

DaimlerChrysler



Part Submission Warrant

Part Name ASM TERM F APEX 2.8 SN		Customer P/N	
Shown on Drawing No. 15324842		Org. P/N: 54001800 (10757690)	
Engineering Change Level (PCL): 01			Dated 10/04/13
Additional Engineering Changes NA			Dated NA
Safety and Government Regulation: ☐ Yes ☒ No	Purchase Order No. NA	Weight (kg) 0,0006	
Checking Aid No. NA	Checking Aid Engineering Change Level NA	Dated NA	
ORGANIZATION MANUFACTURING INFORMATION		CUSTOMER SUBMITTAL INFORMATION	
DCS ITALIA - DELPHI		SY-System Technologies	
Supplier Name & Supplier/Vendor Code Strada del Francese 137		Customer Name/Division	
Street Address Turin Piemonte 10156 Italy		Buyer/Buyer Code Various	
City	Region	Postal Code	Country
MATERIALS REPORTING			
Has Customer-required Substances of Concern Information been reported?		☒ Yes ☐ No ☐ N/A	
Submitted by IMDS or other customer format:		IMDS #	
Are Polymeric parts identified with appropriate ISO marking codes:		☒ Yes ☐ No ☐ N/A	
REASON FOR SUBMISSION (check at least one)			
☒ Initial Submission		☐ Change to Optional Construction or Material	
☐ Engineering Change(s)		☐ Sub-supplier or Material Source Change	
☐ Tooling: Transfer, Replacement, Refurbishment, or additional		☐ Change in Part Processing	
☐ Correction of Discrepancy		☐ Parts Produced at Additional Location	
☐ Tooling Inactive > than 1 year		☐ Other - please specify	
REQUESTED SUBMISSION LEVEL (Check One)			
☐ Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.			
☐ Level 2 - Warrant with product samples and limited supporting data submitted to customer.			
☒ Level 3 - Warrant with product samples and complete supporting data submitted to customer.			
☐ Level 4 - Warrant and other requirements as defined by customer.			
☐ Level 5 - Warrant with product samples and complete supporting data reviewed at supplier's manufacturing location.			
SUBMISSION RESULTS			
The results for ☒ dimensional measurements ☒ material and functional tests ☐ appearance criteria ☒ statistical process pkg			
These results meet all design record requirements: ☒ Yes ☐ NO (If "NO" - explanation required)			
Mold/ Cavity/ Production Process		00000471MAAF00A - 00000471MAAF00B	
DECLARATION			
I affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all Production Part Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the production rate of 220000/ 8 hours. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below			
EXPLANATION/COMMENTS			
Is each Customer Tool properly tagged and numbered? ☐ Yes ☐ No ☒ N/A			
Organization Authorized Signature: <i>B.M. RLS</i>		Date: 25/09/13	
Print Name: Roberto Bortoloni	Phone: +39 011 4519703	Fax. No.: +39 011 4701986	
Title: Quality Engineer	E-mail: roberto.bortoloni@delphi.com		
FOR CUSTOMER USE ONLY (IF APPLICABLE)			
Part Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other			
Customer Signature:		Date:	
Print Name	Customer Tracking Number (optional):		

March

CFG-1001

2006



SAMPLE IDENTIFICATION TAG

Part Certification

Part Certification Approval Date:
9-Jul-2013

☒ Master Sample
☐ Submission Sample

Part Number (Delphi:10757690)	Part Description (Delphi:ASM TERM F APEX 2.8 SN)	Number of Pieces 100
ECL Level (Delphi:01)	ECL Date (Delphi:10-APR-13)	Make Department & Supplier Location Plant 11 1110 USA
Tool Number 00000471MAAF00A	Cavity Number	Machine Number 1007
Material lot or Identification Number M6554H81/M6552H80	Collected by KINSER, CHRISTOPHER J.	Collected Date 2-Jul-2013

MASTER SAMPLES ARE TO BE RETAINED by the manufacturing location.

TO:	FROM: MILLER, LAURIE-JO M/S 11A 1265 NORTH RIVER ROAD WARREN, OH 44483
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Dim No.	Ref Only	Drawing Dimension	Acceptance		Parts/Tool Cavities Checked								Discrep Col #	Product Eng. Notes																
			Lower	Upper	1									Fix Tool	Will change Dwg to															
100		MATERIAL			OK										LJM															
100A		THICKNESS			OK										LJM															
100B		TENS STR			OK										LJM															
100C		ELONG			OK										LJM															
101		MATERIAL			OK										LJM															
101A		THICKNESS			OK										LJM															
101B		TENSILE			OK										LJM															
101C		YIELD			OK										LJM															
101D		ELONG			OK										LJM															
101E		HOT TIN DIP			NA										LJM															
102		MATERIAL			NA																									
102A		MATERIAL			NA																									
102B		MATERIAL			NA																									
102C		MATERIAL			NA																									
103		MATERIAL			NA																									
103A		MATERIAL			NA																									
103B		MATERIAL			NA																									
103C		MATERIAL			NA																									
103D		MATERIAL			NA																									
103E		MATERIAL			NA																									
104		MATERIAL			NA																									
104A		MATERIAL			NA																									
104B		MATERIAL			NA																									
104C		MATERIAL			NA																									
105		MATERIAL			NA																									
105A		MATERIAL			NA																									
105B		MATERIAL			NA																									
105C		MATERIAL			NA																									
200		PLATE			NA																									
201		PLATE			NA																									
202		PLATE			NA																									
203		PLATE			NA																									
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210		PLATE			NA																									
211		PLATE			NA																									
212		PLATE			NA																									
213		PLATE			NA																									
214		PLATE			NA																									
NOTES																														
01	Conforms to SAE/USCAR: NA																													
02	Terminal symmetrical: OK																													
03	Tolerances: 1 plc is .25, 2 plc is .10, angular is 3 degrees: OK.																													
04	Cavity specification information: NA																													
05	USCAR Drawing: NA																													
06	Annual quality requirements: OK.																													
07	Quality assurance requirements: OK.																													
08	In process inspections: OK.																													
09	Gage checks: OK.																													
Inspection Source Company Name																														
Delphi Packard Electric Systems Plant USA 11																														
Inspected by BELLOMO, SHELLEY								Title AUDITOR				Inspection Report Date 3-Jul-2013																		
Inspector Supervisor MILLER, LAURIE-JO								Title ADVANCED QUALITY ENGINEER - PLANT 11				Date 3-Jul-2013																		
Approved by BUCCINO, DANIEL A								Title COMPONENT ENGINEER				Date 3-Jul-2013																		



SAMPLE IDENTIFICATION TAG

Part Certification

Part Certification Approval Date:
13-Aug-2013

☒ Master Sample
☐ Submission Sample

Part Number (Delphi:10757690)	Part Description (Delphi:ASM TERM F APEX 2.8 SN)	Number of Pieces 100
ECL Level (Delphi:01)	ECL Date (Delphi:01-AUG-13)	Make Department & Supplier Location Plant 11 1110 USA
Tool Number 00000471MAAF00B	Cavity Number NA	Machine Number 1007
Material lot or Identification Number M65554H81/M6552H80	Collected by KINSER, CHRISTOPHER J.	Collected Date 12-Aug-2013

MASTER SAMPLES ARE TO BE RETAINED by the manufacturing location.

TO:

FROM: MILLER, LAURIE-JO
M/S 11A
1265 NORTH RIVER ROAD
WARREN, OH 44483

Dim No.	Ref Only	Drawing Dimension	Acceptance		Parts/Tool Cavities Checked								Discrep Col #	Product Eng. Notes	
			Lower	Upper	1									Fix Tool	Will change Dwg to
100		MATERIAL			OK										LJM
100A		THICKNESS			OK										LJM
100B		TENS STR			OK										LJM
100C		ELONG			OK										LJM
101		MATERIAL			OK										LJM
101A		THICKNESS			OK										LJM
101B		TENSILE			OK										LJM
101C		YIELD			OK										LJM
101D		ELONG			OK										LJM
101E		HOT TIN DIP			NA										LJM
102		MATERIAL			NA										
102A		MATERIAL			NA										
102B		MATERIAL			NA										
102C		MATERIAL			NA										
103		MATERIAL			NA										
103A		MATERIAL			NA										
103B		MATERIAL			NA										
103C		MATERIAL			NA										
103D		MATERIAL			NA										
103E		MATERIAL			NA										
104		MATERIAL			NA										
104A		MATERIAL			NA										
104B		MATERIAL			NA										
104C		MATERIAL			NA										
105		MATERIAL			NA										
105A		MATERIAL			NA										
105B		MATERIAL			NA										
105C		MATERIAL			NA										
200		PLATE			NA										
201		PLATE			NA										
202		PLATE			NA										
203		PLATE			NA										
204		PLATE			NA										
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210		PLATE			NA										
211		PLATE			NA										
212		PLATE			NA										
213		PLATE			NA										
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01	Conforms to SAE/USCAR: NA														
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05	USCAR Drawing: NA														
06	Annual quality requirements: OK.														
07	Quality assurance requirements: OK.														
08	In process inspections: OK.														
09	Gage checks: OK.														
Inspection Source Company Name Delphi Packard Electric Systems Plant USA 11															
Inspected by BELLOMO, SHELLEY										Title AUDITOR			Inspection Report Date 13-Aug-2013		
Inspector Supervisor MILLER, LAURIE-JO										Title ADVANCED QUALITY ENGINEER - PLANT 11			Date 13-Aug-2013		
Approved by PENN, MATTHEW L										Title SENIOR PROJECT ENGINEER			Date 13-Aug-2013		

**MATERION**BRUSH PERFORMANCE ALLOYS
606 Lamont Road, Elmhurst, IL US 60126Delphi Connection systems US Inc
11823 Lenape Drive
Mount Union PA 17066-9733
US

Repeat printout

Page
1 of 2**Material Certificate**Date
02/28/2013
Purchase order item/date
po69427 / 01/31/2013
Delivery item/date shipped
80643439 000010 / 02/05/2013
Order item/date
385482 000010 / 01/31/2013
Customer nbr Customer part nbr
29244 47121
Customer spec
ASTM-B-768

Rev Type Comp Class Grade

Our Material: 620000859 STRIP 17410 HT .00800 X .2200

Materion Brush testing for chemistry composition, mechanical and physical properties were tested at our laboratory in Elmore OH. or as necessary, outside laboratories under control of the Elmore Quality Department.

This material was inspected and tested and is conforming as required in accordance with the noted part, specification, drawing and revision. The test methods for these tests are available for review by the buyer.

This is to certify that during the manufacturing process, examination, testing, and packaging, our products do not come in contact with mercury or any of its compounds nor with any mercury-containing devices employing a single boundary of containment.

