



Test Report Product Development

Braganca-Paulista Electrical Components Test Laboratory
RUA AMPERE 304 Dist. Indl I BRAGANCA PAULISTA SAO PAULO BRAZIL 12929-570

Report Title: BFT 5 POS ASSY
Report Number: RL150080
Revision: O
Date Issued: 08 JUN 2015

Execution: Jesus Preto
Phone: 11 3404-6270

Requestor: Natanael Santos
Phone: 11 3404-6225
Address: nmsantos@te.com

Disposition of Samples: Retain in Lab

List of Part Numbers: 2819050-1

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Scope/Abstract and Conclusions

Purpose

PV phase according to attached DVP&R.

Summary

Samples met requirements.

1. RESULTS

Test Sequence/Environment	Requirements	Results																																																																						
Group 0 - Cross Section Inspection	A summary of each component's condition shall be documented and reported to the GM ENV SME or CVE. GM Engineering will evaluate the reports and decide as to the necessity of corrective action.	Samples met requirements.																																																																						
Group 0 - Visual Inspection and Dissection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Samples met requirements.																																																																						
Group 0 - Thermal Cycle Profile Development	N/A	Definition of cycle Temperature x current - This definition occurred in accordance between General Motors and TE. Accomplished on DV phase.																																																																						
Group 0 - Vibration Transmissibility Demonstration	Item 6.8 GMW 3172 (Rev. Nov/2012).	Samples met requirements. Please see Magneti Marelli's test report Nr. DFI017/14 Rev1. Accomplished on DV phase.																																																																						
Group 1 - 5-Point Functional/Parametric Check (Voltage Drop)	Functional Status Classification shall be A.	<p>Initial measurements.</p> <table border="1"> <thead> <tr> <th rowspan="3">Sample</th> <th colspan="5">Voltage Drop [V]</th> </tr> <tr> <th colspan="5">Ways</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>PV 6</td> <td>0,856</td> <td>0,786</td> <td>0,758</td> <td>0,435</td> <td>0,477</td> </tr> <tr> <td>PV 7</td> <td>0,947</td> <td>0,768</td> <td>0,747</td> <td>0,441</td> <td>0,458</td> </tr> <tr> <td>PV 8</td> <td>0,819</td> <td>0,772</td> <td>0,759</td> <td>0,515</td> <td>0,462</td> </tr> <tr> <td>PV 9</td> <td>0,848</td> <td>0,759</td> <td>0,761</td> <td>0,475</td> <td>0,519</td> </tr> <tr> <td>PV 10</td> <td>0,876</td> <td>0,787</td> <td>0,774</td> <td>0,443</td> <td>0,448</td> </tr> <tr> <td>PV 11</td> <td>0,880</td> <td>0,774</td> <td>0,770</td> <td>0,489</td> <td>0,421</td> </tr> <tr> <td>MIN.</td> <td>0,819</td> <td>0,759</td> <td>0,747</td> <td>0,435</td> <td>0,421</td> </tr> <tr> <td>AVER.</td> <td>0,871</td> <td>0,774</td> <td>0,762</td> <td>0,466</td> <td>0,464</td> </tr> <tr> <td>MAX.</td> <td>0,947</td> <td>0,787</td> <td>0,774</td> <td>0,515</td> <td>0,519</td> </tr> </tbody> </table> <p>Samples met requirements.</p>	Sample	Voltage Drop [V]					Ways					1	2	3	4	5	PV 6	0,856	0,786	0,758	0,435	0,477	PV 7	0,947	0,768	0,747	0,441	0,458	PV 8	0,819	0,772	0,759	0,515	0,462	PV 9	0,848	0,759	0,761	0,475	0,519	PV 10	0,876	0,787	0,774	0,443	0,448	PV 11	0,880	0,774	0,770	0,489	0,421	MIN.	0,819	0,759	0,747	0,435	0,421	AVER.	0,871	0,774	0,762	0,466	0,464	MAX.	0,947	0,787	0,774	0,515	0,519
