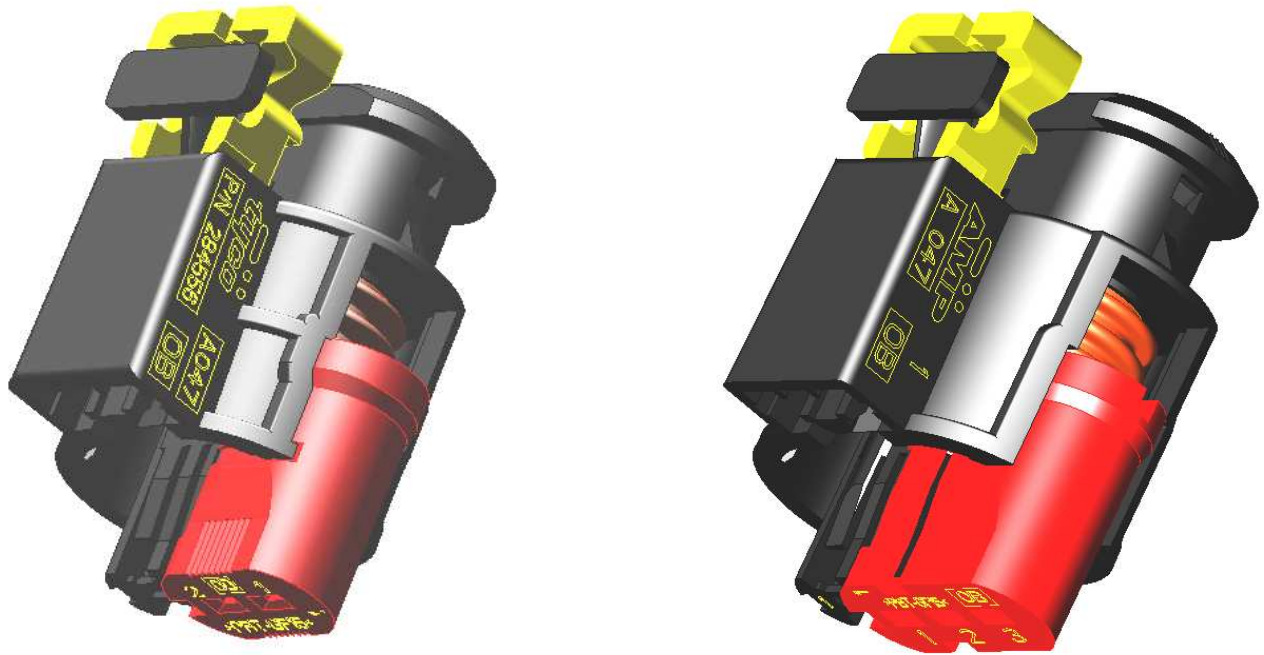


Description

**2 & 3 POSITIONS SEALED CONNECTORS FOR SPARK COIL**



<b>B4</b>	REVISED AND REDRAWN	M.G.	29MAY2009	M.G.	29MAY2009
<b>B3</b>	UPDATED (ET00-0007-04)	M.P.	14 JAN 2004	C. P.	14 JAN 2004
<b>B2</b>	UPDATED (ET00-0035-01)	C. PIA	02 FEB 2001	A.G.	02 FEB 2001
<b>B1</b>	REVISED (ET00-0329-00)	C. PIA	27 DEC 2000	A.G.	27 DEC 2000
<b>A</b>	ADDED 2 POSN. CONNECTOR	P.C.	JUN 00	A.G.	JUN 00
<b>0</b>	FIRST ISSUE (ENGLISH VERSION)	P.C.	JULY 99	A.G.	JULY 99
rev letter	rev. record	DR	Date	CHK	Date
DR.		DATE	APVD		DATE
P. CASSANDRIN		JULY 1999	A. GENTA		JULY 1999

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## **0.1 CONTENTS**

This specification covers the requirements for product performance, test methods and quality assurance provision for the 2 & 3 POSITION SEALED CONNECTORS FOR SPARK COIL, composed by the parts listed in the following table :

<b>PN's</b>	<b>DESCRIPTION</b>
<b>284556-X</b>	<b>2 POSITION SEALED CONNECTOR</b>
<b>284425-X</b>	<b>3 POSITION SEALED CONNECTOR</b>
<b>929027-1</b>	<b>SENSOR FLAT CONTACT, 1.5 mm SERIES GOLD VERSION</b>
<b>929025-1</b>	<b>SENSOR FLAT CONTACT, 1.5 mm SERIES GOLD VERSION</b>

## **0.2 APPLICABLE DOCUMENTS**

Product drawings have to be considered part of this specification. In case of conflicts between specification and referenced documents, this specification shall take precedence.

