

# TEST REPORT

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1. Title of the Test : The FAT of the Fiber Optic Splice Closure  
2. Test Item : CS402A  
3. Manufacturer : VISSEM Electronics Co., Ltd.  
4. Inspector : Quality Assurance Team of VISSEM Electronics Co., Ltd.  
5. Test Specification : Korea Telecom Generic Requirements KT-T24007-11-03  
6. Test Period : 2011.12.21~22(Type test:2011. 12.01 ~ 2011. 12.20)  
7. Inspection location : At VISSEM Factory, Korea

**December 23, 2011**

Reviewed by **Park Kyeong-Bae**  
Assistant Manager  
QUALITY ASSURANCE DEPARTMENT  
VISSEM Electronics Co., Ltd




Approved by **Park Jong-Sun**  
Manager  
QUALITY ASSURANCE DEPARTMENT  
VISSEM Electronics Co., Ltd.

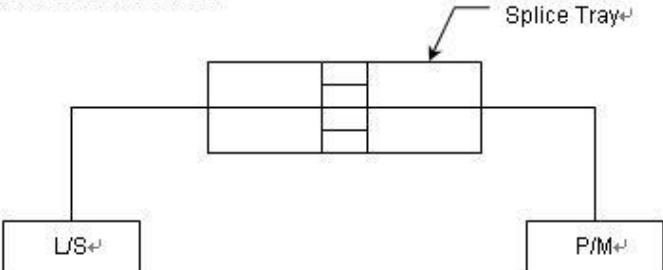



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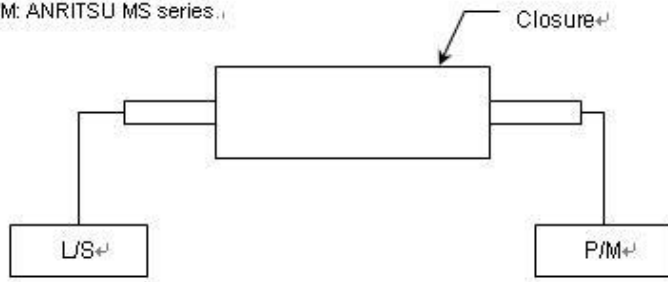
**VISSEM Electronics Co., Ltd.**


- This report has 15 pages with cover page -

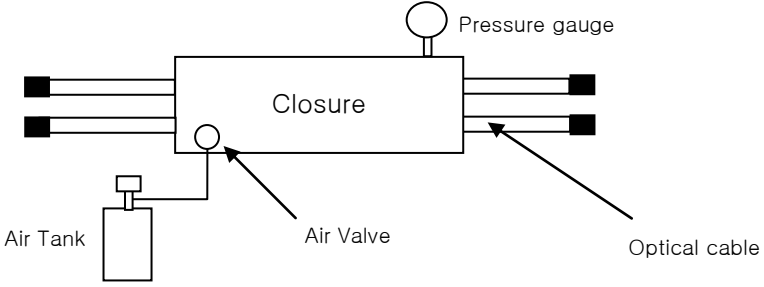
	Date	Doc No.	
	2011.12.20	TR-CS402A-111223	
Code 01	Rev	Classification	
<b>Fiber Fixing &amp; Assembly Test</b>	1.0	Type Test	


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>Place a cable onto a closure</li> <li>Splice fibers and measure the attenuation</li> <li>Clamp the cable and insert splice sleeves into each slit of the splice tray</li> <li>Store three surplus fibers in the tray and measure the attenuation loss</li> </ol>			
<b>Requirements</b>	The attenuation change should be less than $\pm 0.05$ dB			
<b>Test Assembly</b>	<p>[Test Equipment], L/S: ANRITSU MS series, P/M: ANRITSU MS series.</p> 			
<b>Test Result</b>		Core 1	Core 2	Core 3
	Before fixing & assembly	-8.04 dBm	-8.04 dBm	-8.00 dBm
	After fixing & assembly	-8.05 dBm	-8.05 dBm	-8.01 dBm
	Optical attenuation change	0.01 dB	0.01 dB	0.01 dB
<b>Judgment</b>	PASS			
<b>Remarks</b>				

