

Doc. Number	Rev.
NNP-DVER-0005	v1

NNP-DVER-0005 - Design Verification Report – Network Cable Post-Test Evaluations

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1.0 Document Purpose

This report documents design verification of the COSMIIC system against its reliability requirements. This verification activity was conducted in accordance with NNP-DEVP-0005 – Design Verification Protocol - Network Cable Post-Test Evaluations.

2.0 Document Scope

This report addresses verification of the COSMIIC system against the reliability requirements that are defined in NNP-REQ-0001 – Product Requirements Specification – Network Cable.

This includes the following cables:

Cable	Part Number
Cable Body, Insulated DFT Filars, Blue/Clear	NNP-DWG-140-012-001
Cable Body, Insulated SS Filars, Red/Clear	NNP-DWG-140-012-002
Cable Body, Insulated SS Filars, Green/Clear	NNP-DWG-140-012-003

3.0 Background

Initial design verification of the network cables against its reliability requirements was conducted to verify against NNP-REQ-0001 for the IDE submission of the COSMIIC device.

4.0 Definitions

Terms used in this protocol are defined in the applicable requirements specification(s) and standards, where referenced.



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5.0 Requirements Addressed

This protocol addresses the requirement listed below from NNP-REQ-001 – Product Requirements Specification – Network Cable. The Requirement Text is for reference only; the listed Product Requirement Specification document is the definitive source for requirement content.

Req ID	Requirement Text
NC.7.1	The Network Cable shall remain functional during and after 1.2 x 10 ⁶ cycles of stretching to 120% of the initial installed length of separation.
NC.7.2	The Network Cable shall remain functional during and after 1.2 x 10 ⁶ cycles of crushing by a force of 1.2 Newtons delivered over a 1cm x 2mm bar without sharp edges.
NC.7.3	The Network Cable shall remain functional during and after 1.2 x 10 ⁶ cycles of bending (wrapping) over a rod of 3mm radius with an angle of bend (wrap) of at least 140°.
NC.7.4	The Network Cable shall remain functional during and after 6 x 10 ⁵ cycles of twisting at a rate of 36° of rotation per linear cm of separation about the axis of separation.

6.0 Verification by Analysis

All tests were conducted using EnduraTEC TestBench (Bose Corporation, Minnetonka, MN) equipped with two pneumatic linear actuators and one electromagnetic torsion actuator. All tests were conducted under room temperature (nominally 22°C) laboratory conditions. Before mechanical testing, each sample was prepared for testing and connected to a Fluke 8711 True RMS multimeter to measure electrical resistance with resolution of 0.1W. Impedance of the sample was measured using the Electrochemical Impedance Spectroscopy technique. A Gamry PC4/FAS1 Femtostat with current detection resolution of 1pA was utilized to detect damage to the cable insulation layer. Each sample was placed in an electrochemical cell with a test solution of physiological saline solution of 0.9wt% NaCl. An AC voltage of 1V was applied to each filar of the test sample with frequency range varying from 100kHz to 100mHz.

Impedance of the cable and phase angle between response current and applied voltage were recorded. The sample was then mounted between two pinvise grips with an exposed sample length of 45mm between the grips.



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6.1 General Approach

Verification was accomplished using test methods and inspection. Testing was used to confirm the Network Cable meets the strength and durability requirements. Inspection was used to verify there was no damage or fracture to the insulating tubing of the cable after testing.

6.2 Sample Size

The sample size was four (4) Network Cable bodies. The test result was binary (pass/fail) for each test sample. A sample size of 4 was deemed sufficient primarily due to the extensive time required for each test cycle, with hundreds of thousands of cycles needed per sample, each taking a few seconds. This resulted in several days of continuous testing per sample, meaning that running four samples on a single fixture spanned a few weeks. Given the early development phase of the project, limited resources, and budget constraints, it was essential to balance thorough testing with the need to progress on multiple fronts. Contracting external experts in materials science further justified the decision to limit the sample size to four, as the associated costs and the high expense of the testing fixture necessitated a practical approach. Thus, four samples provided adequate data to inform decisions and allow the project to advance efficiently.

6.3 Test Article

The test samples were in a work in progress state; it was the finished cable body before the final assembly with the interconnect and electrodes.

6.4 Test Facility, Dates and Personnel

Verification was conducted in the Case Western Reserve University engineering laboratory under room temperature (22±2°C) conditions.



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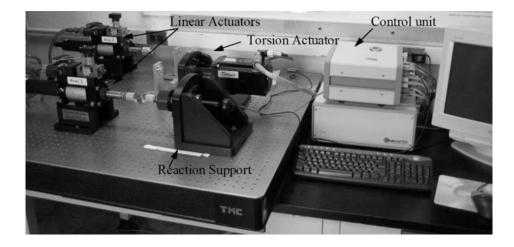


Figure 1. EnduraTEC TestBench with actuators and control unit.

6.5 Equipment and Materials

All tests were conducted using EnduraTEC TestBench (Bose Corporation, Minnetonka, MN) equipped with two pneumatic linear actuators and one electromagnetic torsion actuator. After testing, each cable was examined under an Olympus DP20 (Olympus America Inc, Center Valley, PA) optical microscope at 45x magnification.

All data for this report is recorded on the attached traveler sheets of Appendix A.

6.6 Acceptance Criteria

The acceptance criterion for the mechanical tests were:

- No visual damage or fracture of the cable can be seen through the objective lens of the microscope while moving them slowly.
- The DC resistance per unit of length of the able must not increase by more than 100% from the initial pre-test values. Any cable exceeding this threshold will be considered a failure.
- The impedance of the cable must not decrease by more than 20% between pre-test and post-test measurements. Any cable with an impedance reduction beyond this limit will be deemed to have an insulating failure.

7.0 Deviations

There were no deviations to the protocol.

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8.0 Test Results

The results for measured resistance and impedance of the samples is recorded in Table 1 below. The % change in resistance and impedance values is shown in Table 2.

Table 1. Pre and post test resistance and impedance values measured for the test samples

	Pre Test			Post Test						
Sample ID	Sample Type	Min Resistanc e (Ω)	Max Resistance (Ω)	Min Impedance (Ω)	Max Impedance (Ω)	Min Resistance (Ω)	Max Resistance (Ω)	Impedance at 10kHz (Ω)	Impedance at 100kHz (Ω)	Notes
50-1		13.6	13.7	3133640	297119					Fixture Failed
50-2		13.6	13.7	3167000	299000	8.1	8.1	2900000	280000	
50-3	316LVM, 2-filar	13.6	13.7	3203000	302000	8.2	8.2	2870000	270000	
50-4		13.6	13.7	3002000	284000	8.2	8.3	3200000	300000	
**		14.2	14.2	3090000	290000	8.1	8.1	3220000	300000	
52-1		0.6	0.7	3658193	343766	0.3	0.4	3143000	297000	
52-2	DFT,	0.6	0.6	3699707	346897	0.3	0.4	3120000	290000	
52-3	2-filar	0.6	0.6	3540307	332882	0.3	0.4	3239000	306000	
52-4		0.6	0.7	3418140	322070	0.3	0.4	3272000	308000	
53-1		0.2	0.3	2900913	276523	0.1	0.2	2719000	271000	
53-2	DFT, 4-filar	0.2	0.3	2958667	281144	0.1	0.2	2857000	272000	
53-3		0.2	0.3	2862975	272658	0.1	0.2	2760000	270000	
53-4		0.2	0.2	2864910	273296	0.1	0.2	2810000	270000	



