



TEST REPORT

| | | |
|---|---|---|
| PRODUCT ENGINEERING LABORATORY | RL. 130847 | REVISION: 1 |
| Material / Parts description: SUPERSEAL 1.5 SERIES 4P (REC) AMP SUPERSEAL 1.5 SERIES 4P (TAB) MINI MIC TAB CONTACT MINI MIC REC CONTACT | PN: 282088-1 282106-1 282465-1 282466-1 | REVISION: B B A A |
| Requester: GENTIL JR | Dept: EPA | |
| Customer: SEVERAL | Supplier: TE CONNECTIVITY | |

| | |
|--|---|
| Confidentiality: | Distribution: |
| <input type="checkbox"/> 1- CONFIDENTIAL <input type="checkbox"/> 2- TE RESTRICTED <input checked="" type="checkbox"/> 3- ADDRESSED CUSTOMER <input type="checkbox"/> | <input checked="" type="checkbox"/> REQUESTER <input checked="" type="checkbox"/> DM.TEC <input type="checkbox"/> <input type="checkbox"/> |

| | |
|----------------------------------|---|
| Purpose: 1 - NEW RAW MATERIAL | History: WAR ON MATERIAL PROJECT. VALIDATION TEST WITH PA6.6 13GF RAW MATERIAL (PN 702596-1). |
|----------------------------------|---|

| | |
|--|---|
| Test(s) Made : TESTS EXTRACTED FROM SPEC. 108-20090: ITEM 3.5 ITEM 3.6 ITEM 3.9 ITEM 3.16 ITEM 3.17 ITEM 3.18 | Specification (s): TE 108-20090 REVISION 2007. |
|--|---|

Conclusion:

Please see individual tests results.

| | | |
|-------------------|---|--|
| 28/ago/13 Date | *Signature on file Executed by DIOGO BIASETTO ROJAS TEST ENGINEER | *Signature on file Responsible PAULO S. ALMEIDA LABORATORY COORDINATOR |
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Accomplished tests according to Test Plan attached:

1.1 - Connector mating force (item 3.5)..... pg. 03
 1.2 - Connector unmating force (item 3.6)..... pg. 03
 1.3 - Retention force of the single contact in the housing (item 3.9)..... pg. 04
 1.4 - Thermal cycling (item 3.16)..... pg. 06
 1.5 - Ageing resistance (item 3.17)..... pg. 08
 1.6 - Chemical resistance (item 3.18)..... pg. 10

Samples Identification

48 parts of SUPERSEAL 1.5 SERIES 4P (REC) PN: 282088-1 WITH PA6.6 13GF RAW MATERIAL (PN 702596-1).
 48 parts of AMP SUPERSEAL 1.5 SERIES 4P (TAB) PN: 282106-1.
 192 parts of MINI MIC TAB CONTACT PN: 282465-1.
 192 parts of MINI MIC REC CONTACT PN: 282466-1.



Photo 1 - MINI MIC CONTACT



Photo 2 - HSG SUPERSEAL TAB



Photo 3 - HSG SUPERSEAL REC

1.1 - Connector mating force (item 3.5):

Samples:

Samples number 21 to 31.

Equipment:

Imada Digital dynamometer, model DPS 11R, ref. TE 92-339017-076.

Procedure:

Measure mating force from terminal to housing manually.

Requirements:

Mating force $\leq 120\text{N}$.

Results:

| Sample | Mating force [N] |
|---------|------------------|
| 21 | 88,0 |
| 22 | 84,6 |
| 23 | 97,0 |
| 24 | 97,5 |
| 25 | 97,0 |
| 26 | 87,0 |
| 27 | 95,5 |
| 28 | 98,5 |
| 29 | 98,0 |
| 30 | 100,5 |
| 31 | 101,5 |
| Minimum | 84,6 |
| Average | 95,0 |
| Maximum | 101,5 |

Conclusion:

All samples met the requirements.

1.2 - Connector unmating force (item 3.6):

Samples:

Samples number 21 to 31.

Equipment:

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, ref. TE 92-339017-090.

Procedure:

Measure unmating force from connector to counterpart, with a 50mm/min speed.

Requirements:

A) Unmating force (without operating the locking lance) $\geq 145\text{N}$ (samples 1 to 6).

B) Unmating force (operating the locking lance) $\leq 120\text{N}$ (samples 7 to 11).