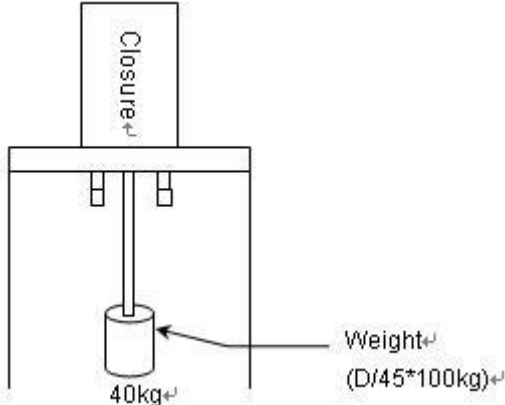
	Date	Doc No.	
	2011.12.20	TR-CS402A-111223	
Code 02	Rev	Classification	
<b>Disassembly &amp; Reassembly Loss Test</b>	1.0	Type Test	


<b>Test Procedure</b>	1. Measure the optical loss after the fiber installation 2. Repeat assembly / reentry and the optical measurements 3 times			
<b>Requirements</b>	The attenuation change should be less than $\pm 0.05$ dB			
<b>Test Assembly</b>	<p>[Test Equipment]          L/S: ANRITSU MS series          P/M: ANRITSU MS series</p> 			
<b>Test Result</b>		Core 1	Core 2	Core 3
	Before assembly	-8.11 dBm	-8.15 dBm	-8.06 dBm
	After 1 <sup>st</sup> assembly	-8.12 dBm	-8.16 dBm	-8.07 dBm
	After 2 <sup>nd</sup> assembly	-8.12 dBm	-8.15 dBm	-8.06 dBm
	After 3 <sup>rd</sup> assembly	-8.11 dBm	-8.16 dBm	-8.07 dBm
	Attenuation change	0.01 dB	0.01 dB	0.01 dB
<b>Judgment</b>	PASS			
<b>Remarks</b>				

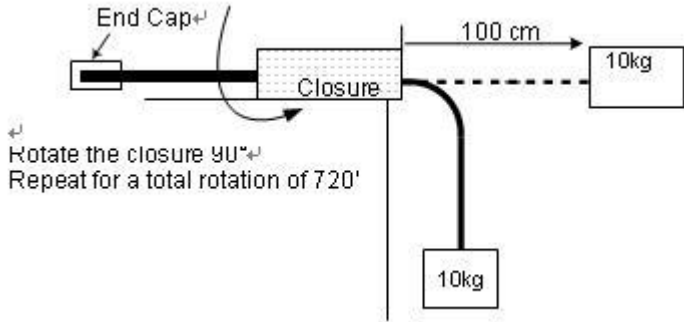
		Date 2011.12.21	Doc No. TR-CS402A-111223	
Code	03	Rev	Classification	
<b>Air Tightness Test</b>		1.0	Routine Test	


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Pressurization of 6 psi (0.42kg/cm<sup>2</sup>) inside of the closure.</li> <li>2. Maintain the conditioned closure for 30 minutes at an ambient air.</li> <li>3. Check for the inner pressure of the closure.</li> <li>4. Submerge the closure for 10 minutes.</li> <li>5. Check the air bubbles when submerged.</li> </ol>		
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No more than 1psi of pressure drop.</li> <li>2. No presence of bubbles when the closure is submerged.</li> </ol>		
<b>Test Assembly</b>			
<b>Test Result</b>	Pressure drop	Before test	6 psi
		After test	6 psi
		Variation	0 psi
	Presence of Bubbles		None
<b>Judgment</b>	PASS		
<b>Remarks</b>			

