



Project Number: Design Qualification Test Report	Tracking Code: 106935_Report_Rev_1
Requested by: Bryon Saylor	Date: 7/3/2018
Part #: ERF5-075-05.0-L-DV-FL/ERM5-075-04.0-L-DV-FL ERF5-005-07.0-L-DV-FL/ERM5-005-04.0-L-DV-FL ERF5-030-07.0-L-DV-FL/ERM5-030-04.0-L-DV-FL	
Part description: ERF5/ERM5	Tech: Gary Lomax
Test Start: 2/4/2011	Test Completed: 2/4/2011



(Actual part not depicted)

## DESIGN QUALIFICATION TEST REPORT

### ERF5/ERM5

ERF5-005-07.0-L-DV-FL/ERM5-005-04.0-L-DV-FL  
ERF5-030-07.0-L-DV-FL/ERM5-030-04.0-L-DV-FL  
ERF5-075-05.0-L-DV-FL/ERM5-075-04.0-L-DV-FL

Tracking Code: 106935_Report_Rev_1	Part #: ERF5-075-05.0-L-DV-FL/ERM5-075-04.0-L-DV-FL
Part description: ERF5/ERM5	

**REVISION HISTORY**

<b>DATE</b>	<b>REV.NUM.</b>	<b>DESCRIPTION</b>	<b>ENG</b>
7/2/2018	1	Initial Issue	KH

## CERTIFICATION

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

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### 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

**FLOWCHARTS****Mating/Unmating**

ERF5-005-07.0-L-DV-FL

ERF5-030-07.0-L-DV-FL

ERF5-075-05.0-L-DV-FL

ERM5-005-04.0-L-DV-FL

ERM5-030-04.0-L-DV-FL

ERM5-075-04.0-L-DV-FL

<b>TEST STEP</b>	<b>GROUP 1 8 Boards (10 cycle)</b>	<b>GROUP 2 8 Boards (10 cycle)</b>	<b>GROUP 3 8 Boards (10 cycle)</b>
<b>01</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
<b>02</b>	2 cycles	2 cycles	2 cycles
<b>03</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
<b>04</b>	3 cycles	3 cycles	3 cycles
<b>05</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
<b>06</b>	4 cycles	4 cycles	4 cycles
<b>07</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
<b>08</b>	5 cycles	5 cycles	5 cycles
<b>09</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
<b>10</b>	10 cycles	10 cycles	10 cycles
<b>11</b>	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating

**Mating / Unmating Forces = EIA-364-13**

**ATTRIBUTE DEFINITIONS**

The following is a brief, simplified description of attributes.

**MATING/UNMATING:**

- 1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
- 2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
- 3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

## RESULTS

### Mating – Unmating Forces

#### Group 1: ERF5-005-07.0-L-DV-FL/ERM5-005-04.0-L-DV-FL

- **Initial**
  - **Mating**
    - **Min** ----- 0.93 lbs
    - **Max** ----- 1.64 lbs
  - **Unmating**
    - **Min** ----- 2.30 lbs
    - **Max** ----- 2.62 lbs
- **After 2 Cycles**
  - **Mating**
    - **Min** ----- 0.96 lbs
    - **Max** ----- 1.10 lbs
  - **Unmating**
    - **Min** ----- 2.16 lbs
    - **Max** ----- 2.39 lbs
- **After 3 Cycles**
  - **Mating**
    - **Min** ----- 0.94 lbs
    - **Max** ----- 1.04 lbs
  - **Unmating**
    - **Min** ----- 2.11 lbs
    - **Max** ----- 2.21 lbs
- **After 4 Cycles**
  - **Mating**
    - **Min** ----- 0.91 lbs
    - **Max** ----- 1.01 lbs
  - **Unmating**
    - **Min** ----- 2.07 lbs
    - **Max** ----- 2.16 lbs
- **After 5 Cycles**
  - **Mating**
    - **Min** ----- 0.95 lbs
    - **Max** ----- 1.00 lbs
  - **Unmating**
    - **Min** ----- 2.02 lbs
    - **Max** ----- 2.13 lbs
- **After 10 Cycles**
  - **Mating**
    - **Min** ----- 0.94 lbs
    - **Max** ----- 1.02 lbs
  - **Unmating**
    - **Min** ----- 1.95 lbs
    - **Max** ----- 2.05 lbs