Results:

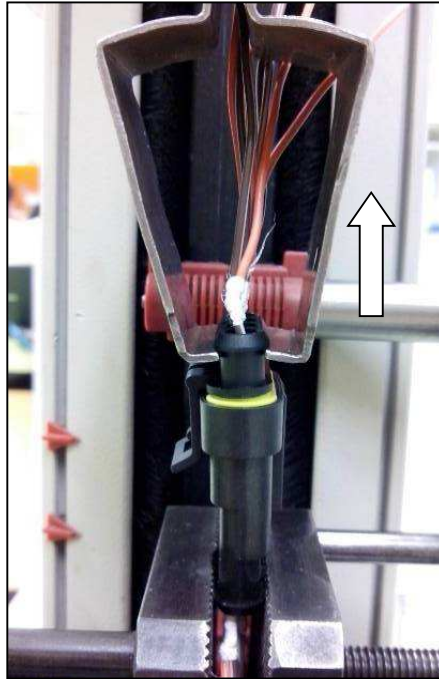


Photo 4 - Connector unmating force

| Sample | Unmating force [N] | |
|----------------|--------------------|------|
| | A | B |
| 21 | 359,0 | - |
| 22 | 349,0 | - |
| 23 | 367,0 | - |
| 24 | 356,0 | - |
| 25 | 361,5 | - |
| 26 | 332,0 | - |
| 27 | - | 32,0 |
| 28 | - | 26,5 |
| 29 | - | 39,5 |
| 30 | - | 36,5 |
| 31 | - | 44,5 |
| Minimum | 332,0 | 26,5 |
| Average | 354,1 | 35,8 |
| Maximum | 367,0 | 44,5 |

Conclusion:

All samples met the requirements.

1.3 - Retention force of the single contact in the housing (item 3.9):

Samples:

Samples number 32 to 41.

Equipment:

Imada Digital dynamometer, model DPS 11R, ref. TE 92-339017-076.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, ref. TE 92-339017-090.

Procedure:

Contact to housing insertion force at a rate of 50mm/min.

Contact to housing retention force at a rate of 50mm/min (informative).

Requirements:

Retention force $\geq 80\text{N}$.

Results:

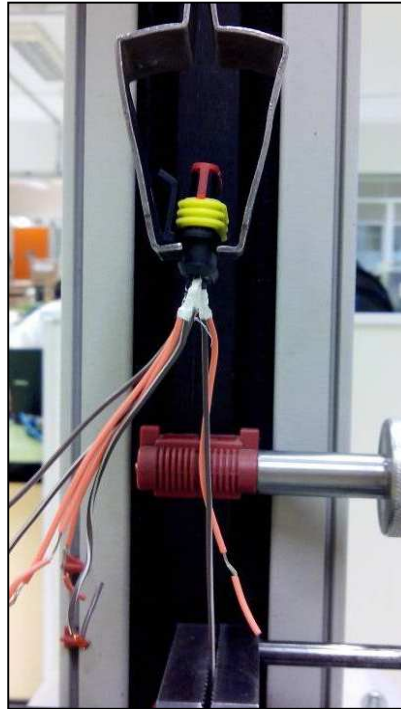


Photo 5 - Terminal retention force

| Sample | Insertion force [N] | | | |
|----------------|---------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 32 | 6,44 | 6,79 | 7,12 | 7,03 |
| 33 | 7,39 | 6,23 | 6,05 | 6,21 |
| 34 | 5,96 | 5,78 | 6,41 | 6,62 |
| 35 | 7,23 | 6,62 | 6,56 | 11,08 |
| 36 | 7,61 | 7,21 | 7,41 | 12,50 |
| 37 | 7,05 | 7,09 | 6,99 | 6,41 |
| 38 | 7,92 | 6,98 | 6,59 | 6,82 |
| 39 | 7,05 | 7,06 | 7,15 | 7,63 |
| 40 | 6,61 | 7,27 | 6,23 | 6,62 |
| 41 | 7,15 | 6,86 | 7,09 | 6,53 |
| Minimum | 5,96 | 5,78 | 6,05 | 6,21 |
| Average | 7,04 | 6,79 | 6,76 | 7,75 |
| Maximum | 7,92 | 7,27 | 7,41 | 12,50 |

| Sample | Retention force [N] | | | |
|----------------|---------------------|-------------|-------------|-------------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 32 | 90,5 | 74,5 | 79,5 | 72,0 |
| 33 | 85,5 | 84,0 | 82,5 | 87,0 |
| 34 | 81,5 | 85,5 | 86,0 | 76,0 |
| 35 | 85,5 | 74,5 | 78,5 | 73,0 |
| 36 | 80,0 | 83,0 | 85,5 | 84,0 |
| 37 | 90,5 | 92,5 | 85,5 | 79,0 |
| 38 | 79,0 | 84,5 | 85,0 | 78,5 |
| 39 | 80,0 | 84,5 | 82,5 | 80,5 |
| 40 | 80,0 | 85,0 | 82,5 | 81,0 |
| 41 | 84,0 | 82,0 | 80,0 | 82,5 |
| Minimum | 79,0 | 74,5 | 78,5 | 72,0 |
| Average | 83,7 | 83,0 | 82,8 | 79,4 |
| Maximum | 90,5 | 92,5 | 86,0 | 87,0 |

Conclusion:

The bold values were under specified. Others values were approved.

