

NHTSA PE14-023
Supplemental Information

Attachment 1

관리 번호: K1-140918-0



NFa Buckle PT Firing
test result

2014.09.18



| Background

- Seatbelts are being replaced in service because the customer observes an airbag light being on.
- The warning light is triggered when the RCM reads a resistance outside the allowable range.

| Reproduce testing

➤ Test Series 1

- Reproduce test with vehicle vibration by vibration test device to check the resistance changing
- Use long wiring connect about 10m

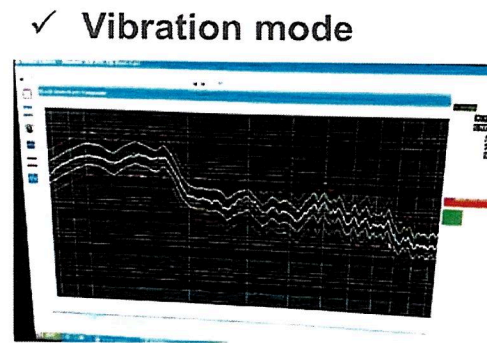
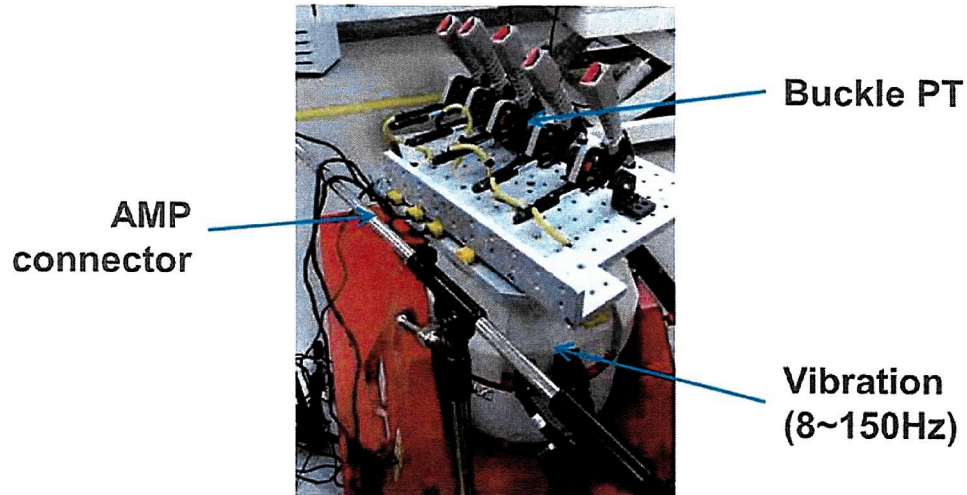
➤ Test Series 2

- To find out deployment characteristics with difference terminal resistance level from 20ohm to 35ohm.

Test Result for reproduce testing

➤ Test Series 1

	Initial Resistance	Vibration (Z axis)	Elapsed Time	Resistance after Elapsed Time	Fire (Y/N)
Sample 6	2.47	8 ~ 150Hz (Random)	4 hours	2.46	N/A
Sample 7	2.48	8 ~ 150Hz (Random)	4 hours	2.47	N/A
Sample 8	2.44	8 ~ 150Hz (Random)	4 hours	2.43	N/A
Sample 9	2.43	8 ~ 150Hz (Random)	4 hours	2.43	N/A
Sample 10	2.38	8 ~ 150Hz (Random)	4 hours	2.37	N/A



Test Result for reproduce testing

➤ Test Series 2

	Input	Initial Resistance	Additional resistance	Electric wire resistance (From ACU to BKL P/T)	Resistance after Setup	Fire (Y/N)	Test date
Sample 1	12V 5A	-	25	-	28.50	Y	9/16
Sample 2	12V 5A	-	30	-	33.39	Y	
Sample 3	12V 5A	-	35	-	38.90	N	
	12V 5A	-	32	-	35.14	Y	
Sample 4	12V 5A	-	35	-	38.59	N	
	12V 5A	-	32	-	35.23	Y	
Sample 5	12V 5A	-	35	-	38.16	N	09월 18일
	12V 5A	-	34	-	37.62	N	
	12V 5A	-	33	-	36.18	N	
	12V 5A	-	32	-	35.08	Y	
Sample 6 (After Vibration)	12V 5A	-	34	-	36.99	N	
	12V 5A	-	33	-	36.15	N	
	12V 5A	-	32	-	35.11	Y	
Sample 7 (After Vibration)	12V 5A	-	34	-	37.15	N	
	12V 5A	-	32	-	35.10	Y	
	12V 5A	-	20	-	23.03	Y	
Sample 8 (After Vibration)	12V 5A	-	34	-	37.17	N	
	12V 5A	-	32	-	35.19	Y	
	12V 5A	-	20	-	23.10	Y	

Our mission – your safety



Test Result for reproduce testing

➤ Test Series 2

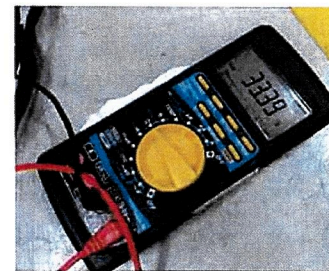
✓ Additional Resistance



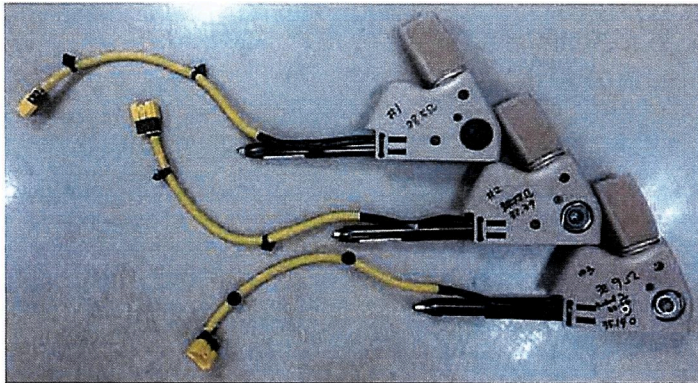
✓ ACU



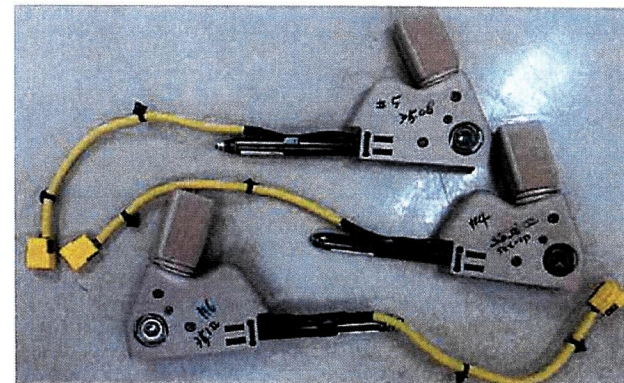
✓ Check terminal Resistance



➤ After test (sample 1 ~ 3)



➤ After test (sample 4 ~ 6)



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 **TAKATA**

| Summary

- The result of test series 1 shows no change of resistance during 4hours at vehicle vibration condition (8~150Hz)
- The result of test series 2 shows Buckle PT fires additional resistance range during 20ohm ~ 32ohm.
(MGG terminal resistance value : 2.15 ± 0.35 ohm)