**RESULTS Continued****Mating – Unmating Forces****Group 2: ERF5-030-07.0-L-DV-FL/ERM5-030-04.0-L-DV-FL**

- **Initial**
  - **Mating**
    - **Min** ----- 2.03 lbs
    - **Max** ----- 2.14 lbs
  - **Unmating**
    - **Min** ----- 2.14 lbs
    - **Max** ----- 2.87 lbs
- **After 2 Cycles**
  - **Mating**
    - **Min** ----- 2.12 lbs
    - **Max** ----- 2.23 lbs
  - **Unmating**
    - **Min** ----- 1.94 lbs
    - **Max** ----- 2.73 lbs
- **After 3 Cycles**
  - **Mating**
    - **Min** ----- 2.12 lbs
    - **Max** ----- 2.26 lbs
  - **Unmating**
    - **Min** ----- 1.93 lbs
    - **Max** ----- 2.75 lbs
- **After 4 Cycles**
  - **Mating**
    - **Min** ----- 2.14 lbs
    - **Max** ----- 2.24 lbs
  - **Unmating**
    - **Min** ----- 1.97 lbs
    - **Max** ----- 2.74 lbs
- **After 5 Cycles**
  - **Mating**
    - **Min** ----- 2.15 lbs
    - **Max** ----- 2.62 lbs
  - **Unmating**
    - **Min** ----- 1.94 lbs
    - **Max** ----- 2.72 lbs
- **After 10 Cycles**
  - **Mating**
    - **Min** ----- 2.16 lbs
    - **Max** ----- 2.35 lbs
  - **Unmating**
    - **Min** ----- 1.98 lbs
    - **Max** ----- 2.74 lbs

**RESULTS Continued****Mating – Unmating Forces****Group 3: ERF5-075-05.0-L-DV-FL/ERM5-075-04.0-L-DV-FL**

- **Initial**
  - **Mating**
    - **Min** ----- 4.77 lbs
    - **Max** ----- 5.16 lbs
  - **Unmating**
    - **Min** ----- 3.01 lbs
    - **Max** ----- 3.52 lbs
- **After 2 Cycles**
  - **Mating**
    - **Min** ----- 4.75 lbs
    - **Max** ----- 5.18 lbs
  - **Unmating**
    - **Min** ----- 2.63 lbs
    - **Max** ----- 3.27 lbs
- **After 3 Cycles**
  - **Mating**
    - **Min** ----- 4.71 lbs
    - **Max** ----- 5.21 lbs
  - **Unmating**
    - **Min** ----- 2.68 lbs
    - **Max** ----- 3.24 lbs
- **After 4 Cycles**
  - **Mating**
    - **Min** ----- 4.70 lbs
    - **Max** ----- 5.25 lbs
  - **Unmating**
    - **Min** ----- 2.75 lbs
    - **Max** ----- 3.27 lbs
- **After 5 Cycles**
  - **Mating**
    - **Min** ----- 4.73 lbs
    - **Max** ----- 5.26 lbs
  - **Unmating**
    - **Min** ----- 2.74 lbs
    - **Max** ----- 3.33 lbs
- **After 10 Cycles**
  - **Mating**
    - **Min** ----- 4.77 lbs
    - **Max** ----- 5.24 lbs
  - **Unmating**
    - **Min** ----- 2.93 lbs
    - **Max** ----- 3.44 lbs

## DATA SUMMARIES

## MATING/UNMATING:

## Group 1: ERF5-005-07.0-L-DV-FL/ERM5-005-04.0-L-DV-FL

	Initial				After 2 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	4.13	0.93	10.23	2.30	4.27	0.96	9.61	2.16
Maximum	7.29	1.64	11.65	2.62	4.89	1.10	10.63	2.39
<b>Average</b>	5.12	<b>1.15</b>	10.68	<b>2.40</b>	4.56	<b>1.03</b>	9.87	<b>2.22</b>
St Dev	1.29	0.29	0.59	0.13	0.27	0.06	0.43	0.10
Count	5	5	5	5	5	5	5	5
	After 3 Cycles				After 4 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	4.18	0.94	9.39	2.11	4.05	0.91	9.21	2.07
Maximum	4.63	1.04	9.83	2.21	4.49	1.01	9.61	2.16
<b>Average</b>	4.38	<b>0.98</b>	9.52	<b>2.14</b>	4.27	<b>0.96</b>	9.41	<b>2.12</b>
St Dev	0.18	0.04	0.20	0.04	0.18	0.04	0.19	0.04
Count	5	5	5	5	5	5	5	5
	After 5 Cycles				After 10 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	4.23	0.95	8.98	2.02	4.18	0.94	8.67	1.95
Maximum	4.45	1.00	9.47	2.13	4.54	1.02	9.12	2.05
<b>Average</b>	4.31	<b>0.97</b>	9.15	<b>2.06</b>	4.35	<b>0.98</b>	8.93	<b>2.01</b>
St Dev	0.10	0.02	0.19	0.04	0.16	0.03	0.18	0.04
Count	5	5	5	5	5	5	5	5