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Table 2. % Change in the Resistance/Impedance of the Cables

	Sample Type		ease in tance	Meets Acceptance	" Mecreas	e in Impedance	Meets Acceptance Criteria? (% Decrease <20%)
Sample ID		Min Resistance	Max Resistance	Criteria? (% Increase <100%)	Impedance at 10kHz	Impedance at 100kHz	
50-1		NA	NA	NA	NA	NA	NA
50-2		-40.4%	-40.9%	Yes	-8.4%	-6.4%	Yes
50-3	316LVM, 2-filar	-39.7%	-40.1%	Yes	-10.4%	-10.6%	Yes
50-4		-39.7%	-39.4%	Yes	6.6%	5.6%	Yes
50-5		-43.0%	-43.0%	Yes	4.2%	3.4%	Yes
52-1	DET o si	-50.0%	-42.9%	Yes	-14.1%	-13.6%	Yes
52-2		-50.0%	-33.3%	Yes	-15.7%	-16.4%	Yes
52-3	DFT, 2-filar	-50.0%	-33.3%	Yes	-8.5%	-8.1%	Yes
52-4		-50.0%	-42.9%	Yes	-4.3%	-4.4%	Yes
53-1		-50.0%	-33.3%	Yes	-6.3%	-2.0%	Yes
53-2	DFT, 4-filar	-50.0%	-33.3%	Yes	-3.4%	-3.3%	Yes
53-3		-50.0%	-33.3%	Yes	-3.6%	-1.0%	Yes
53-4		-50.0%	0.0%	Yes	-1.9%	-1.2%	Yes

For the 316LVM 2-filar sample type, one test iteration experienced an apparatus failure and thus an additional sample was tested. All additional 4 test samples passed testing.

For the DFT 2-filar sample type, all samples passed testing.

For the DFT 4-filar sample type, all samples passed testing.

All samples passed the visual inspection. This testing and its results are documented in the following reports:

- NNP-DVER-0001, Network Cable Stretch Test
- NNP-DVER-0002, Network Cable Crush Test
- NNP-DVER-0003, Network Cable Flex Test
- NNP-DVER-0004, Network Cable Torsion Test



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9.0 Conclusion

All samples that did not experience apparatus failure passed the acceptance criteria required in this protocol.

The COSMIIC system components, part numbers NNP-DWG-140-012-001, NNP-DWG-140-012-002, and NNP-DWG-140-012-003, successfully satisfied the reliability requirements (REQ IDs NC.7.1, NC.7.2, NC.7.3, and NC.7.4) defined in NNP-REQ-0001 - Product Requirements Specification – Network Cable.

10.0 References

Document Identifier	Title
NNP-DVEP-0005	Design Verification Protocol – Network Cable Post-Test Evaluations
NNP-REQ-0001	Product Requirements Specification – Network Cable
NNP-DWG-140-012-001	Cable Body, Insulated DFT Filars, Blue/Clear
NNP-DWG-140-012-002	Cable Body, Insulated SS Filars, Red/Clear
NNP-DWG-140-012-003	Cable Body, Insulated SS Filars, Green/Clear
NNP-DVER-0001	Network Cable Stretch Test
NNP-DVER-0002	Network Cable Crush Test
NNP-DVER-0003	Network Cable Flex Test
NNP-DVER-0004	Network Cable Torsion Test

11.0 Revision History

Revision	Summary of Changes	Date	Author
v1	First version of document.	7/15/2024	J. Daghstani



Appendix A

Traveler Sheets for Network Cable Post-Test Evaluations



And Green	
Cable: 31655 - 210 - Supplied by: Ardien Strial No: 03-30-0110 Part No:	Rev
Protocol: PRT-NNPS-TST-PEN-07	
1. Pre-Test Evaluations	
Date: 8 /4 /68 Cable length: 71 mm, Initials: #	
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade	
Cable Resistance: min 43.6 Ω max 43.7Ω, Impedance 10kHz 3133640Ω Impedance 100l	kHz 297119;
Data File 52-01- pretest - 0.1544Nacl -080608-	
Notes: Resistance value reported from 3 different measurements.	
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)	
Start Date: 08/08/08 Gage length (Start): 45 mm, End Date 1/18/08 Gage lengt	h (End): 47 mm,
Initials: Ky	
Data Acquisition: 10 cycles data for every 100,000 cycles;	
Data File /S2-01/ Stretch/ S2-01- Stretch. +xt	
Notes:	
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)	
Start Date: <u>29/13/88</u> Gage length (Start): <u>47</u> mm, End Date: <u>09/14/08</u> Gage length. Initials: RV	h (End): 47 mm,
Data Acquisition: 10 cycles data for every 20,000 cycles;	
Data File / 52-01/ Crush/ (2-01-cmah. +x+	
Notes:	
	89

	est (1est Paramete.				0	(T) (1)	
	7/24/08 Gage	length (Start): 4 mm, I	End Date://	Gage lengt	h (End):	mm,
Initials: R	<u> </u>	est	alled -	Broke a	t lower	Trip	
	sition: 10 cycles da	ita for every	100,000 cycles;				
Marketon .							12/20
Notes:	- 09					Nf =	424>
						10:45	42430 AM.
		204 0	1 1000		, ,		
				Twist, 4Hz, 0.6 milli			
		length (Start	i):mm, l	End Date://	Gage lengt	h (End):	mm,
Initials:							
	sition: 10 cycles da						
Data File _							
Votes:							
	est Evaluations						
	/ Cable leng						
	sition: scan from 10						
Cable Resis				OkHz Ω Imp		zΩ;	
Filar:R				e 10kHz		00kHz	;
	Data File						
Filar: Re				e 10kHz	_, Impedance 1	00kHz	;
	Data File	134					
Filar: Re	esistance: min	_Ω max	Ω, Impedanc	e 10kHz	_, Impedance 1	00kHz	;
	Data File						
Filar: Re	esistance: min	_Ω max	Ω, Impedanc	e 10kHz	_, Impedance 1	00kHz	;
	Data File						
Notes: Resid	stance values repor						
TOTOS. ICOS	rance values repor	tog Holli 2 di	incasalei	north.			
					2		
1	on History				1 2 7		
REV	I	DESCRIPTIO)N	AUTHOR	DATE	APPRO	VAL
A	Initial draft			RV/HH	6/9/08		
-							