## **0.3 AMP SPECIFICATIONS**

A. 109-5000 Test Specification, General Requirements for Test Methods

## **0.4 COMMERCIAL STANDARD SPECIFICATIONS**

A. Low Voltage Stranded Cables for Automobiles acc. to FIAT Norm. Table N° 91107/15 (T3 Class Lead-Free) and N° 91107/06 (T4 Class).

B. FIAT General Specification for Connectors 9.91320/02

## 0.5 DESIGN AND CONSTRUCTION

Product shall comply with design, construction and physical dimensions specified in the applicable product drawing

## 0.6 RATINGS

### **A. CURRENT RATING:**

SENSOR FLAT CONTACT : 11 A max. with 1.5 mm<sup>2</sup> wire  
10 A max with 1.0 mm<sup>2</sup> wire  
9 A max. with 0.75 mm<sup>2</sup> wire

### **B. TEMPERATURE RATING:**

-40°C TO +140 °C ( including the temperature increase due to working current flow )  
using wire according to FIAT Spec. 91107/06 (T4 Class).

-40°C TO +125 °C ( including the temperature increase due to working current flow )  
using wire according to FIAT Spec. 91107/15 (T3 Class).

### **C: MAXIMUM OPERATING VOLTAGE:**

24 V d.c.; for application at higher voltage please contact AMP

### **D. SEALING PERFORMANCES :** according to IEC 529 , IP54

#### **WARNING!**

**MINIMUM ACCEPTABLE CABLE INSULATION DIAMETER: 1.7mm,**  
corresponding to 0,75mm<sup>2</sup> min. wire section acc. to FIAT Spec. 91107/15 and 91107/06

## 0.7. QUALITY ASSURANCE PROVISION

### A. Sample preparation

The test samples to be used for the test shall be prepared by random selection from the current production and the contact shall be crimped in accordance with the Applic. Spec. 114-18254-1 and additional Appl. Spec. 114-20116.

No sample shall be reused, unless otherwise specified.

### B. Test condition:

All the test shall be performed under any combination of the following test condition, unless otherwise specified:

Room temperature: 23±5°C

Relative humidity: 45÷70%

Atmospheric pressure: 860÷1060 mbar

**0.8 TEST REQUIREMENTS AND PROCEDURES**

Test Description	Requirements	Procedure
<b>1. PRODUCT EXAMINATION</b>		
1.1 Confirmation of product	-Product shall confirm the requirements of applicable product drawing and application specification	Visually, dimensionally and functionally inspection per applicable quality inspection plan
1.2 Visual examination	-Any visible damage, cracking or defect when the product is new and even after environmental, mechanical and electrical test.	Visual inspection
<b>2. MECHANICAL</b>		
2.1 Single contact engaging force	Ist insertion: $\leq 12.0$ N	Operation speed: 50 mm /min.
2.2 Single contact separating force	Ist extraction: $\leq 8.0$ N Xth extraction: $\geq 4.0$ N	Operation speed: 50 mm /min.
2.3 Connector mating force	2 ways: $\leq 40$ N 3 ways: $\leq 50$ N	With corresponding counterpart (assembled) with an operating speed of 50 mm/min.
2.4. Connector unmating force	2 ways: $\leq 40$ N 3 ways: $\leq 50$ N	With corresponding counterpart (assembled) with an operating speed of 50 mm/min.
2.5 Contact insertion force in housing ( crimp contacts )	20 N max	Insert contact into the cavity with an operating speed of 25 mm/min.. The housing has to be mounted on a self aligning platform.
2.6 Contact extraction force from housing ( crimp contacts )	-With primary locking : 70 N min. -With secondary locking included : 100 N min.	Pulling wires axially with an operating speed of 50 mm/min. max.
2.8 Front seal retention force	- Retention force $\geq 30$ N	Pull front gasket with proper fixture at a speed of 25 to 100 mm/min

