1.6mm MALE AND FEMALE CONNECTORS

Product Code: E498 **GPL: A42**

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DR.	DATE	APVD	DATE
M.GHISOLFI	21 MAR 2007	R. MARTINI	21 MAR 2007

1.0 SCOPE:

This specification covers the requirements for product performances, test methods and quality assurance provisions of:

2 way connector male	3 way connector male	4 way connector male	6 way connector male	8 way connector male
P/N	P/N	P/N	P/N	P/N
0-1437710-1	7-1437710-6	8-1437710-4	4-1437710-0	4-1437709-5
5-1437710-5	7-1437710-7	8-1437710-5	4-1437710-1	4-1437710-5
5-1437710-6	7-1437710-8	8-1437710-6	4-1437710-2	4-1437710-6
5-1437710-7	7-1437710-9	8-1437710-7	4-1437710-3	4-1437710-7
5-1437710-8	8-1437710-0	8-1437710-8	4-1437710-4	4-1437710-8
5-1437710-9	8-1437710-1	8-1437710-9		4-1437710-9
6-1437710-0	8-1437710-2	9-1437710-0		5-1437710-0
6-1437710-1	8-1437710-3	9-1437710-1		5-1437710-1
6-1437710-2		9-1437710-2		5-1437710-2
6-1437710-3		9-1437710-3		
6-1437710-4				
6-1437710-5				
6-1437710-6				
6-1437710-7				
6-1437710-8				
6-1437710-9				
7-1437710-0				
7-1437710-1				
7-1437710-2				
7-1437710-3				
7-1437710-4				
7-1437710-5				

2 way connector female	3 way connector female	4 way connector female	6 way connector female	8 way connector female
P/N	P/N	P/N	P/N	P/N
2-1437712-5	3-1437712-1	3-1437712-3	2-1437712-0	1-1437712-3
2-1437712-6	3-1437712-2	3-1437712-4	2-1437712-1	2-1437712-2
2-1437712-7		3-1437712-5		2-1437712-3
2-1437712-8				
2-1437712-9				
3-1437712-0				
2-1437713-6				

The contacts listed in the below table are to be used in the above mentioned connectors:

Description	Tyco Part Number	Wire range	To be used in
Tin plated female contact	**1-1437709-4** **1-1437709-5** **1-1437709-6**	0.35mm² 0.5-1.0mm² 1.5-2.5mm²	Male connectors
Gold plated female contact	**0-1437709-9** **1-1437709-0** **1-1437709-7**	0.35mm² 0.5-1.0mm² 1.5-2.5mm²	
Tin plated male contact	**1-1437709-1** **1-1437709-2** **1-1437709-3**	0.35mm² 0.5-1.0mm² 1.5-2.5mm²	Female connectors
Gold plated male contact	**0-1437709-6** **0-1437709-7**	0.35mm² 0.5-1.0mm²	

The single wire seals listed in the below table are to be crimped onto the above mentioned contacts and to be used in connectors listed at page 2:

Description	Tyco Part Number	Insulation Dia. range
Single wire seal	**1-1437713-1**	1.2-1.4mm
Single wire seal	**1-1437713-2**	1.5-2.1mm
Single wire seal	**1-1437713-3**	2.2-2.4mm

The cavity blind plug P/N **1-1437713-4** must be used to close unused cavities of connectors listed at page 2

2.0 APPLICABLE DOCUMENTS:

The following documents form a part of this specification to the extent specified herein.
In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 TYCO SPECIFICATIONS:

Tyco Document	Description
114-20121	Application Specification for 1.6mm contacts
108-20260	Product Specification for 1.6mm contacts
501-20142	Qualification Test Report for 1,6mm ctc. system
C-1418068	Customer Drawing for single wire seals and cavity plug
C-1418069	Customer Drawing for female contacts
C-1418070	Customer Drawing for male contacts
C-1418066	Customer Drawing for 2 way male connectors
C-1418071	Customer Drawing for 3 way male connectors
C-1418073	Customer Drawing for 4 way male connectors
C-1418075	Customer Drawing for 6 way male connectors
C-1418077	Customer Drawing for 8 way male connectors
C-1418067	Customer Drawing for 2 way female connectors
C-1418072	Customer Drawing for 3 way female connectors
C-1418074	Customer Drawing for 4 way female connectors
C-1418076	Customer Drawing for 6 way female connectors
C-1418078	Customer Drawing for 8 way female connectors

2.1 CUSTOMER SPECIFICATIONS (ONLY FOR REF.):

Customer Standard	Description
ES-F8DB-14A464-AA (PD 3947-a2)	Ford Engineering Specification
SAE/USCAR-2 Rev.4	Performance Specification for Automotive electrical connector systems

REQUIREMENTS:

3.0 DESIGN AND CONSTRUCTION:

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

3.1 CONNECTOR RATING:

Current carrying capacity	20A max. with 2.5mm² wire (unseald applications)
Water Protection Degree	IP X7 (sealed applications) (acc. to IEC 529)
Temperature range	-40°C to 135°C
Operating Voltage	24 V d.c. (for application at higher voltage please contact Tyco Electronics)
Flammability Class	UL94-HB

3.2 MATERIALS:

Component	Material
Housings	PBT glass fiber filled
Spacer	PBT glass fiber filled
Pin / Socket contacts	See Spec. 108-20260
Wire seals / Cavity plugs	Liquid Silicone Rubber
Peripheral seal	Liquid Silicone Rubber

3.3 QUALITY ASSURANCE PROVISION:

A. **Sample preparation:**

The samples to be used for the tests shall be prepared by randomly selecting from the current production, and the contacts shall be crimped in accordance with the relevant Application Spec.

No sample shall be reused, unless otherwise specified.

B. **Test Conditions:**

All the tests shall be performed under the combination of the following test conditions, unless otherwise specified:

Room temperature: 23 ± 5°C
Relative Humidity: 45÷75%
Atmospheric Pressure: 860÷1060 mbar

4.0 TEST REQUIREMENTS AND PROCEDURES SUMMARY:

VISUAL EXAMINATION			
Par.	Test Items	Test method	Requirements
4.1.0	Confirmation of product and visual examination	Inspect visually, dimensionally and functionally as per applicable Quality Inspection Plan.	Product shall be in accordance with the requirements of applicable Product drawing and Application specification. No visible damage, cracking or defect when the product is new and even after environmental, mechanical and electrical tests

ELECTRICAL REQUIREMENTS			
Par.	Test Items	Test method	Requirements
4.2.0	Voltage Drop (Total connection resistance)	Test circuit as per image at page 16. Test current rating: 5A x square millimeters of used conductor cross-section. The voltage drop of wire must be subtracted.	≤ 8 mΩ (at new and after 10 IN/OUT cycles)
4.2.1	Insulation resistance	(New contacts) Between adjacent contacts apply 500Vdc for 1 minute	≥20MΩ
4.2.2	Dielectric breakdown resistance	Between adjacent contacts apply 1500Vac for 1 minute	No breakdown or flashes

MECHANICAL REQUIREMENTS			
Par.	Test Items	Test method	Requirements
4.3.1	Connector mating force	Mate connectors loaded with contacts at an operating speed of 25 mm/min.	2pos.: ≤ 30N 3pos.: ≤ 40N 4pos.: ≤ 50N 6pos.: ≤ 70N 8pos.: ≤ 90N
4.3.2	Connector unmating force	Unmate connectors loaded with contacts at a speed of 25mm/min, operating on the locking lance.	All positions: ≤ 90N
4.3.3	Connector retention force from counterpart	Unmate connectors loaded with contacts at a speed of 25mm/min, without operating on the locking lance.	All positions: ≥ 110N
4.3.4	Terminal engaging force into connector	Operating Speed: 25 mm/min	≤ 30N The forward stop must withstand a minimum force of 50N and the wire must not buckle (with max. wire size)