Traveler sheet for Cable Endurance Tests

SPECIMEN ID: 52-02

Cable: 31655 - 2 filor Supplied by: Medical Social No.	: 03-33-0110 Part No:	Rev
Protocol: PRJ-NNPS-TRT-PLN-07	- 0-	
1. Pre-Test Evaluations		
Date: 8 /4 /08 Cable length: 44 mm, Initials: #		
Data Acquisition: scan from 100kHz to 100mHz, record rate	10point/decade	
Cable Resistance: min 12.6 Ω max 12.7Ω, Impedance 10	kHz <u>3167/cn</u> , Impedance 100)	kHz 29960
Data File S2-02-pretest-010	+MNa(6-080608	
Notes: Resistance value reported from 3 different measureme		
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Str		
Start Date: 09/30/08 Gage length (Start): 45 mm, En	nd Date: 0 /04/08 Gage lengt	th (End): <u>4-6</u> mm
Initials: RV		
Data Acquisition: 10 cycles data for every 100,000 cycles;		
Data File / 52-02/ streetch/ 52-02	2-Smetch.+xt	
Notes:		
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 mi		
Start Date: <u>^0 /04/08</u> Gage length (Start): <u>46 </u> mm, Er Initials: <u> </u>	nd Date: 10 10 St & Cage lengt	th (End): 46mm
Data Acquisition: 10 cycles data for every 20,000 cycles;		
Data File / Chuh/ Sz-oz-chuh.	+× t	
Notes:		

		est (Test Parameters: 140° Flex, 4Hz, 1.2 mil			- 1/3
		* CNE / 08 Gage length (Start): 46 mm,	End Date: 10 / 16 /02	Gage length	(End): 46 mm,
	als:f				
		sition: 10 cycles data for every 100,000 cycle	s;		
		flex/s2-02-flex.txt			
Note	231				
5.	Tòrsio	n Test (Test Parameters: 2% Pre stretch, 180	0° Twist. 4Hz. 0.6 million	a cycles)	
		ェ /11/08 Gage length (Start): 46 mm,			(End): 46 mm.
	als:		1 .4.5	2 0.8	,,
		sition: 10 cycles data for every 100,000 cycle	s;		
Data	File_	/ torxim/ 52-02- tord.	m.txt		
Note					
6.	Post-T	est Evaluations			
Date	:10/	22/08 Cable length: 45 mm, Initials: +			
Data	Acqui	sition: scan from 100kHz to 100mHz, record	rate 10point/decade		
Cabl	e Resis	tance: min_8-,1_Ω max_8,1_Ω, Impedance			0,2810;
		Data File 62-02-posttest-0,15			
Filar	C R	esistance: min 159 Ω max 159 Ω, Impeda			00kHz 0,20MQ
		Data File S2-02 - cyan filar - O.C.			
Filar	: <u>G</u> R	esistance: $\min_{1} \frac{1}{1} \sum_{i=1}^{n} \Omega_{i} \max_{i=1}^{n} \frac{1}{1} \sum_{i=1}^{n} \Omega_{i}$, Impeda			00kHz 0,20UC
		Data File S2-02-posttest-green			
Filar	: R	esistance: min Ω max Ω , Impeda		Impedance 10	00kHz;
T'''	n	Data File			201 **
Filar	: R	esistance: min Ω max Ω , Impeda		Impedance 10	00kHz;
Note	e Paris	Data File		_	
Note	3. Resis	nance values reported from 3 different measu	rements.		
7.	Revisio	n History			
	REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
	A	Initial draft	RV/HH	6/9/08	

PRJ-NNPS-TST-TR-01 Cable Mechanical Qualification Testing_2008-06-11.doc

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Date: 03 / 10/ 09 Cable length: $\frac{1}{4}$ mm, Initials: $\frac{1}{4}$ Filar: $\frac{1}{6}$ Resistance: min $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ Resistance: min $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{6}$



SPECIMEN ID: 52-03 Alim Green
Cable: 31655 - 24 filar Supplied by: Nacional Sector No: 03-3)-On O Part No: Rev
Protocol: PRJ-NNPS-757-PLN-07
1. Pre-Test Evaluations
Date: 8 / 4/08 Cable length: 71 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 13.6 Ω max 13.7Ω, Impedance 10kHz 32.03kΩ, Impedance 100kHz 302kΩ;
Data File 52-03 - pretect - 0.154MNall - 050608
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)
Start Date: 10 /06 /08 Gage length (Start): 45 mm, End Date: 10 /10 / 08 Gage length (End): 4 mm,
Initials: RV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File /82-03/Soretch/52-03-Stretch. Lxt
Notes:
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 10/14/08 Gage length (Start): 46 mm, End Date: 10/14/08 Gage length (End): 46 mm,
Initials: PV
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File: / court / 52-03 - crossh. txt
Notes:

A Initial draft	DV/UU	6/0/09	
REV DESCRIPTION	AUTHOR	DATE	APPROVAL
7. Revision History	Andrito.		
Data File			
Filar: Resistance: min Ω max Ω, Impedan	ce 10kHz	, Impedance 1	00kHz;
Data File	oc Tokitz	, impedance is	, , , , , , , , , , , , , , , , , , ,
Data File \$2-03-post test-green file Filar: Resistance: min Ω max Ω, Impedan			00kH2 ·
Filar: <u>A</u> Resistance: min 16,2 Ω max 16,2 Ω, Impedan			00kHz <u>0.19UQ</u>
Data File S2-03 - post tost - cyan g			
Filar: \underline{C} Resistance: $\min_{\underline{16,2}} \Omega \max_{\underline{16,2}} \Omega$, Impedan			00kHz 0. 22 Mg2
Data File S2-05-posttest-0.154	MNace-102708		
Cable Resistance: min 8.2Ω max 8.2Ω , Impedance	10kHz <u>2.87 μ</u> Ω Impo	edance 100kHz	z <u>0,274</u> Ω;
Data Acquisition: scan from 100kHz to 100mHz, record ra	ate 10point/decade		
Date: 10/27/08 Cable length: 4 mm, Initials: 4			
6. Post-Test Evaluations			
Notes:			
Data File / torxin / 32-13-torxion	. 7×F		
Data Acquisition: 10 cycles data for every 100,000 cycles;			
Initials: RV			
Start Date: 0 / 23/08 Gage length (Start): 46 mm,	End Date: 10 /24/0	A Gage length	n (End): 46 mm,
5. Torsion Test (Test Parameters: 2% Pre stretch, 180°			
Notes:			
Data File / flex/ S2-07-frex. +x+			
Data Acquisition: 10 cycles data for every 100,000 cycles;			
Initials: RV			
Start Date: 10/19/08 Gage length (Start): 46 mm,	End Date: 10 /22 10	& Gage lengtl	n (End): 4 mm,
4. Flex l'est (l'est Parameters: 140° Flex, 4Hz, 1.2 milli	on cycles)		

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Traveler sheet for Cable Endurance Tests

SPECIMEN ID: 52-04

Andien green
Cable: 31655 - 21clar Supplied by: Midical Septem No: 63-70-0110 Part No: Rev_
Protocol: PRI-NNPS- Tet-PIN-07
1. Pre-Test Evaluations
Date: 8/4/08 Cable length: 71 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 43.6 Ω max 43.7 Ω, Impedance 10kHz 3002 kΩ, Impedance 100kHz 28 4 kΩ;
Data File 52-04-pretest-0.154MNacl-080608
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles) Start Date: 10 / 13/08 Gage length (Start): 45 mm, End Date: 10/16/08 Gage length (End): 46 mm Initials: PV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File · · · S2-04/ Stretch/ 52-04-Shertch. +x+
Notes:
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 10 / 17/08 Gage length (Start): 46 mm, End Date: 10 / 18/08 Gage length (End): 46 mm
Initials: <u>RV</u>
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File crush/ 82-04- Crush. xxt
Notes:

	10 125/08 Gage length (Start): 45 mm, E	•	A Gage lengt	h (End): 46 mm.
Initials:			7	(,
	nisition: 10 cycles data for every 100,000 cycles;			
	flex/ S2-04-flex. +x+			
Notes:				
5. Torsi	on Test (Test Parameters: 2% Pre stretch, 180° 1	wist, 4Hz, 0.6 millio	n cycles)	
Start Date:	10/29/68 Gage length (Start): 46 mm, E	and Date: 0 /30 /0	& Gage lengtl	h (End): 46 mm,
Data Acqu	sisition: 10 cycles data for every 100,000 cycles;			
Data File	torxim/ 52-04-torxim	1. *x+	E	
Notes:				
6. Post-7	Test Evaluations			
Date: 11 /	13/08 Cable length: 45 mm, Initials: 444			
Data Acqu	isition: scan from 100kHz to 100mHz, record rate	10point/decade		
Cable Resi	stance: min 8, 2 Ω max 8-3 Ω, Impedance 10	kHz <u>3.2 M</u> Ω Impo	edance 100kHz	20,3040;52
	Data File			
Filar: C F	Resistance: min 16.5 Ω max 16.6 Ω, Impedance Data File	: 10kHz <u>z,2&μΩ</u>	, Impedance 1	00kHz <u>0.22mΩ</u> ;
Filar: G R	Resistance: min 16.5Ω max 16.6Ω , Impedance Data File	10kHz 2, 27MD	, Impedance 1	00kHz 0,22 MΩ
Filar: R	Resistance: min Ω max Ω, Impedance	10kHz	, Impedance 1	00kHz;
	Data File			
Filar: R	tesistance: min Ω max Ω , Impedance Data File Ω		, Impedance 1	00kHz;
Notes: Resi	istance values reported from 3 different measurem	ents.		
7. Revisi	on History			
REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
A	Initial draft	RV/HH	6/9/08	
-				

Date: 03/10/09 Cable length: $4\sqrt{}$ mm, Initials: 44 Filar: $\underline{}$ Resistance: min $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ Resistance: min $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ Resistance: min $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ $\underline{}$ Resistance: min $\underline{}$ $\underline{$



SPECIMEN ID: 5205 Ardien Grem Cable: 3161-2 flor Supplied by: Medical Revisal No: 7-30-0110 Part No: Rev
Protocol: P27- NNPS-T3T-PIN-02
1. Pre-Test Evaluations
Date: 10/22/08 Cable length: 71 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 14,2 Ω max 14.2 Ω, Impedance 10kHz 339 MΩ, Impedance 100kHz 0,29 MΩ
Data File 52-05-pretest-0.1544Nacl-102208
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles) Start Date: 10/25/08 Gage length (Start): 45 mm, End Date: 1c/21/08 Gage length (End): 46 mm, Initials: 10 cycles data for every 100,000 cycles; Data File S2-05/Stretch S2-05-Stretch Notes:
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles) Start Date: 0/2708 Gage length (Start): 46 mm, End Date: 8 Bo/68 Gage length (End): 46 mm, Initials: 2V Data Acquisition: 10 cycles data for every 20,000 cycles; Data File / S2 05 - Crush + +x+ Notes:

Start Date:	st (Test Parameters: 140° Flex, 4Hz, 1.2 millio			11
	0 /2 /08 Gage length (Start): 46, mm, 1	End Date: 11/3/08	Gage length ((End): 46 mm,
Initials:				
Data Acquis	ition: 10 cycles data for every 100,000 cycles;			
Data File	/fiex/ 52-05-flex. +x+	-		
Notes:				
5. Torsion	Test (Test Parameters: 2% Pre stretch, 180°	Twist, 4Hz, 0.6 million	cycles)	
Start Date:	1 / + / O& Gage length (Start): 46 mm,	End Date: 1 /06/08	Gage length	(End): 4 mm,
Initials: R	V			
Data Acquis	ition: 10 cycles data for every 100,000 cycles;			
Data File	/ torxion/ 52-05-fo.	-sion .txt		
Notes:				
6. Post-Te	est Evaluations			
Date: 11_/1	2/08 Cable length: 45 mm, Initials: 44			
Data Acquis	ition: scan from 100kHz to 100mHz, record ra	te 10point/decade		
Cable Resist	tance: min 8,1 Ω max 8 1 Ω, Impedance 1	OkHz 3 22M Ω Impe	dance 100kHz	0.30505
	Data File			
Filar: C Re	esistance: min 14, 5 Ω max 16.6 Ω, Impedan	ce 10kHz 722MQ,	Impedance 10	0kHz 205k0;
	Data File			
Filar: G Re		ce 10kHz 1.14 M Ω ,	Impedance 10	
Filar: G Re	esistance: min $(\zeta \subseteq \Omega)$ max $(\zeta \subseteq \Omega)$, Impedan Data File	ce 10kHz <u>ll4 M Q</u> ,	Impedance 10	
	esistance: min <u>((, ς Ω max 16, 6 Ω</u> , Impedan Data File			00kHz <u>0.131M<i>S</i>);</u>
	esistance: $\min_{\mathcal{C}} \mathcal{C} \Omega \max_{\mathcal{C}} \Omega \mathcal{C} \Omega$, Impedan Data File	ce 10kHz,		00kHz <u>0.131M<i>S</i>);</u>
Filar: Re	esistance: $\min_{\mathcal{C}} (\mathcal{C} \Omega) \max_{\mathcal{C}} (\mathcal{C} \Omega)$, Impedan Data File esistance: $\min_{\mathcal{C}} \Omega \max_{\mathcal{C}} \Omega$, Impedan Data File Data File	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re	esistance: $\min_{\mathcal{C}} \underline{\mathcal{C}} \Omega \max_{\mathcal{C}} \underline{\mathcal{C}} \Omega$, Impedan Data File esistance: $\min_{\mathcal{C}} \underline{\Omega} \max_{\mathcal{C}} \underline{\Omega}$, Impedan Data File esistance: $\min_{\mathcal{C}} \underline{\Omega} \max_{\mathcal{C}} \underline{\Omega}$, Impedan	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re	esistance: $\min_{\mathcal{U}} \Omega \max_{\mathcal{U}} \Omega$, Impedan Data File Data File Data File Data File esistance: $\min_{\mathcal{U}} \Omega \max_{\mathcal{U}} \Omega$, Impedan Data File Data File Data File	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re	esistance: $\min_{\mathcal{C}} \underline{\mathcal{C}} \Omega \max_{\mathcal{C}} \underline{\mathcal{C}} \Omega$, Impedan Data File esistance: $\min_{\mathcal{C}} \underline{\Omega} \max_{\mathcal{C}} \underline{\Omega}$, Impedan Data File esistance: $\min_{\mathcal{C}} \underline{\Omega} \max_{\mathcal{C}} \underline{\Omega}$, Impedan	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re	esistance: $\min_{\mathcal{U}} \Omega \max_{\mathcal{U}} \Omega$, Impedan Data File Data File Data File Data File esistance: $\min_{\mathcal{U}} \Omega \max_{\mathcal{U}} \Omega$, Impedan Data File Data File Data File	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re	esistance: min (() Ω max (6) Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File estance values reported from 3 different measure	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re Filar: Re Notes: Resis	esistance: min (() Ω max (6) Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File esistance: min Ω max Ω, Impedan Data File estance values reported from 3 different measure	ce 10kHz,	Impedance 10	00kHz <u>0,131ms);</u> 00kHz;
Filar: Re Filar: Re Notes: Resis	esistance: min (() Ω max (6) Ω, Impedan Data File Ω max Ω ifferent measure stance values reported from 3 different measure on History	ce 10kHz, ce 10kHz, ements.	Impedance 10	00kHz <u>0,131mS);</u> 00kHz;