2.9 Mechanical retention of the connector.	<ul style="list-style-type: none"> <li>- No connector disengagement ( total or partial )</li> <li>- No contact extraction</li> <li>- No electrical discontinuity</li> <li>- No damage to the retention device</li> </ul>	<p>Connector fully loaded mated with the corresponding header counterpart ( wire bundle fixed to the shell. by a tie ) Operating speed: 50 mm/mim. Apply an axial pull-off load of 100 N to the cable bundle in all directions of a 90° cone.</p>
2.10 Polarization effectiveness	<ul style="list-style-type: none"> <li>- No electrical contact</li> <li>- No mechanical engagement with a force &gt; 100 N</li> </ul>	Assembled connectors must withstand without mating the counterpart with the incorrect orientation
2.11 Retention of secondary lock	<ul style="list-style-type: none"> <li>- No detachment from housing with a pulling force <math>\geq 20</math> N</li> </ul>	Pull secondary lock applying a force parallel to its operating direction
2.12A Operating force of secondary lock ( all contacts properly inserted ) 2.12B Operating force of secondary lock ( one or more contacts not properly inserted )	<ul style="list-style-type: none"> <li>- Operating force <math>\leq 30</math> N</li> <li>- Operating force <math>\geq 70</math> N</li> </ul>	Apply increasing load parallel to the operating direction and measure force to actuate
2.13 Retention of CPA	<ul style="list-style-type: none"> <li>- No detachment from housing with pulling force <math>\leq 30</math> N</li> <li>- No movement or breaking from pre-locking position with pushing force <math>\leq 40</math> N</li> </ul>	Pull CPA applying a force parallel to its operating direction
2.14 Operating force of CPA 2.14A Operating force of CPA with mated connector 2.14B Operating force to open CPA with mated connector	<ul style="list-style-type: none"> <li>- Operating force &lt; 30 N</li> <li>- Operating force &lt; 20 N</li> </ul>	Apply increasing load parallel to the operating direction and measure force to actuate
2.15 Mating load with secondary lock not properly closed	<ul style="list-style-type: none"> <li>- Operating force &gt; 100 N</li> </ul>	Apply increasing force in the closing direction and measure the closing force
2.16 Durability	<ul style="list-style-type: none"> <li>- As requested by the Table 1</li> </ul>	10 mating / unmating operations
2.17 Vibration test ( vibration under temperature-engine compartment)	<ul style="list-style-type: none"> <li>- No electrical discontinuity (<math>R_c &gt; 100</math> ohm) greater than 1 microsec. shall occur during the vibration</li> <li>- Voltage drop within 50% increase of limits specified for new contacts</li> <li>- No breakages, damages, deformations.</li> </ul>	<p>Ageing : -40 °C...+140°C at 30 min, 50 cycles Contacts crimped on cable acc. to FIAT Spec. 91107/06 (T4 Class)</p> <p>Vibration(sinus) : 70Hz...170Hz <math>\rightarrow</math> 0.17 mm 7g at 70Hz</p> <p>Diagram see figure 1 Recourse to 3 directions Duration : 100 h for each direction Overlay of temperature : 50% at room temperature and 50% at 120°C. Wire bundle fixed at a distance of 100mm from connectors.</p>