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Group 1 – Mechanical Shock – Pothole 25G	Functional Status Classification shall be A.	Samples met requirements. Please see Qualpa’s test report Nr. REQ112.																																																																	
Group 1 – Vibration with Thermal Cycling (For Car sprung Masses)	Functional Status Classification shall be A.	Samples met requirements. Please see Qualpa’s test report Nr. REQ112.																																																																	
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Group 6 - Connector Test - GMW-3191 (For connector 2w	Terminal Push-out Force. Normal condition > 90 N.	<table border="1"> <thead> <tr> <th rowspan="2">Sample</th> <th colspan="2">Terminal Extraction Force [N]</th> </tr> <tr> <th>Way 1</th> <th>Way 2</th> </tr> </thead> <tbody> <tr><td>PV C6</td><td>152,0</td><td>156,5</td></tr> <tr><td>PV C7</td><td>187,5</td><td>202,5</td></tr> <tr><td>PV C8</td><td>194,0</td><td>194,5</td></tr> <tr><td>PV C9</td><td>168,5</td><td>162,0</td></tr> <tr><td>PV C10</td><td>219,5</td><td>200,0</td></tr> <tr><td>Min.</td><td>152,0</td><td>156,5</td></tr> <tr><td>Aver.</td><td>184,3</td><td>183,1</td></tr> <tr><td>Max.</td><td>219,5</td><td>202,5</td></tr> </tbody> </table> <p>Samples met requirements.</p>	Sample	Terminal Extraction Force [N]		Way 1	Way 2	PV C6	152,0	156,5	PV C7	187,5	202,5	PV C8	194,0	194,5	PV C9	168,5	162,0	PV C10	219,5	200,0	Min.	152,0	156,5	Aver.	184,3	183,1	Max.	219,5	202,5
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	Locked Connector Disengagement Force > 120N.	<table border="1"> <thead> <tr> <th>Sample</th> <th>Locked Connector Disengagement Force [N]</th> </tr> </thead> <tbody> <tr><td>PV C21</td><td>153,5</td></tr> <tr><td>PV C22</td><td>142,5</td></tr> <tr><td>PV C23</td><td>155,5</td></tr> <tr><td>PV C24</td><td>125,5</td></tr> <tr><td>PV C25</td><td>130,0</td></tr> <tr><td>PV C26</td><td>148,0</td></tr> <tr><td>PV C27</td><td>138,5</td></tr> <tr><td>PV C28</td><td>152,0</td></tr> <tr><td>PV C29</td><td>155,0</td></tr> <tr><td>PV C30</td><td>137,0</td></tr> <tr><td>Min.</td><td>125,5</td></tr> <tr><td>Aver.</td><td>143,8</td></tr> <tr><td>Max.</td><td>155,5</td></tr> </tbody> </table>	Sample	Locked Connector Disengagement Force [N]	PV C21	153,5	PV C22	142,5	PV C23	155,5	PV C24	125,5	PV C25	130,0	PV C26	148,0	PV C27	138,5	PV C28	152,0	PV C29	155,0	PV C30	137,0	Min.	125,5	Aver.	143,8	Max.	155,5	<p>Samples met requirements.</p>
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	Unlocked Connector Disengagement Force < 100N.	<table border="1"> <thead> <tr> <th>Sample</th> <th>Connector extraction Force Without lock [N]</th> </tr> </thead> <tbody> <tr><td>PV C11</td><td>25,5</td></tr> <tr><td>PV C12</td><td>28,5</td></tr> <tr><td>PV C13</td><td>27,5</td></tr> <tr><td>PV C14</td><td>26,0</td></tr> <tr><td>PV C15</td><td>26,5</td></tr> <tr><td>PV C16</td><td>27,0</td></tr> <tr><td>PV C17</td><td>26,0</td></tr> <tr><td>PV C18</td><td>23,0</td></tr> <tr><td>PV C19</td><td>26,0</td></tr> <tr><td>PV C20</td><td>30,5</td></tr> <tr><td>Min.</td><td>23,0</td></tr> <tr><td>Aver.</td><td>26,7</td></tr> <tr><td>Max.</td><td>30,5</td></tr> </tbody> </table> <p>Samples met requirements.</p>	Sample	Connector extraction Force Without lock [N]	PV C11	25,5	PV C12	28,5	PV C13	27,5	PV C14	26,0	PV C15	26,5	PV C16	27,0	PV C17	26,0	PV C18	23,0	PV C19	26,0	PV C20	30,5	Min.	23,0	Aver.	26,7	Max.	30,5
