



Engineering Testing

FLEX AND BENDING TEST

Author: A. PANGILINAN
Date: 04.12.07
Drawing-No.: CAV-040106-05
 (HYPERTRONICS CONNECTOR OVERMOLD)
Customer: X/ FAST TRACK
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 (HYPERTRONICS CONNECTOR OVERMOLD)

Measurements and Parameters		Testparameters	Results		
Output Lead		Bending Test with 200 g (+ 90°; - 90°)	Lead	Bending Cycles	Failure Mode
Drawing-No.:	CAV-040106-05		1	7560	none
Project No.	PA-040106-05		2	9400	none
Wire Construction:	Jacketed cable AWG#18		3	8004	none
			4	7040	none
			5	10090	none
Connector:	DO2PB315MSHT				
Test for:	UL REQUIREMENT	Failure Mode:	Mean Average Value=		
Test begin:	04-12-07	Interruption = I	Standard Deviation=		
Test end:	DONE	Short Circuit = S			
Remarks:	STRAIN RELIEF PASSED EXCEED UL BEND TESTING OF 4000 FLEX AND BEND +/- 90 DEGREE				
Failure Cause:	NONE				

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Specifications:

- Connector Over mold Specifications: **Material: OM 638 (Vendor: Henkel Germany)**

Macromelt® Data based on general values

Properties	Test Method	Unit	OM633/OM638	OM641/OM646	OM652/OM657	OM673/OM678
Physical						
Color			amber / black	amber / black	amber / black	amber / black
Odor			slight resinous	slight resinous	slight resinous	slight resinous
Specific gravity	DIN 53479, B	S.G.	0.98	0.98	0.98	0.98
Working temperature	Henkel method	°C	-60 to +130	-60 to +130	-60 to +100	-60 to +160
Hardness		Shore A	90	92	77	88
Tensile strength, rupture @ 24C	ASTM D-1708	N / mm ²	5.2	13	2.7	5.7 / 5.5
Elongation @ rupture		%	400	800	400	500
Tensile Modulus, 2% @ 24C	ASTM D-638	psi				5200
Glass transition temperature		°C	-36	-35	-45	-52 / -52
Thermal conductivity	ASTM C 538	W/(mC)	0.15	0.15	0.15	0.15
Softening point, Ball & Ring	ASTM E 28	°C	175	175	155	187 / 185
Molding temperature	Henkel method	°C	200 to 240	210 to 240	180 to 230	210 to 240
Viscosity @ 210 C	ASTM D 3236	mPas	3700	7000	4100	3400
Thermal volume expansion	Henkel method		5.7E-4 / 5.4E-4			pending
Shrinkage going from liquid to solid	Henkel method	%	9.3 / 9.0			pending
Shrinkage after molding, 24 hours	Henkel method	%	1.8			pending
Thermal expansion coefficient, linear	ASTM D696-98			1.6E-04		1.61E-04
Taber Abrasion	ASTM			pending		
Electrical						
Dielectric constant @ 50 Hz	ASTM D150-95		4.9 / 5.1		6.5 / 6.8	5.3
Dielectric constant @ 1 kHz	ASTM D150-95		4.5 / 4.7	5.1 / 5.5	6.2 / 6.3	4.9
Dielectric constant @ 1 MHz	ASTM D150-95		3.0 / 3.1		3.8	3.2
Dissipation Factor @ 50 Hz	ASTM D150-95		0.041 / 0.039		0.144 / 0.156	pending
Dissipation Factor @ 1 kHz	ASTM D150-95		0.052 / 0.057		0.128 / 0.129	pending
Dissipation Factor @ 1 MHz	ASTM D150-95				0.044 / 0.048	pending
Volume resistivity	D257-93	Ohm cm	1.7E13 / 2.4E13	8.3E12 / 1.7E12	1.0E12 / 7.2E11	1.9E12
Volume resistivity @ % moisture	D257-93	Ohm cm	3.0E11 @ .38 / NA			pending
Volume resistivity @ % moisture	D257-93	Ohm cm	7.9E10 @ .91 / NA			pending
Volume resistivity @ % moisture	D257-93	Ohm cm	4.3E10 @ 1.23 / NA			pending