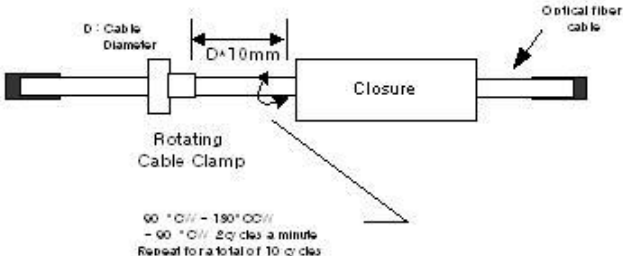
		Date 2011.12.21	Doc No. TR-CS402A-111223
Code	04	Rev	Classification
<b>Tensile Strength Test</b>		1.0	Routine Test


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Pressurization of 6 psi (0.42kg/cm<sup>2</sup>)</li> <li>2. Apply a load of D/45x100kg at 100cm point from the cable end for 8 hours (D: cable diameter in mm)</li> <li>3. Check the cable pull out</li> <li>4. Check the pressure drop and submerge the closure for checking the presence of bubbles</li> </ol>		
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No presence of cable pullout less than 1cm</li> <li>2. No more than 1PSI of pressure drop</li> <li>3. No presence of bubbles when the closure is submerged</li> </ol>		
<b>Test Assembly</b>			
<b>Test Result</b>	Cable pullout		
	Pressure drop	Before test	6 psi
		After test	5.9 psi
		Variation	0.1 psi
Presence of Bubbles		Nonr	
<b>Judgment</b>	PASS		
<b>Remarks</b>			

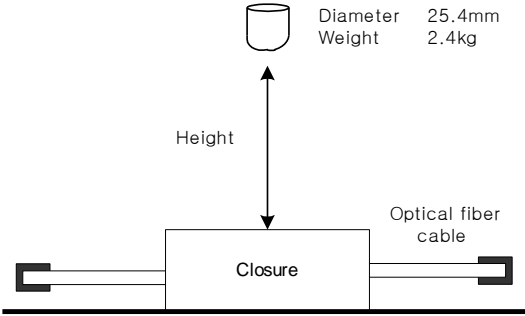
		Date 2011.12.21~22	Doc No. TR-CS402A-111223
Code	05	Rev	Classification
<b>Bending Test</b>		1.0	Routine Test

<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Pressurization of 6 psi (0.42kg/cm<sup>2</sup>)</li> <li>2. Attach a 10kg weight to the cable 100cm from the closure end</li> <li>3. Lower the weight to 90degree and maintain for 15 minutes</li> <li>4. Rotate the closure 90degree and maintain for 15 minutes</li> <li>5. Repeat the steps for a total closure rotation of 720degree</li> <li>6. Check the pressure drop and the presence of bubbles when the closure is submerged</li> </ol>		
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No presence of mechanical damage to the closure</li> <li>2. No more than 1psi of pressure drop</li> <li>3. No presence of bubbles when the closure is submerged</li> </ol>		
<b>Test Assembly</b>			
<b>Test Result</b>	Mechanical Damage		None
	Pressure drop	Before test	6 psi
		After test	5.8 psi
		Variation	0.2 psi
Presence of Bubbles		None	
<b>Judgment</b>	PASS		
<b>Remarks</b>			


		Date 2011.12.22~22	Doc No. TR-CS402A-111223	
Code	06	Rev	Classification	
<b>Torsion Test</b>		1.0	Routine Test	