1.4 - Thermal cycling (item 3.16):

Samples:

Samples number 11 to 20.

Equipment:

Hypot ULTRA III Associated Research, Inc Serial number 9373007.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, ref. TE 92-339017-090.

HP Digital Multimeter, model 34401A, ref. TE 93-339033-030.

PAK20-36A Power Supply, nr. 02703.

Procedure:

-Measure insulation resistance (500Vdc) and dielectric withstanding resistance (1500Vac) between adjacent terminals before and after thermal cycling;

-Perform voltage drop test before and after thermal cycling;

-Subject the samples to 14 cycles as described below:

16 hours at 40°C, 95% r.h.

2 hours at -40°C

2 hours at 125°C

4 hours at 23°C

-Perform 10 mating and unmating operations;

-In samples nr. 11 to 15 measure connector mating force before start the tests and connector unmating force after tests;

-In samples nr. 16 to 20 measure contact retention force from housing.

Specified:

No damages.

Insulation resistance $\geq 200M\Omega$.

Dielectric withstanding voltage: No breakdown or flashes.

Voltage drop $\leq 5mV/A$.

Connector mating force $\leq 120N$.

Connector unmating force $\geq 145N$.

Terminal retention force $\geq 80N$.

Results:

Insulation resistance: All samples presented values $> 50G\Omega$.

Dielectric withstanding: Samples didn't present breakdown or flashes.

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INITIAL MEASUREMENTS

| Sample | Voltage drop [mV/A] | | | |
|---------|---------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 11 | 2,29 | 2,43 | 2,38 | 2,26 |
| 12 | 2,34 | 2,36 | 2,32 | 2,31 |
| 13 | 2,39 | 2,39 | 2,46 | 2,45 |
| 14 | 2,55 | 2,47 | 2,37 | 2,46 |
| 15 | 2,52 | 2,39 | 2,36 | 2,36 |
| 16 | 2,33 | 2,44 | 2,38 | 2,39 |
| 17 | 2,49 | 2,42 | 2,38 | 2,42 |
| 18 | 2,48 | 2,51 | 2,46 | 2,35 |
| 19 | 2,43 | 2,42 | 2,44 | 2,29 |
| 20 | 2,25 | 2,40 | 2,34 | 2,35 |
| Minimum | 2,25 | 2,36 | 2,32 | 2,26 |
| Average | 2,41 | 2,42 | 2,39 | 2,36 |
| Maximum | 2,55 | 2,51 | 2,46 | 2,46 |

AFTER CONDITIONING MEASUREMENTS

| Sample | Voltage drop [mV/A] | | | |
|---------|---------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 11 | 2,89 | 3,24 | 3,09 | 3,05 |
| 12 | 2,79 | 3,03 | 3,10 | 3,34 |
| 13 | 2,87 | 2,90 | 2,83 | 3,00 |
| 14 | 2,87 | 3,50 | 2,68 | 3,17 |
| 15 | 2,99 | 2,68 | 3,11 | 3,22 |
| 16 | 2,83 | 2,88 | 2,70 | 3,37 |
| 17 | 2,80 | 2,53 | 3,05 | 2,94 |
| 18 | 3,29 | 3,86 | 3,02 | 3,34 |
| 19 | 3,27 | 3,19 | 3,10 | 3,10 |
| 20 | 3,02 | 3,37 | 3,29 | 3,03 |
| Minimum | 2,79 | 2,53 | 2,68 | 2,94 |
| Average | 2,96 | 3,12 | 3,00 | 3,15 |
| Maximum | 3,29 | 3,86 | 3,29 | 3,37 |

| Sample | Connector mating force [N] | Connector Unmating force [N] |
|---------|----------------------------|------------------------------|
| 11 | 101,1 | 430,0 |
| 12 | 100,5 | 418,5 |
| 13 | 105,4 | 447,0 |
| 14 | 98,8 | 440,0 |
| 15 | 99,3 | 455,5 |
| Minimum | 98,8 | 418,5 |
| Average | 101,0 | 438,2 |
| Maximum | 105,4 | 455,5 |

