

PRODUCT ENGINEERING

LABORATORY

RL.

130471

Rev. 1

Material / Parts description:

PN:

Drawing Issue

Amplivar Splice

280004-1

R1

Requester:

Dept:

Natanael M. Santos

EPA

Customer:

Supplier:

Denso

TE - Brazil

Confidentiality:

- () 1- CONFIDENTIAL
 () 2- TYCO RESTRICTED
 (X) 3- ADDRESSED CUSTOMER
 ()

- (X) REQUESTER
 (X) DM-TEC
 ()

Purpose:

1 - Validation

General information:

Validation of Amplivar Splice PN TE 280004-1 in "A" and "B" Splices (specified below), according with Denso solicitation.

"A" Splice - Thermo fuse 23 AWG + MAG Copper 23AWG.

Total CAM = 1104

11 samples

"B" Splice - MAG Copper 23 AWG + 0,75mm² wire.

Total CAM = 2070

12 samples

Test(s):

Specification (s):

Please, view page 2.

Has no specification. Procedure in accordance to requester definition.

Conclusion:

Informative test report.

March 4th, 2013

Date

Executed by

JÉSUS V. DE OLIVEIRA PRETO
 LABORATORY ENGINEER

Responsible

PAULO SÉRGIO DE ALMEIDA
 LABORATORY COORDINATOR

Summary:

1 - General pg. 3
1.1 - Samples Identification pg. 3

2 - Group I (Thermal Shock) pg. 4
2.1 - Low/High-Level Current Resistance..... pg. 5
2.2 - Thermal Shock pg. 6
2.3 - Low/High-Level Current Resistance..... pg. 6

3 - Group II (Traction Test) pg. 9
3.1 - Traction Test..... pg. 10

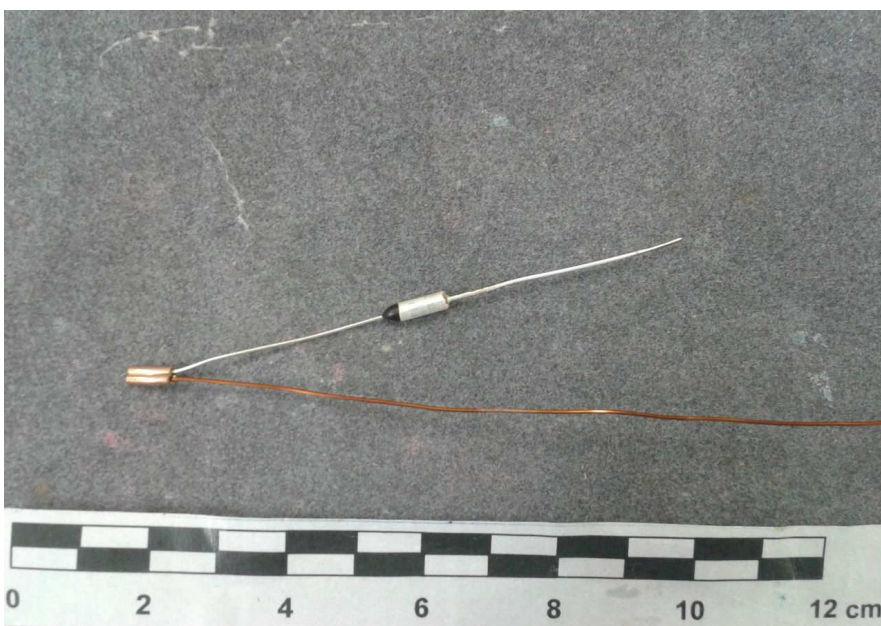
4 - Group III (Crimping Picture) pg. 11

1 General

Tests performed at Bragança Paulista electrical components test laboratory. Period: February to March 2013.

1.1 Samples Identification

| Sample Group | Samples | Part Number | Description |
|--------------|---------|-------------|-------------------------------------------------------------------------------------------------------|
| I | 1~10 | 280004-1 | 1~5: thermo fuse 23 AWG + MAG Copper 23 AWG 6~10: MAG copper 23 AWG + 0,75mm ² wire gauge |
| II | 11~20 | 280004-1 | 11~15: thermo fuse 23AWG + MAG Copper 23AWG 16~20: MAG copper 23 AWG + 0,75mm ² wire gauge |
| III | 21~23 | 280004-1 | 21: thermo fuse 23 AWG + MAG Copper 23 AWG 22~23: MAG copper 23 AWG + 0,75mm ² wire gauge |