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Date: 03/10/04 Cable length: $4 \subseteq mm$, Initials: ##Filar: C Resistance: $min_1 \subseteq \Omega$ max $1 \subseteq \Omega$,

Filar: C Resistance: $min_1 \subseteq \Omega$ max $1 \subseteq \Omega$,

Filar: C Resistance: $min_1 \subseteq \Omega$ max C,

Filar: C Resistance: C min C max C,



SPECIMEN ID: DZ - 04 ARDIEM ITEMNO;
Cable: DFT 2-1: ar Supplied by: MEDICAL SERIAL NO: 03-30-0210 Part No: Rev
1. Pre-Test Evaluations
Date: 06/13/08 Cable length: 41 mm, Initials: 4
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0, 6 Ω max 0. TΩ, Impedance 10kHz 36581930 Impedance 100kHz 343766.Ω
Data File D2-01- pretest-0.154M Nacl -061308
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)
Start Date: 66/18/08 Gage length (Start): 45 mm, End Date: 06/21/08 Gage length (End): 46 mm, Initials: 15:30 PM
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data Acquisition: 10 cycles data for every 100,000 cycles; Data File C:/Rany Phase - I / D2 - 01 / D2 - 01 - Stretch . txt
Notes: Grage length (Bold) meanined at 11.15 PM on 6/25/08
Level 1 -2.1; Level 2 6.9 -> Required Toget, Level 1 -2.9; Level 2 7.7 -> Used un this 3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Level 1 -2.9; Level 2 7.7 > Used
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 6 /23/08 Gage length (Start): 46 mm, End Date: 6 /24/08 Gage length (End): mm,
Initials: VR 3PM
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File C:/ RAVI / Prouse-I/D2-01/CRUSH/D2-01-Crush-Ext
Data File C:/RAVI/Prone-I/D2-01/CRUSH/D2-01-Crush. Ext Notes: Cragelength measured at 11:AM m 6/24/08. Tent Stopped much setore that.
much setole that.

4. Flex T	est (Test Parameters: 140° Flex, 4Hz, 1.2 million c	ycles)		
Start Date:	6/24/08 Gage length (Start): 46 mm, End	Date: 06 / 30/ 08	Gage length	(End): 46 mm,
Initials:		8:30P	, A	
Data Acqu	sition: 10 cycles data for every 100,000 cycles;			
Data File	: Ravi Phas-1 D2-01 Fiex	D2-01-Flex	·t×t	
Notes: Ł	25/8-11AM > Fined the actuator s	itopped Oto	o, on cycli	24.
5. Torsic	on Test (Test Parameters: 2% Pre stretch, 180° Twi	st, 4Hz, 0.6 million	cycles)	
Start Date:	06/30/08 Gage length (Start): 46 mm, End	Date: 7/7/09	Gage length	(End): \$6_mm,
Initials: Uf				
	isition: 10 cycles data for every 100,000 cycles;			
Data File	" Torsian)	102-01-Tor	sim-txt	
Notes:				
6. Post-	Cest Evaluations			
Date: 8 /	18/08 Cable length: 45 mm, Initials: 1			
Data Acqu	isition: scan from 100kHz to 100mHz, record rate 1	Opoint/decade		
Cable Res	stance: min 0, 3 Ω max 0, 4 Ω, Impedance 10k	Hz 3143k Ω Impe	dance 100kH2	297kΩ;
	Data File D2-01- posttest - D.154N	Nacl - 08180	8	
Filar: 4	Resistance: $\min \underline{0, + \Omega} \max \underline{0, + \Omega}$, Impedance			00kHz 0.18MD;
	Data File D2-01-patterf-gold flar	-0.154MNacl	-292408-1	
Filar: 2	Resistance: $\min_{0,\frac{1}{2}} \Omega \max_{0,\frac{1}{2}} \Omega$, Impedance			00kHz 0.22MS2
	Data File D2-01 - posttest - green file	Or-0.154MNGE-	092408-	
Filar:	Resistance: min Ω max Ω , Impedance			00kHz;
	Data File			
Filar:	Resistance: min Ω max Ω , Impedance	10kHz	, Impedance 1	00kHz;
	Data File		_	
Notes: Re	sistance values reported from 3 different measurement	ents.		
		1		
7. Revis	ion History			
REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
A	Initial draft	RV/HH	6/9/08	

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Date: 02/12/09 Cable length: $4 \le mm$, Initials: $4 \le mm$, Init

SPECIMEN ID: <u>1) 2 - 0 2</u>	
Cable: DFT -21 or Supplied by: ARDIEM Serial No: 03-30-0210Part No:	Rev
Protocol: PRI-NAM-FET-PLN-07	
1. Pre-Test Evaluations	
Date: 06/13/08 Cable length: 71 mm, Initials: 74	
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade	
	1 1 1 1 1 1 1
Cable Resistance: min 0.6 Ω max 0.6 Ω, Impedance 10kHz 3699707 Ω, Impedance 100kHz 3 Data File Db2-02-prefest-0.154MNacl-061608	4648752
Notes: Resistance value reported from 3 different measurements.	
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)	
Start Date: 08/19/08 Gage length (Start): 46 mm, End Date: 08/25/08 Gage length (End	d): 4 6 mm,
Initials: QV	
Data Acquisition: 10 cycles data for every 100,000 cycles;	
Data File D2-02/ Stretch/ D2-02-Stretch. txt	
Notes:	
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)	
Start Date: 02 /25/08 Gage length (Start): 46 mm, End Date: 0 1/26/08 Gage length (End	d): 46 mm.
Initials: RV	
Data Acquisition: 10 cycles data for every 20,000 cycles;	
Data File D2-02/Comh/02-02-crush. fxz.	
Notes:	

4.	Flex T	est (Test Parameters: 140° Flex, 4Hz, 1.2 mill	ion cycles)		
Sta		19/02/08 Gage length (Start): 46 mm,		Gage leng	th (End): <u> </u>
		sition: 10 cycles data for every 100,000 cycles			
		/D2-02/ Flex / D2-02-flex			
	etes:				
5.	Torsio	n Test (Test Parameters: 2% Pre stretch, 180°	Twist AH2 0.6 millio	na malaal	
Sta	rt Date	9 / 06/08 Gage length (Start): 16 mm,	End Date: 09 /08/0	C Gage lengt	h (End): 46 mm,
Da	ta Acqui	sition: 10 cycles data for every 100,000 cycles			
		·/D2-02/Torsion/D2-02-tor			
No	tes:				
		est Evaluations			
		01/08 Cable length: 40 mm, Initials: #			
		sition: scan from 100kHz to 100mHz, record ra			
Cal	ble Resis	tance: $\min 0, 3 \Omega \max 0, 4 \Omega$, Impedance	10kHz <u>3.i2 Μ</u> Ω Impo	edance 100kH	z 0.29100
		Data File D2-02 - porttest - 0.1541	MNacl - 100108	22	
Fila	ar: 1 Re	esistance: min_0,6_Ω max_0,6_Ω, Impedan	ice 10kHz 1.73 MO	, Impedance 1	00kHz 0.185M52
		Data File D2-02-posttost-gold file	C-O. CUMNall-11	20208	
Fila	ar: Re	esistance: min <u>0.6</u> Ω max <u>0.6</u> Ω, Impedan	ce 10kHz 1.92 MQ	, Impedance 1	00kHz 0, 202 MD
		Data File 12+02-posttest-green	ilor-0.154MNall-	100208	
Fila	ur: Re	esistance: min Ω max Ω, Impedan		, Impedance 1	00kHz;
		Data File			
Fila	ır: Re	esistance: minΩ maxΩ, Impedan	ce 10kHz	, Impedance 1	00kHz;
		Data File			
Noi	es: Resis	stance values reported from 3 different measure	ements.		
7.	Revisio	n History			
	REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
	A	Initial draft	RV/HH	6/9/08	
				20.15	