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Group 6 - Visual Inspection and Dissection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Samples met requirements.																												
Group 8 - Fretting Corrosion	The resistance measured shall always meet the value as required by GMW3191 Dry Circuit Resistance acceptance criteria.	<p>Please see Qualpas' test report Nr. BFT_REQ081.</p> <p>Initial</p> <table border="1"> <thead> <tr> <th rowspan="3">Sample</th> <th colspan="2">Voltage drop (mv)</th> </tr> <tr> <th colspan="2">Way</th> </tr> <tr> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr><td>PV1</td><td>0,829</td><td>0,819</td></tr> <tr><td>PV2</td><td>0,822</td><td>0,813</td></tr> <tr><td>PV3</td><td>0,814</td><td>0,800</td></tr> <tr><td>PV4</td><td>0,836</td><td>0,825</td></tr> <tr><td>PV5</td><td>0,806</td><td>0,802</td></tr> </tbody> </table>	Sample	Voltage drop (mv)		Way		2	3	PV1	0,829	0,819	PV2	0,822	0,813	PV3	0,814	0,800	PV4	0,836	0,825	PV5	0,806	0,802						
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	Way																																																																			
	2	3																																																																		
PV1	0,794	0,798																																																																		
PV2	0,809	0,801																																																																		
PV3	0,815	0,793																																																																		
PV4	0,810	0,804																																																																		
PV5	0,806	0,796																																																																		
Sample	Voltage drop (mv)																																																																			
	Way																																																																			
	2	3																																																																		
PV1	0,800	0,790																																																																		
PV2	0,817	0,802																																																																		
PV3	0,821	0,808																																																																		
PV4	0,812	0,797																																																																		
PV5	0,810	0,799																																																																		
Sample	Voltage drop (mv)																																																																			
	Way																																																																			
	2	3																																																																		
PV1	0,809	0,798																																																																		
PV2	0,815	0,806																																																																		
PV3	0,828	0,809																																																																		
PV4	0,804	0,803																																																																		
PV5	0,800	0,800																																																																		