Batch 0001267323 / Quantity 1,864 LBS

Characteristic	Unit	Value	Specification Limits	
			Lower	Upper
CDA (UNS) Alloy	-	C17410		
ASTM Temper	-	TH04		
<u>Dimensional Attributes</u>				
Gauge	"	0.00800		
Gauge Plus	"	0.00025		
Gauge Minus	"	0.00025		
Width	"	0.2200		
Width Plus	"	0.00300		
Width Minus	"	0.00300		
<u>Mechanical/Physical Properties</u>				
Tensile	ksi	123.1 124.6	110.0	130.0
Yield @ 0.2% Offset	ksi	114.2 116.2	100.0	120.0
Elongation	%	10.0 12.0	7.0	17.0
Hardness Scale	-	HV		
Hardness		264.0	230.0	280.0
Percent IACS	%	53.4 53.7	45.0	60.0
Bend 1 Direction	-	LONGITUDINAL		

This Report may not be reproduced, except in full without written approval. "Melted and Made in the USA"

This transaction is entered into with Materion Brush Inc., 606 Lamont Road, Elmhurst, IL 60126



MATERION
BRUSH PERFORMANCE ALLOYS
606 Lamont Road, Elmhurst, IL US 60126

Delphi Connection systems US Inc
11823 Lenape Drive
Mount Union PA 17066-9733
US

Delivery item/date
80643439 000010 /
02/05/2013

Bend 2 Direction	-	TRANSVERSE		
Percent IACS	%	53.4 53.7	45.0	60.0

Chemistry Composition

Beryllium	%	0.32		
Fe+Si+Al	%	0.05		
Cobalt	%	0.53		
Iron	%	0.02		
Silicon	%	0.01		
Aluminum	%	0.02		
Tin	%	< 0.01		
Zinc	%	< 0.01		
Chromium	%	< 0.01		0.01
Alloy Balance	-	COPPER		

Lot Identification

Heat Number	-	81094
Coil Number	-	SINGLE
Prod Order/Pc/Lot Nbr.	-	100757056

Quality Representative - Kevin Russell

Inspection Dept.

**MATERION**BRUSH PERFORMANCE ALLOYS
606 Lamont Road, Elmhurst, IL 60126 TEL: 630-832-9650

Page 1 of 2

For inquiries regarding this shipment, contact:

Ship-to: Delphi Connection systems US Inc
11823 Lenape Drive
Mount Union PA 17066-9733**Sold-to:** Delphi Connection systems US Inc
11823 Lenape Drive
Mount Union PA 17066-9733**Packing List**Repeat printout 02/28/2013
Delivery Number: 80643439
Delivery Created: 02/05/2013Order Number: 385482
Customer PO Number: po69427Customer No.: 29244
Payment Terms: Net 30 Days
Incoterms: FCA Shipping Point - Collect
Carrier: YRC Worldwide Freight

Bill of Lading No.: YRC 318-046477-9

No. of Containers: 3 Skid
Gross Weight: 2,140 LBS

Made in the USA

Item Plnt	Material Description	Quantity	Weight
10	620000859	1,864 LBS	1,864 LBS
CH	Line Item 10		
	STRIP 17410 HT .00800 X .2200		
	Batch 1267323		
	With the following configuration:		
	Alloy 17410		
	Temper HT		
	Customer Spec Nbr ASTM-B-768		
	Customer Part Nbr 47121		
	Gauge 0.00800 "		
	Gauge Plus 0.00025 "		
	Gauge Minus 0.00025 "		
	Width 0.22000 "		
	Width Plus 0.00300 "		
	Width Minus 0.00300 "		
	Type of Edge Slit		
	Type of Length Coil		
	Plating SN		
	MSDS Website: www.materion.com/msds/A10		
20	620000853	96 LBS	96 LBS
CH	Line Item 20		
	STRIP 190 XHM .008 X .1500 FCI E-Tin		
	Batch 1262979		
	With the following configuration:		

8778

IMPORTANT NOTICE: ACCEPTANCE OF DELIVERY OF ANY ORDER SHALL BE DEEMED TO BE ACCEPTANCE OF THE SELLER'S TERMS AND CONDITIONS OF SALE, A COPY OF WHICH CAN BE FOUND AT www.materion.com/TermsandConditions

**MATERION**

BRUSH PERFORMANCE ALLOYS
606 Lamont Road, Elmhurst, IL 60126 TEL: 630-832-9650

Page 2 of 2

Ship-to: Delphi Connection systems US Inc
11823 Lenape Drive
Mount Union PA 17066-9733

Packing List

Repeat printout	02/28/2013
Delivery Number:	80643439
Delivery Created:	02/05/2013
Order Number:	385482
Customer PO Number:	po69427
Customer No.:	29244

Item Plnt	Material Description	Quantity	Weight
	Alloy	190	
	Temper	XHM	
	Customer Spec Nbr	ASTM-B-194	
	Customer Part Nbr	52471	
	Gauge	0.00800 "	
	Gauge Plus	0.00030 "	
	Gauge Minus	0.00030 "	
	Width	0.15000 "	
	Width Plus	0.00200 "	
	Width Minus	0.00200 "	
	Type of Edge	Slit	
	Type of Length	Coil	
	Plating	ELECTRO TIN / MATTE	

MSDS Website: www.materion.com/msds/A10

IMPORTANT NOTICE: ACCEPTANCE OF DELIVERY OF ANY ORDER SHALL BE DEEMED TO BE ACCEPTANCE OF THE SELLER'S TERMS AND CONDITIONS OF SALE, A COPY OF WHICH CAN BE FOUND AT www.materion.com/TermsandConditions

This transaction is entered into with Materion Brush Inc., 606 Lamont Road, Elmhurst, IL 60126

CERTIFICATION REPORT



SOLD TO
DELPHI CONNECTION SYS. US, INC.
ACCOUNTS PAYABLE DEPARTMENT
825 OLD TRAIL ROAD
ETTERS, PA 17319

SHIP TO
DELPHI CONNECTION SYS. US, INC.
11823 LENAPE DRIVE
MT. UNION, PA 17066

ENTRY - BOL
78365-379558

ALLOY
1453

PRODUCT DESCRIPTION
1.1600 .01200
H08 SN/TE COPPER STRIP *TINNED*
P/N 47129 MMC 5/29/09
ASTM B152/B152M-09 (CHEMISTRY ONLY)

QUANTITY ORDERED

PCS.

LBS. 95000

PCS. 11
LBS. 21141
DATE 4/3/2013
TIME 11:40:48 AM

CUSTOMER ORDER NO.

PO 76564

GOV'T CONTRACT NO.

COIL NUMBER	582954C	582954A	583913C	583912C		
COMPOSITION - %						
Copper - includes Ag	99.94	99.94	99.95	99.95		
Phosphorous	.006	.006	.006	.004		
Tin	.017	.017	.015	.015		
Tellurium	.0098	.0098	.0093	.0082		
PROPERTIES						
Tensile Str. (ksi)	59.6	59.6	60.5	58.0		
Elongation (%) in 2 inches	4.3	4.3	3.7	3.4		
Coating Thickness (µin)	27.00	28.00	26.00	25.00		

WE HEREBY CERTIFY that these test results were obtained from samples taken from coil(s), which were produced for the purchase order stated. These samples have been subjected to the tests called for by the customer and /or ASTM specification(s).

This product was manufactured in compliance with all applicable government and safety constraints on restricted, toxic, and hazardous materials and complies to the Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC and the Consumer Product Safety Improvement Act of 2008. Aurubis Buffalo, Inc. product Material Safety Data Sheets (MSDS) provides component information for all hazardous materials in conformance with the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Technical Department - Thomas C. Pilkington

PROCESS FLOW DIAGRAM

Family name: METAL STAMPING HIGH SPEED AND MISC		Date (Orig.) 7-Apr-2003	Prepared by: ELLSWORTH, MIKE
Part Number: (Delphi:10757690)		Date (Rev.) 1-Feb-2011	Title: MANUFACTURING ENGINEERING SUPERVISOR
Part Name: (Delphi:ASM TERM F APEX 2.8 SN)		Page 1	Phone Number 330.373.3047
Cross Functional team Members ELLSWORTH, MIKE 330.373.3047 KOUNTZ, JOHN G. 330-373-7831 STITT, RANDY W 330-373-3423 FLAK, THOMAS E. 330-373-3664 JOHNSON, MICHAEL T 330-373-7508 EVANS, PHYLLIS 330-367-6031 MILLER, LAURIE-JO 330-373-3499			<u>Symbol Key:</u> ◆ Manufacturing/Assembly ● Movement of Materials/Parts ▲ Storage of Materials/Parts ■ Inspection

Step #	Fab	Move	Store	Insp	Operation description	Item #	Special Characteristics
0.2		●		■	MOVE STOCK FROM DOCK TO SLIT STOCK STORE		
0.5		●	▲	■	MOVE STOCK TO PRESS FROM SLIT STOCK STORE		
1	◆			■	LOAD MAKE PRESS		
2	◆			■	RUN (AND ASSEMBLE) SAMPLES ON PRESS FOR SETUP INSPECTION		
3	◆			■	RUN (AND ASSEMBLE) PARTS ON METAL STAMPING PRESS		
4				■	INSPECT SAMPLES		
5		●		■	UNLOAD REELS / CONTAINER FROM PRESS TO SHIPPING SKID OR BOX. INSPECT WINDING/PACKAGING		
6				■	INSPECT SAMPLES PER CONTROL PLAN DOCUMENTS		
6.1				■	PRODUCT AUDITS		
6.2				■	LAYOUT		
7		●		■	MOVE TO FINISHED GOODS STORE OR REWIND AREA. TUGGER / HI LIFT OPERATOR VERIFIES THAT INSPECTION AND TEST INDICATOR IS PRESENT		
8				■	REWIND PARTIAL REELS TO FULL REELS (IF APPLICABLE)		
9		●		■	REWIND AREA ONLY: MOVE TO FINISHED GOODS STORE. TUGGER / HI LIFT OPERATOR VERIFIES THAT INSPECTION AND TEST INDICATOR IS PRESENT		
10	◆	●	▲	■	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION		
11		●		■	PICK MATERIAL AND MOVE TO DOCK OR PACKOUT		
12	◆			■	RE-PACK MATERIAL IF APPLICABLE		
13		●		■	MOVE TO DOCK		