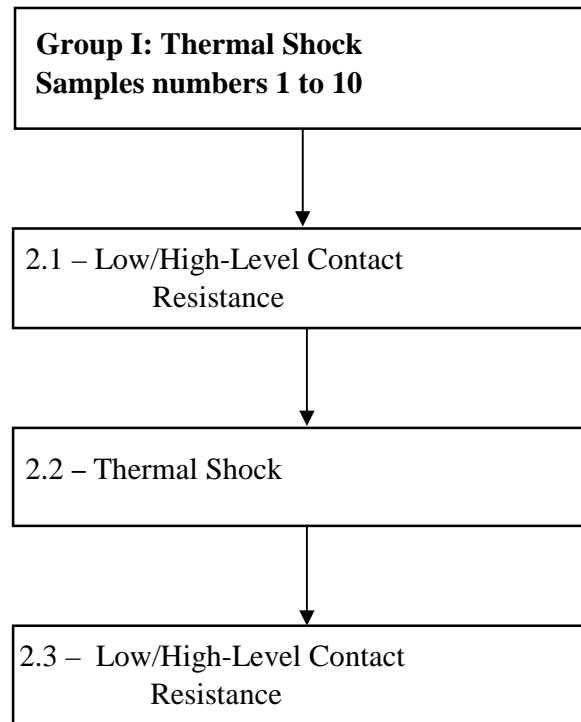
"A" Splice - Thermo fuse 23 AWG + MAG Copper 23AWG.



"B" Splice - MAG Copper 23 AWG + 0,75mm² wire.

2 - Group I: Thermal Shock

Sequence:



2.1 – Low/High - Level Contact Resistance

Samples

10 parts, numbers 1 to 10.

Equipments

HP Digital Multimeter Model 34401A, TE reference Nr. 93-339033-031.
Agilent Power Supply, Model E3641A, TE reference Nr. 93-339036-019.
HP Power Supply, Model 6571A, TE reference Nr. 93-339036-021.

Specification

No specification.

Requirements

Just informative.

Procedures

Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage to low-level contact resistance test and 1 ampere to high-level contact resistance test.

Results

Low-Level Contact Resistance (100mA)

"A" Splice

Initial Measurement:

| Voltage Drop (mV) - "A" Splice | | |
|--------------------------------|-----------|-------------------|
| Sample | MAG 23AWG | Thermo fuse 23AWG |
| 1 | 0,023 | 0,016 |
| 2 | 0,001 | 0,034 |
| 3 | 0,025 | 0,019 |
| 4 | 0,004 | 0,021 |
| 5 | 0,012 | 0,026 |

"B" Splice

Initial Measurement:

| Voltage Drop (mV) - "B" Splice | | |
|--------------------------------|-----------|--------------------------|
| Sample | MAG 23AWG | 0,75mm ² Wire |
| 6 | 0,000 | 0,000 |
| 7 | 0,005 | 0,000 |
| 8 | 0,016 | 0,005 |
| 9 | 0,000 | 0,005 |
| 10 | 0,003 | 0,002 |

High-Level Contact Resistance (1A)

"A" Splice

Initial Measurement:

| Voltage Drop (mV) - "A" Splice | | |
|--------------------------------|-----------|-------------------|
| Sample | MAG 23AWG | Thermo fuse 23AWG |
| 1 | 0,515 | 0,245 |
| 2 | 0,080 | 0,310 |
| 3 | 0,480 | 0,372 |
| 4 | 0,100 | 0,375 |
| 5 | 0,237 | 0,330 |

"B" Splice

Initial Measurement:

| Voltage Drop (mV) - "B" Splice | | |
|--------------------------------|-----------|--------------------------|
| Sample | MAG 23AWG | 0,75mm ² Wire |
| 6 | 0,150 | 0,015 |
| 7 | 0,115 | 0,000 |
| 8 | 0,175 | 0,064 |
| 9 | 0,080 | 0,045 |
| 10 | 0,085 | 0,018 |

2.2 – Thermal Shock*Samples*

10 parts, numbers 1 to 10.

Equipments

Fanem Ovem Incubator, Model 320E, TE reference Nr. 92-339031-1065.

Indrel Industrial Freezer, Model IULT 364 D, TE reference 93-339032-008

Specification

No specification.

Requirements

Just informative.

Procedures

Subject specimens to 25 cycles between -65 and 150°C with 30 minutes of dwells at extreme temperatures

Transition time: $\leq 1m$ *Results*

Results will be shown at item 2.3

2.3 – Low/High - Level Contact Resistance*Samples*

10 parts, numbers 1 to 10.