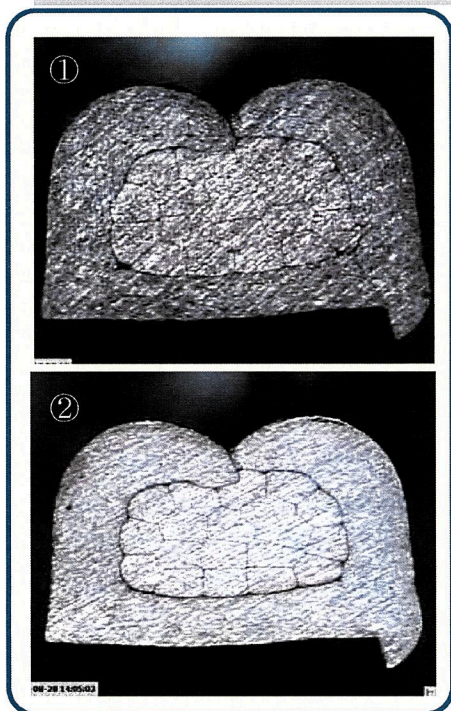
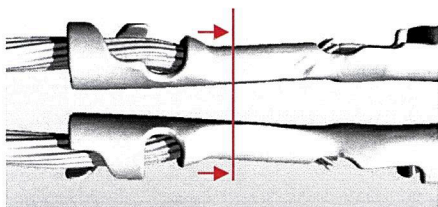
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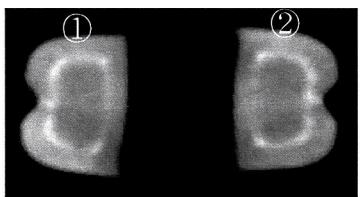
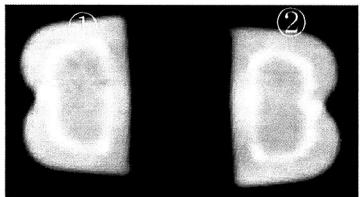
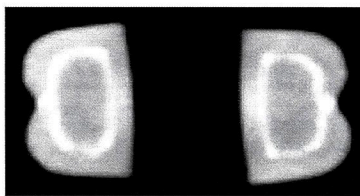
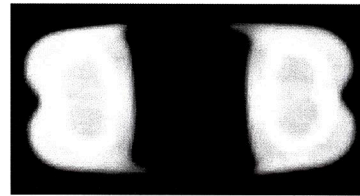
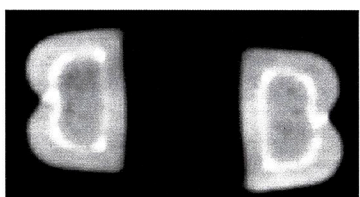
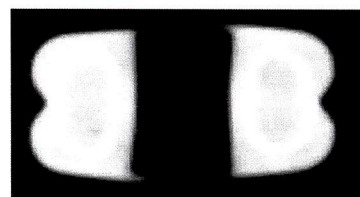
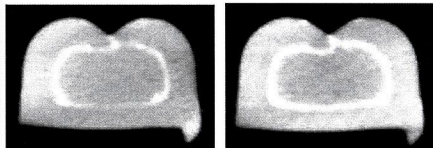
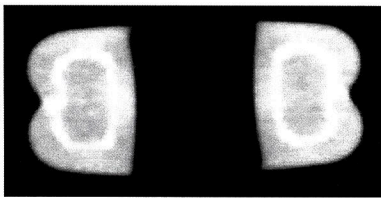
Attachment 2

Buckle PT side wire terminal compression part analysis (CT analysis)

▣ CT analysis result:

- No gap in terminal compression part



NO	Terminal	NO	Terminal
1	 <VIN NO [REDACTED]>	5	 <VIN NO [REDACTED]>
2	 <VIN NO [REDACTED]>	6	 <VIN NO [REDACTED]>
3	 <VIN NO [REDACTED]>	7	 <VIN NO [REDACTED]>
4	 <VIN NO [REDACTED]>	8	 <RO [REDACTED]>

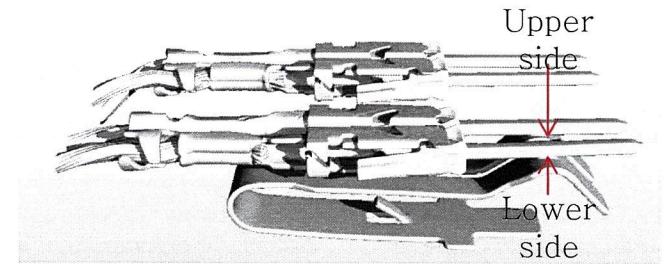
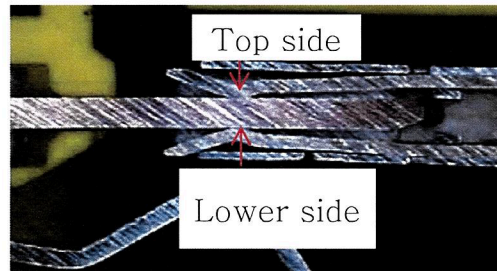
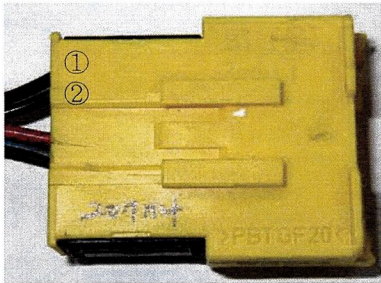
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Attachment 3

Buckle PT side connector SEM analysis

SEM analysis result

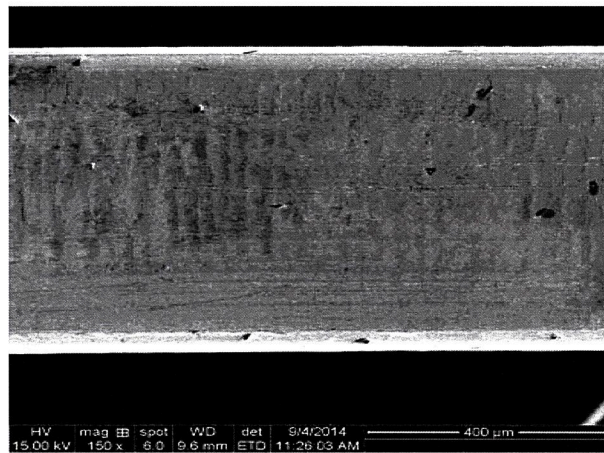
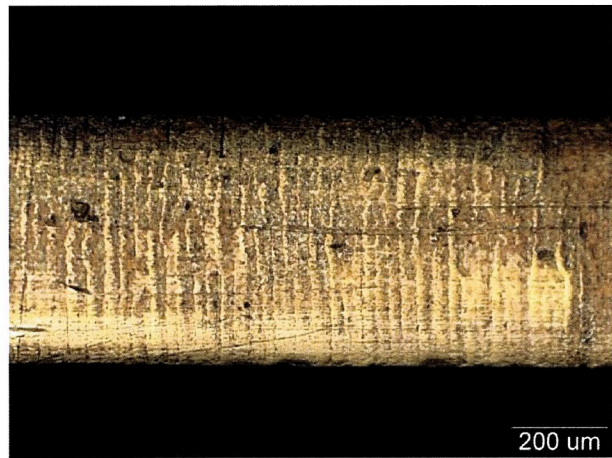
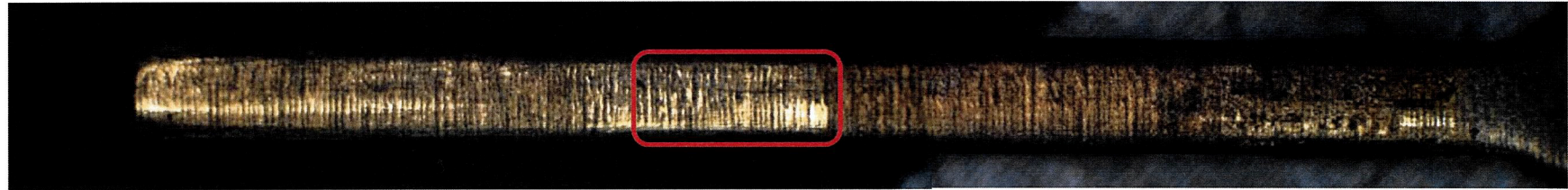
- Male terminal upper/lower side gold plating had surface scratch but had no lower gold plating exposure



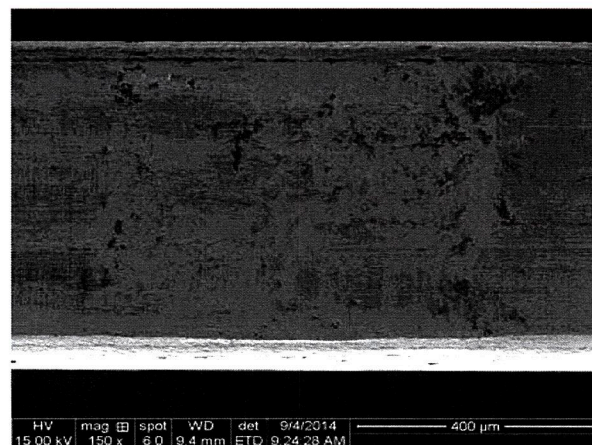
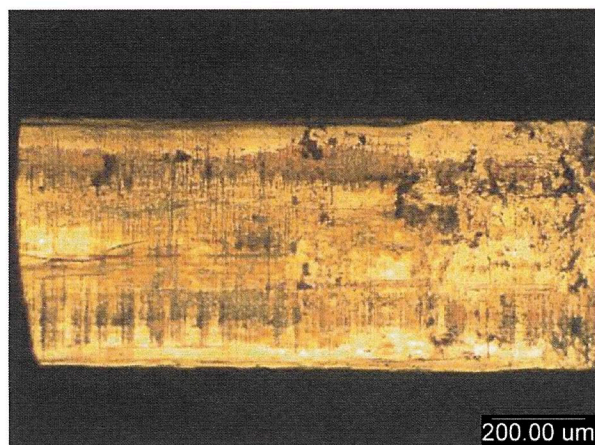
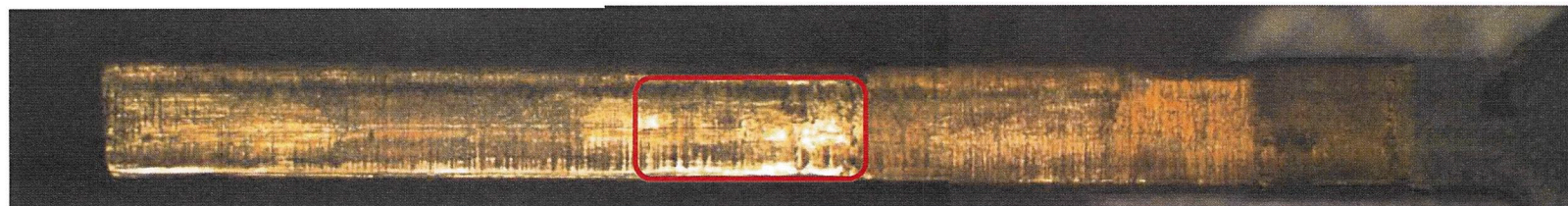
VIN NO [REDACTED] (Production date : 7/29.'06)		
Class	Upper side	Lower side
①		
②		