| Sample | Contact retention force [N] | | | |
|---------|-----------------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 16 | 93,0 | 86,5 | 95,5 | 89,0 |
| 17 | 97,5 | 108,5 | 95,5 | 98,5 |
| 18 | 96,0 | 85,5 | 95,0 | 92,0 |
| 19 | 101,0 | 88,0 | 96,5 | 93,0 |
| 20 | 93,5 | 97,5 | 95,5 | 99,5 |
| Minimum | 93,0 | 85,5 | 95,0 | 89,0 |
| Average | 96,2 | 93,2 | 95,6 | 94,4 |
| Maximum | 101,0 | 108,5 | 96,5 | 99,5 |

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Conclusion:

All samples met the requirements.

1.5 - Ageing resistance (item 3.17):

Samples:

Samples number 1 to 10.

Equipment:

Hypot ULTRA III Associated Research, Inc Serial number 9373007.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, ref. TE 92-339017-090.

HP Digital Multimeter, model 34401A, ref. TE 93-339033-030.

PAK20-36A Power Supply, nr. 02703.

Procedure:

- Measure insulation resistance (500Vdc) and dielectric withstanding voltage (1500Vac) between adjacent terminals before and after thermal cycling;
- Perform voltage drop test before and after thermal cycling;
- Subject the samples to 100 hours at 125°C;
- Perform 10 mating and unmating operations;
- In samples nr. 1 to 5 measure connector mating force before start the tests and connector unmating force after tests;
- In samples nr. 6 to 10 measure terminal retention force from housing.

Specified:

No damages.

Insulation resistance $\geq 200M\Omega$.

Dielectric withstanding voltage: No breakdown or flashes.

Voltage drop $\leq 5mV/A$.

Connector mating force $\leq 120N$.

Connector unmating force $\geq 145N$.

Terminal retention force $\geq 80N$.

Results:

Insulation resistance: All samples presented values $> 50G\Omega$.

Dielectric withstanding: Samples didn't present breakdown or flashes.

| INITIAL MEASUREMENTS | | | | |
|-----------------------------|----------------------------|--------------|--------------|--------------|
| Sample | Voltage drop [mV/A] | | | |
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 1 | 2,52 | 2,55 | 2,54 | 2,42 |
| 2 | 2,42 | 2,44 | 2,30 | 2,38 |
| 3 | 2,40 | 2,30 | 2,20 | 2,26 |
| 4 | 2,28 | 2,33 | 2,36 | 2,39 |
| 5 | 2,50 | 2,49 | 2,25 | 2,39 |
| 6 | 2,35 | 2,27 | 2,39 | 2,38 |
| 7 | 2,42 | 2,39 | 2,33 | 2,42 |
| 8 | 2,36 | 2,56 | 2,25 | 2,32 |
| 9 | 2,32 | 2,27 | 2,34 | 2,23 |
| 10 | 2,30 | 2,53 | 2,36 | 2,39 |
| Minimum | 2,28 | 2,27 | 2,20 | 2,23 |
| Average | 2,39 | 2,41 | 2,33 | 2,36 |
| Maximum | 2,52 | 2,56 | 2,54 | 2,42 |

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AFTER CONDITIONING MEASUREMENTS

| Sample | Voltage drop [mV/A] | | | |
|----------------|---------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 1 | 3,82 | 3,83 | 3,80 | 3,17 |
| 2 | 3,82 | 4,31 | 4,48 | 4,17 |
| 3 | 2,90 | 2,83 | 3,42 | 3,87 |
| 4 | 3,44 | 2,55 | 4,20 | 3,20 |
| 5 | 3,47 | 3,71 | 3,62 | 2,77 |
| 6 | 4,02 | 3,83 | 3,63 | 4,38 |
| 7 | 4,32 | 4,28 | 4,55 | 4,53 |
| 8 | 3,52 | 3,80 | 3,72 | 3,47 |
| 9 | 2,89 | 3,42 | 2,97 | 4,02 |
| 10 | 4,90 | 4,75 | 4,82 | 4,85 |
| Minimum | 2,89 | 2,55 | 2,97 | 2,77 |
| Average | 3,71 | 3,73 | 3,92 | 3,84 |
| Maximum | 4,90 | 4,75 | 4,82 | 4,85 |