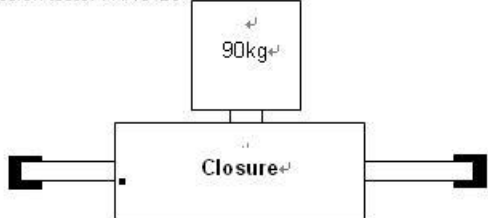
<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Condition the closure for 2 hrs at an ambient temperature of <math>-20\pm 2^{\circ}\text{C}</math> and pressurization of 6 psi</li> <li>2. Twist the cable for a total of 10cycles at a distance of D (D:cable diameter)<math>\times 10\text{mm}</math> from the closure end</li> <li>3. 1cycle=CW90°- CCW180°- CW90°, two cycles per minute</li> <li>4. Check the mechanical damage on the closure end</li> <li>5. Check the pressure drop</li> <li>6. Submerge the closure for checking the bubbles</li> <li>7. Repeat the test after aging at <math>40\pm 2^{\circ}\text{C}</math></li> </ol>			
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No presence of mechanical damage to the closure inlet port</li> <li>2. No more than 1psi of pressure drop</li> <li>3. No presence of bubbles when the closure is submerged</li> </ol>			
<b>Test Assembly</b>	<p>[Test Equipment] Torsion tester :DTF-510Series</p>  <p style="text-align: center;"> <small>90 ° CW / - 180 ° CCW  - 90 ° CW / 2 cycles a minute  Repeat for a total of 10 cycles</small> </p>			
<b>Test Result</b>			$-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$	$40^{\circ}\text{C}\pm 2^{\circ}\text{C}$
	Mechanical damage		None	None
	Pressure drop	Before test	6 psi	6 psi
		After test	6.4 psi	5.6 psi
		Variation	0.4 psi	0.4 psi
Presence of Bubbles		None	None	
<b>Judgment</b>	PASS			
<b>Remarks</b>				


	Date	Doc No.	
	2011.12.21~22	TR-CS402A-111223	
Code 07	Rev	Classification	
<b>Impact Test</b>	1.0	Routine Test	

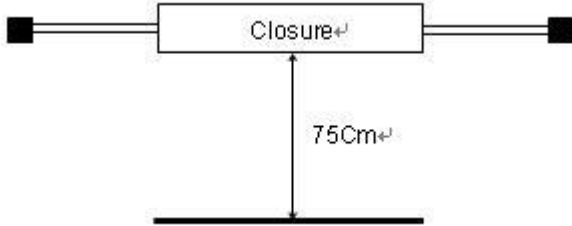
<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Condition the closure for 2hrs at an ambient temperature of <math>-20^{\circ}\text{C}\pm 2^{\circ}\text{C}</math></li> <li>2. Pressurize the closure with 6psi Nitrogen gas within 10minutes</li> <li>3. Impact the closure from 1m height using an impact device with weight 2.4 kg, diameter 2.54cm, spherical radius at the point of contact</li> <li>4. Check the mechanical damage, pressure drop and air bubbles when the closure is submerged.</li> </ol>			
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No presence of mechanical damage to the closure</li> <li>2. No more than 1psi of pressure drop</li> <li>3. No presence of bubbles when the closure is submerged</li> </ol>			
<b>Test Assembly</b>	 <p>Diameter 25.4mm Weight 2.4kg</p> <p>Height</p> <p>Optical fiber cable</p> <p>Closure</p>			
<b>Test Result</b>			$-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$	
	Mechanical damage		None	
	Pressure drop	Before test	6 psi	
		After test	5.8 psi	
		Variation	0.2 psi	
Presence of Bubbles		None		
<b>Judgment</b>	PASS			
<b>Remarks</b>				




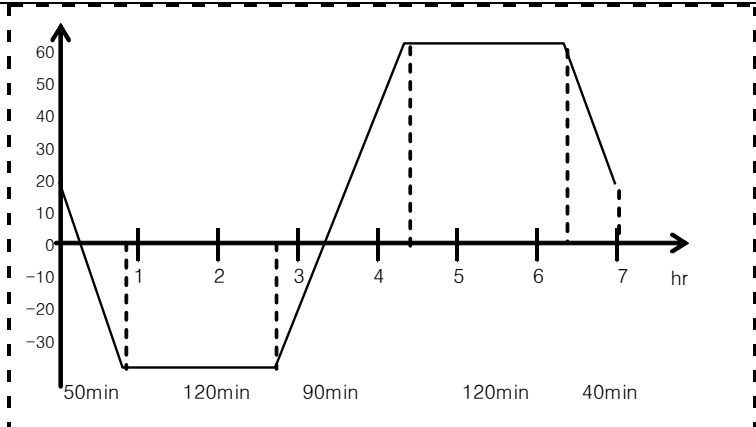
		Date 2011.12.21~22	Doc No. TR-CS402A-111223	
Code	08	Rev	Classification	
<b>Compression Test</b>		1.0	Routine Test	