Design FMEA

☒ Process FMEA

Delphi
Confidential

Part Certification

X	System		Subsystem		Component		Page 1		FMEA Number METAL STAMPING HIGH SPEED AND MISC (e-FMEA DOC ID 3592016)							
Part Number (Delphi:10757690)						Design or Process Responsibility ELLSWORTH, MIKE		Prepared by ELLSWORTH, MIKE		Telephone # 330.373.3047						
Model Year(s)/Vehicle(s) MULTIPLE						Key Date		Original FMEA Date 19-JUN-07		FMEA Revision Date 22-JAN-13						
Core Team ELLSWORTH, MIKE, MANUFACTURING ENGINEERING SUPERVISOR 330.373.3047 STITT, RANDY W, QUALITY GENERAL SUPERVISOR 330-373-3423 KOUNTZ, JOHN G., SUPERVISOR PLANT SUPPORT ENGINEERING 330-373-7831 FLAK, THOMAS E., MANUFACTURING & TOOL ROOM GENERAL SUPERVISOR 330-373-3664 JOHNSON, MICHAEL T, GENERAL SUPERVISOR MAINTENANCE/ TOOLROOM 330-373-7508 EVANS, PHYLLIS, SUPERVISOR, INDUSTRIAL ENGINEERING 330-367-6031										Supervisor's Approval ELLSWORTH, MIKE						
Action Results																
Item/Process Function Requirements	Potential Failure Mode	Potential Effect(s) of Failure	S e v	C l a s s	Potential Cause(s)/ Mechanism(s) of Failure	O c c	Current Design/Process Controls	D e t	R P N	Recommended Actions	Responsibility & Target Completion Date	Actions Taken	S e v	O c c	D e t	P N
0.2) MOVE STOCK FROM DOCK TO SLIT STOCK STORE	Stock is not moved properly	Stock is not available in slit stock store	1		Operator (hi lift / tow motor) error	1	(P) Operator's work instructions / Training / subsequent operation	4	4	None						
0.5) MOVE STOCK TO PRESS FROM SLIT STOCK STORE	Stock is not properly delivered	Stock is not available at press	1		Operator (hi lift) error	1	(P) Operator's work instructions / Training / subsequent operation	4	4	None						
0.51) MOVE STOCK TO PRESS FROM SLIT STOCK STORE	Damaged stock	Stock cannot be used	1		Operator (hi lift) error	1	(D) Operator's work instructions / subsequent operation	4	4	None						
1) LOAD MAKE PRESS	Wrong Stock Spec	Stock will not feed	1		Not labeled correctly	1	(D) Operator's work instructions subsequent operation	4	4	None						
1.0001) MOVE, LOAD MAKE PRESS	Wrong Stock Spec	Terminal not to spec	6		Stock not verified	1	(D) Operator's work instructions	4	24	None						
1.0002) MOVE, LOAD MAKE PRESS	Stock inverted in press	Terminal not to spec	6		Stock orientation not verified	1	(D) Operator's work instructions / electronic verification	8	48	None						
1.0003) MOVE, LOAD MAKE PRESS	Previous reels not removed from winder at changeover	Mixed material on reel	4		Winder not verified	1	(D) Supervisors work instructions / Electronic verification	8	32	None						
2) RUN (AND ASSEMBLE) SAMPLES ON PRESS FOR SETUP INSPECTION	SEE # 3	NA	1		NA	1	(D) NA	1	1	None						
3) RUN (AND ASSEMBLE) PARTS ON METAL STAMPING PRESS	NA	NA	1		NA	1	(D) NA	1	1	None						
3.00001) DEREELER	Senix unit does not function properly	Press will shut down	1		Defective Unit	3	(D) Diagnostic Fault Display	2	6	None						
3.0000101) DEREELER	Senix unit does not function properly	Press will shut down	1		Limit Switch program loss	3	(D) Diagnostic Fault Display	2	6	None						
3.0000102) DEREELER	Feed Rollers not operating properly	Press will shut down	1		Bad Motor	3	(D) Diagnostic Fault Display	2	6	None						
3.0000103) DEREELER	Feed Rollers not operating properly	Press will shut down	1		Improper gap set Up	3	(D) Diagnostic Fault Display	2	6	None						
3.0000104) DEREELER	Feed Rollers not operating properly	Press will shut down	1		Bad card	3	(D) Diagnostic Fault Display	2	6	None						
3.0000105) DEREELER	Improper turn table speed	Press will shut down	1		Belts are loose	3	(D) Diagnostic Fault Display	2	6	None						
3.0000106) DEREELER	Improper turn table speed	Press will shut down	1		Fluid level too low	3	(D) Diagnostic Fault Display	2	6	None						
3.0000107) DEREELER	Improper turn table speed	Press will shut down	1		Bad Card	3	(D) Diagnostic Fault Display	2	6	None						
3.00001077) PRESS (Maxi fuse assembly press)	Incomplete Assembly	missing clip	7		Assembly malfunction	2	(P) In Process/Vision Inspection	2	28	None						
3.0000108) PRESS	Loose Ram	Terminal dimensional variability	7		Non flat piston surface	2	(P) "Bearing drop inspection, In Process/ Vision Inspection"	1	14	None						
3.0000109) PRESS	Loose Ram	Terminal dimensional variability	7		Unclean Fasteners	2	(P) "Bearing drop inspection, In Process/ Vision Inspection"	1	14	None						
3.0000111) PRESS	Loose Ram	Terminal dimensional variability	7		Improperly torqued fasteners and set screws	2	(P) "Bearing drop inspection, In Process/ Vision Inspection"	1	14	None						
3.0000111) PRESS	Improper Hydraulic System Pressure	Press will shut down	1		Compensator failures	3	(D) Diagnostic Fault Display	2	6	None						
3.0000112) PRESS	Improper Hydraulic System Pressure	Press will shut down	1		Accumulator failures	3	(D) Diagnostic Fault Display	2	6	None						
3.0000113) PRESS	Improper Hydraulic System Pressure	Press will shut down	1		Hydraulic pump failure	3	(D) Diagnostic Fault Display	2	6	None						
3.0000114) PRESS	Improper Hydraulic System Pressure-- Con't	Press will shut down	1		Air in the system	3	(D) Diagnostic Fault Display	2	6	None						
3.0000115) PRESS	Improper Hydraulic System Pressure-- Con't	Press will shut down	1		Plugged orifice	3	(D) Diagnostic Fault Display	2	6	None						
3.0000116) PRESS	Bearing lube system failure	Press will shut down	1		Bad Pump	3	(D) Diagnostic Fault Display	2	6	None						
3.0000117) PRESS	Bearing lube system failure	Press will shut down	1		Air in the system	3	(D) Diagnostic Fault Display	2	6	None						
3.0000118) PRESS	Bearing lube system failure	Press will shut down	1		Plugged orifice	3	(D) Diagnostic Fault Display	2	6	None						
3.0000119) PRESS	Loose or cracked belts--Aida's Only	Press motor variation	3		Normal wear	2	(P) Check speed PM Procedure	4	24	None						
3.000012) PRESS	Bearing lube filter clogged-- Aida's Only	Press will shut down	3		Filter	3	(P) Diagnostic Fault Display / Filter PM	2	18	None						
3.0000121) PRESS	Excessive Stop Time	Terminal dimensional variability	7		Brake shoe lining	2	(P) In process / Vision Inspection/ PMS	2	28	None						
3.0000122) PRESS	Excessive stop time	Terminal dimensional variability	7		Belview lining washers	1	(D) In process/Vision Inspection	2	14	None						
3.0000123) PRESS	Press Run @ Inch Mode	Terminal dimensional variability	7		Improper operation	2	(D) "In process / Vision Inspection, Operator's work instructions, Operating manuals"	2	28	None						
3.00001231) PRESS	improper startup	Terminal dimensional variability	4		Damage Terminal	4	(D) Operator's work instructions, Automatic Start Stop reel scrapped	1	16	None						
3.0000124) PRESS	Resolver Failure	Tool jams	1		Bad Unit	2	(D) Diagnostic Fault Display	2	4	None						