Equipments

HP Digital Multimeter Model 34401A, TE reference Nr. 93-339033-031.

Agilent Power Supply, Model E3641A, TE reference Nr. 93-339036-019.

HP Power Supply, Model 6571A, TE reference Nr. 93-339036-021.

Specification

No specification.

Requirements

Just informative.

Procedures

Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage to low-level contact resistance test and 1 ampere to high-level contact resistance test.

Results

Low-Level Contact Resistance (100mA)

"A" Splice

Final Measurement:

| Voltage Drop (mV) - "A" Splice | | |
|--------------------------------|-----------|-------------------|
| Sample | MAG 23AWG | Thermo fuse 23AWG |
| 1 | 0,074 | 0,033 |
| 2 | 0,015 | 0,037 |
| 3 | 0,072 | 0,026 |
| 4 | 0,019 | 0,050 |
| 5 | 0,014 | 0,027 |

| Maximum Variation | Average Variation |
|-------------------|-------------------|
| 0,051 | 0,019 |

"B" Splice

Final Measurement:

| Voltage Drop (mV) - "B" Splice | | |
|--------------------------------|-----------|--------------------------|
| Sample | MAG 23AWG | 0,75mm ² Wire |
| 6 | 0,028 | 0,009 |
| 7 | 0,015 | 0,003 |
| 8 | 0,032 | 0,007 |
| 9 | 0,012 | 0,009 |
| 10 | 0,018 | 0,005 |

| Maximum Variation | Average Variation |
|-------------------|-------------------|
| 0,028 | 0,010 |

High-Level Contact Resistance (1A)

"A" Splice

Final Measurement:

| Voltage Drop (mV) - "A" Splice | | |
|--------------------------------|-----------|-------------------|
| Sample | MAG 23AWG | Thermo fuse 23AWG |
| 1 | 1,110 | 0,448 |
| 2 | 0,538 | 0,580 |
| 3 | 1,080 | 0,615 |
| 4 | 0,595 | 0,637 |
| 5 | 0,722 | 0,592 |

| Maximum Variation | Average Variation |
|-------------------|-------------------|
| 0,6 | 0,387 |

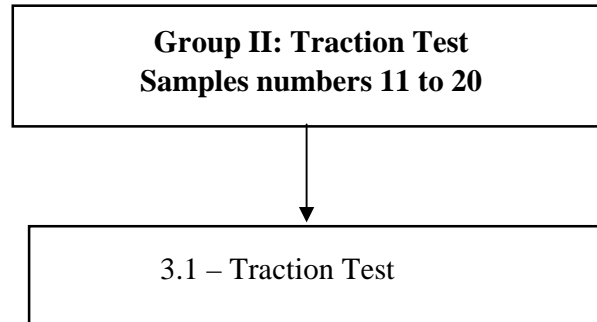
Final Measurement:

| Voltage Drop (mV) - "B" Splice | | |
|--------------------------------|-----------|--------------------------|
| Sample | MAG 23AWG | 0,75mm ² Wire |
| 6 | 0,565 | 0,390 |
| 7 | 0,505 | 0,340 |
| 8 | 0,610 | 0,435 |
| 9 | 0,495 | 0,370 |
| 10 | 0,510 | 0,407 |

| Maximum Variation | Average Variation |
|-------------------|-------------------|
| 0,435 | 0,388 |

3 - Group II: Traction Test

Sequence:



3.1 - Traction Test

Samples

10 parts, numbers 11 to 20.

Equipments

Instron Traction Machine, TE reference NR. 92.339017-085

Specification

No specification.

Requirements

Crimping traction resistance shall be greater than 70% of wire traction resistance.

Procedures

Submit specimens to traction until reaches the breaking point and record the peak force.

Results

"A" Splice

| Thermo fuse 23AWG + MAG Copper Wire 23AWG | | | |
|-------------------------------------------|------------------|-----------|---------|
| Breaking Force [N] | | | |
| Sample | Wire + Connector | Only Wire | Percent |
| 11 | 66,46 | 66,68 | 99,67% |
| 12 | 66,68 | 66,68 | 100,00% |
| 13 | 66,51 | 66,68 | 99,75% |
| 14 | 65,65 | 66,68 | 98,46% |
| 15 | 65,54 | 66,68 | 98,29% |