VIN NO [REDACTED] (Production date : 06.10/25)		
Class	Upper side	Lower side
①		
②		

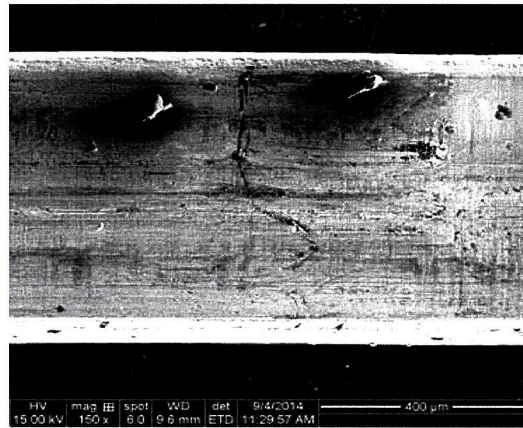
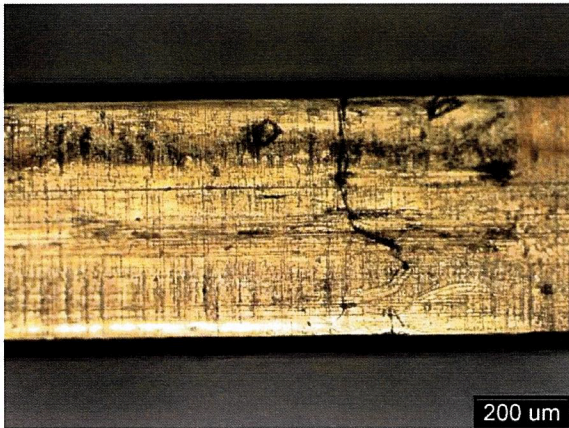
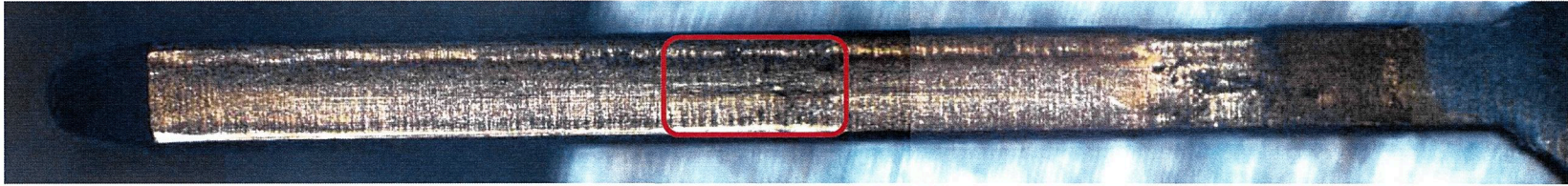
① Top(VIN NO [REDACTED])



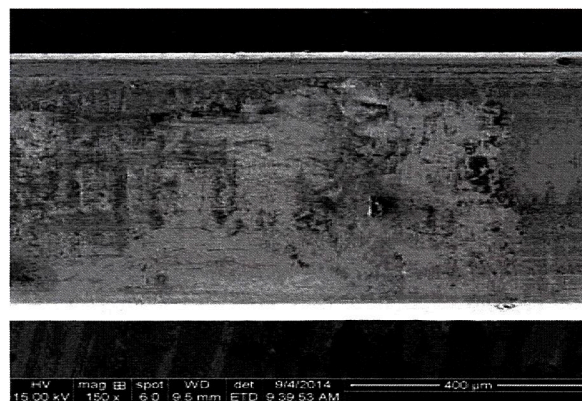
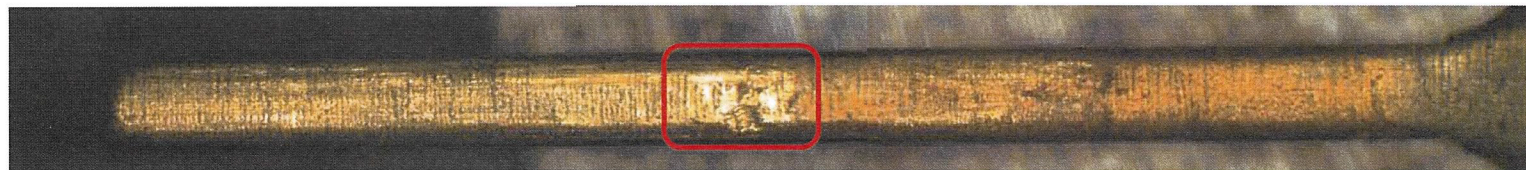
① Underside (VIN NO [REDACTED])



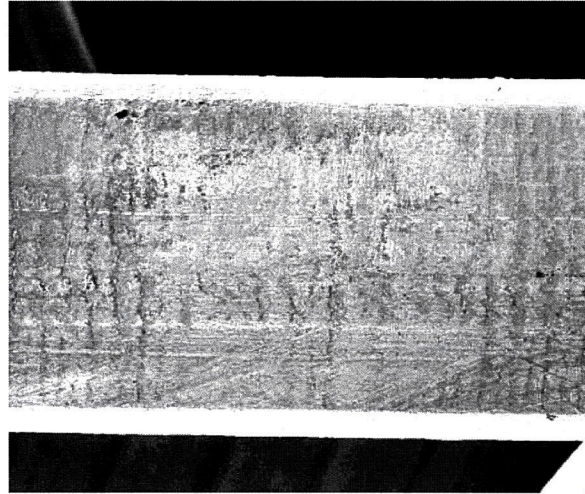
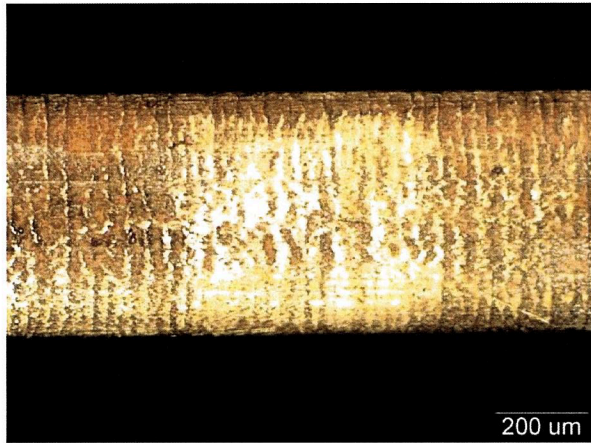
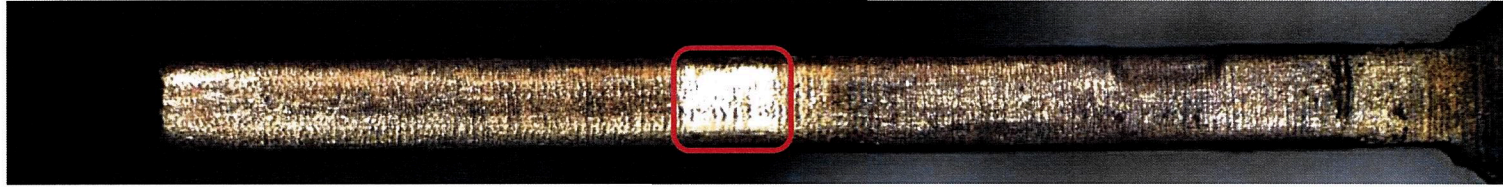
② Top (VIN NO [REDACTED])