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Part Number (Delphi:10757690)				Design or Process Responsibility ELLSWORTH, MIKE	Prepared by ELLSWORTH, MIKE	Telephone # 330.373.3047									
Model Year(s)/Vehicle(s) MULTIPLE				Key Date	Original FMEA Date 19-JUN-07	FMEA Revision Date 22-JAN-13									
Core Team ELLSWORTH, MIKE, MANUFACTURING ENGINEERING SUPERVISOR 330.373.3047 STITT, RANDY W, QUALITY GENERAL SUPERVISOR 330-373-3423 KOUNTZ, JOHN G., SUPERVISOR PLANT SUPPORT ENGINEERING 330-373-7831 FLAK, THOMAS E., MANUFACTURING & TOOL ROOM GENERAL SUPERVISOR 330-373-3664 JOHNSON, MICHAEL T, GENERAL SUPERVISOR MAINTENANCE/ TOOLROOM 330-373-7508 EVANS, PHYLLIS, SUPERVISOR, INDUSTRIAL ENGINEERING 330-367-6031						Supervisor's Approval ELLSWORTH, MIKE									
						Action Results									
Item/Process Function Requirements	Potential Failure Mode	Potential Effect(s) of Failure	S e v	C l a s s	Potential Cause(s)/ Mechanism(s) of Failure	O c c	Current Design/Process Controls	D e t R P N	Recommended Actions	Responsibility & Target Completion Date	Actions Taken	S e v	O c c	D e t	R P N
3.0000125) PRESS	Flywheel bearing failures	Press will not start	4		Lack of lube	1	(D) Diagnostic Fault Display / Sealed bearing	2 8	None						
3.0000201) FEED	Improper Position	Burr Terminals and/or Tool jams	6		Loose connection / broken wire	2	(D) "Diagnostic Fault Display, Vamco operating Manual."	2 24	None						
3.0000202) FEED	Improper Position	Burr Terminals and/or Tool jams	6		Initial set up	2	(D) "Diagnostic Fault Display, Vamco operating Manual."	2 24	None						
3.0000203) FEED	Improper Position	Burr Terminals and/or Tool jams	6		Pulley wear	2	(D) "Diagnostic Fault Display, Vamco operating Manual."	2 24	None						
3.0000204) FEED	Incorrect Release Point	Tool jams	1		T/D set up	2	(D) Diagnostic Fault Display	2 4	None						
3.00002042) FEED	Improper Position	Damage Terminal, Tool jam	6		Pulley wear	2	(P) Tool Jam / damaged terminal detection device	2 24	None						
3.0000205) FEED	Incorrect Release Point	Tool jams	1		Broken Parts	2	(D) Diagnostic Fault Display	2 4	None						
3.0000206) FEED	Incorrect Release Point	Tool jams	1		Air pressure	2	(D) Diagnostic Fault Display	2 4	None						
3.0000207) FEED	Incorrect Release Point	Press will not start	1		Cam wear	2	(D) Diagnostic Fault Display	2 4	None						
3.0000208) FEED	Improper Timing	Tool jams	1		Set Up	2	(D) Diagnostic Fault Display	2 4	None						
3.0000209) FEED	Improper Timing	Tool jams	1		Bad Belts	2	(D) Diagnostic Fault Display	2 4	None						
3.000021) FEED	Roller Air Pressure	Tool jams	1		Bad Gauge	2	(D) Diagnostic Fault Display	2 4	None						
3.0000211) FEED	Roller Air Pressure	Tool jams	1		Improper Adjustment	2	(D) Diagnostic Fault Display	2 4	None						
3.0000212) FEED	Lube	Tool jams	1		Low Level	2	(D) Diagnostic Fault Display	2 4	None						
3.0000213) FEED	Lube	Tool jams	1		Leaks	2	(D) Diagnostic Fault Display	2 4	None						
3.0000214) FEED	% Speed to Feed	Term. dimensional variability, Tool Jams*	6		Set Up	1	(P) Diagnostic Fault Display Automatic download Press logic.	2 12	None						
3.0000215) FEED	Resolver failure	Tool jams	1		Improper set up	2	(D) Diagnostic Fault Display	2 4	None						
3.0000216) FEED	Resolver failure	Tool jams	1		Coupling failures	2	(D) Diagnostic Fault Display	2 4	None						
3.0000217) FEED	Resolver failure	Tool jams	1		Loose connections	2	(D) Diagnostic Fault Display	2 4	None						
3.0000218) FEED	Resolver failure	Tool jams	1		Bad Card	2	(D) Diagnostic Fault Display	2 4	None						
3.00003) BOLSTER (Pulsars & Birds)	Out of Parallel	Terminal dimensional variability	7		Improper set up	2	(D) In process/Vision Inspection	2 28	None						
3.0000301) BOLSTER (Pulsars & Birds)	Out of Parallel	Terminal dimensional variability	7		Die Crash	2	(D) Diagnostic Fault Display	2 28	None						
3.0000302) BOLSTER (Pulsars & Birds)	Broken Bolts	Terminal dimensional variability	7		Excessive Hydraulic Pressure	2	(D) Diagnostic Fault Display	2 28	None						
3.0000303) BOLSTER (Pulsars & Birds)	Broken Bolts	Terminal dimensional variability	7		Loose Bolts	2	(D) "Diagnostic Fault Display, In process / Vision inspection"	2 28	None						
3.0000304) BOLSTER (Pulsars & Birds)	Broken Bolts	Terminal dimensional variability	7		Die Crash	2	(D) "Diagnostic Fault Display"	2 28	None						
3.0000305) BOLSTER (Pulsars & Birds)	Broken Bolts	Terminal dimensional variability	7		Overtorque	2	(D) " In process / Vision inspection"	2 28	None						
3.0000306) BOLSTER (Pulsars & Birds)	Broken Bolts	Terminal dimensional variability	7		Overstressed	2	(D) " In process / Vision inspection"	2 28	None						
3.0000307) BOLSTER (Pulsars & Birds)	Variation	Terminal dimensional variability	7		Hydraulic pressure variation	2	(D) Diagnostic Fault Display	2 28	None						
3.0000308) BOLSTER (Pulsars & Birds)	Variation	Terminal dimensional variability	7		Initial start up	2	(D) Press logic will label as vision scrap/start stop in all new modules	2 28	None						
3.0000309) BOLSTER (Pulsars & Birds)	Gear Box	Press will shut down	1		Contaminents	2	(D) Diagnostic Fault Display	2 4	None						
3.000031) BOLSTER (Pulsars & Birds)	Gear Box	Press will shut down	1		Chain tension	2	(D) Diagnostic Fault Display	2 4	None						
3.0000311) BOLSTER (Pulsars & Birds)	Gear Box	Press will shut down	1		Adjustment Nuts / Interference	2	(D) Diagnostic Fault Display	2 4	None						
3.00004) SHUT HEIGHT	Amplifier failure	"Press will shut down, Tool Jams"	1		Bad Unit	2	(D) "Diagnostic Fault Display,	2 4	None						
3.0000401) SHUT HEIGHT	Sensor	"Press will shut down, Tool Jams"	1		Broken / Scratched	2	(D) Diagnostic Fault Display	2 4	None						
3.0000402) SHUT HEIGHT	Sensor	"Press will shut down, Tool Jams"	1		Out of adjustment	2	(D) Diagnostic Fault Display	2 4	None						
3.0000403) SHUT HEIGHT	Sensor	"Press will shut down, Tool Jams"	1		Initial / Improper set up	2	(D) Diagnostic Fault Display	2 4	None						
3.0000404) SHUT HEIGHT	Improper Shut height	Press will shut down	5		Improper set up	2	(D) Diagnostic Fault Display	2 20	None						
3.0000405) SHUT HEIGHT	Verification	"Press will shut down, Tool Jams"	1		Improper set up	2	(D) Diagnostic Fault Display	2 4	None						
3.00005) CHUTES / BLOWOFFS	Jams	Press will shut down	2		Rail out of adjustment.	3	(D) Diagnostic Fault Display	2 12	None						
3.0000501) CHUTES / BLOWOFFS	Nuisance Fault	Vision will shut down press	1		Nozzle Location	3	(D) Operator's work instructions	8 24	None						
3.0000502) CHUTES / BLOWOFFS	Nuisance Fault	Vision will shut down press	1		Improper Adjustment	3	(D) Operator's work instructions	8 24	None						
3.00007) LUBE SYSTEM	Clogged Valve	"Tool wear / Jams, Terminal Dimensional Variability"	5		Contaminated	2	(D) Diagnostic Fault Display, In process Vision inspections	2 20	None						
3.0000701) LUBE SYSTEM	Faulty Proximity Switch	"Tool wear / Jams, Terminal Dimensional Variability"	5		Loose	2	(D) "Diagnostic Fault Display, In process / Vision inspection"	2 20	None						
3.0000702) LUBE SYSTEM	Faulty Proximity Switch	"Tool wear / Jams, Terminal Dimensional Variability"	5		Location	2	(D) "Diagnostic Fault Display, In process / Vision inspection"	2 20	None						
3.0000703) LUBE SYSTEM	% Panel Adjustment	"Tool wear / Jams, Terminal Dimensional Variability"	5		T/D Set up	2	(D) "Diagnostic Fault Display, In process / Vision inspection"	2 20	None						
3.0000704) LUBE SYSTEM	% Panel Adjustment	"Tool wear / Jams, Terminal Dimensional Variability"	5		Operator Adjustment	2	(D) Operator's work instructions Operator's Manuals / lubricant control	2 20	None						
3.0000705) CENTRAL LUBE SYSTEM	Pump failure	Press will shut down	1		Leaking Seals	2	(D) Diagnostic Fault Display.	2 4	None						
3.0000706) CENTRAL LUBE SYSTEM	Pump failure	Press will shut down	1		Bad Unit	2	(D) Diagnostic Fault Display.	2 4	None						
3.0000707) CENTRAL LUBE SYSTEM	Pump failure	Press will shut down	1		Sludge	2	(D) Diagnostic Fault Display.	2 4	None						

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								Action Results									
Item/Process Function Requirements		Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design/Process Controls	Detection	RPN	Recommended Actions	Responsibility & Target Completion Date	Actions Taken	Severity	Occurrence	Detection	RPN
3.0000708) CENTRAL LUBE SYSTEM		Proximity Sensors	Press will shut down	1		Location	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000709) CENTRAL LUBE SYSTEM		Float Switches	Press will shut down	1		Broken / loose wires	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000711) CENTRAL LUBE SYSTEM		Valve stuck	Mixed lubricants	2		Faulty valve	1	(P) Part number automatically downloaded / check valves	2	4	None						
3.00008) CENTRAL LUBE SYSTEM		Improper mix ratio	"Tool wear / Jams, Terminal Dimensional Variability"	5		Pump failure	2	(D) Diagnostic fault / analog sensor fault / operator work instructions	2	20	None						
3.000081) CENTRAL LUBE SYSTEM		Improper mix ratio	"Tool wear / Jams, Terminal Dimensional Variability"	7		Used oil added to system	1	(P) Container labels / Drums	2	14	None						
3.0000811) Lubricant Post Application System		Proximity Sensors	Press will shut down	1		Location	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000812) Lubricant Post Application System		Proximity Sensors	Press will shut down	1		Broken/Loose wires	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000813) Lubricant Post Application System		Proximity Sensors	Press will shut down	1		Defective Sensor	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000814) Lubricant Post Application System		Pressure Switches	Press will shut down	1		Loss of compressed air	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000815) Lubricant Post Application System		Pressure Switches	Press will shut down	1		Broken/Loose wires	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000816) Lubricant Post Application System		Presence Detection Sensor	Press will shut down	1		Out of adjustment	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000817) Lubricant Post Application System		Presence Detection Sensor	Terminal dimensional variability	5		Defective Sensor	1	(P) Daily verification / Operator's work instruction / Lubricant in die	7	35	None						
3.0000818) Lubricant Post Application System		Dispense Air Regulator	Excessive amount of oil on terminals	1		Oil Contamination of Regulator	2	(D) Diagnostic Fault Display.	2	4	None						
3.0000819) Lubricant Post Application System		Dispense Air Regulator	Oil on floor	1		Oil Contamination of Regulator	1	(P) Operator's work instructions	8	8	None						
3.000082) Lubricant Post Application System		Not enough lubricant on terminals	Press will shut down	1		Clogged Valve	2	(D) Control Alarm	2	4	None						
3.0000821) Lubricant Post Application System		Not enough lubricant on terminals	Customer processing difficulty	5		Inproper Sensor adjustment	1	(P) Daily verification and visual inspection per work instruction	7	35	None						
3.0000822) Lubricant Post Application System		Not enough lubricant on terminals	Press will shut down	1		Actuation Air not set to a minimum of 70 psi	2	(D) Diagnostic Fault Display	2	4	None						
3.00009) Blanking Details		Excessive Wear	Terminal dimensional variability	7		Tooling wear.	1	(P) Operator's work instructions, Vision inspection preventive maintenance on dies"	2	14	None						
3.0000901) Blanking Details		Excessive Wear	Terminal dimensional variability	7		Improper Cutting Clearance	2	(D) Operator's work instructions, Vision inspection	2	28	None						
3.00009011) Blanking Details		Excessive Wear	Terminal dimensional variability / burr	6		Tool wear due to bare stock	1	(D) Operator's work instructions, Vision inspection	7	42	None						
3.00009012) Blanking Details		Excessive Wear	Terminal dimensional variability / burr	6		Tool wear	2	(D) Operator's work instructions, Vision inspection	5	60	None						
3.0000902) Blanking Details		Excessive Wear	Terminal dimensional variability	7		Detail Made Wrong	2	(D) Operator's work instructions, Vision inspection	2	28	None						
3.0000903) Blanking Details		Excessive Wear	Die Jam	1		Tooling Misalignment	2	(D) Diagnostic Fault Display	2	4	None						
3.0000904) Blanking Details		Excessive Wear	Die Jam	1		Detail Made Wrong	2	(D) Diagnostic Fault Display	2	4	None						
3.0000905) Blanking Details		Die detail design	Terminal dimensional variability - damaged index tab	6		Die detail design not capable of producing parts in spec.	2	(D) Operator's work instructions, Vision inspection	2	24	None						
3.00009054) Blanking Details		Die detail design	Terminal dimensional variability - index tab	6		Die detail design not capable of producing parts in spec.	3	(D) Operator's work instructions, Vision inspection	2	36	None						
3.00009055) Blanking Details		Die Detail design	Terminal Dimensional variability	7		Die detail design not capable of producing parts in spec	3	(D) Operator's work instructions, Vision inspection	2	42	None						
3.00009056) Blanking Details		Die Detail design	Terminal dimensional variability on tang on 12040996 die	7		Die detail design not capable of producing parts in spec	3	(D) Operator's work instructions, Vision inspection	2	42	Evaluating product and or material change	SALERNO, JOHN A 30-APR-13		7	2	2	
3.00009057) Blanking Details		Die Detail design	Terminal dimensional variability on tang on 12040996 die	7		Die detail made wrong	2	(D) Operator's work instructions, Vision inspection	2	28	None						
3.0000906) Blanking Details		Breakage	Terminal dimensional variability	7		Tooling Misalignment	2	(D) Operator's work instructions, Vision inspection	2	28	None						
3.0000908) Blanking Details		Breakage	Terminal dimensional variability	7		Improper Cutting Clearance	1	(D) Operator's work instructions, Vision inspection	2	14	None						
3.00009085) Blanking Details		Die Detail Design	Incomplete Terminal (missing core wing notches)	6		Worn/broken tooling	2	(D) Operator's work instructions, Tool Room notification of detail purchase-AAPL - broken tooling containment procedure	2	24	None						
3.00009086) Blanking Details		Die Detail Design	Incomplete Terminal (missing core wing notches) Die 12162595	6		Worn/broken tooling	3	(P) Operator's work instructions, Tool Room notification of detail purchase-AAPL - broken tooling containment procedure	2	36		SALERNO, JOHN A 31-OCT-12	EXP Details implemented into design	6	2	2	24
3.0000909) Blanking Details		Breakage	Terminal dimensional variability	7		Detail Made Wrong	2	(D) Operator's work instructions, Vision inspection	2	28	None						
3.000091) Blanking Details		Breakage	Die Jam	1		Detail Installed in Die Wrong	2	(D) Diagnostic Fault Display	2	4	None						
3.0000915) Blanking Details		Die Detail Design	Terminal dimensional variability (damage term tang)	5		Loose Wafer	1	(D) Operator's work instructions, Vision Inspection	2	10	None						
3.0000916) Blanking Details		Die Detail Design	Incomplete Terminal	7		Broken/worn tooling	3	(D) Operator's work instructions - broken tooling containment procedure	2	42	None						