## DATA SUMMARIES Continued

## MATING/UNMATING:

## Group 2: ERF5-030-07.0-L-DV-FL/ERM5-030-04.0-L-DV-FL

	Initial				2 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	9.03	2.03	9.52	2.14	9.43	2.12	8.63	1.94
Maximum	9.52	2.14	12.77	2.87	9.92	2.23	12.14	2.73
<b>Average</b>	9.20	<b>2.07</b>	11.75	<b>2.64</b>	9.65	<b>2.17</b>	11.16	<b>2.51</b>
St Dev	0.24	0.05	1.35	0.30	0.19	0.04	1.47	0.33
Count	5	5	5	5	5	5	5	5
	3 Cycles				4 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	9.43	2.12	8.58	1.93	9.52	2.14	8.76	1.97
Maximum	10.05	2.26	12.23	2.75	9.96	2.24	12.19	2.74
<b>Average</b>	9.76	<b>2.19</b>	11.11	<b>2.50</b>	9.73	<b>2.19</b>	11.12	<b>2.50</b>
St Dev	0.26	0.06	1.47	0.33	0.17	0.04	1.39	0.31
Count	5	5	5	5	5	5	5	5
	5 Cycles				10 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	9.56	2.15	8.63	1.94	9.61	2.16	8.81	1.98
Maximum	11.65	2.62	12.10	2.72	10.45	2.35	12.19	2.74
<b>Average</b>	10.14	<b>2.28</b>	10.98	<b>2.47</b>	10.02	<b>2.25</b>	11.02	<b>2.48</b>
St Dev	0.87	0.20	1.42	0.32	0.32	0.07	1.32	0.30
Count	5	5	5	5	5	5	5	5

## DATA SUMMARIES Continued

## MATING/UNMATING:

## Group 3: ERF5-075-05.0-L-DV-FL/ERM5-075-04.0-L-DV-FL

	Initial				After 2 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	21.21	4.77	13.41	3.01	21.11	4.75	11.71	2.63
Maximum	22.95	5.16	15.67	3.52	23.04	5.18	14.54	3.27
<b>Average</b>	22.29	<b>5.01</b>	14.61	<b>3.28</b>	22.32	<b>5.02</b>	13.31	<b>2.99</b>
St Dev	0.51	0.12	0.77	0.17	0.56	0.13	1.27	0.29
Count	9	9	9	9	9	9	9	9
	After 3 Cycles				After 4 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	20.97	4.71	11.90	2.68	20.89	4.70	12.23	2.75
Maximum	23.17	5.21	14.41	3.24	23.35	5.25	14.53	3.27
<b>Average</b>	22.44	<b>5.04</b>	13.25	<b>2.98</b>	22.44	<b>5.04</b>	13.40	<b>3.01</b>
St Dev	0.68	0.15	1.02	0.23	0.72	0.16	1.03	0.23
Count	9	9	9	9	9	9	9	9
	After 5 Cycles				After 10 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	21.02	4.73	12.17	2.74	21.22	4.77	13.05	2.93
Maximum	23.41	5.26	14.82	3.33	23.31	5.24	15.29	3.44
<b>Average</b>	22.56	<b>5.07</b>	13.46	<b>3.03</b>	22.51	<b>5.06</b>	14.07	<b>3.16</b>
St Dev	0.77	0.17	1.02	0.23	0.66	0.15	0.78	0.18
Count	9	9	9	9	9	9	9	9

**EQUIPMENT AND CALIBRATION SCHEDULES****Equipment #:** TCT-04**Description:** Dillon Quantrol TC21 25-1000 mm/min series test stand**Manufacturer:** Dillon Quantrol**Model:** TC2 I series test stand**Serial #:** 04-1041-04**Accuracy:** Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;  
... Last Cal: 05/29/2018, Next Cal: 05/29/2019