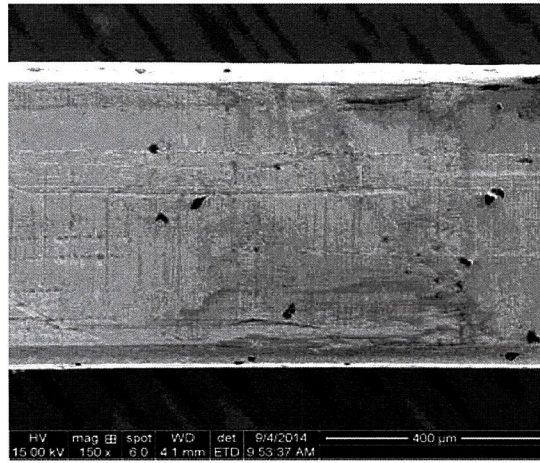
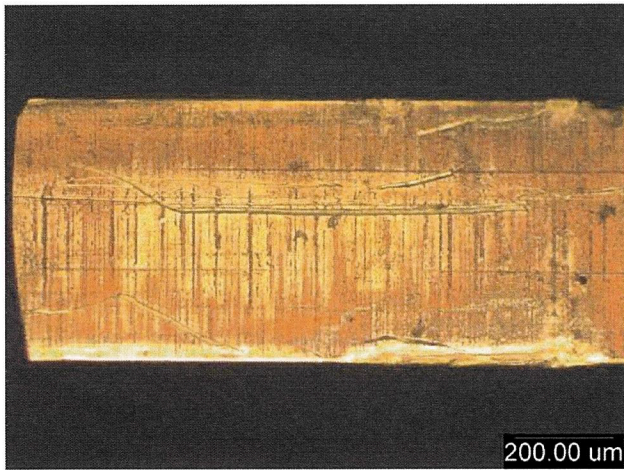
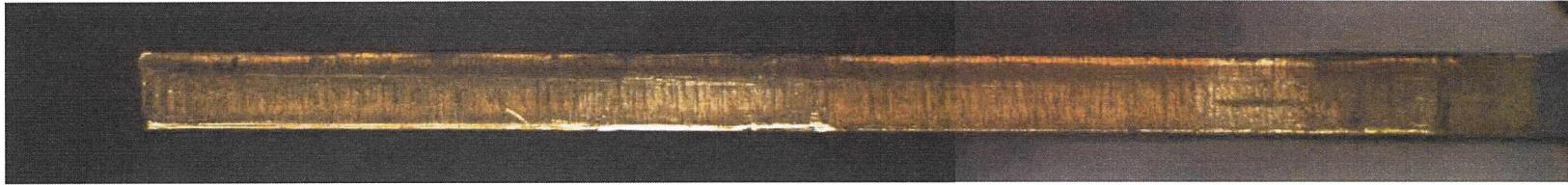
② Underside (VIN NO [REDACTED])



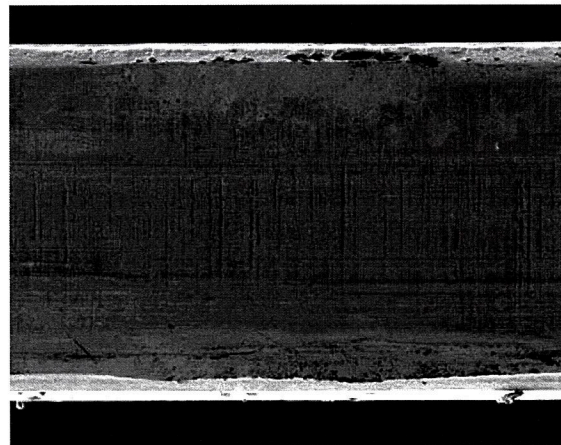
① Top (VIN NO [REDACTED])



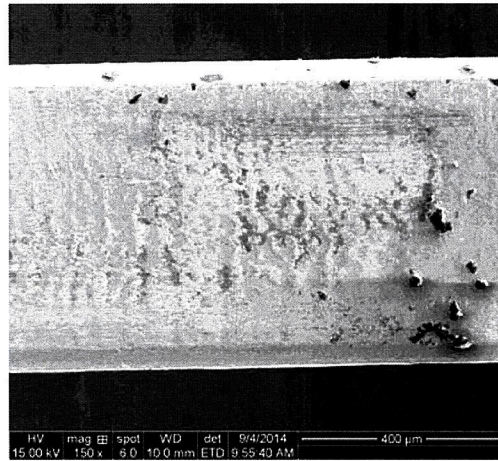
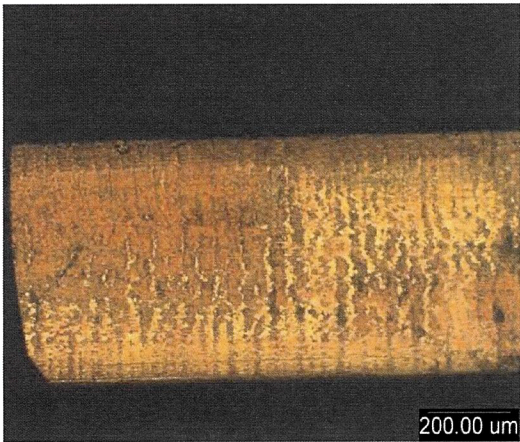
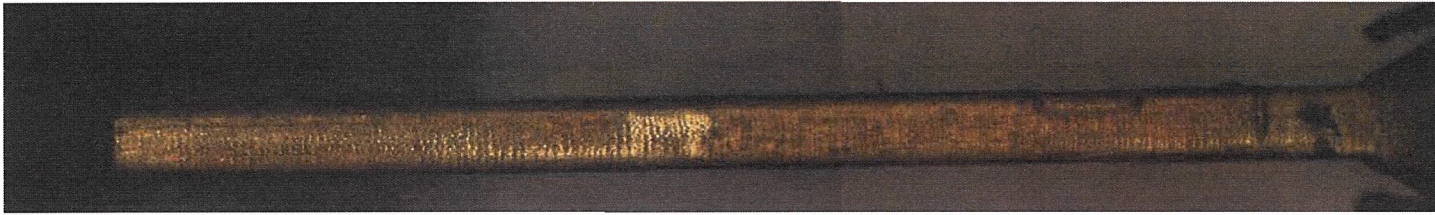
① Underside (VIN NO [REDACTED])



② Top (VIN NO [REDACTED])



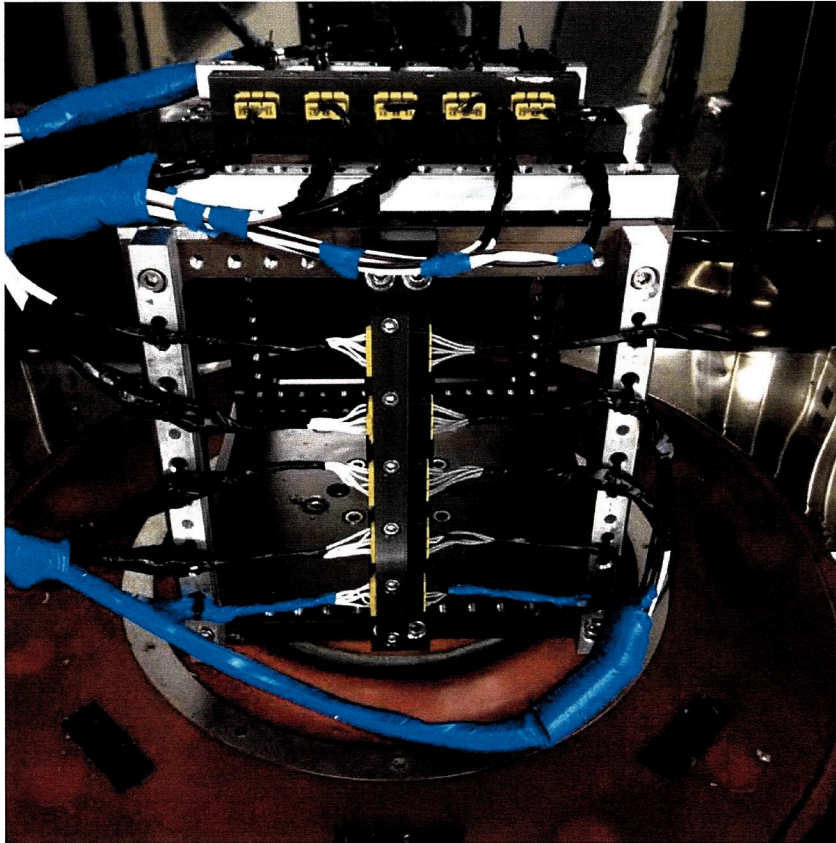
② Underside (VIN NO [REDACTED])



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Attachment 4

Connector vibration evaluation

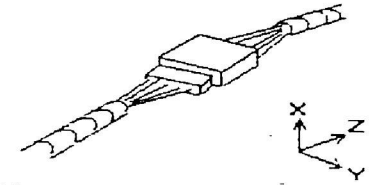


※ Single axis (+/-) vibration fixture. Axis under test oriented as required.