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3.00009161) Blanking Details	Slug	Deformed Terminal	7		Pulling slugs due to inadequate slug retention.	2	(D) Operator's work instruction / Vision Inspection	2	28	None								
3.00009162) Blanking Details	Camber punch	Terminal progression	7		Tooling Misalignment	2	(D) Operator's work instruction / Vision inspection	2	28	None								
3.00009163) Blanking Details	Die Detail Design	Debris on terminal	4		Splice saver slug retention - "stinger design"	2	(P) Operator's work instruction	8	64	None								
3.00009164) Blanking Details	Terminal Progression	Terminal dimensional variability	7		Punch hitting too hard	2	(D) Operator's work instructions, Vision inspection, gage check / Removal of camber punch	2	28	None								
3.000092) Forming Details	Excessive Wear	Terminal dimensional variability	7		Tooling Wear	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000921) Forming Details	Excessive Wear	Terminal dimensional variability	7		Detail made Wrong	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000922) Forming Details	Excessive Wear	Die Jam	1		Tooling Misalignment	2	(D) Diagnostic Fault Display	2	4	None								
3.0000923) Forming Details	Excessive Wear	Die Jam	1		Detail Made Wrong	2	(D) Diagnostic Fault Display	2	4	None								
3.0000924) Forming Details	Die detail design	Terminal dimensional variability	7		Die detail design not capable of producing parts in spec. / slivers on 15443837 dies	3	(D) Operator's work instructions, Vision inspection	2	42	EXP details to eliminate slivers	SALERNO, JOHN A 30-APR-13	Under evaluation	7	2	2	28		
3.0000925) Forming Details	Die detail design	Terminal dimensional variability	7		Die detail design not capable of producing parts in spec.	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000928) Forming Details	Die detail design	Die Mark on terminal	6		Detail made wrong	2	(D) Operator's work instructions, Vision inspection. Commodity manager auditing.	2	24	None								
3.00009281) Forming Details	Die detail design	Terminal dimensional variability	7		Mechanism failure shear condition- contact	3	(D) Operator's work instructions, Vision inspection	2	42	None								
3.0000929) Forming Details	Breakage	Terminal dimensional variability	7		Tooling Misalignment	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.00009295) Forming Details	Die detail design	Terminal dimensional variability	7		worn/broken tooling	1	(D) Operator's work instruction	8	56	None								
3.000093) Forming Details	Breakage	Terminal dimensional variability	7		Detail Made Wrong	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000941) Forming Details	Breakage	Die Jam	1		Detail installed in die wrong	2	(D) Diagnostic Fault Display	2	4	None								
3.0000942) Forming Details	Breakage	Terminal dimensional variability	7		Detail Fatigue	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.00009421) Forming Detail	Breakage	Terminal dimensional variability - Bent tab	6		Detail failure on 12176545 die	2	(D) Operator's work instructions, Vision inspection	2	24	None								
3.0000943) Forming Details	Breakage	Terminal dimensional variability	7		Detail Fatigue	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000944) Forming Details-280 F GT Body Height	Breakage	Terminal dimensional variability	7		Detail Fatigue	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.0000945) Forming Details	Driver Station button becomes dislodged	Terminal dimensional variability	7		Rocker station driver button wear	1	(D) Operator's work instructions, Vision inspection	2	14	None								
3.00009451) Forming Details	Die Detail	Terminal dimensional variability	7		Improper Adjustment on 15305314 dies	1	(D) Operator's work instructions	8	56	None								
3.00009452) Forming Details	Over Driven Rocker Station	Wing extruded/Customer Process difficulty	5		Improper Adjustment	1	(P) Operator's work instructions	8	40	None								
3.00009453) Forming Detail	Die Detail	Terminal dimensional variability	7		Improper Adjustment	1	(D) Operator's work instructions	8	56	None								
3.00009454) Forming Details	Breakage	Terminal dimensional variability	7		Detail Fatigue	2	(D) Operator's work instructions, Vision inspection - broken tolling containment procedure	2	28	None								
3.00009455) Forming Details	Die detail design	Terminal dimensional variability	7		Die detail design	2	(D) Operator's work instructions, Vision inspection	2	28	None								
3.00009456) Forming Details	Die Detail Design	Terminal dimensional variability - Index body form	6		Improper Adjustment	2	(D) Operator's work instructions, Vision inspection	5	60	None								
3.00009457) Forming Details	Die Detail Design	Terminal dimensional variability - knurl depth	5		Die detail design	2	(P) Operator's work instructions, offline inspection	4	40	None								
3.00009458) Forming Details	Die Detail Design	Crack down the side of male blade	5		Insufficient blade scores / worn liner	1	(D) Operator's work instructiions	8	40	None								
3.00009459) Forming Details	Die Detail Design	Crack in transition area	5		Improper adjustment	2	(D) Operator's work instructions	8	80	None								
3.0000946) Assembly Details-maxi fuse assembly	Breakage	Missing Clip	7		Detail Fatigue	3	(D) Operator's work instructions,machine sensor / Vision Inspection	2	42	None								
3.00009461) Forming Details	Wrong wing tooling	Terminal dimensional variability	7		Wrong tooling	1	(D) Operator's work instructions - inspection plan	2	14	None								
3.00009462) Forming Details	Die Detail Design	Terminal dimensional variability - camber	4		Die detail design	2	(D) Operator's work instructions - inspection plan	2	16	None								
3.00009463) Forming Details	Die detail not made properly	Terminal dimensional variability - camber	4		Die detail not made properly	3	(D) Operator's work instructions - inspection plan	2	24	None								
3.00009464) Forming Details	Die Detail Design	Terminal dimensional variability - camber	4		Improper adjustment	2	(D) Operator's work instructions - inspection plan	2	16	None								
3.00009465) Forming Details	Die Detail Wear	Terminal dimensional variability - AL CRIMP knurl depth	5		Worn Tooling	2	(D) Operator's work instructions, offline inspection	4	40	None								
3.00009466) Forming Details	Die Detail Design	Terminal dimensional variability - AL CRIMP knurl depth	5		Die detail design	1	(P) Operator's work instructions, offline inspection	4	20	None								
3.00009467) Forming Details	Detail Breakage	Terminal dimensional variability -	5		Detail Fatigue	2	(D) Operator's work instructions, offline inspection	4	40	None								