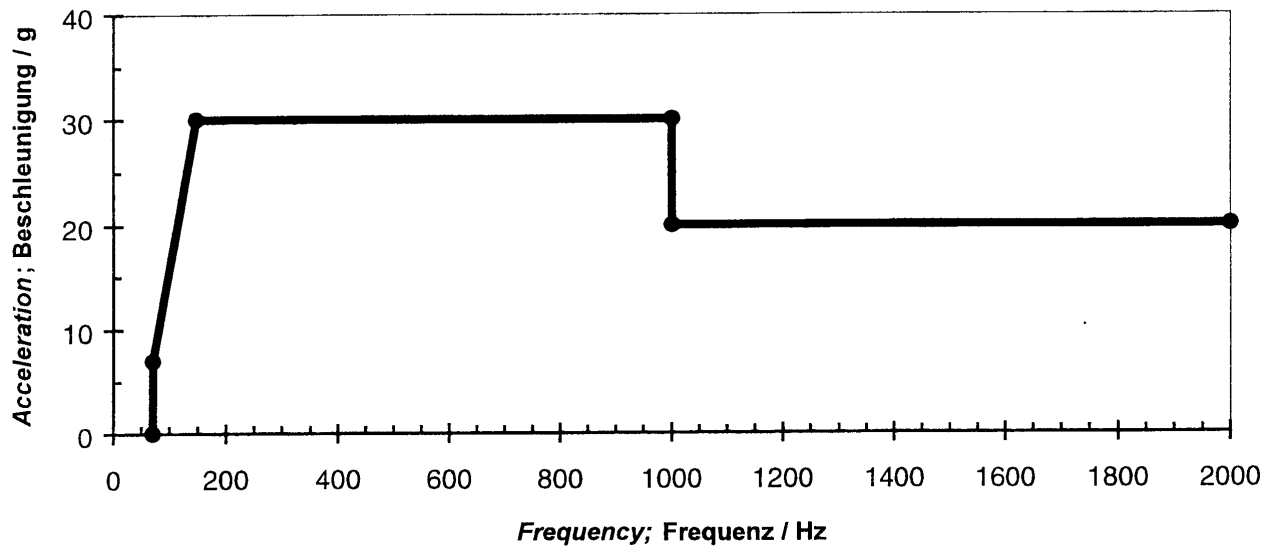
<b>3. ELECTRICAL</b>		
3.1 Voltage drop	<ul style="list-style-type: none"> <li>- <math>\leq 4</math> mV/A - wire size: 2.5 mmq</li> <li>- new contacts</li> <li>- after ten insertion/extraction</li> </ul>	<p>Between a point of the wire at 1 cm from the conn. edge, both sides, at the nominal current for each wire size.          (Termination resistance is obtained after subtraction of the resistance of wire used for termination ).          For the wire current rating see § 0.6-A</p>
3.2 Dielectric strength	Neither creeping discharge nor flashover shall occur	$\geq 1000$ Vac for 1 minute. Test between adjacent circuits of mated connectors
3.3 Insulation resistance	10 M $\Omega$ min.	Applied voltage: 500 Vdc between one contact and the others short circuited.
3.4 High temperature resistance with current load	<ul style="list-style-type: none"> <li>-Temperature increase <math>\leq 45^{\circ}\text{C}</math> after first cycle</li> <li>-Temperature increase <math>\leq 50^{\circ}\text{C}</math> after 5 cycles</li> <li>(Thermocouple placed on transition between contact body and wire barrel )</li> <li>-Voltage drop within limits indicated for new contacts</li> <li>-No damaging</li> </ul>	<p>Rated current applied to all 3 conn. posit.          5 temperature cycles composed of :</p> <ul style="list-style-type: none"> <li>-5 hours in oven at <math>80 \pm 2^{\circ}\text{C}</math> without air ventilation, with rated current according to wire size</li> <li>-2 hours in freezing cell at <math>-30^{\circ}\text{C}</math>, without current</li> </ul>
3.5 Current overload	<ul style="list-style-type: none"> <li>Temperature rise increase: <math>\leq 70^{\circ}\text{C}</math> ( thermocouple placed on transition between contact body and wire barrel )</li> <li>-Voltage drop within 50% increase of limits indicated for new contacts</li> <li>-No damaging</li> </ul>	<p>On one pair of mated contacts without housing:          Test current 1.5 time nominal current ( see par. 0.6 )</p> <ul style="list-style-type: none"> <li>-Duration 500 cycles composed of::             <ul style="list-style-type: none"> <li>45 min current ON</li> <li>15 min current OFF</li> </ul> </li> </ul>