Test Sequence/Environment	Requirements	Results
Group 10 - Shipping vibration	Functional Status Classification shall be C. Additionally, during the Visual Inspection and Dissection – DRBTR, there shall be no external visible damage to any of the components. And there shall be no internal damage to the 6 selected components that were functionally tested.	Samples met requirements. Samples met requirements. Please see Smarttech's test report Nr. 014901-1.
Group 10 - Visual Inspection and Dissection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Samples met requirements.

2. SAMPLE & WIRE DESCRIPTION

The Certification of Conformance (C of C), submitted with the test request, lacked the necessary information to verify the samples tested. Therefore the Test Lab cannot verify that the samples have been produced, inspected, and accepted as conforming to product drawing requirements, and made using the same core manufacturing processes and technologies as production or parts.

2.1. Group / Samples

Group	Part Number	Rev.	Date Code	Sample Description	Quantity Tested
0	2819050-1	4	N/A*	BFT 5 POS ASSY – Nr 1 to 3.	3
1	2819050-1	4	N/A*	BFT 5 POS ASSY – Nr PV 7 to PV 12.	6
6	2819050-1	4	N/A*	BFT 5 POS ASSY – Nr PV 13 to PV 22.	10
6	2819052-1	*	N/A*	2 WAYS CONNECTOR Nr. PV C1 to PV C30.	30
8	2819050-1	4	N/A*	BFT 5 POS ASSY – Nr PV 1 to PV 6.	6
10	2819050-1	4	N/A*	BFT 5 POS ASSY – PV 30 to 69.	40

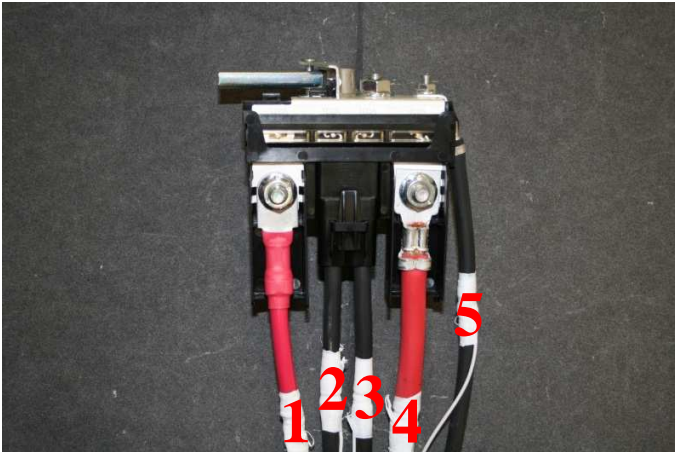
* Information either unavailable or not provided by requestor.

2.2. Wire Information

Group Number	Wire Gage	Overall Diameter	Strand Diameter	Number of Strands	Wire Length
All Groups	16mm ²	7,1	0,38	122	500
	16mm ²	7,4	0,38	125	520
	25mm ²	10	0,38	256	500

3. SAMPLE PREPARATION

3.1. Sample identification



CIRCUIT IDENTIFICATION



BFT 5 POS ASSY

3.2 High Temperature degradation

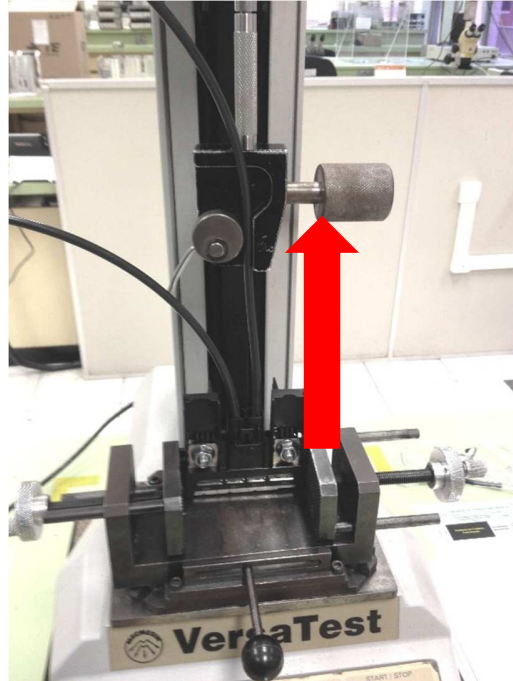


Samples inside chamber



Sample after exposure

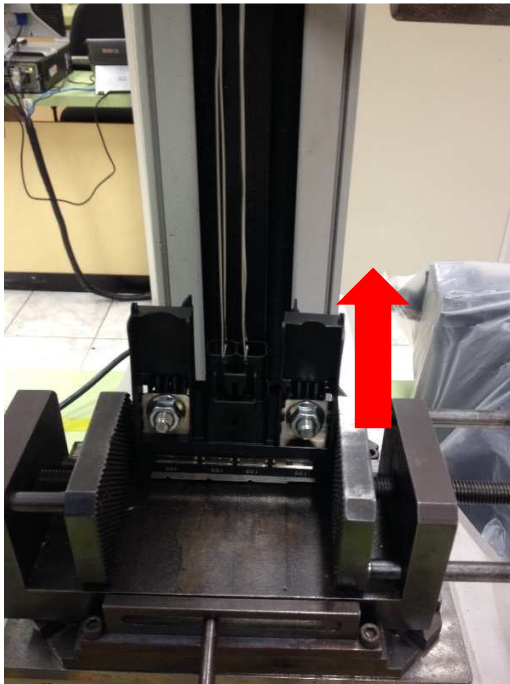
3.3 Connector Test - GMW-3191 (For connector 2w)