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Part Number (Delphi:10757690)						Design or Process Responsibility ELLSWORTH, MIKE						Telephone # 330.373.3047											
Model Year(s)/Vehicle(s) MULTIPLE						Key Date						Original FMEA Date 19-JUN-07						FMEA Revision Date 22-JAN-13					
Core Team ELLSWORTH, MIKE, MANUFACTURING ENGINEERING SUPERVISOR 330.373.3047 STITT, RANDY W, QUALITY GENERAL SUPERVISOR 330-373-3423 KOUNTZ, JOHN G., SUPERVISOR PLANT SUPPORT ENGINEERING 330-373-7831 FLAK, THOMAS E., MANUFACTURING & TOOL ROOM GENERAL SUPERVISOR 330-373-3664 JOHNSON, MICHAEL T, GENERAL SUPERVISOR MAINTENANCE/ TOOLROOM 330-373-7508 EVANS, PHYLLIS, SUPERVISOR, INDUSTRIAL ENGINEERING 330-367-6031												Supervisor's Approval ELLSWORTH, MIKE											
Action Results																							
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3.00009468) Forming Details		Knurl Punch	AL CRIMP knurl depth Terminal dimensional variability - AL CRIMP knurl depth	5		Improper adjustment	2	(D) Operator's work instructions, offline inspection	4	40	Investigate monitoring force with strain gauges	ELLSWORTH, MIKE 31-JUL-13		5	1	4							
3.00009469) Forming Details		Die detail not made properly	Terminal dimensional variability - AL CRIMP knurl depth	5		Detail Made Wrong	2	(D) Operator's work instructions, offline inspection	4	40	None												
3.000095) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Not square or parallel (retainers, stripper plates)	Die Jam	1		Misalignment	2	(D) Diagnostic Fault Display	2	4	None												
3.0000951) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Not square or parallel (retainers, stripper plates)	Die Jam	1		Made Wrong(Dimensional or Material)	3	(D) Diagnostic Fault Display	2	6	None												
3.0000952) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Not square or parallel (retainers, stripper plates)	Die Jam	1		Installed in Die Wrong	2	(D) Diagnostic Fault Display	2	4	None												
3.0000953) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Broken stripper plates, retainer, back up plate	Die Jam	1		Misalignment	2	(D) Diagnostic Fault Display	2	4	None												
3.0000954) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Broken stripper plates, retainer, back up plate	Die Jam	1		Made Wrong(Dimensional or Material)	3	(D) Diagnostic Fault Display	2	6	None												
3.0000956) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Broken stripper plates, retainer, back up plate	Die Jam	1		Installed in Die Wrong	2	(D) Diagnostic Fault Display	2	4	None												
3.0000957) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		spring not functioning properly	Terminal dimensional variability	7		worn/broken spring	3	(P) Operator's Work Instruction,Vision Inspection / PM's	2	42	None												
3.0000958) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		spring not functioning properly	Die Jam	1		worn/broken spring	3	(D) Diagnostic Fault Display	2	6	None												
3.0000959) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Wrong Spring called out on print	Terminal dimensional variability	7		Spring not capable of producing parts in spec	3	(D) Operator's Work Instruction,Vision Inspection / PM's	2	42	None.												
3.000096) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Wrong Spring called out on print	Die Jam	1		broken spring	3	(D) Diagnostic Fault Display	2	6	None												
3.0000961) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Wrong spring in die	Terminal dimensional variability	7		Spring not capable of producing parts in spec	3	(D) Operator's Work Instruction,Vision Inspection / PM's	2	42	None												
3.0000962) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Wrong spring in die	Die Jam	1		broken spring	3	(D) Diagnostic Fault Display	2	6	None												
3.0001) *Common Tooling (Shoes, Backup Plates, Retainers, Stripper Plates& Springs) 3.1.44"		Vision Failed to Locate the Part	Press shuts down	1		Terminal variation	2	(D) Diagnostic Fault Display	2	4	None												
3.0001001) Vision System		Program in need of enhancement (box/emboss height)	Pass bad parts	7		Part movement through vision block creates shadow / cannot see part clearly with vision	2	(D) In-process inspection/Stabilizer rails in vision block / subsequent operation	4	56	None												
3.00010014) Vision System		Program in need of enhancement (630 M GT Blade)	Pass bad parts	7		Die Set up	2	(D) Enhanced vision Inspection	2	28	None												
3.00010015) Vision System		Program in need of enhancement (gap / box)	Pass parts on edge of spec	7		Die Set up	2	(D) Vision Inspection	2	28	None												
3.00010016) Vision System		deformed box	Does not detect part variation	7		Die Set up	2	(D) Enhanced vision Inspection	2	28	None												
3.00010017) Vision System		Program in need of enhancement to detect all contact related issues	Pass bad parts	7		Die Set up	2	(D) Operator's work instruction / Vision program enhanced to detect all tongue related defects even when locators are in wrong position	2	28	None												
3.00010018) Vision System		Program in need of enhancement (Index tab detection)	Pass bad parts	7		Die Set up	2	(D) Vision Inspection	2	28	None												
3.00010019) Vision System		System in need of enhancement to detect all contact not captured in terminal issues	Pass bad parts	7		Die Set up	2	(D) Vision Inspection	2	28	None												
3.0001002) Vision System		"Vision off"	Does not detect part variation	7		Vision disabled at the panel view	1	(D) In-process inspection/ troling bit logic	2	14	None												
3.0001003) Vision System		Vision system variation	Does not detect part variation	7		Improperly adjusted/ lense moved	2	(D) Setup/In-process inspection	2	28	None												
3.0001004) Vision System		Nuisance Fault	Press will shut down	1		Oil / Water / Plating / Debris on part	3	(D) Blow Offs - Wash station	2	6	None												
3.0001005) Vision System		Nuisance Fault	Press will shut down	1		Part Bounces in Vision Block	3	(D) Lead in / Vision Block with support rails / subsequent operation	4	12	None												
3.0001006) Vision System		Vision Failed to Locate the Part	Press shuts down	1		Part Out Of View / Focus	2	(D) Diagnostic Fault Display	2	4	None												
3.0001007) Vision System		Vision Failed to Locate the Part	Press shuts down	1		No Light / Strobe	1	(D) Diagnostic Fault Display	2	2	None												
3.0001008) Vision System		Vision Failed to Locate the Part	Press will not shut down	7		Vision Program excution Time Too Short	3	(D) AB software handshaking logic / Diagnostic Fault Display	1	21	None												
3.0001009) Vision System		No Trigger or Intermittent	Press Shuts Down	1		Bad Trigger	2	(D) Kevance Fiber Optic Trigger	1	2	None												

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		Trigger																		
3.000101) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Low Sensitivity	2	(D) Keyance Fiber Optic Trigger	1	2	None									
3.0001011) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Oil / Dirt On trigger	3	(D) Keyance Fiber Optic Trigger	1	3	None									
3.0001012) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Bad Amplifier	2	(D) Keyance Fiber Optic Trigger	1	2	None									
3.0001013) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Bad Power supply	2	(D) 12VDC Keyance Power Supply	1	2	None									
3.000104) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Fiber Optic Cables	2	(D) Keyance Fiber Optic Trigger	1	2	None									
3.000105) Vision System	No Trigger or Intermittent Trigger	Press Shuts Down	1			Triggers Not Lined up	2	(D) Keyance Fiber Optic Trigger	1	2	None									
3.000106) vision system	Program in need of enhancement (tongue out of box)	Pass bad parts	7			Operator failed to follow procedures	2	(D) Operator's work instruction / vision inspection	2	28	None									
3.000107) Vision System	Program in need of enhancement (tongue out of box)	Pass bad parts	7			Operator failed to follow procedures	3	(D) Operator's work instruction / vision inspection	2	42	None									
3.000108) Vision System - asm presses	Missing clip	Pass bad parts	7			Improperly adjusted/ lense moved	2	(D) Operator's work instruction / enhanced vision inspection	2	28	None									
3.000111) Terminal Reel Winding	Loose Wrap	Terminals hanging outside of reel.	3			Low tension adjustment.	2	(D) Operator's work instruction / Process Card	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24			
3.0001101) Terminal Reel Winding	Loose Wrap	Terminals hanging outside of reel.	3			Dancer Arm out of adjustment (too high)	2	(D) Operator's work instruction / Process Card	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24			
3.0001102) Terminal Reel Winding	Loose Wrap	Terminals hanging outside of reel.	3			Wind Spindle speed too slow	2	(D) Operator's work instruction	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24			
3.0001103) Terminal Reel Winding	Loose Wrap	Terminals hanging outside of reel.	3			Turret Rotation too slow	2	(D) Operator's work instruction	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24			
3.0001104) Terminal Reel Winding	Tight Wrap	Terminal dimensional variability	7			High tension adjustment.	2	(D) Operator's work instruction / Process Card	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001105) Terminal Reel Winding	Tight Wrap	Terminal dimensional variability	7			Dancer Arm out of adjustment(too low)	2	(D) Operator's work instruction / Process Card	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001106) Terminal Reel Winding	Tight Wrap	Terminal dimensional variability	7			Turret Rotation too fast.	2	(D) Operator's work instruction / Process Card	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001107) Terminal Reel Winding	Tangled Terminals on reel	Damaged Terminals	7			Too many terminals sticking out when gripped at wind station.	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001108) Terminal Reel Winding	Tangled Terminals on reel	Damaged Terminals	7			Speed of drop roll too fast.	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.00011082) Terminal Reel Winding	Improper Splice	Jam in customer assembly equipment	7			Operator not following proper Splice Procedure	1	(D) Operator Work Instruction/Visual Aid	8	56	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001109) Terminal Reel Winding	Terminal Down Side of Reel	Damaged Terminals	7			High tension adjustment.	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001111) Terminal Reel Winding	Terminal Down Side of Reel	Damaged Terminals	7			Wind Spindle speed too fast.	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001111) Terminal Reel Winding	Terminal Down Side of Reel	Damaged Terminals	7			Turret Rotation too fast.	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			
3.0001112) Terminal Reel Winding	Terminal Down Side of Reel	Damaged Terminals	7			Camber strip	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56			

☐ Design FMEA

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3.0001113) Terminal Reel Winding	Terminal Down Side of Reel	Damaged Terminals	7		Twisted stock	2	(D) Operator's work instruction	8	112	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	8	56				
3.0001114) Terminal Reel Winding	Paper Alignment Outer wrap of reel.	Damaged Tangs	6		Anti-flip arm and roller out of adjustment	2	(D) Operator's work instruction	8	96	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	6	1	8	48				
3.0001115) Terminal Reel Winding	Paper Alignment Outer wrap of reel.	Damaged Tangs	6		Turret roller alignment.	2	(D) Operator's work instruction	8	96	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	6	1	8	48				
3.00011151) Terminal Reel Winding	Paper Alignment Outer wrap of reel	Damaged Tangs	6		Warped Reel/insufficient terminal strip guidance	2	(D) Operator's work instruction	8	96	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	6	1	8	48				
3.0001116) Terminal Reel Winding	Terminal Buckle at Hub of Reel	Damaged Terminals	7		Too many terminals sticking out when gripped at wind station.	3	(D) Terminal pull back adjustment / subsequent operation	2	42	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	2	14				
3.0001117) Terminal Reel Winding	Flipped Terminals on Reel	Reel can not be used.	4		Too many terminals sticking out when gripped at wind station.	2	(D) Terminal pull back adjustment.	2	16	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	4	1	2	8				
3.0001118) Terminal Reel Winding	Flipped Terminals on Reel	Reel can not be used.	4		High or Low pressure on tension adjustment	2	(D) Operator's work instruction	8	64	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	4	1	8	32				
3.0001119) Terminal Reel Winding	Flipped Terminals on Reel	Reel can not be used.	4		Turret Rotation too slow	2	(D) Operator's work instruction	8	64	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	4	1	8	32				
3.000112) Terminal Reel Winding	Flipped Terminals on Reel	Reel can not be used.	4		Warped reel	2	(D) Operator/ Outside vender sort	8	64	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	4	1	8	32				
3.0001121) Terminal Reel Winding	Paper Up the Side of the Reel	Non-Conforming Wrap	3		Paper twisted at gripper	2	(D) Operator's work instruction	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24				
3.0001122) Terminal Reel Winding	Paper Up the Side of the Reel	Non-Conforming Wrap	3		Warped reel	1	(D) Operator/ Outside vender sort	8	24	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24				
3.0001123) Terminal Reel Winding	Paper Up the Side of the Reel	Non-Conforming Wrap	3		Twisted and camber terminals	2	(D) Operator's work instruction	8	48	None										
3.0001124) Terminal Reel Winding	Twisted Paper at Hub of Reel	Non-Conforming Wrap	3		Paper twisted at gripper	2	(D) Operator's work instruction	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24				
3.0001125) Terminal Reel Winding	Twisted Paper at Hub of Reel	Non-Conforming Wrap	3		Warped reel	1	(D) Operator/ Outside vender sort	8	24	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24				
3.0001126) Terminal Reel Winding	Twisted Paper at Hub of Reel	Non-Conforming Wrap	3		Twisted and camber terminals	2	(D) Operator's work instruction	8	48	None										
3.0001127) Terminal Reel Winding	No Paper Between Terminals	Non-Conforming Wrap	3		Paper break	3	(D) Diagnostic fault display	2	18	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	2	2	12				
3.0001128) Terminal Reel Winding	No Paper Between Terminals	Non-Conforming Wrap	3		Improper stringing by operator.	2	(D) Operator's work instruction	8	48	None										
3.0001129) Terminal Reel Winding	No Paper Between Terminals	Non-Conforming Wrap	3		Defective sensor	2	(D) Operator's work instruction	8	48	None										
3.000113) Terminal Reel Winding	Excessive Paper between Terminals	Non-Conforming Wrap	3		Dropped terminal strip	2	(D) Operator's work instruction	8	48	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	3	1	8	24				
3.0001131) Terminal Reel Winding	No outer stretch wrap	Damaged terminals	7		Machine out of stretch wrap.	1	(D) Diagnostic fault display	2	14	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	2	14				
3.0001132) Terminal Reel Winding	No outer stretch wrap	Damaged terminals	7		Operator uses wrong stretch wrap	1	(D) Operator's work instruction/Reel can't be packaged / subsequent operation	4	28	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	4	28				
3.0001133) Terminal Reel Winding	No outer stretch wrap	Damaged terminals	7		Stretch wrap gripper failure	2	(D) Operator's work instruction/Reel can't be packaged / subsequent operation	4	56	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	7	1	4	28				
3.00011331) Terminal Reel Winding	Damaged terminals	Damaged terminals	2		Load finger design/Pressure	2	(D) Operator's work instruction	8	32	Investigate new winder design	ELLSWORTH, MIKE 30-JUL-13	Prototype running on 1614, proliferation plan has begun	2	1	8	16				
3.00011332) Terminal Reel Winding	Camber on Obeya style dragout	Terminals will not process	3		Roller pressure	2	(P) Operator's work instruction / pressure setting	7	42	None										
3.00011333) Terminal Reel Winding	Terminal strip not loaded	Damaeged terminals	3		Operator did not follw instructions	2	(P) Operator's work instruction	7	42	None										