<b>4.0 ENVIRONMENTAL</b>		
4.1 Accelerated ageing	<ul style="list-style-type: none"> <li>-No deformation or cracking of the plastic parts ( color change allowed )</li> <li>-Voltage drop: :≤specified limits for new contacts increased of 50%</li> <li>-Insulation resistance and dielectric strength within indicated limits</li> <li>-Perform additional cumulative tests as specified in Table 1</li> <li>-Mechanical performances within limits specified for new parts with 50% max. acceptable variation</li> </ul>	<p>On mated connectors submitted to the following cumulative tests:</p> <p>A- 5 cycles ( with therm. shock) composed of:</p> <ul style="list-style-type: none"> <li>-2 hrs at 140°C ± 2°C</li> <li>-2 hrs -40°C± 2°C</li> </ul> <p>B- 5 cycles (without shock, gradient ≤ 5°C) composed of:</p> <ul style="list-style-type: none"> <li>-2 hrs at 140°C ± 2°C</li> <li>-2 hrs at +40°C ± 2°C and 90-95% r.h.</li> <li>-2 hrs -40°C± 2°C</li> </ul> <p>C- 200 hrs at 140 °C</p> <p>Contacts crimped on cable acc. to FIAT Spec. 91107/06 (T4 Class)</p>
4.2 Resistance to splashing water	<ul style="list-style-type: none"> <li>- Insulation resistance and Dielectric strength must be according to the specified limits.</li> <li>- No presence of water must be detected inside the connectors, after unmating.</li> </ul>	<p>Test according to IEC 529</p> <p>Samples (mated connectors) conditioned at ageing temperature (par 4.1) must be tested using equipment as shown in fig. 2</p> <p>Duration : 4 hrs</p>
4.3 Resistance to low temperature	<ul style="list-style-type: none"> <li>- No breakage of parts detected</li> </ul>	<p>Keep mated sample to -40° C for 2 hours, move to 0° C in a time of 3 min max and let stabilize, then unmate and re-mate the connectors 1 time.</p>
4.4 Salt spray corrosion test	<ul style="list-style-type: none"> <li>-Voltage drop: :≤specified limits for new contacts increased of 100%</li> </ul>	<p>-150 hours of salt mist at 35°C± 2°C, 5% of NaCl , pH 6.5-7.2 class 2 ( mated connector )</p>
4.5 Kesternich corrosion	<ul style="list-style-type: none"> <li>-Voltage drop: : ≤specified limits for new contacts increased of 100%</li> </ul>	<p>4 cycles composed of:</p> <ul style="list-style-type: none"> <li>-8 hrs of exposure to an atmosphere with 0.66% of SO<sub>2</sub> at +40°C ± 2°C ( method acc. to DIN 50118 )</li> <li>-16 hours in free air ( mated connector )</li> </ul>
4.6 Resistance to fluids	<ul style="list-style-type: none"> <li>- No damages, deformations , cracks , breakages found on the parts.</li> <li>- Contact retention in housing, connector mating / unmating forces according to the specified limits.</li> </ul>	<p>Test complete, mated connectors with 3 min. of immersion in the following fluids (not cumulative test, use different samples for each fluid) :</p> <ul style="list-style-type: none"> <li>- Gasoline at 23° +/- 5°C</li> <li>- Cleaning agent at 23° +/- 5°C</li> <li>- Brake fluid at 50° +/- 5°C</li> <li>- Anti-freeze mixture at 23° +/- 5°C</li> <li>- ASTM1 oil/engine oil at 100° +/- 3° C</li> <li>- Leadless engine fuel at 23° +/- 5°C</li> <li>- Transmission fluid at 100° +/- 3° C</li> </ul>
4.7 Resistance to dust (according to IEC 529, level 5)	<ul style="list-style-type: none"> <li>- Voltage drop and insulation resistance according to the specified limits.</li> <li>- Minor traces of dust allowed inside the connectors after unmating.</li> </ul>	<p>Test the mated connectors, assembled and Mounted.</p> <p>Test characteristics :</p> <ul style="list-style-type: none"> <li>- Duration 30 min.</li> <li>- Ambient temperature from 15 to 35° C</li> <li>- Density of dust 2 Kg / m<sup>3</sup> ( 4,5 Kg of Portland cement )</li> </ul>