Volume resistivity @ % moisture	D257-93	Ohm cm	2.3E10 @ 1.84 / NA	4.0E10 / 9.7E9 @ 2.5	7.5E9 / 3.8E9 @ 3.5	pending
Dielectric strength	ASTM D149-97a	kV / mm	24 / 19	25 / 22	14 / 15	20
Adhesion						
Adhesion to PVC	Henkel method	= to +---	+++	++++	++++	+++
Adhesion to PA 6,6	Henkel method	= to +---	++	++++	++++	++
180 Peel Test Nylon 6,6	ASTM D-903	lbf	NA / 17,435	>21,000	NA / 19,432	NA / 13,845
180 Peel Test Rigid PVC	ASTM D-903	lbf	NA / 20,408	>21,000	>21,000	NA / 20,035
180 Peel Test Vinyl	ASTM D-903	lbf	NA / >21,000	>21,000	>21,000	>21,000
180 Peel Test ABS	ASTM D-903	lbf	NA / 16,124	>21,000	NA / 20,848	NA / 17,353
180 Peel Test ABS (100 C)	ASTM D-903	lbf	pending	>21,000	>21,000	NA / 20,704
180 Peel Test LDPE	ASTM D-903	lbf	none	none	none	none
180 Peel Test LDPE (100C)	ASTM D-903	lbf	NA / 9,888	NA / 15,609	NA / 11,034	NA / 15,006
Lap shear creep, paper / paper, 3 psi	Henkel MH 11	°C	155	155	155	165
Chemical Resistance						
Moisture absorption, 24 hrs @ 23C	Henkel method	%	approx. 1.2	0.69 / 0.68	1.2	1.03 / 1.01
Moisture absorption, 7 day @ 23C	Henkel method	%	2.61	1.90 / 1.89	2.38	2.18 / 2.10
Moisture absorption, 30 day @ 23C	Henkel method	%	3.43 / 3.38	2.45 / 2.42	2.99 / 3.11	2.69 / 2.68
Water pressure seal, typical		psi	> 2	> 2	> 2	> 2
Weak acids	Henkel method		Good	Good	Good	Good
Strong acids	Henkel method		Poor	Poor	Poor	poor
Weak alkali	Henkel method		Good	Good	Good	Good
Strong alkali	Henkel method		Poor	Poor	Poor	Good
Oils & fats	Henkel method		Excellent	Excellent	Excellent	Excellent
Salts (NaCl, Na2SO4)	Henkel method		Excellent	Excellent	Excellent	Excellent
Plasticizer	Henkel method		Good	Good	Good	Good
Non-polar solvents, i.e. hexane	Henkel method		Good/excellent	Good/excellent	Good/excellent	Good
Polar solvents, i.e. alcohol	Henkel method		Poor/fair	Poor/fair	Poor/fair	Poor
 Ratings & Test Results						
FDA category	FDA	Adhesive	175.105	175.105	175.105	175.105
Flammability rating	UL, 94		V-0	V-0	V-0	V-0
Minimum thickness	UL, 94	mm	1.0	0.90 to 1.20		
UL/L Recognition file no.	UL Standards		E182771	E182771	E182771	E182771

Click on the graphic at left for more detail

- Engineering Specifications: **Part Number: CAV – 040106-05**

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4. Testing Process and Procedure

Cord Flex Life and Strain Relief Test

Objective

This document describes the specification and instruction for assessing the quality and usability of cords and cable assemblies for power supplies.

Scope

The scope of this instruction is to address the requirements and responsibility for the evaluation of cable assemblies on power supply products.

Test Requirement

4.1 General

Operating range for indoor use: -25 to +60°C

Storage temperature: -40 to +100°C

Material Flammability rating: UL 94-V0

4.2 Test Condition

4.2.1 Flex Life of Cable Assemblies

Sample size = 5 units

Load = 200g free weight

Bent angle = $\pm 90^\circ$ with respect to the main axis

Bend rate = 1 cycle per second maximum

4.3 Pass/Fail Criteria

4.3.1 Flex Life of Cable Assemblies

Flex life at the DC plug side >4000.