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Date: 03/12/09 Cable length: 40 mm, Initials: $\frac{1}{10}$ Filar: $\frac{1}{10}$ Resistance: min $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ Resistance: min $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ Resistance: min $\frac{1}{10}$ $\frac{1}{10}$ max $\frac{1}{10}$, Filar: Resistance: min $\frac{1}{10}$ max $\frac{1}{10}$,

SPECIMEN ID: <u>D2-03</u> Cable: <u>DFT-2flar</u> Supplied by: <u>Nedical</u> Serial No: <u>03-30-0240</u> Part No: Rev
1. Pre-Test Evaluations
Date: 06/13/08 Cable length: 71 mm, Initials: 4
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0.6Ω max 0.6Ω , Impedance 10kHz 35703070 Impedance 100kHz 3328820
Data File 102-03-pretest-0.154MNan-062408
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles) Start Date: 7/8/08 Gage length (Start): 45 mm, End Date: 7/11/08 Gage length (End): 45 mm, Initials: 6AD Data Acquisition: 10 cycles data for every 100,000 cycles; Data File 6: / Ran / phuse-1/D2-03/stretch/D2-03-stretch, two yet -1,2 - 7,8 Notes:
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles) Start Date: 7/12/08 Gage length (Start): 45 mm, End Date: 7/14/08 Gage length (End): 45 mm, Initials: LAD Data Acquisition: 10 cycles data for every 20,000 cycles; Data File C: / Ravi/phase-1/D2-03/Crush/D2-03-Crush Notes:

4. Flex Test (Test Parameters: 140° Flex, 4Hz, 1.2 million			45
Start Date: 7 / 15/ 08 Gage length (Start): 45 mm, E	nd Date: 7/19/09	Gage length	(End): mm,
Initials: LAO			
Data Acquisition: 10 cycles data for every 100,000 cycles;			
Data File " / Flex / D2-03 flex.	txt		
Notes:			
		7/	
5. Torsion Test (Test Parameters: 2% Pre stretch, 180° T			
Start Date: 7/23/08 Gage length (Start): 45 mm, E	nd Date: _/ / 25/_0	Gage length	(End): 43 mm,
Initials: 1AO			
Data Acquisition: 10 cycles data for every 100,000 cycles;	mile by b		
Data File u/ Torsion/D2-03-10	121016.6		
Notes:			
6. Post-Test Evaluations			
Date: 8 /18/08 Cable length: 45 mm, Initials: 4			
Data Acquisition: scan from 100kHz to 100mHz, record rate	- 10noint/decade		
Cable Resistance: min 0.3 Ω max 0.4 Ω , Impedance 10		dance 100kHz	30CkO.
Data File D2-03 - posttest -0.15			2082
Filar: 4 Resistance: min 0.6Ω max 0.7Ω , Impedance			00kHz n 167MO
Data File D2-03-postlest-galle			
Filar: 2 Resistance: min 0.6 Ω max 0.7 Ω, Impedance	7		
Data File D2-03 -postest-green			
Filar: Resistance: min Ω max Ω, Impedance	,		
Data File			
Filar: Resistance: min Ω max Ω, Impedance	e 10kHz	, Impedance 10	00kHz;
Data File			
Notes: Resistance values reported from 3 different measure	ments.		
		,	
*			
7. Revision History			
REV DESCRIPTION	AUTHOR	DATE	APPROVAL
A Initial draft	RV/HH	6/9/08	

45

Date: 03/12/09 Cable length: 45 mm, Initials: 45 Filar: 6 Resistance: 6 Resistance:



Sta	rt Date: tials: 4	7:126/08 Gage length (Start): 45 mm	n, End Date: 7/300	28 Gage lengt	h (End): 45 mm.
		<u>-n</u>			(
Da	ta Acqui	sition: 10 cycles data for every 100,000 cycl	es; Cion-		
Da	ta File	sition: 10 cycles data for every 100,000 cycl	1-torsion. 1	*	
	tes:	Flex			
5.	Torsio	n Test (Test Parameters: 2% Pre stretch, 18	80° Twist 4Hz 0.6 millio	n cucles)	
Sta	rt Date:	8 18 108 Gage length (Start): 45 mm	Fnd Date: 2 /1///6	(C) Gage lengt	h (End): 45
Ini	tials: LA	-p	, Lind Date. A / 10/2	& Gage lengt	ii (End): 47 mm,
		sition: 10 cycles data for every 100,000 cycl	es:		
		04-02/Torsion/D9-02-+			
	tes:				
6.	Post-T	est Evaluations			
Dat	te: 8 /1	8/08 Cable length: 44 mm, Initials: -	11-		
		sition: scan from 100kHz to 100mHz, record			
		tance: min 0.3Ω max 0.4Ω , Impedance		edance 100kH:	7258 0.
		Data File D2-04-posttest - 0			200_12,
Fila	ar: 4 Re	esistance: min 0.6Ω max 0.7Ω , Imped			00kH2 0 4 8 9 4 5
		Data File D2 - D4 - pottest - gol			00x112 <u>0,762m</u> 32
Fila	ar: 2 Re	esistance: min <u>0.6</u> Ω max <u>0.7</u> Ω, Imped	lance 10kHz 2 2 CALC	Impedance 1	00kH2 6 212110
		Data File D2-Ou - posttect- gre			
Fila	ar: Re	esistance: min Ω max Ω , Imped	lance 10kHz	Immedence 1	00111-
		Data File	ance Tokitz	, impedance i	ooknz;
Fila	ar: Re	esistance: min Ω max Ω, Imped	ance 10kHz	Impadance 1	001-11-
		Data File		, impedance i	ooknz;
Not	es: Resis	stance values reported from 3 different meas		_	
			dicinents.		
				4	
7.	Revisio	n History			
	REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
	A	Initial draft	RV/HH	6/9/08	

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Traveler sheet for Cable Endurance Tests

SPECIMEN ID: D4-01

Cable: OFT - 4 flar Supplied by: Ardian Serial No: 03-30-0510 Part No: Rev_ Protocol: PRJ - NNPS - TST- PLN -07
Protocol: PRJ-NNPS-TST-PLN-07
1. Pre-Test Evaluations Date: 06 /25/08 Cable length: 71 mm, Initials: 74
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0.2 Ω max 0.3 Ω, Impedance 10kHz 2900 913 Ω Impedance 100kHz 276 523 Ω Data File D4-01- pretest - 0.154M NaCl-062 508
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)
Start Date: 06/26/08 Gage length (Start): 45 mm, End Date: 06/30/08 Gage length (End): 46 mm, Initials: VR
Data Acquisition: 10 cycles data for every 100,000 cycles; Data File C: Rari phase - 1 D4-01 Stretch D4-01-Stretch. txt Notes: SCantime- 2-5
Notes: Scantime- 2-5 - Axial 2 at court 1 Level 1 -2-1, Level 2. 1-3
No-cof Sciens - 13 to get -2.09, 6.9
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 06/30/08 Gage length (Start): 46 mm, End Date: 7/4/08 Gage length (End): 46 mm, Initials: VR 8:30PM
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File D4-01/Crush/ D4-01-Crushotx1-
Notes:

4. Flex Test (Test Parameters: 140° Flex, 4Hz, 1.2 million cycles)
Start Date: 717108 Gage length (Start): 46 mm, End Date: 7/11/08 Gage length (End): 46 mm,
Initials: LAD
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File <u>D4-01/Flex/D4-01-flex.fdt</u> Notes: Navdrel fell off sometime overnight - 3000000 cycles when it
Notes: Mandrel fell off sometime overnight - 3000000 cycles when it
5. Torsion Test (Test Parameters: 2% Pre stretch, 180° Twist, 4Hz, 0.6 million cycles)
Start Date: 7/19/08 Gage length (Start): 46 mm, End Date: 7/21/08 Gage length (End): 46 mm, Initials: 40
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File P4-01/torsion/D4-01-torsion. fdt
Notes:
6. Post-Test Evaluations
Date: 8/18/08 Cable length: 3-2 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0 1 Ω max 0.2 Ω, Impedance 10kHz 271 Ω Impedance 100kHz 271 kΩ;
Data File D4-01- postfest -0.154MNacl-081808
Filar: 1 Resistance: min Ω 5 Ω max 0 5 Ω, Impedance 10kHz 7.68 MΩ, Impedance 100kHz 6.644 MΩ
Data File Dy-01- posttest-gold flor-0.154MNacl-082408-
Filar: 2 Resistance: min 0.5 Ω max 0 ΓΩ, Impedance 10kHz 6.17MΩ, Impedance 100kHz 0.648MΩ
Data File Du-01-post-test-green flox-0.154MNacl-082408
Filar: 3 Resistance: min 0, 4 Ω max 0, ΓΩ, Impedance 10kHz 6,69MΩ, Impedance 100kHz 0,577MΩ
Data File D4-01- post-text-blue flar-0.154MNaC6-08240S
Filar: 4 Resistance: min 0, 4 Ω max 0, ΓΩ, Impedance 10kHz 3,03MΩ, Impedance 100kHz 0.288MΩ
Data File D4-01 - postfect - white flar - 0.154MNacl - 082408
Notes: Resistance values reported from 3 different measurements.

7. Revision History

REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
A	Initial draft	RV/HH	6/9/08	

was

Date: 03/12/09 Cable length: 30 mm, Initials: 411 Filar: G Resistance: min 0.4 Ω max 0.5 Ω , Filar: G Resistance: min 0.3 Ω max 0.4 Ω , Filar: G Resistance: min 0.3 Ω max 0.4 Ω , Filar: G Resistance: min 0.3 Ω max 0.4 Ω ,

SPECIMEN ID: <u>D4-02</u>
Cable: DET - 4- Lar Supplied by: Ardiem Serval No: 03-30-056Part No: Rev_
Cable: DET - 4-1 ar Supplied by: Ardiem Septial No: 03-30-050Part No: Rev_ Protocol: PRJ -NNPS- TST-PLN-07
1. Pre-Test Evaluations
Date: 06/25/08 Cable length: 71 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0,2 Ω max 0,3 Ω, Impedance 10kHz 2978667Ω Impedance 100kHz 281144Ω
Data File D4-02- pretest - 0.154MNacl-062508
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)
Start Date: 06/30/08 Gage length (Start): 45 mm, End Date: 7/4/08 Gage length (End): 47 mm, Initials: VR 8:342M
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File D4-02/ D4-02-Stretch.txt
Data File D4-02/D4-02-Stretch.txt Notes: Level 1 -2-7, Level 2 7.5 -> used to get -2.9, 6.9
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 7/5/08 Gage length (Start): 47 mm, End Date: 7/6/08 Gage length (End): 47 mm,
Initials: LAD
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File 11 D4-02-Crush
Notes:

Start Date: 7/11/08 Gage length (Start): 47 mm, End Date: 7/15/08 Gage length (End): 47 mm,
Initials: LAD
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File " D4-02 - Fle-1
Notes:
5. Torsion Test (Test Parameters: 2% Pre stretch, 180° Twist, 4Hz, 0.6 million cycles)
Start Date: 7/21/08 Gage length (Start): 47 mm, End Date: 7/33/08 Gage length (End): 47 mm,
Initials: LAN
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File 19-02/torsion/09-02-torsion
Notes:
6. Post-Test Evaluations
Date: 8/18/08 Cable length: 45 mm, Initials: #
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0.1 Ω max 0.2 Ω, Impedance 10kHz 2857 kΩ Impedance 100kHz 272k Ω;
Data File <u>D4-02-posttest-0.154MNaCl-081808</u>
Filar: 1 Resistance: min 6. 5 Ω max 0. 5 Ω, Impedance 10kHz 3.25 MΩ, Impedance 100kHz 0.307 MΩ
Data File D4-02-posttest-gold filor-0.154MNacl-082408
Filar: 2 Resistance: min 0, 4 Ω max 0, 5 Ω, Impedance 10kHz 3, 40 MΩ, Impedance 100kHz 0, 32 MΩ
Data File Dy-02-port test-green flor-0.154MMall-082408
Filar: 3 Resistance: min 0.4 Ω max 0.5 Ω, Impedance 10kHz 3.307MΩ, Impedance 100kHz 0.312 MΩ
Data File Dy-02-post text - blue filar - 0.154M Nacl - 062408
Filar: 4 Resistance: min 0, 5 Ω max 6, 5 Ω, Impedance 10kHz 3,35MΩ, Impedance 100kHz 0,315 MΩ
Data File D4-02-post test - white filar-0.154MNacc- 082408
Notes: Resistance values reported from 3 different measurements.
7. Revision History

REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
A	Initial draft	RV/HH	6/9/08	

Date: 03/12/09 Cable length: 38 mm, Initials: ##

Filar: G Resistance: min 0.5Ω max 0.5Ω ,

Filar: B Resistance: min 0.0Ω max 0.0Ω ,

Filar: W Resistance: min 0.0Ω max 0.0Ω ,

Filar: \underline{y} Resistance: min $\underline{0}$, $\underline{\zeta}$ Ω max $\underline{0}$, $\underline{6}$ Ω ,

SPECIMEN ID: 14-03 Cable: DFT-4-silver Supplied by: Ardiem Serial No: 03-30-0505 Part No: Rev
Cable: DFT-4 plar Supplied by: Ardiem Serial No: 03-30-0575 Part No: Rev
1. Pre-Test Evaluations
Date: 06/25/08 Cable length: 71 mm, Initials: 4
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0,2 Ω max 0,3 Ω, Impedance 10kHz 2862957ΩImpedance 100kHz 272658Ω
Data File <u>D4-03-protost-0.154MNac0-062508</u>
Notes: Resistance value reported from 3 different measurements.
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)
Start Date 08 / 20/08 Gage length (Start): 45 mm, End Date 09 / 03/08 Gage length (End): 47 mm, Initials: RV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File/ D4-03/Stretch/ D4-03-Stretch. txt
Notes:
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)
Start Date: 09/04/08 Gage length (Start): 47 mm, End Date: 09/04/08 Gage length (End): 47 mm,
Initials: RV
Data Acquisition: 10 cycles data for every 20,000 cycles;
Data File / Crush / D4-03-Crush. Ext
Notes:

4. Flex Test (Test Parameters: 140° Flex, 4Hz, 1.2 million cycles)
Start Date 0 9 108 1 08 Gage length (Start): 47 mm, End Date 0 9 1 13/08 Gage length (End): 7 mm,
Initials: PV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File / Fiex / D4-03-fiex . txt
Notes:
5. Torsion Test (Test Parameters: 2% Pre stretch, 180° Twist, 4Hz, 0.6 million cycles)
Start Date 09 / 22/08 Gage length (Start): 47 mm, End Date: 9/24/48 Gage length (End): 47 mm,
Initials: RV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File / D4-03-Torsion .txt
Notes:
6. Post-Test Evaluations
Date: 10/01/08 Cable length: 40 mm, Initials: 4
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0, 1 Ω max 0, 2 Ω, Impedance 10kHz 2,76μ Ω Impedance 100kHz 0,26μΩ;
Data File <u>D4-03-postfeet-0.154NNacl-100108</u>
Filar: 1 Resistance: min 0.5 Ω max 0,5 Ω, Impedance 10kHz 1. 45MΩ, Impedance 100kHz 0.15MΩ
Data File D4-03- portfest-gold filar-0.154MNacl-100208
Filar: 2 Resistance: min 0.4 Ω max 0.4 Ω, Impedance 10kHz 1.41 MΩ, Impedance 100kHz 0.14MΩ
Data File D4-03-rostest-areau shr- 0154MNos1-10008
Data File D4-03-pottest-green flor-0.154MNaCl-100608 Filar: 3 Resistance: min 0.4 Ω max 0.4 Ω, Impedance 10kHz 12.3MΩ, Impedance 100kHz 0.85MΩ
Data File Du-03-posttest-blue filar-0.154MNacl-100608
Filar: <u>U</u> Resistance: min <u>O. Γ. Ω max O. ΓΩ</u> , Impedance 10kHz <u>2.37MΩ</u> , Impedance 100kHz <u>0.235MΩ</u>
Data File D4-03-posttest-white fiber-0.154MNacl-100208
Notes: Resistance values reported from 3 different measurements.

7. Revision History

REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
Α	Initial draft	RV/HH	6/9/08	

Date: 03/12/09 Cable length: 3 4 mm, Initials: 44

Filar: G Resistance: min 0.5Ω max 0.5Ω ,

Filar: β Resistance: min 0.6 Ω max 0.6 Ω,

Filar: 45 Resistance: min 0 & Ω max 0, 9 Ω,

Filar: \mathcal{J} Resistance: min 0.3 Ω max 0.4 Ω ,



SPECIMEN ID: 1)4-04	
Cable: DFT-45hr Supplied by: Ardiem Serial No: 03-30-0540Part No:	Rev
Protocol: PRJ - NNPS - TST - PLN -07	
1. Pre-Test Evaluations	
Date: 06 / 25 of Cable length: 71 mm, Initials: 4	
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade	
Cable Resistance: min 0 2 Ω max 0,2 Ω, Impedance 10kHz 2864910Ω Impedance 100kHz	27329602
Data File D4-04-pretect-0.154MNaCl-062608	
Notes: Resistance value reported from 3 different measurements.	
2. Stretch Test (Test Parameters: 2% Pre stretch, 20% Stretch, 4Hz, 1.2 million cycles)	
Start Date: 09/03/08 Gage length (Start): 45 mm, End Date: 09/08/08 Gage length (Finitials: RV	ind): <u>4</u> & mm,
Data Acquisition: 10 cycles data for every 100,000 cycles;	
Data File / D4-04/ Stretch/ D4-04 - Stretch. txt	
Notes:	
3. Crush Test (Test Parameters: 1.2N Crush, 4Hz, 0.12 million cycles)	
	End): 46
Start Date 1 / 108/08 Gage length (Start): 48 mm, End Date 1 09/08 Gage length (I	511d). 78 11d11,
Initials: RV	
Data Acquisition: 10 cycles data for every 20,000 cycles;	
Data File / crush/ D4-04-crush txt	
Notes:	

4. Flex Test (Test Parameters: 140° Flex, 4Hz, 1.2 million cycles)
Start Date: 1913/03 Gage length (Start): 48 mm, End Date 9/17/08 Gage length (End): 48 mm,
Initials:
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File · · · · /flex/ D4-04-flex·txt
Notes:
5. Torsion Test (Test Parameters: 2% Pre stretch, 180° Twist, 4Hz, 0.6 million cycles)
Start Date: 09/19/08 Gage length (Start): 48 mm, End Date: 09/21/08 Gage length (End): 48 mm,
Initials: AV
Data Acquisition: 10 cycles data for every 100,000 cycles;
Data File / Torsion/ D4-04 - Torsion. txt
Notes:
6. Post-Test Evaluations
Date: 40/01/08 Cable length: 40 mm, Initials: 4
Data Acquisition: scan from 100kHz to 100mHz, record rate 10point/decade
Cable Resistance: min 0.1 Ω max 0.2 Ω, Impedance 10kHz 2.81M Ω Impedance 100kHz 0.27MΩ;
Data File D4-04-posttet-0,154M Nacl-100108
Filar: 4 Resistance: min 0.4 Ω max 0.4 Ω, Impedance 10kHz 1.24 MΩ, Impedance 100kHz 0.18MΩ;
Filar: 1 Resistance: min 0.4 Ω max 0.4 Ω, Impedance 10kHz 1.24 MΩ, Impedance 100kHz 0.18MΩ; Data File D4-04-posttect 10.15 4MNa Cl-100308
Filar: 2 Resistance: min 0.5 Ω max 0.5 Ω, Impedance 10kHz 2.48 MΩ, Impedance 100kHz 0.28 μΩ
Data File D4-04-gost test-green filor-0,154NI Nacl- 100308
Filar: 3 Resistance: min 0.5 Ω max 0.5 Ω, Impedance 10kHz 2,23 MΩ, Impedance 100kHz 0,214 MΩ
Data File Dir-04-posttest - blue filar-0.154MNacl-100308
Filar: 4 Resistance: min Ω. 4 Ω max 0.4 Ω, Impedance 10kHz 2,55 MΩ, Impedance 100kHz 0,247 MΩ
Data File D4-04-post-test-white filer-0.154M Nacl-100308
Notes: Resistance values reported from 3 different measurements.

7. Revision History

REV	DESCRIPTION	AUTHOR	DATE	APPROVAL
Α	Initial draft	RV/HH	6/9/08	

Date: 03/12/6Q Cable length: 35 mm, Initials: 444 Filar: 6 Resistance: $\min 0.4 \Omega \max 0.5 \Omega$,

Filar: 8 Resistance: $\min 0.5 \Omega \max 1.0 \Omega$,

Filar: 8 Resistance: $\min 0.7 \Omega \max 0.7 \Omega$,

Filar: 9 Resistance: $\min 0.7 \Omega \max 0.7 \Omega$,