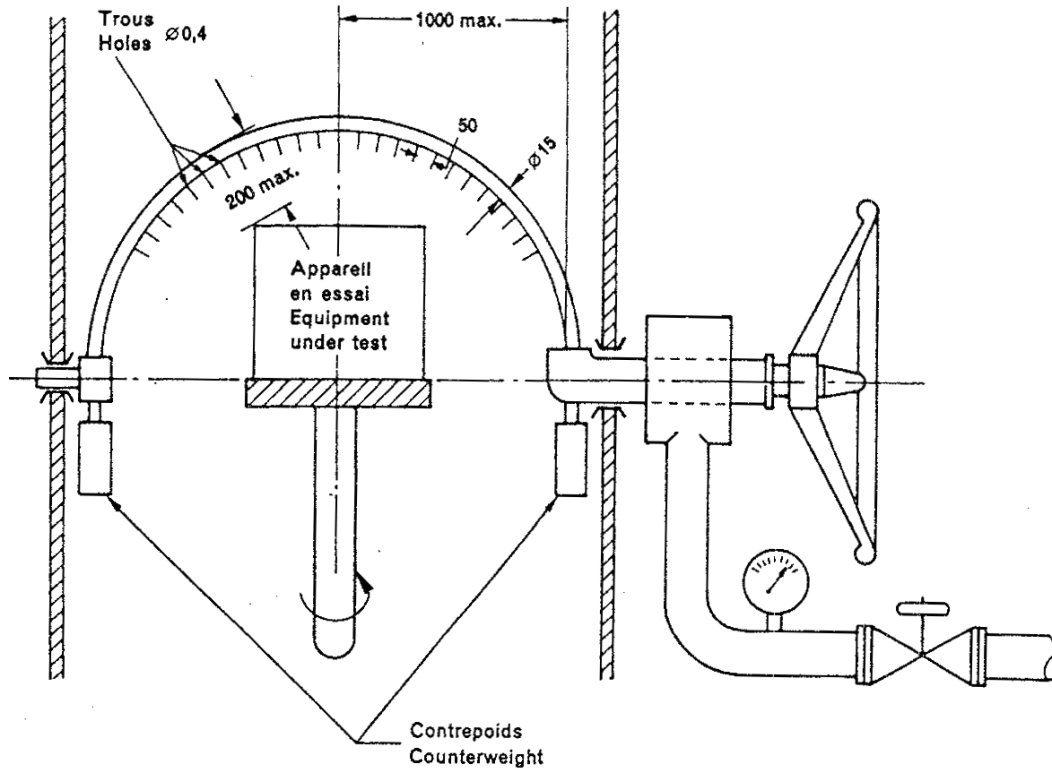


**TABLE I**  
**PRODUCT QUALIFICATION TEST SEQUENCE**  
**TEST GROUPS**

ITEM	DESCRIPTION	A	B	C	D	E	F	G	H	I	J	K	L
1	Visual examination	1 5	1 9 15	1 5	1 5	1 5	1 6 22	1 3	1 8	1 5	1 5	1 9	1 7
2.1	Single contact insert force	2											
2.2	Single contact sep. Force	4											
2.3	Connector mating force		2				11					2 6	
2.4	Connector unmating force		3				12					3 7	
2.5	Contact ins. force (in hsg)		4				13						
2.6	Cont. ext. force (from hsg)		5				14					4 8	
2.8	Retention of front seal		6				15						
2.9	Retention of connector		7										
2.10	Polarization effectiveness		8				16						
2.11	Retention of sec. Lock		10				17						
2.12	Oper. force of sec lock		11				18						
2.13	Retention of C.P.A.		12				19						
2.14	Operating force of C.P.A.		13				20						
2.15	Mating load		14				21						
2.16	Durability						10						
2.17	Vibration test			3									
3.1	Voltage drop	3		2 4	2 4	2 4	2 7			2 4	2 4		2 5
3.2	Dielectric strength						3 8		2 6				
3.3	Insulation resistance						4 9		3 7				3 6
3.4	High temp. resist.(in oven)				3								
3.5	Current over-load					3							
4.1	Accelerated ageing						5		4				
4.2	Splashing water								5				
4.3	Resist. to low temperature							2					
4.4	Salt spray corrosion									3			
4.5	Kesternick corrosion										3		
4.6	Resistance to fluids											5	
4.7	Resistance to dust												4



**Fig. 1 – Vibration test diagram**



*Dimensions en millimètres*

*Dimensions in millimetres*

Appareil pour la vérification de la protection contre l'eau tombant en pluie et contre les projections d'eau.

Equipment to prove protection against spraying and splashing water.

**Fig. 2 – Splashing water equipment**