Flex life at charger/power supply side >3000.

No breakage of conductor, cable jacket and or strain relief is allowed.

Any change in conductor resistance should be <20%.



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5. Procedure

Withdraw at least 5 samples and label it for identification.

Subject all samples to initial visual inspection and characterization which will be used as base reference for comparison after completing all required test.

Flex Life of Cable Assemblies

Refer to Appendix A for setup.

The flex test is performed using a free weight of 200g fixed to the other end of the vertically suspended cable assembly.

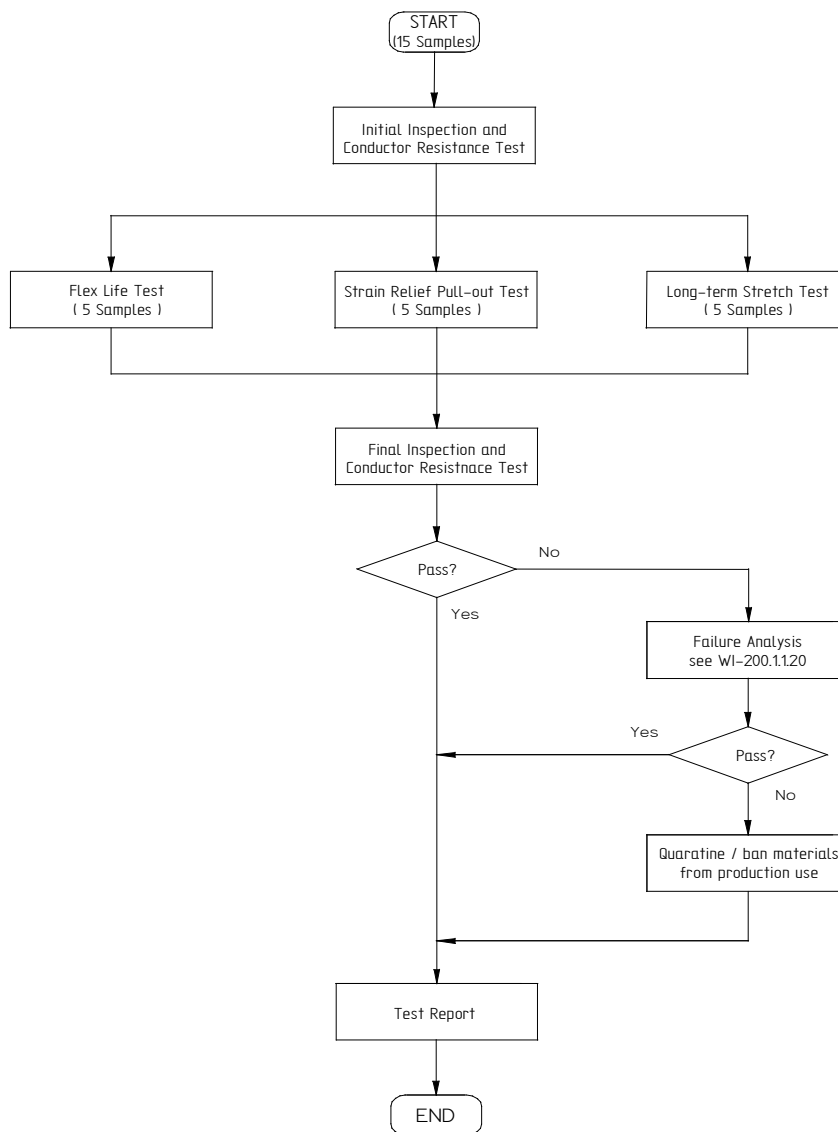
The cord/cable is bent to an angle of $\pm 90^\circ$ with respect to the main axis.

The bending test shall cover both cord and strain relief.