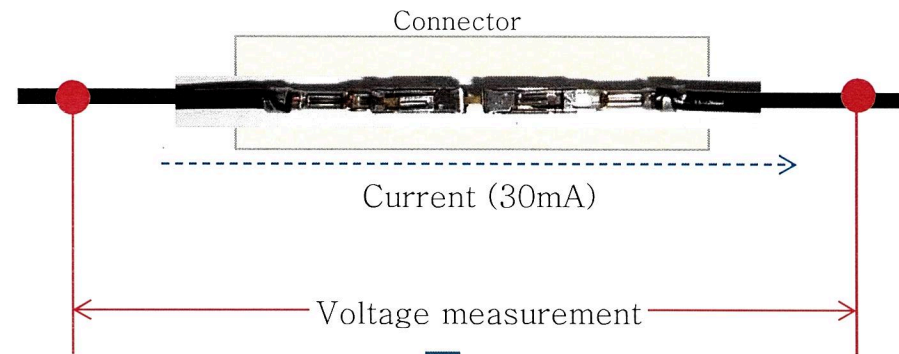
■ Test condition

Sinusoidal Vibration

- Applied current: 30mA
- Vibration acceleration: 4.4G
- Vibration Frequency : 20~200Hz
- Vibration direction +/- x, y, and z axes
- Time 40 hours each axis



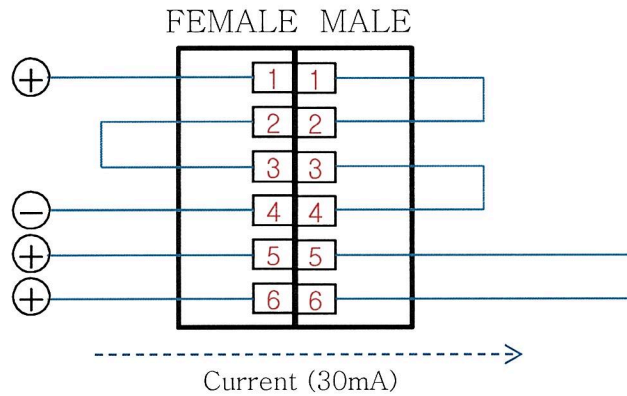
■ Measurement method



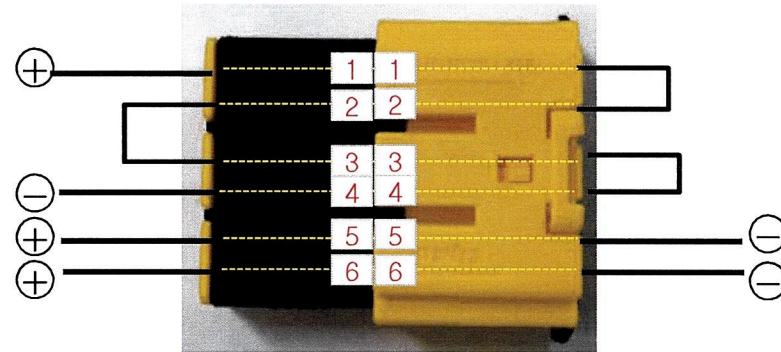
$$\text{Resistance} = \text{Voltage} / \text{Current (30mA)}$$

Connector vibration evaluation

■ Circuitry connection schematic

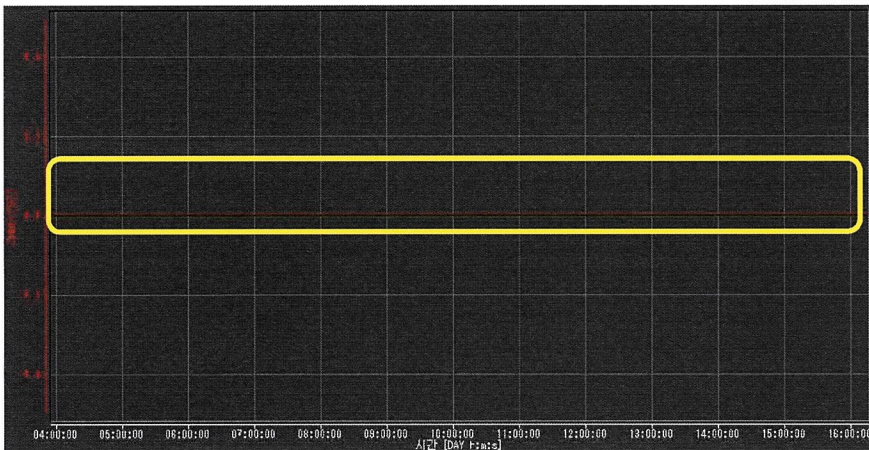


FEMALE MALE



■ Evaluation result

- Maximum value of 0.067Ω observed
- No warning lamp ON condition



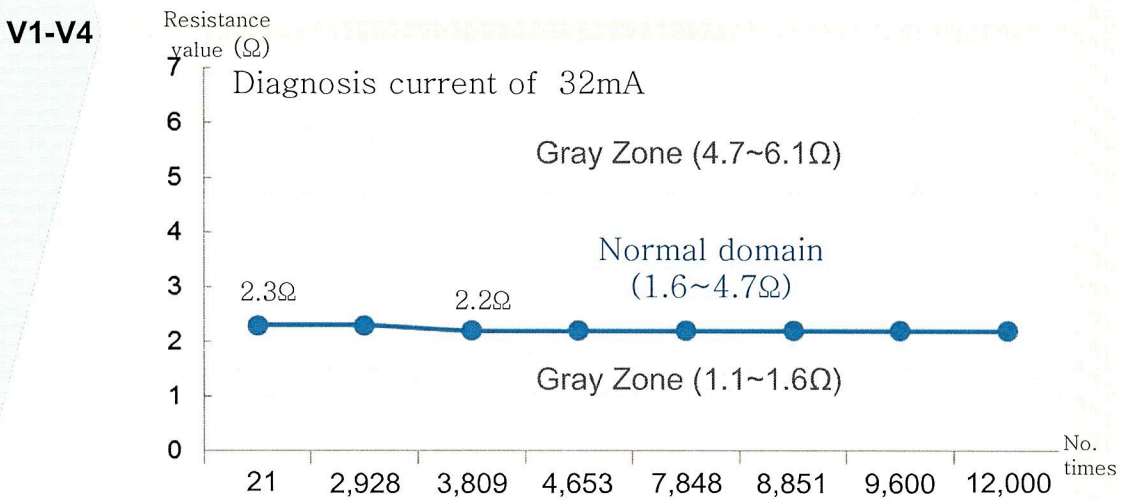
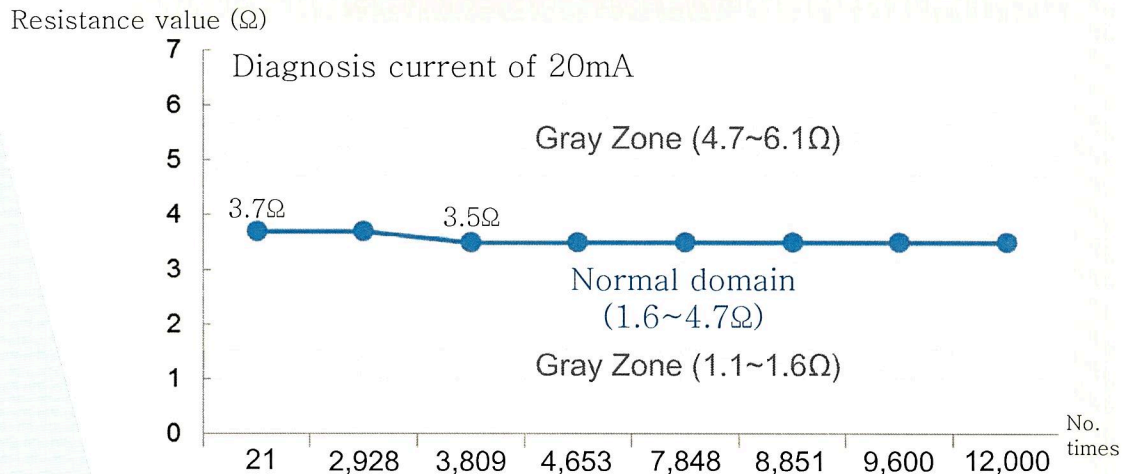
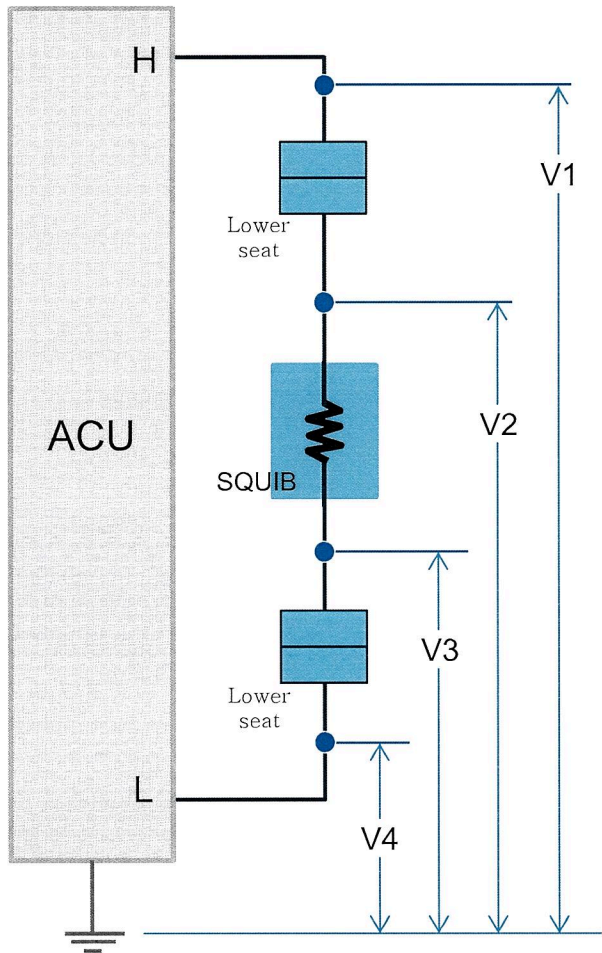
Sample		Resistance(Ω)					
		X axis		Y axis		Z axis	
		MIN	MAX	MIN	MAX	MIN	MAX
#1	PIN 1~4	0.043	0.067	0.040	0.063	0.050	0.057
	PIN 5	0.007	0.017	0.003	0.017	0.007	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.017
#2	PIN 1~4	0.040	0.063	0.040	0.063	0.050	0.057
	PIN 5	0.007	0.017	0.003	0.017	0.007	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.013
#3	PIN 1~4	0.043	0.067	0.043	0.067	0.050	0.057
	PIN 5	0.007	0.017	0.007	0.017	0.010	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.013
#4	PIN 1~4	0.040	0.063	0.040	0.063	0.050	0.057
	PIN 5	0.007	0.017	0.007	0.017	0.010	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.017
#5	PIN 1~4	0.040	0.063	0.040	0.063	0.050	0.057
	PIN 5	0.007	0.017	0.007	0.017	0.010	0.017
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.017