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Part Number (Delphi:10757690)					Design or Process Responsibility ELLSWORTH, MIKE			Prepared by ELLSWORTH, MIKE			Telephone # 330.373.3047					
Model Year(s)/Vehicle(s) MULTIPLE					Key Date			Original FMEA Date 19-JUN-07			FMEA Revision Date 22-JAN-13					
Core Team ELLSWORTH, MIKE, MANUFACTURING ENGINEERING SUPERVISOR 330.373.3047 STITT, RANDY W, QUALITY GENERAL SUPERVISOR 330-373-3423 KOUNTZ, JOHN G., SUPERVISOR PLANT SUPPORT ENGINEERING 330-373-7831 FLAK, THOMAS E., MANUFACTURING & TOOL ROOM GENERAL SUPERVISOR 330-373-3664 JOHNSON, MICHAEL T, GENERAL SUPERVISOR MAINTENANCE/ TOOLROOM 330-373-7508 EVANS, PHYLLIS, SUPERVISOR, INDUSTRIAL ENGINEERING 330-367-6031										Supervisor's Approval ELLSWORTH, MIKE						
										Action Results						
Item/Process Function Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design/Process Controls	Det	RPN	Recommended Actions	Responsibility & Target Completion Date	Actions Taken	Severity	Occ	Det	RPN
	properly through rollers															
3.0001134) Labeling	Wrong Part Number	Mis I.D.	6		Not clearing previous reels	1	(D) Operator's work instruction Supervisor's set up check list	7	42	None						
3.0001135) Labeling	Scrap labeled as good	Non-conforming part	7		Switch good label with bad label	1	(D) Operator's work instruction	8	56	None						
3.0001136) Labeling	Scrap labeled as good	Non-conforming part	7		Manual ticket misplacement	1	(D) Operator's work instruction	8	56	None						
3.0001137) Labeling	Labeling wrong side of reel	Customer orientation	2		Operator placing label on wrong side of reel	2	(P) Operator's work instruction	8	32	None						
3.0001138) Labeling	Scrap labeled as good	Weld in stock not contained	7		PLC program	1	(D) Operator's work instruction / on-line weld detector	4	28	None						
4) INSPECT SAMPLES	Samples not inspected	Damaged terminals	7		Operator does not visually inspect sample	1	(D) Visual inspection/operator's work instruction	8	56	None						
5) UNLOAD REELS / CONTAINER FROM PRESS TO SHIPPING SKID OR BOX. INSPECT WINDING/PACKAGING	Mis-handled material	Damaged terminals	7		Dropping reels into containers	1	(D) Operator's work instruction	4	28	None						
5.001) Packaging	Inconsistent reel count	Over/under shipment	2		Inconsistent communication between counter and PLC	1	(P) Operator's work instruction/Press Release	7	14	None						
5.002) Packaging	Inconsistent reel count	Over/under shipment	2		Operator removes terminals from reel	2	(D) Operator's work instruction	7	28	None						
5.003) Packaging	Inconsistent reel count	Over/under shipment	2		Count wheel assembled incorrectly	3	(P) Operator's work instruction / count wheel verification	8	48	None						
6) INSPECT SAMPLES PER CONTROL PLAN DOCUMENTS	Samples not inspected	Damaged terminal	7		Operator does not inspect samples	1	(D) Operator's work instruction / subsequent operation	4	28	None						
6.00001) INSPECT SAMPLES PER CONTROL PLAN DOCUMENTS	Samples not inspected	High engage	7		Process settings can provide dimensionally in-tolerance parts, but fail engage	2	(P) Normal Force	4	56	None						
6.000012) INSPECT SAMPLES PER CONTROL PLAN DOCUMENTS	Failure to contain all suspect material	Non-conforming material shipped out	5		Operator not following proper containment procedure	1	(D) Operator's work instruction / redtag notification procedure	7	35	None						
6.000013) INSPECT SAMPLES PER CONTROL PLAN DOCUMENTS	Samples not inspected properly	Terminal dimensional variability	3		Inspection plan not clear on self guide check	2	(D) Operator's work instruction	7	42	None						
6.1) Product Audits	Audits not completed	Non-conformance to standard	1		Audit system not followed	1	(P) Electronic notification system	1	1	None						
6.2) Layout	Layout not completed	Customer requirement not met	1		Requirement not submitted	1	(P) System notification	1	1	None						
7) MOVE TO FINISHED GOODS STORE OR REWIND AREA. HI LIFT / TUGGER OPERATOR VERIFIES THAT INSPECTION AND TEST INDICATOR IS PRESENT	Material moved with out being inspected	Terminal dimensional variability	7		Material handler not following proper handling procedure	1	(D) Operator's work instruction	8	56	None						
7.001) Ship/Handling	Terminal damage	Transfer from press to shipping container	5		Operator not following proper handling procedure	1	(D) Operator's work instruction / new cart design	7	35	None						
7.0015) Ship/Handling	Terminal container mis-handled	Terminal damage	5		Material handling	2	(D) Operator's work instruction	2	20	None						
8.001) REWIND PARTIAL REELS TO FULL REELS (IF APPLICABLE)	Non-conforming material	Non-conforming material shipped out	6		Operator not following proper Quality procedure	1	(D) Inspector's work instruction	8	48	None						
8.002) REWIND PARTIAL REELS TO FULL REELS (IF APPLICABLE)	Wrong part number on reel	Mis-ID	6		Operator not following proper procedure	1	(D) Operator's work instruction	4	24	None						
8.003) REWIND PARTIAL REELS TO FULL REELS (IF APPLICABLE)	Mixed terminals on reel	Mixed terminals on reel	6		Operator not following proper procedure	1	(D) Operator's work instruction	4	24	None						
8.004) REWIND PARTIAL REELS TO FULL REELS (IF APPLICABLE)	Wrong terminal count	Shortage or excess of terminals	3		Operator not following proper procedure	1	(D) Electronic count system - operator's work instruction	2	6	None						
9) REWIND AREA ONLY: MOVE TO FINISHED GOODS STORE. HI LIFT / TUGGER OPERATOR VERIFIES THAT INSPECTION AND TEST INDICATOR IS PRESENT	Terminal damage	Inspector repackaging container	5		Inspector not following proper Quality procedure	1	(D) Inspector's work instruction	8	40	None						
10) RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	Finished good not received into location	Finished goods remain in drop area	1		Mixed material	2	(P) Operator's work instruction - bar code scanning	4	8	None						
11) PICK UP MATERIAL AND MOVE TO DOCK OR PACKOUT	Mis-handled material	Damaged terminal	7		Operator not following handling procedure	1	(D) Operator's work instruction	8	56	None						
12) RE-PACK MATERIAL IF APPLICABLE	Mis-ID	Material cannot be OK'd for shipment	1		Operator not following handling procedure	1	(P) Operator's work instruction - Bar code scanning / subsequent operation	2	2	None						
12.001) Packout	Wrong Part number on box	Mis ID	6		Operator put wrong part number on box	1	(D) Scanning & Work Instruction, labeling on demand	4	24	None						
12.002) Packout	Wrong Part number on box	Mis ID	6		Qualifier not on bar -code of label	1	(P) Scanning & Work Instruction	4	24	None						
13) MOVE TO DOCK	Mis-handled material	Damaged terminal	7		Operator not following handling procedure	1	(D) Operator's work instruction	8	56	None						
2190)										None						
2200)										None						
2210)										None						
2220)										None						
2230)										None						



POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS

☐ Design FMEA

☒ Process FMEA

☐ Delphi Confidential

Part Certification

☒	System		Subsystem		Component	Page 1	FMEA Number METAL STAMPING HIGH SPEED AND MISC (e-FMEA DOC ID 3592016)										
Part Number (Delphi:10757690)			Design or Process Responsibility ELLSWORTH, MIKE			Prepared by ELLSWORTH, MIKE		Telephone # 330.373.3047									
Model Year(s)/Vehicle(s) MULTIPLE			Key Date			Original FMEA Date 19-JUN-07		FMEA Revision Date 22-JAN-13									
Core Team ELLSWORTH, MIKE, MANUFACTURING ENGINEERING SUPERVISOR 330.373.3047 STITT, RANDY W, QUALITY GENERAL SUPERVISOR 330-373-3423 KOUNTZ, JOHN G., SUPERVISOR PLANT SUPPORT ENGINEERING 330-373-7831 FLAK, THOMAS E., MANUFACTURING & TOOL ROOM GENERAL SUPERVISOR 330-373-3664 JOHNSON, MICHAEL T, GENERAL SUPERVISOR MAINTENANCE/ TOOLROOM 330-373-7508 EVANS, PHYLLIS, SUPERVISOR, INDUSTRIAL ENGINEERING 330-367-6031							Supervisor's Approval ELLSWORTH, MIKE										
Item/Process Function Requirements		Potential Failure Mode	Potential Effect(s) of Failure	S e v	C l a s s	Potential Cause(s)/ Mechanism(s) of Failure	O c c	Current Design/Process Controls	D e t	R P N	Recommended Actions	Responsibility & Target Completion Date	Actions Taken	S e v	O c c	D e t	R P N
2240)											None						
2250)											None						
2260)											None						