The test is over when the first conductor is broken, the resistance of the conductor increases more than 20% or exceeds the value specified in the cord/cable drawing.



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Flow Chart



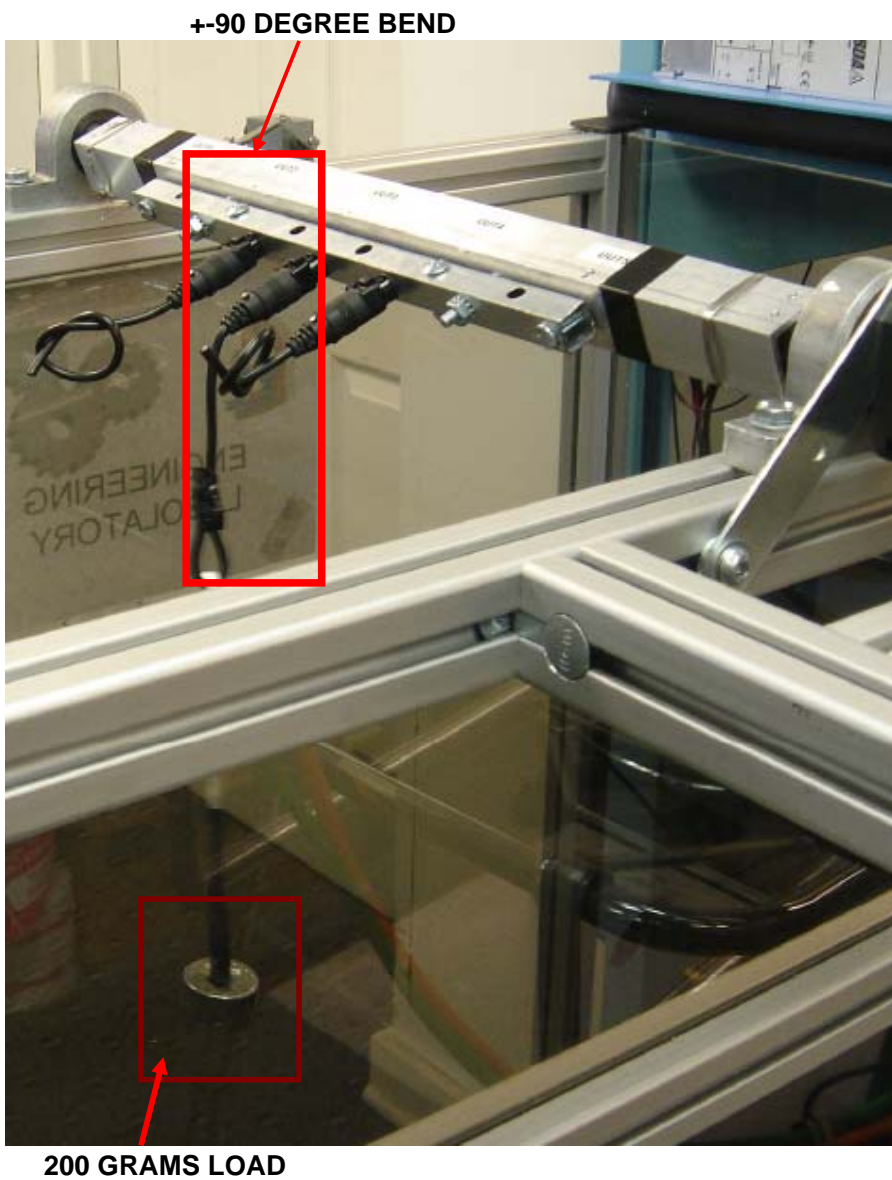
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6. Pictures and Set UP

BEND/FLEX MACHINE: PEI GENESIS FLEX AND BEND MACHINE /
CONTROLLER: BALDOR FLEX DRIVE ADVANCED AC SERVO DRIVE SYSTEM , WINDOWS XP WORKBENCH SOFTWARE



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Bending in Action into positive 90 degree and back to negative 90 degrees. (strain relief in the middle)