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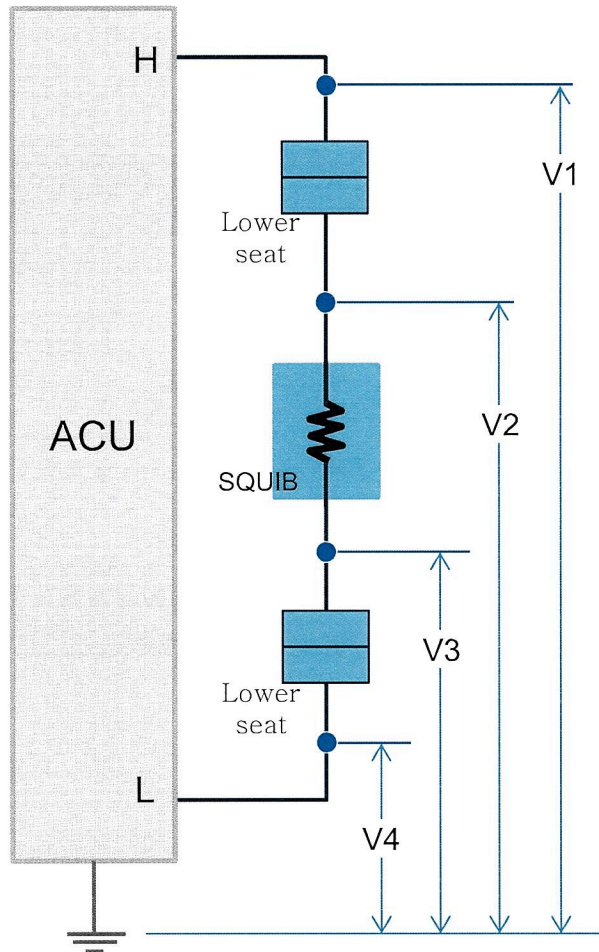
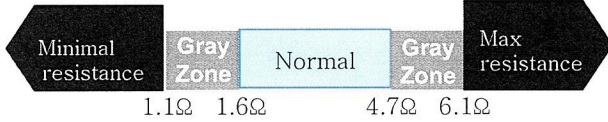
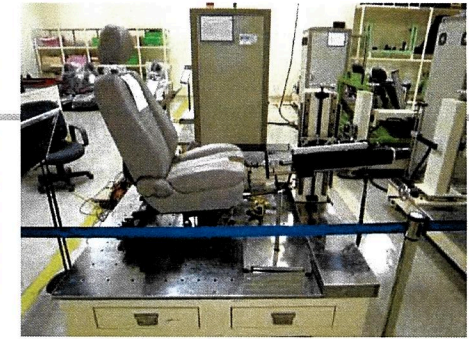
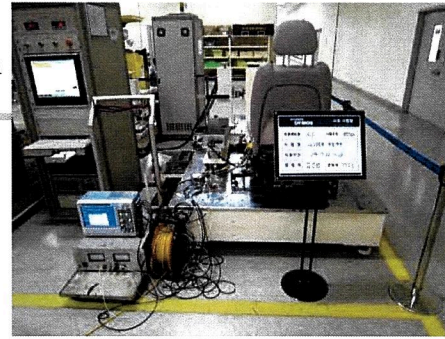
Attachment 5

Buckle Pretensioner circuit seat sliding evaluation

- Sliding evaluation result
 - Measured resistance value within specification
 - ACU diagnosis currents of 20 and 32mA used



Buckle Pretensioner circuit seat sliding evaluation



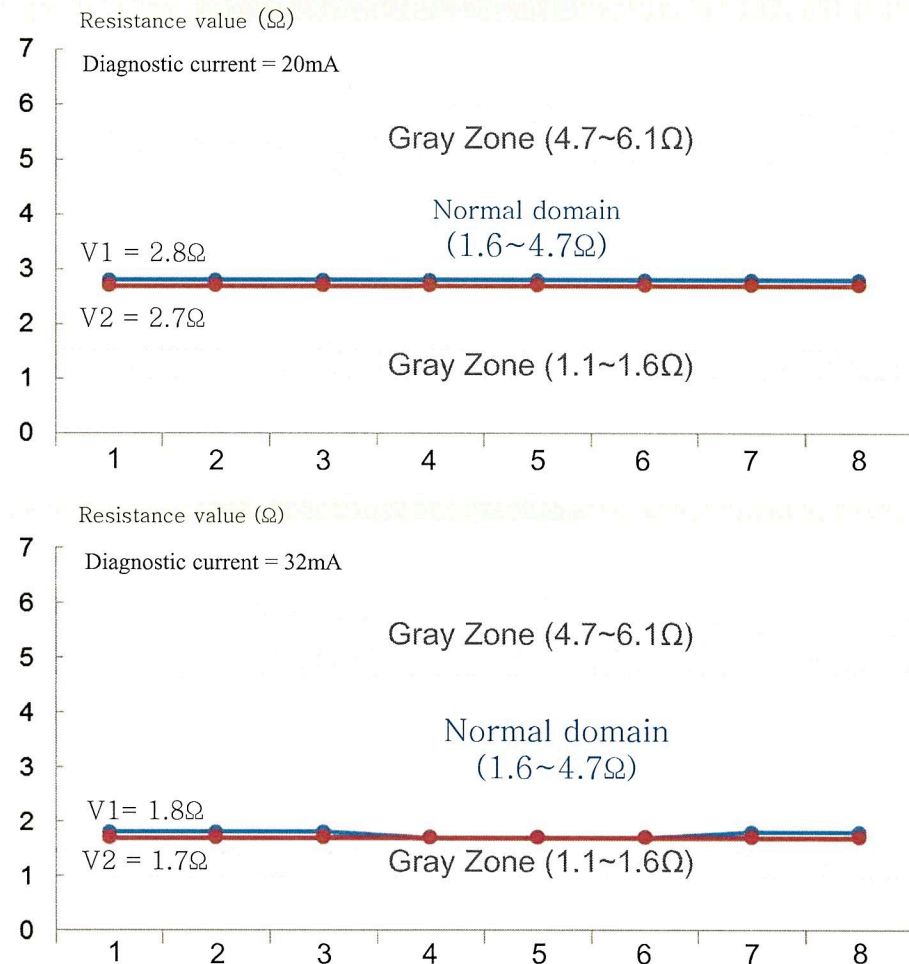
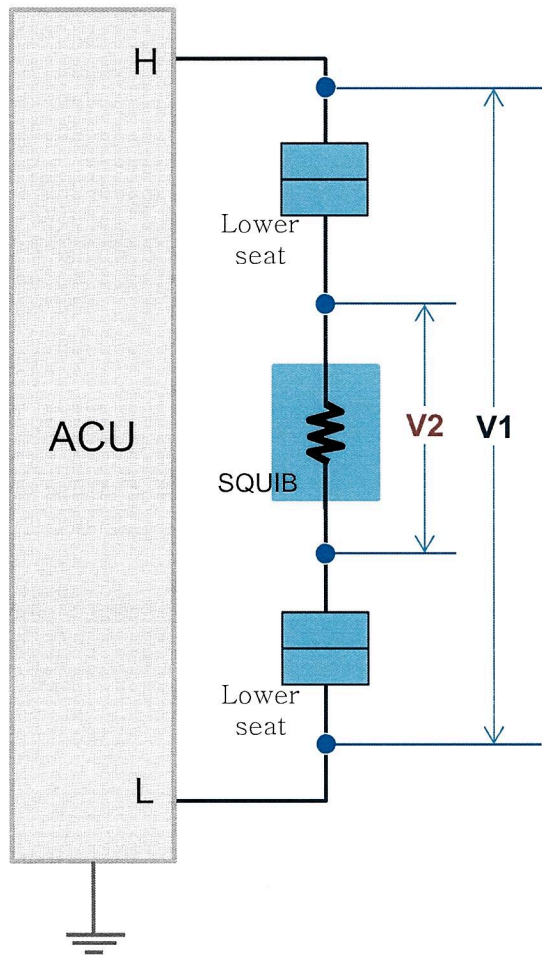
Number of slide cycles	Voltage (V, Max)				Measured connector voltage (mV) (V1-V4)
	V1	V2	V3	V4	
21	3.2600	3.2533	3.2500	3.2533	73.3
2,928	3.2633	3.2633	3.2600	3.2600	73.3
3,809	3.2600	3.2533	3.2567	3.2567	70
4,653	3.2600	3.2600	3.2567	3.2567	70
7,848	3.2567	3.2567	3.2533	3.2467	70
8,851	3.2533	3.2600	3.2500	3.2500	70
9,600	3.2533	3.2600	3.2500	3.2500	70
12,000	3.2500	3.2467	3.2433	3.2467	70