"B" Splice

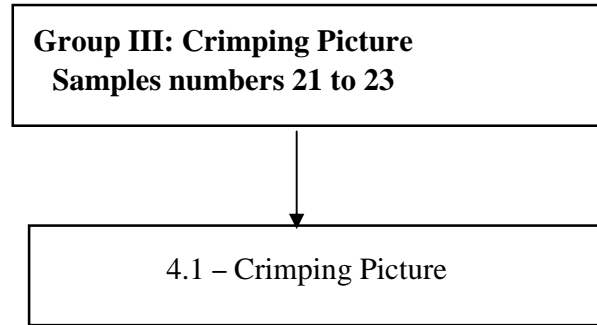
| Wire 0,75mm ² = MAG Copper Wire 23AWG | | | |
|--------------------------------------------------|------------------|-----------|---------|
| Breaking Force [N] | | | |
| Sample | Wire + Connector | Only Wire | Percent |
| 16 | 66,68 | 66,68 | 100,00% |
| 17 | 66,68 | 66,68 | 100,00% |
| 18 | 66,68 | 66,68 | 100,00% |
| 19 | 66,68 | 66,68 | 100,00% |
| 20 | 66,60 | 66,68 | 99,88% |

Conclusion

Samples meet the requirements.

4 - Group III: Crimping Picture

Sequence:



4.1 – Crimping Picture

Samples

3 parts, numbers 21 to 23.

Equipments

Zeiss Microscope, Model Stemi 2000-C

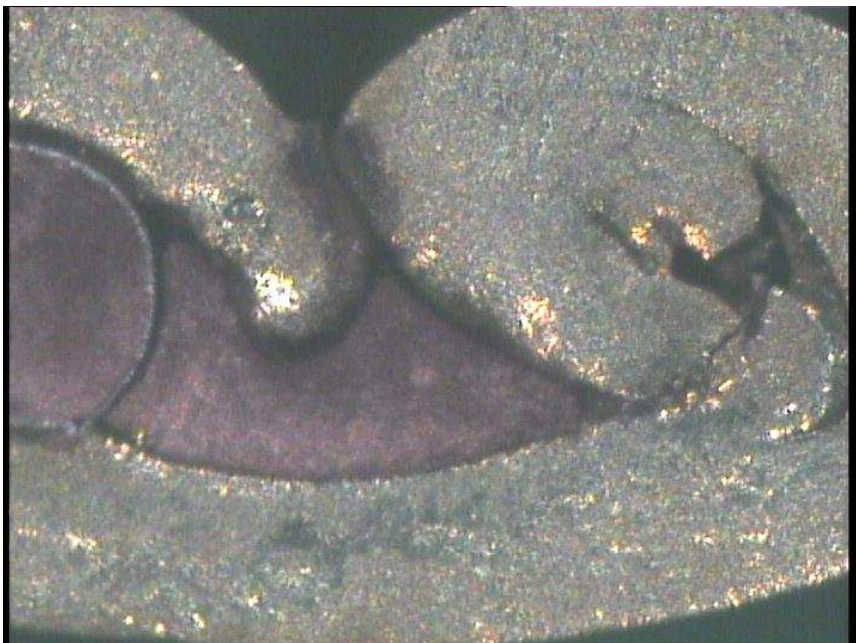
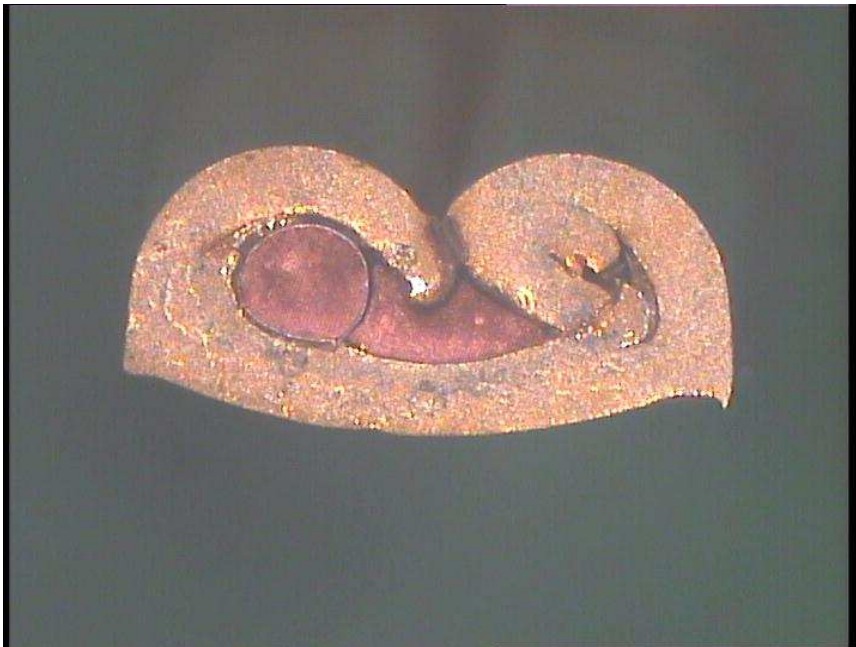
Specification