Par.	Test Items	Test method	Requirements
4.3.5	Terminal retention force from connector cavity	Operating Speed: 25 mm/min	With spacer in pre-latched position : > 30N With spacer in fully latched position : > 80N
4.3.6	Polarization effectiveness	Apply an axial load at a rate of 25mm/min	Mis-mating force ≥ 220N No electrical connection nor even a partial lock between male and female connectors
4.3.7	Spacer insertion force from its pre-set position	Apply an uniform axial load at a rate of 25mm/min	≤ 60N (connector fully loaded) ≥ 15N (without terminals)
4.3.8	Spacer release load from closed position	Apply an uniform axial load at a rate of 25mm/min	≥ 25N

ENVIRONMENTAL REQUIREMENTS			
Par.	Test Items	Test method	Requirements
4.4.0	High temperature exposure	Chamber temperature: 135°C per 1008 hours	Voltage Drop within the limits prescribed for new contacts. No deterioration, cracks, deformities, discoloration (10X magnification). Functionality of the connection still guaranteed

Par.	Test Items	Test method	Requirements
4.4.1	Fluid resistance	(For sealed applications only) Mated connectors fully loaded with the smallest conductor size immersed for 30' (not in a cumulative way) in: • Brake fluid at 50±3°C • Engine coolant at 50±3°C • Engine oil at 50±3°C • Gasoline at 23±5°C • Diesel fuel at 23±5°C • Ethanol at 23±5°C • Power steering fluid at 50±3°C • Automatic transmission fluid at 50±3°C (Use latest available SAE reference fluid) At the end of the test, do not shake off any excess fluid; do not spray any fluid where not required. Keep specimen wet in a suitable container for one week. Do not let samples submersed in different fluids touch each other nor different fluids to get into contact with each other. At the end of the storage period, samples must be sufficiently dry for inspection without contamination of test equipment.	No damages signs of chemical attack, no deformations, no cracking breakage on connector body, no loss of mechanical functionality. Insulation Resistance within limits prescribed for new connectors. The samples must be checked with a 10x to 40x magnification.

Par.	Test Items	Test method	Requirements
4.4.2	Submersion test	(Sealed applications only) Pre-heat the mated connectors in climatic chamber at the max continuous operating temperature of relevant thermal class for 2 hours. Then remove the samples from the chamber and within 30 seconds submerge them in a room temperature salt water solution to a depth of 30-40cm. Keep them submersed for 30 minutes	No trace of fluid ingress in any connector cavity. Insulation Resistance within limits prescribed at new
4.4.3	Temperature-Humidity cycling	Put the samples into climatic chamber, keeping the electrical circuit under continuous monitoring on the basis of the set-up scheme at page 17. (the resistance of each terminal pair must not exceed the value of 7Ω for more than 1μs during the test) Set the start temperature of the chamber at 23±5°C. Execute 10 cycles as per diagram 1 at page 18	Total connection Resistance: ≤ 8mΩ Insulation resistance and dielectric breakdown resistance within limits prescribed at new