Terminal Push-out Force



Connector-to-Connector Engagement Force



Unlocked Connector Disengagement Force



Locked Connector disengagement force

3.4 Fretting Corrosion



Samples under fretting corrosion test

3.5 Shipping vibration



Samples inside box under shipping vibration test

3.6 Mechanical Shock - Pothole 25G and Vibration with Thermal Cycling



4 TEST PROCEDURE

4.1 Cross Section Inspection

According to GMW 3172 (Rev. Nov/2012) item 6.6.

4.2 Visual Inspection and Dissection

According to GMW 3172 (Rev. Nov/2012) item 6.5.

4.3 Vibration with Thermal Cycling (For Car sprung Masses)

According to GMW 3172 (Rev. Nov/2012) item 9.3.1.2. Test accomplished at Qualpas' laboratory. Please see Qualpa's test report Nr. REQ112

4.4 1-Point Functional/Parametric Check (Voltage Drop)

According to GMW 3172 (Rev. Nov/2012) item 6.1, measurements accomplished at room temperature using 1A. Measurements accomplished from wires (circuit identification above) to battery terminal.

4.5 High Temperature Degradation

According to GMW 3172 (Rev. Nov/2012) item 9.4.1. (1000 hours at 115°C).

4.6 Connector Test - GMW-3191 (For connector 2w)

- Terminal Push-out Force -Item 4.5.2.5 GMW 3191.
- Connector-to-Connector Engagement Force – Item 4.2.8.2 GMW 3191.
- Locked Connector Disengagement Force – Item 4.2.18.5 GMW 3191.
- Unlocked Connector Disengagement Force – Item 4.2.19.5 GMW 3191.

4.7 Mechanical Shock – Pothole 25G

According to GMW 3172 (Rev. Nov/2012) item 9.3.2. Test accomplished at Qualpas' laboratory. Please see Qualpa's test report Nr. REQ112.

4.8 Fretting Corrosion

According to GMW 3172 (Rev. Nov/2012) item 9.3.11. Test accomplished at Qualpas' laboratory. Please see Qualpas' test report Nr. BFT_REQ081.

4.9 Shipping vibration

According to GMW 3172 (Rev. Nov/2012) item 10.3.1. Test accomplished in Smarttech's laboratory. Please see Smarttech's test report Nr. 014901-1.

5 TEST EQUIPMENT

All equipment containing a calibration number is calibrated and traceable through TE to the National Institute of Standards and Technology (NIST).

Instrument Description	Manufacturer	Model Number	Calibration Number	Purpose
Dynamometer	Mecmesin	AFG 2500N	92-339017-090	- Connector Test - GMW-3191 (For connector 2w) - Crush for Housing (Elbow Load).
Oven	Fanem	320E	93-339032-1231	High Temperature Degradation
DC Power Supply	GW Laboratory	GPR-1810	93-339033-726	- 5-Point Functional/ Parametric Check (Voltage Drop) - Fretting Corrosion
Digital Multimeter	Hewlett Packard	34401A	93-339033-024	- 5-Point Functional/ Parametric Check (Voltage Drop) - Fretting Corrosion
Humidity chamber	ACS	DCTC 1300	92-339032-009	Connector Test - GMW-3191 (For connector 2w).

6 APPROVALS

Approvals are secured electronically through the corporate document repository routing and approval system.

Testing & Report By: Jesus Preto, Laboratory Engineer

Reviewed & Approved By: Paulo Almeida, Laboratory Coordinator