No specification

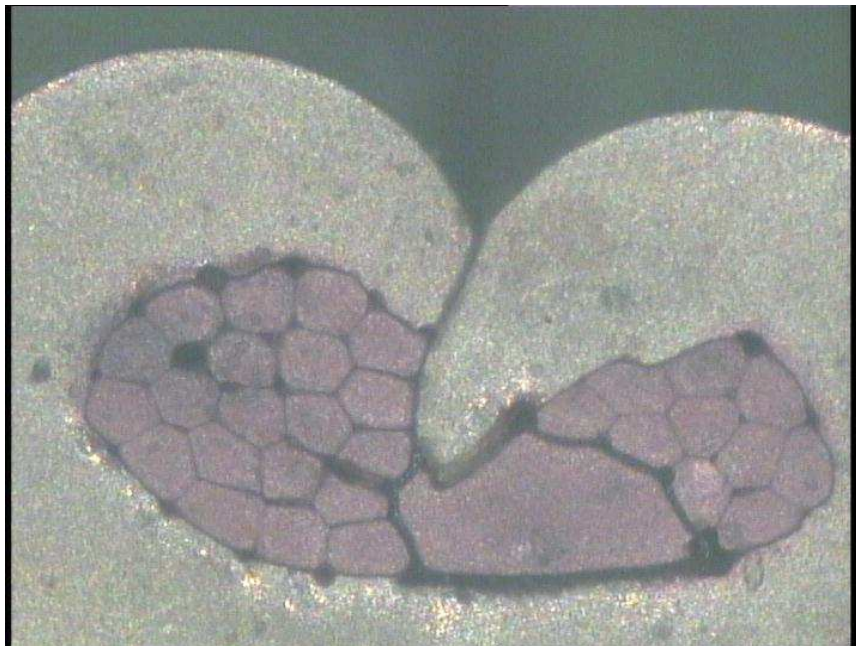
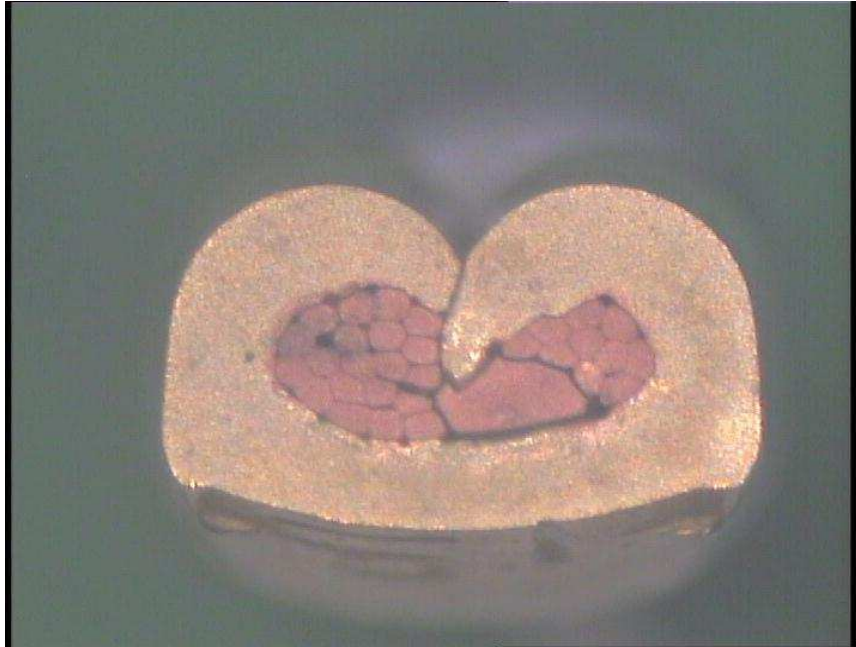
Requirements

Informative test.

Nr. 1: "A" Splice. Thermo fuse 23 AWG + MAG Copper 23AWG.



Nr. 2: "B" Splice. MAG copper 23 AWG + 0,75mm² wire



Nr. 3: "B" Splice. MAG copper 23 AWG + 0,75mm² wire