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>Condition the closure for 2 hours at an ambient temperature of <math>-20^{\circ}\text{C}\pm 2^{\circ}\text{C}</math></li> <li>Pressurization of 6psi within 10minutes</li> <li>Apply a 90kg weight on <math>5\text{cm}^2</math> area of the top of the closure for 15minutes</li> <li>Check the mechanical damage, pressure drop and air bubbles when the closure is submerged.</li> <li>Repeat the procedure after aging at an ambient temperature of <math>40^{\circ}\text{C}\pm 2^{\circ}\text{C}</math></li> </ol>			
<b>Requirements</b>	<ol style="list-style-type: none"> <li>No presence of mechanical damage to the closure</li> <li>No more than 1psi of pressure drop</li> <li>No presence of bubbles when the closure is submerged</li> </ol>			
<b>Test Assembly</b>	<p>[Test Equipment]↵ Tensile/compression tester : KHU-20↵</p> 			
<b>Test Result</b>		$-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$	$40^{\circ}\text{C}\pm 2^{\circ}\text{C}$	
	Mechanical damage	None	None	
	Mechanical deformation	None	None	
	Pressure drop	Before test	6 psi	6 psi
		After test	6.4 psi	5.7 psi
		Variation	0.4 psi	0.3 psi
Presence of bubbles	None	None		
<b>Judgment</b>	PASS			
<b>Remarks</b>				

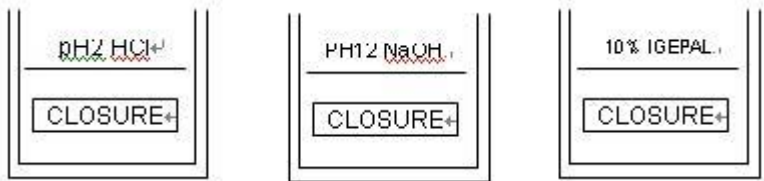
	Date	Doc No.	
	2011.12.21~22	TR-CS402A-111223	
Code 09	Rev	Classification	
<b>Drop Test</b>		1.0	Routine Test


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Condition the closure for 2hours at <math>-20^{\circ}\text{C}\pm 2^{\circ}\text{C}</math></li> <li>2. Raise the closure to a height of 75cm</li> <li>3. Drop the closure onto a concrete floor within 1minute</li> <li>4. Check the mechanical damage, pressure drop and air bubbles when the closure is submerged.</li> </ol>		
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No mechanical damage such as cracks or fractures</li> <li>2. No more than 1psi of pressure drop</li> <li>3. No presence of bubbles when the closure is submerged</li> </ol>		
<b>Test Assembly</b>			
<b>Test Result</b>			$-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$
	Mechanical damage		None
	Pressure drop	Before test	6 psi
		After test	6 psi
		Variation	0 psi
Presence of Bubbles		None	
<b>Judgment</b>	PASS		
<b>Remarks</b>			

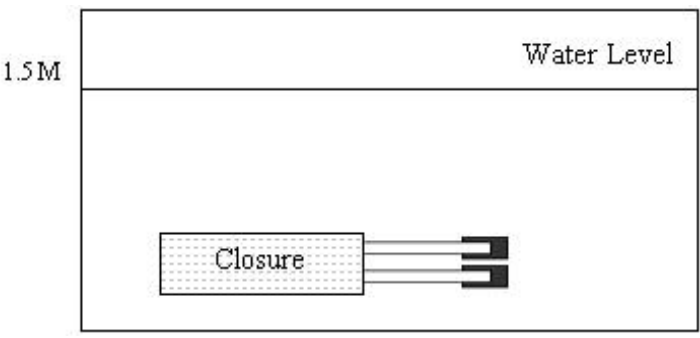
	Date	Doc No.	
	2011.12.01~17	TR-CS402A-111223	
Code 10	Rev	Classification	
<b>Thermal Cycling Test</b>	1.0	Type Test	


