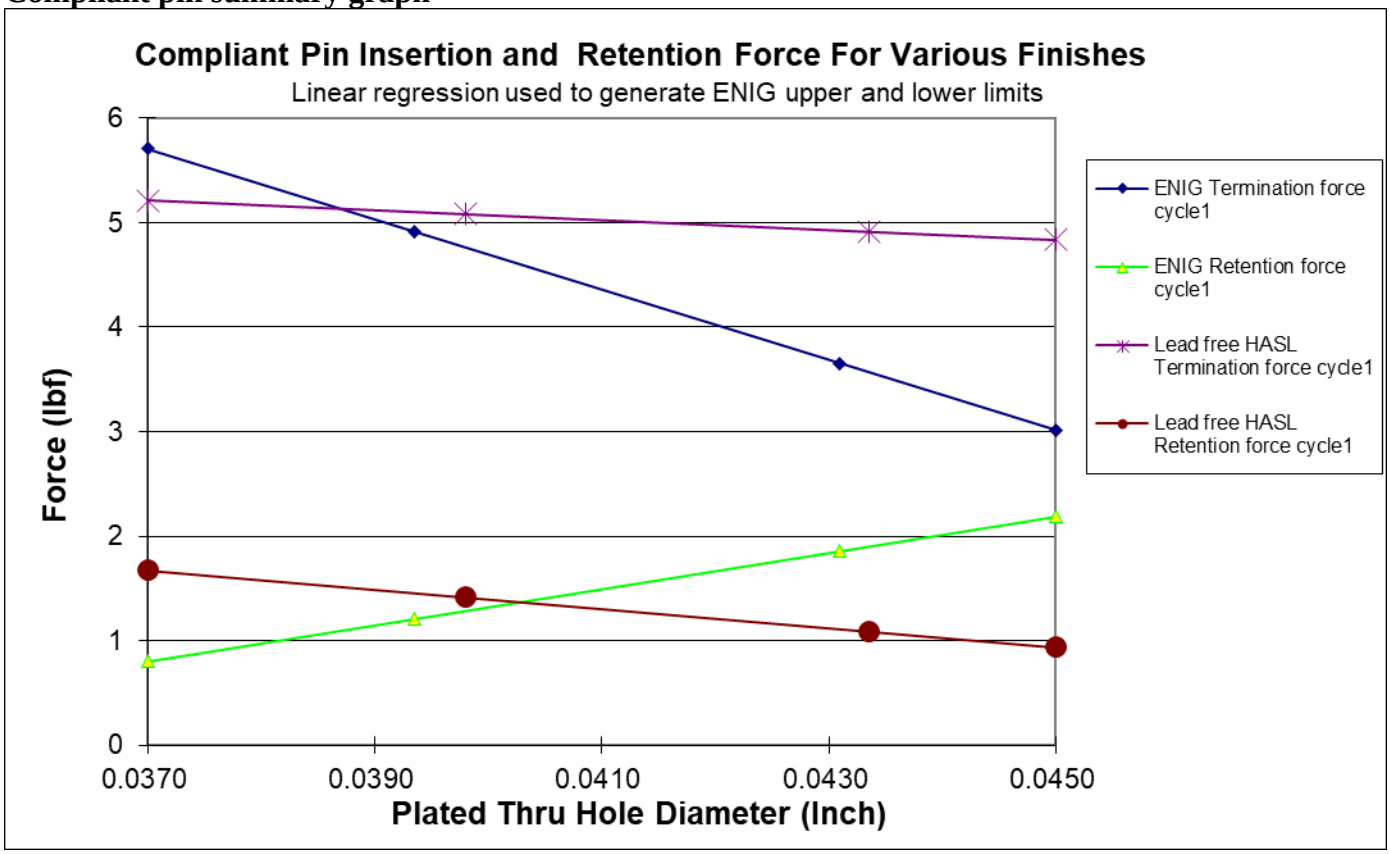
| Cycle 1 | | Cycle 3 | |
|---|---|---|---|
| **Insertion Force Summary** | | **Insertion Force Summary** | |
| Minimum | 4.06 | Minimum | 0.53 |
| Maximum | 5.77 | Maximum | 5.64 |
| Average | 4.92 | Average | 3.93 |
| St. Dev. | 0.74 | St. Dev. | 0.44 |
| | | | |
| **Cycle 1** | | **Cycle 3** | |
| **Retention Force Summary** | | **Retention Force Summary** | |
| Minimum | 0.82 | Minimum | 0.52 |
| Maximum | 1.60 | Maximum | 1.61 |
| Average | 1.22 | Average | 0.88 |
| St. Dev. | 0.15 | St. Dev. | 0.12 |

**ENIG 0.043" PTH**

| Cycle 1 | | Cycle 3 | |
|---|---|---|---|
| **Insertion Force Summary** | | **Insertion Force Summary** | |
| Minimum | 2.76 | Minimum | 2.74 |
| Maximum | 4.55 | Maximum | 4.70 |
| Average | 3.68 | Average | 3.29 |
| St. Dev. | 0.23 | St. Dev. | 0.35 |
| | | | |
| **Cycle 1** | | **Cycle 3** | |
| **Retention Force Summary** | | **Retention Force Summary** | |
| Minimum | 1.00 | Minimum | 1.19 |
| Maximum | 2.72 | Maximum | 2.21 |
| Average | 1.86 | Average | 1.60 |
| St. Dev. | 0.13 | St. Dev. | 0.17 |

## DATA SUMMARIES Continued

### Compliant pin summary graph



## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** HZ-TCT-01
**Description:** Normal force analyzer
**Manufacturer:** Mecmesin Multitester
**Model:** Mecmesin Multitester 2.5-i
**Serial #:** 08-1049-04
**Accuracy:** Last Cal: 2021-4-28, Next Cal: 2022-4-27