| Sample | Connector mating force [N] | Connector unmating force [N] |
|----------------|----------------------------|------------------------------|
| 1 | 106,0 | 455,0 |
| 2 | 106,5 | 464,5 |
| 3 | 94,7 | 447,5 |
| 4 | 98,5 | 442,0 |
| 5 | 99,6 | 475,0 |
| Minimum | 94,7 | 442,0 |
| Average | 101,1 | 456,8 |
| Maximum | 106,5 | 475,0 |

| Sample | Contact retention force [N] | | | |
|----------------|-----------------------------|-------|-------|-------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 6 | 91,0 | 100,5 | 94,0 | 89,0 |
| 7 | 95,0 | 88,0 | 96,5 | 93,5 |
| 8 | 84,0 | 100,5 | 94,0 | 80,5 |
| 9 | 88,5 | 85,5 | 104,5 | 84,0 |
| 10 | 84,5 | 88,0 | 93,5 | 82,5 |
| Minimum | 84,0 | 85,5 | 93,5 | 80,5 |
| Average | 88,6 | 92,5 | 96,5 | 85,9 |
| Maximum | 95,0 | 100,5 | 104,5 | 93,5 |

Conclusion:

All samples met the requirements.

1.6 - Chemical resistance (item 3.18):

Samples:

Samples number 42 to 48.

Equipment:

Fanem 320E oven, nr. 92-339032-010.

Universal tensile strength machine VERSATEST with digital dynamometer Mecmesin AFG 2500N, ref. TE 92-339017-090.

Procedure:

Connectors must be immersed for 3 minutes in:

A-Brake fluid at 50°C (MOTORCRAFT FORD H1000S DOT4).

B-Anti-freeze fluid at 23°C (G012A8G VW).

C-Transmission oil at 100°C (TUTELA G1/A DEXRON II).

D-Engine oil at 100°C (TUTELA EPYX SAE 80W-90).

E-Gasoline at 23°C.

F-Diesel fuel at 23°C.

G-Window cleaner at 23°C (VIDREX VEJA).

-Measure contact retention force from housing.

Specified:

No damages, no leakages detected at visual examination.

Terminal retention force $\geq 80N$.

Results:

| Sample | Contact retention force [N] | | | |
|---------|-----------------------------|-------------|-------|-------------|
| | Way 1 | Way 2 | Way 3 | Way 4 |
| 42 | 83,5 | 81,0 | 86,0 | 83,0 |
| 43 | 87,5 | 90,5 | 81,5 | 78,5 |
| 44 | 83,5 | 98,0 | 80,0 | 80,0 |
| 45 | 79,0 | 83,5 | 82,5 | 75,5 |
| 46 | 83,0 | 79,5 | 84,5 | 86,5 |
| 47 | 81,0 | 82,0 | 85,5 | 78,0 |
| 48 | 79,5 | 86,0 | 88,0 | 76,0 |
| Minimum | 79,0 | 79,5 | 80,0 | 75,5 |
| Average | 82,4 | 85,8 | 84,0 | 79,6 |
| Maximum | 87,5 | 98,0 | 88,0 | 86,5 |

The bold values were under specified. Others values were approved.

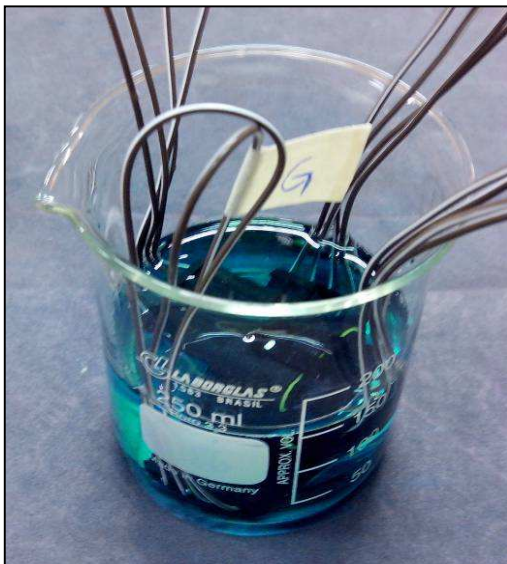


Photo 6 - Samples immersed



Photo 7 - Samples immersed



Photo 8 - Sample 42 after chemical resistance (A)



Photo 9 - Sample 43 after chemical resistance (B)



Photo 10 - Sample 44 after chemical resistance (C)



Photo 11 - Sample 45 after chemical resistance (D)



Photo 12 - Sample 46 after chemical resistance (E)



Photo 13 - Sample 47 after chemical resistance (F)



Photo 14 - Sample 48 after chemical resistance (G)

Conclusion:

No damages and leakages were detected. Samples approved.
Contact retention force: Some values were under specified.