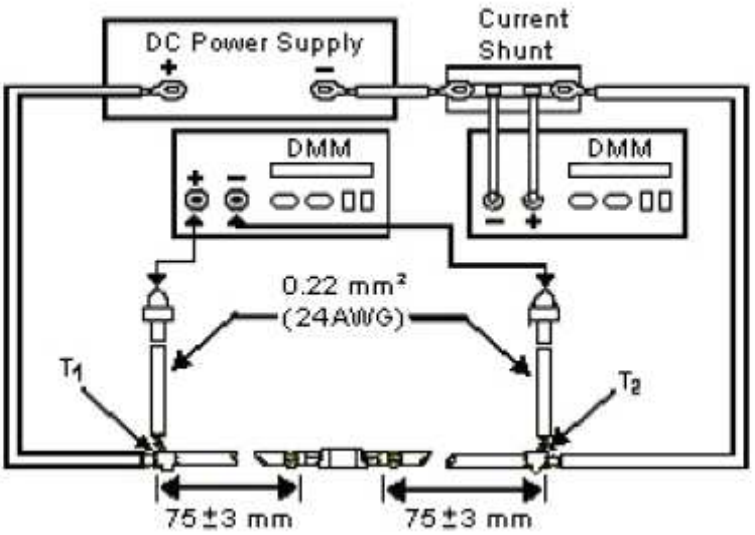
VIBRATIONAL REQUIREMENTS			
Par.	Test Items	Test method	Requirements
4.5.0	Thermo-Vibration Test	- Frequency 20-1000-20 Hz with a variation rate of 2 Hz/sec (cycle duration 16.3 min). - Temperature variation as per Diagram 2 at page 19, one cycle duration: 10 hours. - Acceleration increasing from 10g to 30g between 20 and 100 Hz, constant 30g from 100 Hz to 1000 Hz (see Diagram 3 at page 19). - Test duration 50 hours for each X, Y, Z axis.	At the end of the whole test, the total contact resistance shall be: • ≤ 6mΩ for tin plated terminals • ≤ 4.5mΩ for gold plated terminals No electrical micro-interruption greater than 1µsec shall occur.

5.0 PRODUCT QUALIFICATION TEST SEQUENCE

(Qualificazione prodotto - sequenze di prova)

Test Items *(prova)*	**Test group** *(gruppi di prova)*												
	A	B	C	D	E	F	G	H	I				
	Test sequence *(sequenza prove)*												
Confirmation of product and visual examination (4.1.0)	1,4	1,6	1,6	1,3	1,4	1,5	1,6	1,10	1,5				
Voltage drop (4.2.0)		3,5						3,9	2,4				
Insulation resistance (4.2.1)						2,4	3,5	4,8					
Dielectric breakdown resistance (4.2.2)								5,7					
Durability (4.3.0)		2					2	2					
Connector mating force (4.3.1)			2,4										
Connector unmating force (4.3.2)			3										
Connector retention force from counterpart (4.3.3)			5										
Terminal engaging force into connector (4.3.4)	2												
Terminal retention force from connector cavity (4.3.5)	3												
Polarization effectiveness (4.3.6)				2									
Spacer insertion force from its pre-set position (4.3.7)					2								
Spacer release load from closed position (4.3.8)					3								
High temperature exposure (4.4.0)		4											
Fluid resistance (4.4.1)						3							
Submersion test (4.4.2)							4						
Temperature-Humidity cycling (4.4.3)								6					
Thermo-Vibration test (4.5.0)									3				

VOLTAGE DROP (TOTAL CONNECTION RESISTANCE)
TEST SET - UP



mVD Entire Connection = mVD(T_1 - T_2) - [mVD Conductor]