<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Splice 3cores and measure the optical loss after closure assembly</li> <li>2. Place the spliced closure in a chamber</li> <li>3. Operate the chamber using the cycle shown in test assembly figure for a total of 20 cycles: 7hrs per cycle</li> <li>4. Check the fiber attenuation change</li> <li>5. Perform the air tightness test</li> </ol>				
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No greater than <math>\pm 0.1</math> dB of attenuation change</li> <li>2. No presence of bubbles when the closure is submerged</li> </ol>				
<b>Test Assembly</b>					
<b>Test Result</b>	Attenuation Change		Before	After	Variation
		Core 1	-8.09dBm	-8.11dBm	0.02 dB
Core 2		-8.12dBm	-8.15dBm	0.03 dB	
	Core 3	-8.12dBm	-8.15dBm	0.03 dB	
	Presence of Bubbles	None			
<b>Judgment</b>	PASS				
<b>Remarks</b>					

	Date	Doc No.	
	2011.12.10~15	TR-CS402A-111223	
Code 11	Rev	Classification	
<b>Chemical Resistance Test</b>	1.0	Type Test	

<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Pressurization of 6psi inside of the closure</li> <li>2. Solution: pH2 HCl, pH12 NaOH, 10% IGEPAL</li> <li>3. Immerse each closure in each of the three fluids for 120 hrs</li> <li>4. Check the pressure loss and air bubbles when the closure is submerged</li> <li>5. Perform the impact test and compression test</li> </ol>				
<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. No presence of corrosion and deformation</li> <li>2. Pressure loss should be less than 1psi</li> <li>3. No presence of air bubbles when the closure is submerged</li> <li>4. No mechanical damage (deformation, fracture, breakage)</li> </ol>				
<b>Test Assembly</b>					
<b>Test Result</b>		pH2 HCl	pH12 NaOH	IGEPAL	
	Deformation & Corrosion		None	None	None
	Pressure drop	Before	6.0 psi	6.0 psi	6.0 psi
		After	5.7 psi	5.6 psi	5.8 psi
		Variation	0.3 psi	0.4 psi	0.2 psi
	Presence of Bubbles		None	None	None
Mechanical Damage		None	None	None	
<b>Judgment</b>	PASS				
<b>Remarks</b>					

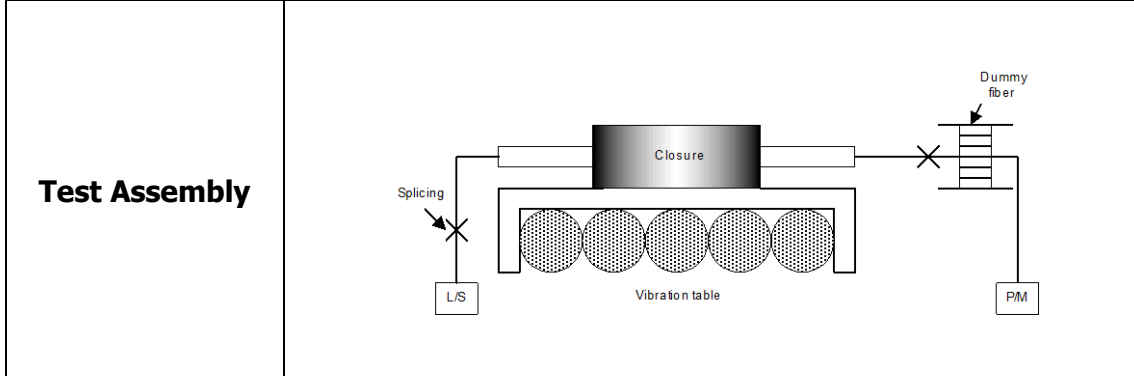
	Date	Doc No.	
	2011.12.01~20	TR-CS402A-111223	
Code 12	Rev	Classification	
<b>Water Immersion Test</b>	1.0	Type Test	