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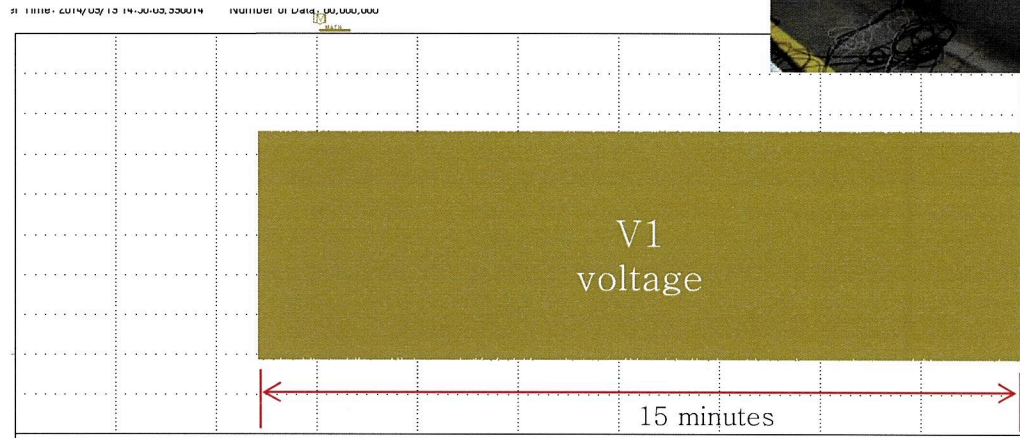
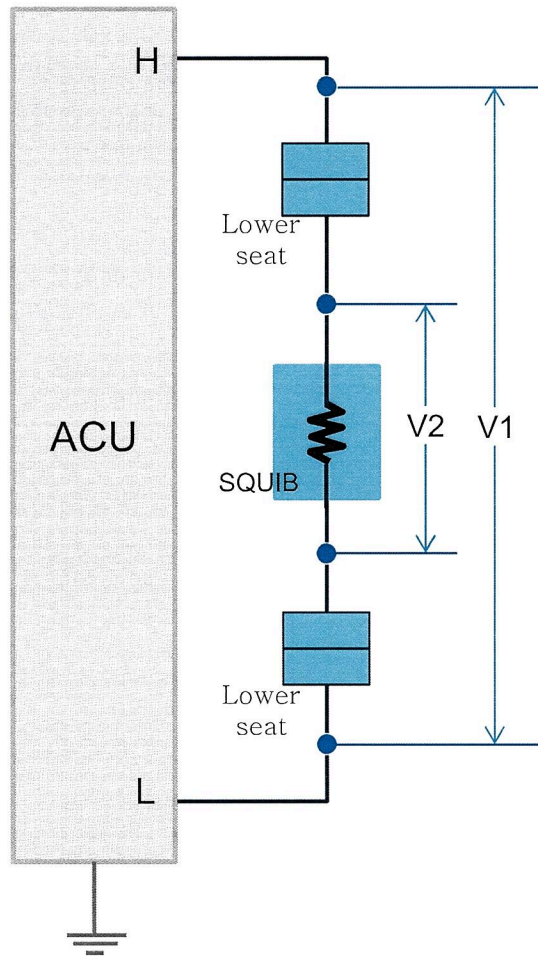
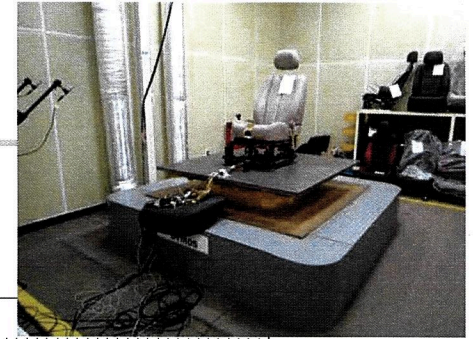
Attachment 6

Buckle Pretensioner 6-axis vibration evaluation

- 6-axle vibration evaluation results:
 - Resistance remained within specification



Buckle Pretensioner 6-axis vibration evaluation

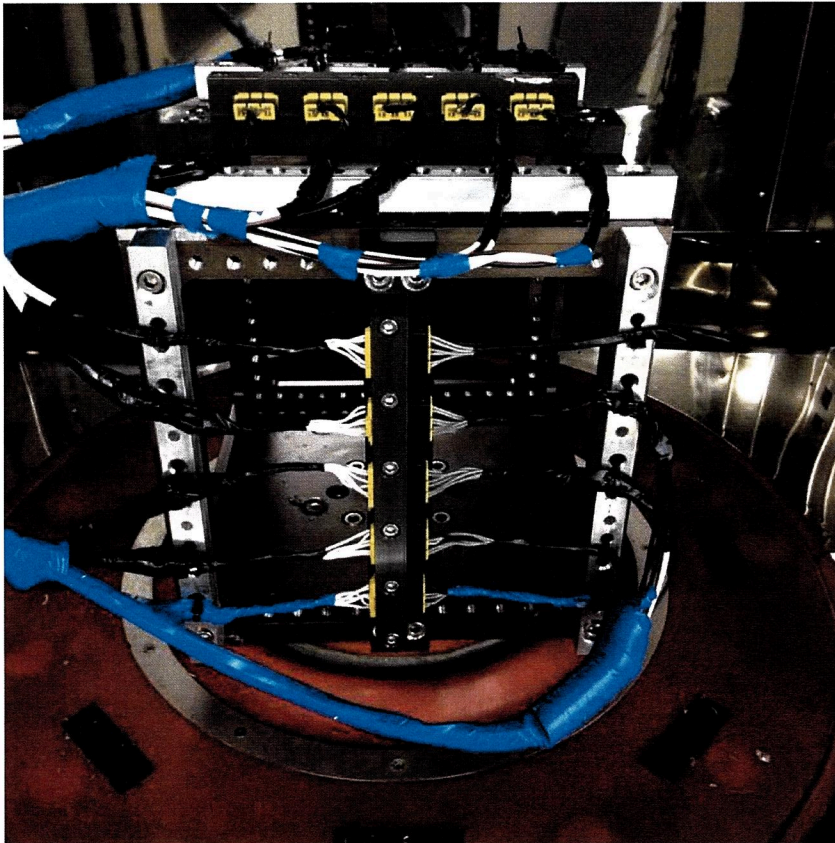


6-axle vibration No.	Measurement time		6-axle vibration No.	Voltage decline (Mv, MAX)	
	Start	End		V1	V2
1	11:32	11:47	1	56	54
2	13:00	13:16	2	56	54
3	14:08	14:23	3	56	54
4	15:11	15:27	4	56	54
5	16:16	16:31	5	56	54
6	08:00	08:16	6	56	54
7	09:10	09:25	7	56	54
8	09:39	09:54	8	56	54

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Attachment 7

Connector vibration evaluation

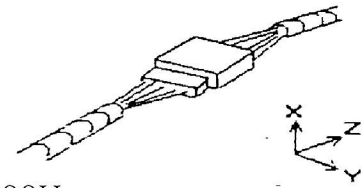


※ Single axis (+/-) vibration. Device under test oriented according to testing plan.