Total Connection Resistance = mVD Entire Connection ÷ Test Current

THERMAL AND HUMIDITY CYCLING
TEST SET - UP

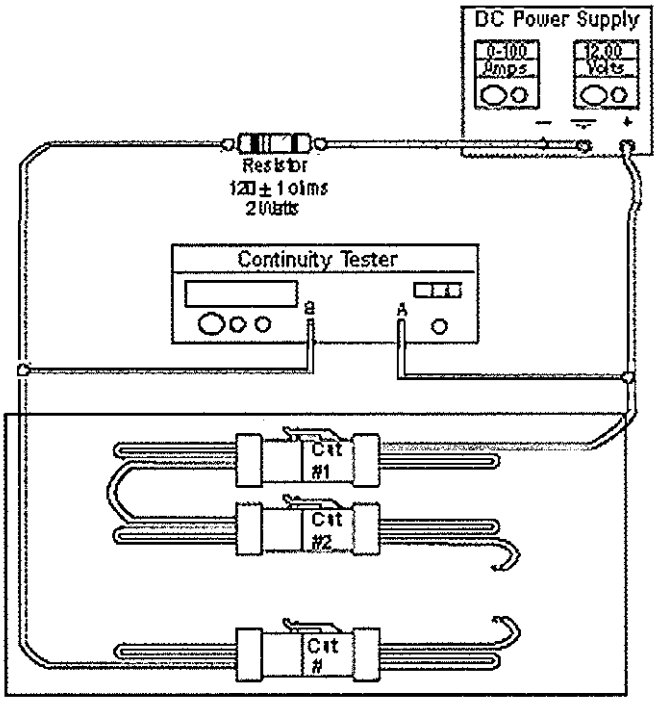
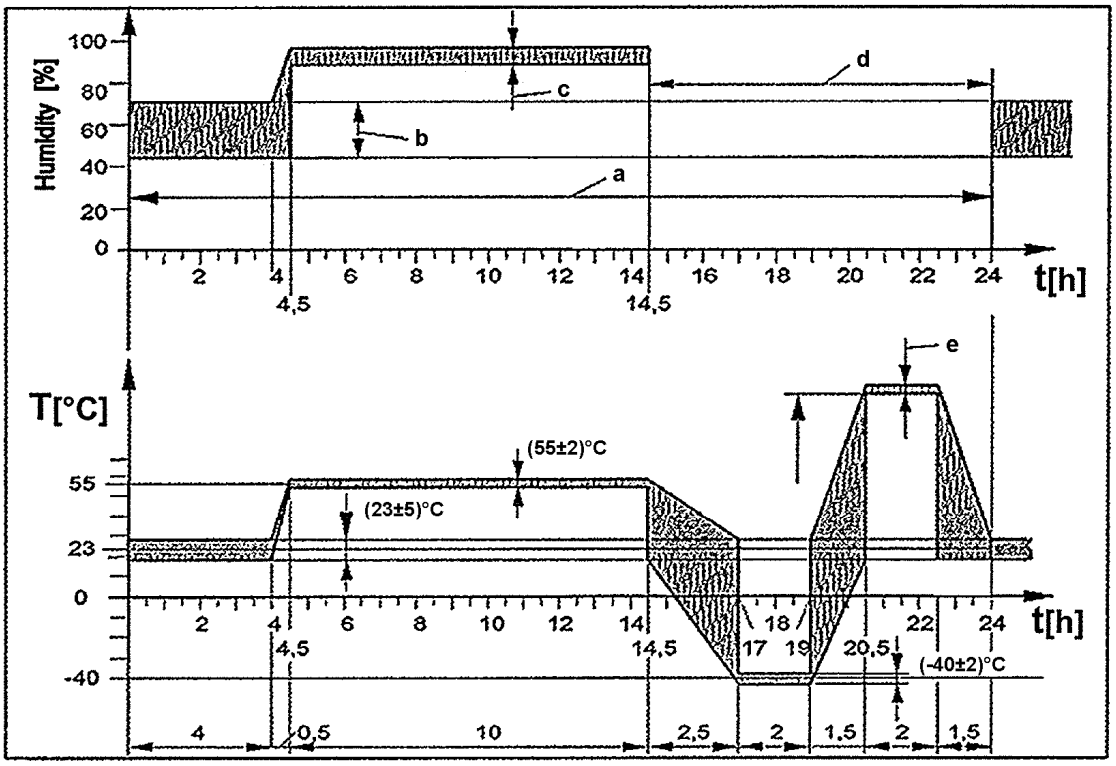


Diagram 1

THERMAL AND HUMIDITY CYCLING TEST



Grey area show the humidity and temperature tolerance admitted

a: one cycle
b: from 45 to 75%
c: from 95 to 99%
d: non-controlled humidity
e: 135° C

VIBRATION TEST

Diagrams 2, 3