<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Place the assembled closure to be tested into the 1.5m water tank</li> <li>2. The closure doesn't need to be pressurized.</li> <li>3. Maintain the closure for 20days</li> <li>4. After 20days, remove the closure and rinse with clean water</li> <li>5. Dry the outside of the closure</li> <li>6. Open the closure and check for the presence of water intrusion</li> </ol>	
<b>Requirements</b>	No presence of water intrusion	
<b>Test Assembly</b>		
<b>Test Result</b>	Presence of Water Intrusion	None
<b>Judgment</b>	PASS	
<b>Remarks</b>		

		Date 2011.12.20	Doc No. TR-CS402A-111223
Code 13		Rev 1.0	Classification Type Test
<b>Vibration Test</b>			

<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Prepare two closure samples (for air tightness &amp; optical loss check)</li> <li>2. Pressurization of 6psil inside of the closure for air tightness test</li> <li>3. Measure the optical loss of three fibers after splicing and closure assembly</li> <li>4. After fixing the closure on to the tester and vibrate the closure for 2hours with amplitude 1mm, frequency 5-55-5Hz/2min and measure the optical loss in every 30minutes</li> <li>5. After vibration, check the pressure drop and bubbles when the closure is submerged</li> </ol>
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<b>Requirements</b>	<ol style="list-style-type: none"> <li>1. Optical loss: less than <math>\pm 0.5</math>dB (during vibration), less than <math>\pm 0.1</math>dB(after vibration)</li> <li>2. Pressure loss should be less than 1psi</li> <li>3. No presence of air bubbles when the closure is submerged</li> </ol>
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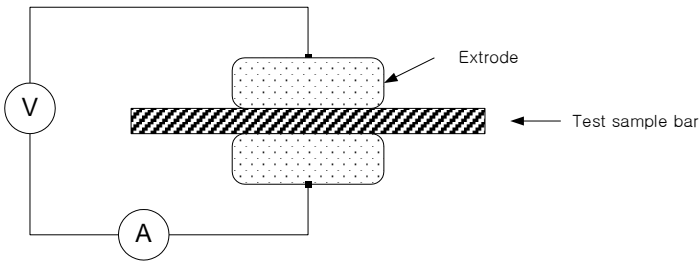


<b>Test Result</b>	Optical Loss		Before	30min	60min	90min	After	Variation
		Core 1	-8.01dBm	-8.02dBm	-8.03dBm	-8.03dBm	-8.03dBm	0.02 dB
		Core 2	-8.01dBm	-8.03dBm	-8.02dBm	-8.01dBm	-8.013Bm	0.02 dB
		Core 3	-8.03dBm	-8.01dBm	-8.03dBm	-8.01dBm	-8.02dBm	0.02dB
Pressur e loss	Before	6 psi						
	After	5.7 psi						
	Variation	0.3 psi						
Presence of Bubble		None						

<b>Judgment</b>	<b>PASS</b>
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<b>Remarks</b>	
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		Date 2011.12.21	Doc No. TR-CS402A-111223	
Code	14	Rev	Classification	
<b>Insulation Resistance Test</b>		1.0	Routine Test	

<b>Test Procedure</b>	<ol style="list-style-type: none"> <li>1. Apply 10 kV DC for a minute to the closure sample bars</li> <li>2. Check the insulation break</li> </ol>		
<b>Requirements</b>	No presence of insulation break		
<b>Test Assembly</b>			
<b>Test Result</b>	Presence of insulation break	None	
<b>Judgment</b>	PASS		
<b>Remarks</b>			

# Test Equipment

**Technology Status** *Testing Equipment Status*

UV resistance 	Fire resistance 	Torsion 	Impact 
Vibration 	Temperature 	Water Spray 	Compression 

VSEM ELECTRONIC 1 Opticube

**Technology Status** *Testing Equipment Status*

Vending 	Immersion 	Temperature 	Fusion Splicer 
Electrical 	Insulation 	Optical switch 	Power meter 

VSEM ELECTRONIC 35 Opticube