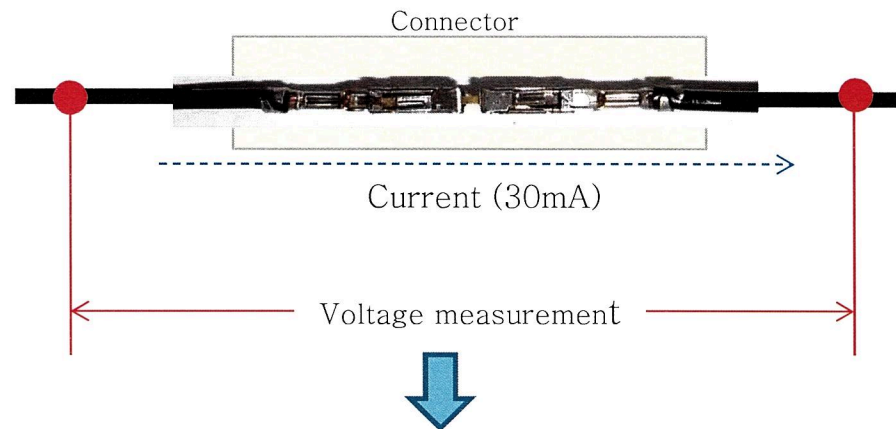
■ Test condition

Sinusoidal Vibration

- Applied current: 30mA
- Vibration acceleration: 4.4G
- Vibration Frequency : 20~200Hz
- Vibration direction +/- x, y, and z axes
- Time 40 hours each axis

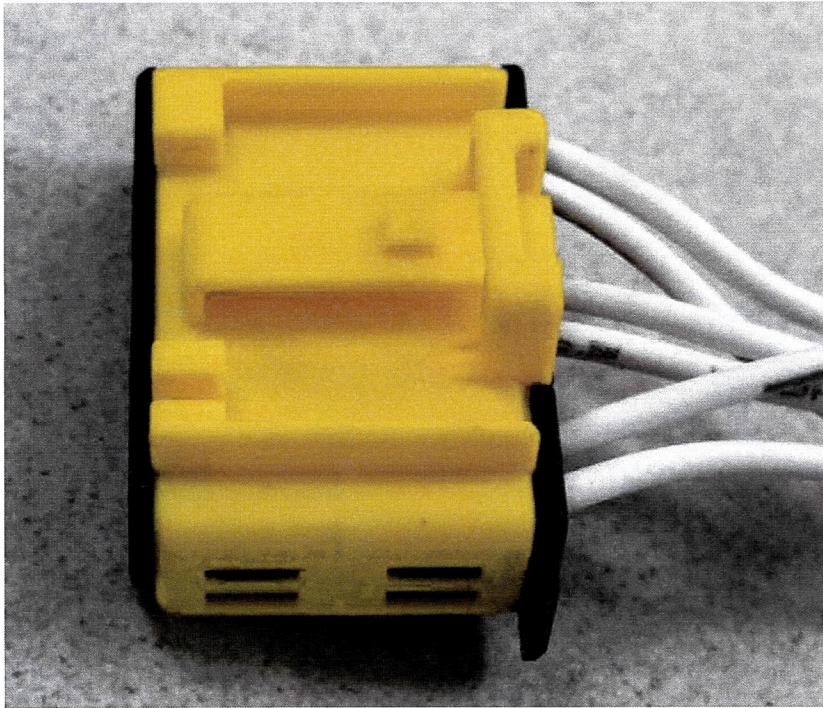


■ Measurement method



$$\text{Resistance} = \text{Voltage measurement} / \text{Current (30mA)}$$

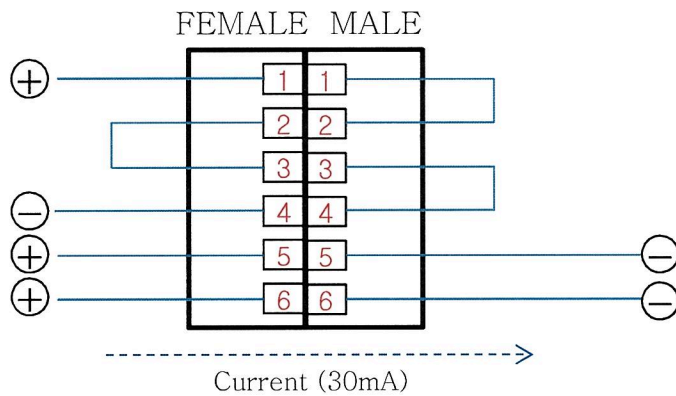
Connector vibration evaluation results (Connector lock mechanism removed)



Connector vibration evaluation results (Connector lock mechanism removed)

■ Sample #1/2/3/4

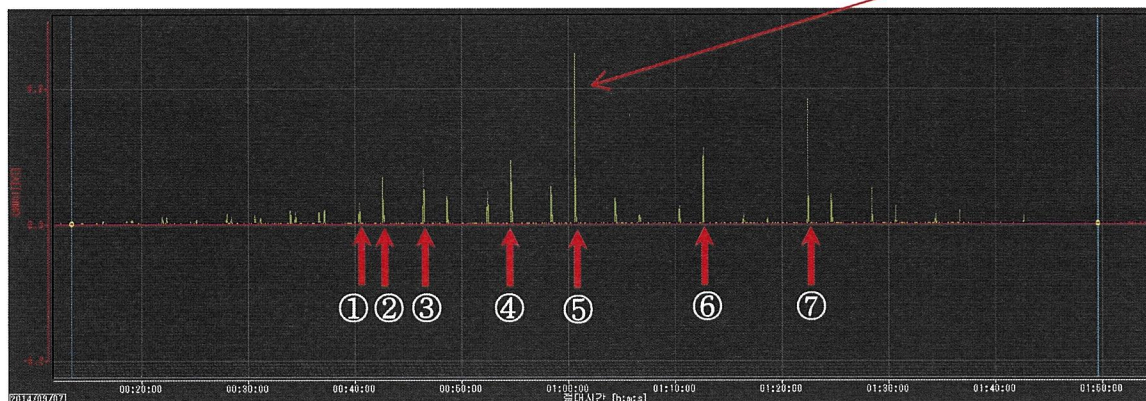
- Connector lock mechanism removed



Sample		Resistance(Ω)					
		X axis		Y axis		Z axis	
		MIN	MAX	MIN	MAX	MIN	MAX
#1	PIN 1~4	0.050	0.057	0.043	0.067	0.040	0.063
	PIN 5	0.010	0.013	0.003	0.017	0.007	0.017
	PIN 6	0.010	0.017	0.003	0.017	0.007	0.017
#2	PIN 1~4	0.053	0.057	0.043	0.067	0.043	0.067
	PIN 5	0.010	0.013	0.007	0.017	0.007	0.017
	PIN 6	0.007	0.013	0.003	0.017	0.007	0.017
#3	PIN 1~4	0.060	0.063	0.043	0.070	0.013	8.380
	PIN 5	0.013	0.020	0.007	0.020	0.010	0.020
	PIN 6	0.020	0.023	0.010	0.023	0.010	0.033
#4	PIN 1~4	0.053	0.060	0.043	0.067	0.037	0.073
	PIN 5	0.020	0.027	0.007	0.017	0.007	0.020
	PIN 6	0.013	0.020	0.003	0.017	0.007	0.023

■ Evaluation result

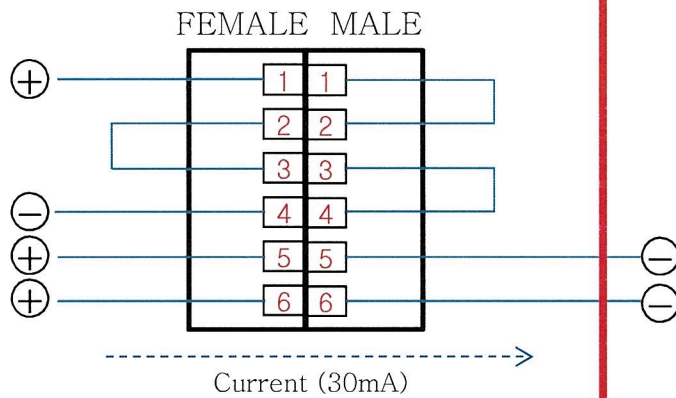
- Upon Z axis vibration, resistance fluctuation occurs for 1 hour and 30 minutes at a 3-minute interval



No	Voltage (mV, MAX)	Resistance (Ω, MAX)
1	0.032	1.1
2	0.069	2.3
3	0.081	2.7
4	0.090	3.0
5	0.251	8.4
6	0.112	3.7
7	0.186	6.2

Connector vibration evaluation result (Cable Tie application)

- Sample #1/2/3/4
- Cable tie is applied to connector body



Sample		Resistance(Ω)					
		X axis		Yaxis		Zaxis	
		MIN	MAX	MIN	MAX	MIN	MAX
#1	PIN 1~4	0.053	0.057	0.053	0.060	0.053	0.060
	PIN 5	0.007	0.017	0.007	0.017	0.010	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.017
#2	PIN 1~4	0.053	0.060	0.053	0.060	0.057	0.060
	PIN 5	0.010	0.017	0.010	0.017	0.010	0.017
	PIN 6	0.007	0.017	0.010	0.017	0.010	0.013
#3	PIN 1~4	0.053	0.060	0.053	0.060	0.053	0.060
	PIN 5	0.007	0.017	0.007	0.017	0.010	0.013
	PIN 6	0.010	0.017	0.010	0.017	0.010	0.017
#4	PIN 1~4	0.050	0.057	0.050	0.057	0.053	0.057
	PIN 5	0.007	0.013	0.007	0.013	0.010	0.013
	PIN 6	0.007	0.017	0.007	0.017	0.010	0.013

Cable tie application