Control Plan Category			Key Contact Name		Date (Orig)	Date (Rev)	Page 1
☐ Prototype	☒ X	☐ Pre-Launch	☐ Production	MILLER, LAURIE-JO	7-Apr-2003	5-Jun-2013	
Control Plan Number: METAL STAMPING HIGH SPEED AND MISC				Key Contact Phone 330-373-3499	Customer Engineering Approval (If Req'd)		Date (If Req'd)
Part Number: (Delphi:10757690)		Ecl (Delphi:01)		Supplier / Plant Approval / Date MILLER, LAURIE-JO 5-Jun-2013	Customer Quality Approval (If Req'd)		Date (If Req'd)
Part Name / Description (Delphi:ASM TERM F APEX 2.8 SN)				Other supplier approval by (If Req'd)	Other Approval (If Req'd)		Date (If Req'd)
Supplier / Plant Delphi Packard Plant 11 USA		Supplier Code 107194362		Other Approval Date (If Req'd)			
Core team Members ELLSWORTH, MIKE 330-373-3047 STITT, RANDY W 330-373-3423 KOUNTZ, JOHN G. 330-373-7831 MILLER, LAURIE-JO 330-373-3499 FLAK, THOMAS E. 330-373-3664 MERCER, DAVID 330-373-5746 ANDERSON, MARK A 330-373-7357							
Manufacturing plant maintains listing of all Gage Numbers							

Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics			Special Char. Class	Methods					Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.	Control Method	
0.2	MOVE STOCK FROM DOCK TO SLIT STOCK STORE	NA					DAMAGE	VISUAL	ALL SKIDS	CONTINUOUSLY	INSPECT PER DPNW- 5.2-PC-WSH-00.20; DPNW-5.2-PC-WSH- 00.04	NOTIFY SUPERVISOR
0.2	MOVE STOCK FROM DOCK TO SLIT STOCK STORE	NA		STOCK PART NUMBER			PACKING SLIP MATCHES LABEL	VISUAL	ALL SKIDS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.04; DPNW-5.3-MG- P11-00.18	NOTIFY SUPERVISOR
0.5	MOVE STOCK TO PRESS FROM SLIT STOCK STORE	NA		STOCK PART NUMBER			STOCK PART NUMBER MATCHES PROCESS CARD	VISUAL	ALL COIL CHANGES	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
1	LOAD STOCK TO PRESS	NA		STOCK PART NUMBER			STOCK PART NUMBER MATCHES PROCESS CARD	VISUAL	ALL SET UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.14; DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11	ADJUST AND/OR NOTIFY QUALITY
1	LOAD STOCK TO PRESS	NA		PRODUCT PART NUMBER AND REVISION LEVEL	PRODUCT PROCESS CARD; CORRECT VIG; PRODUCT PPC SHEET; PPAP APPROVAL		CORRECT PROCESS CARD; CORRECT VIG; CORRECT PPC SHEET; CORRECT PRODUCT REVISION LEVEL; PPAP APPROVAL	VISUAL	ALL SET UPS	CONTINUOUSLY	DPNW 5.3-MG-P11- 00.13	ADJUST AND/OR NOTIFY QUALITY
2	RUN (ASSEMBLE)SAMPLES ON PRESS FOR SETUP and RUN	STAMPING PRESS		PER PART SPECIFIC DRAWING			PART SPECIFIC PPC; PART SPECIFIC PRODUCT DRAWING, PROCESS CARD	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	PER PART SPECIFICPPC	DPNW-5.3-MG-P11- 00.14	ADJUST PROCESS AND/OR NOTIFY QUALITY
2	RUN(ASSEMBLE) PARTS ON PRESS FOR SET UP and RUN	STAMPING PRESS		PER PART SPECIFIC DRAWING		KEY PRODUCT CHARACTERISTICS as applicable	PER PART SPECIFIC PRODUCT DRAWING; PART SPECIFIC PPC	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	DPNW-5.3-MG-P11- 00.14; DPGP-4.8-CS-02	ADJUST PROCESS AND/OR NOTIFY QUALITY
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		NA	SPRING FORMATION for 518, 471, and 622 DIES, AS APPLICABLE		SPRING SHAPE	FORCE TESTING WITH SIGNATURE ANALYSIS	100%	CONTINUOUS	TOOL SET UP	FAIL PART
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		SPRING PRESENCE, FOR 518, 471, and 622 DIES, AS APPLICABLE			SPRING PRESENCE	LASER	100%	CONTINUOUS	TOOL SET UP	REMOVE PART FROM REEL IF SPRING IS MISSING
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SETUP and RUN	STAMPING PRESS		PER PART SPECIFIC PROGRAM	GREASE, AS APPLICABLE		PRODUCT DRAWING	VISION (AS APPLICABLE), UV VERIFICATION AS APPLICABLE	100%	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.28	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		PRODUCT PART NUMBER			CORRECT PRODUCT PART NUMBER MATCHES PROCESS CARD AND VIG	VISUAL	ALL START UPS; ALL SET UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP INSPECTION	STAMPING PRESS		NA	CORRECT PACKAGING		PROCESS CARD	VISUAL	ALL START UPS; ALL SET UPS; ALL REEL CHANGES	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP INSPECTION	STAMPING PRESS		STOCK PART NUMBER	GREASE PART NUMBER		STOCK AND GREASE PART NUMBER, IF APPLICABLE, MATCHES PROCESS CARD	VISUAL	ALL START UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
3	OPERATOR INSPECTS SAMPLES (ATTRIBUTES)	STAMPING PRESS		PER PART SPECIFIC	LABEL, TICKET, PACKAGING, AND		PER PART SPECIFIC PRODUCT DRAWING;	VISUAL	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3-	PER DPNW-5.3- MG-P11-00.07;	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3-	NOTIFY QUALITY COORDINATOR OR

Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics		Special Char. Class	Methods					Reaction Plan	
			No.	Product		Process	Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.		Control Method
				VISUAL INSPECTION GUIDE (VIG)	GREASE IF APPLICABLE		VIG; PROCESS CARD; TICKET		MG-P11-00.11	DPNW-5.3-MG- P11-00.11	MG-P11-00.11	DESIGNATE
4	GP-12 (IF REQUIRED)	STAMPING PRESS		PER PRODUCT DRAWING			PART SPECIFIC PRODUCT DRAWING	VISUAL	PER GP-12 REQUIREMENTS	PER GP-12 REQUIREMENTS	GP-12 REQUIREMENTS	NOTIFY QUALITY COORDINATOR OR DESIGNATE
4	PPAP	STAMPING PRESS		PER PART SPECIFIC PRODUCT DRAWING			PART SPECIFIC PRODUCT DRAWING	PER PART SPECIFIC PPC SHEET; PER PART SPECIFIC MAG; PER PART SPECIFIC VIG	PER AIAG PPAP REQUIREMENTS	PER AIAG PPAP REQUIREMENTS	PER AIAG PPAP MANUAL FOURTH EDITION; ePPAP; DPGP-4.8-CS-02; DPNW-5.3-MG-P11- 00.13; DPNW-5.3-MG- P11-00.13F1	NOTIFY QUALITY COORDINATOR OR DESIGNATE
5	UNLOAD REELS FROM PRESS TO SHIPPING SKID OR BOX	STAMPING PRESS			WINDING AND PACKAGING		PART SPECIFIC PRODUCT DRAWING; PROCESS CARD; VIG; MFG-74	VISUAL	ALL REELS	ALL REELS	VERIFY PER DPNW-5.3- MG-P11-00.07; DPNW- 5.3-MG-P11-00.11	NOTIFY SUPERVISOR
6	UNLOAD REELS FROM PRESS TO SHIPPING SKID OR BOX	STAMPING PRESS		PART NUMBER	LABEL		PART NUMBER ON LABEL MATCHES PART NUMBER ON PROCESS CARD; PART NUMBERS ON SCAN SHEET MATCH; LABEL PRESENT ON SCAN SHEET FOR EACH REEL	VISUAL	ALL REELS	ALL REELS	DPNW-5.3-MG-P11- 00.07; DPNW-5.3-MG- P11-00.11	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6	INSPECT SAMPLES (DIMENSIONAL AND VISUAL)	STAMPING PRESS		PER PART SPECIFIC DRAWING		KEY PRODUCT CHARACTERISTICS as applicable	PART SPECIFIC PRODUCT DRAWING; PPC, VIG	PER PART SPECIFIC PPC SHEET, MAG	PER PART SPECIFIC PPC	PER DPNW-5.3- MG-P11-00.07; DPNW-5.3-MG- P11-00.111	VERIFY PER DPNW-5.3- MG-P11-00.07; DPNW- 5.3-MG-P11-00.11	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6	INSPECT SAMPLES (DIMENSIONAL AND VISUAL)	STAMPING PRESS		PER PART SPECIFIC DRAWING			PRODUCT DRAWING; PER PART SPECIFIC PPC; VIG	PER PART SPECIFIC PPC SHEET, MAG	PER PART SPECIFIC PPCT	PER PART SPECIFIC PPC	PER DPNW-5.3-MG- P11-00.11; DPNW-5.3- MG-P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6.1	PRESS AUDITS	STAMPING PRESS		PER PART SPECIFIC PPC SHEET	LABEL AND PACKAGING		REF. PART SPECIFIC PPC SHEET; VIG; PROCESS CARD	PER PART SPECIFIC PPC, VISUAL, MAG	PER DPNW-5.3-CS- P11-00.02	PER DPNW-5.3- CS-P11-00.02	PER DPNW-5.3-CS-P11- 00.02	NOTIFY QUALITY SUPERVISOR OR DESIGNATE
6.1	AUDITOR DAILY PRODUCTION	STAMPING PRESS		PER PART SPECIFIC DRAWING			PER PART SPECIFIC VIG	VISUAL	PER DPNW-5.3-CS- P11-00.02	DPNW-5.3-CS-P11- 00.02	PER DPNW-5.3-CS-P11- 00.02	NOTIFY QUALITY SUPERVISOR OR DESIGNATE
6.1	PRODUCT AUDITS	STAMPING PRESS		PER PART SPECIFIC PPC	LABEL AND PACKAGING		REF. PART SPECIFIC PPC, PRODUCT DRAWING, PROCESS CARD, VIG	PER PART SPECIFIC PPC; VISUAL, MAG	PER DPNW-5.3-CS- P11-00.11	PER DPNW-5.3- CS-P11-00.11	PER DPNW-5.3-CS-P11- 00.11F1; DPNW-5.3-CS- P11-00.11	NOTIFY QUALITY SUPERVISOR PER DPNW-5.3-CS-P11- 00.11F1
6.2	ANNUAL LAYOUT	NA		PER PART SPECIFIC PRODUCT DRAWING			PART SPECIFIC PRODUCT DRAWING	DIMENSIONAL INSPECTION, MAG	AS REQUESTED	AS REQUESTED	PER CUSTOMER REQUEST	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6.3	LAYERED AUDIT	NA		NA	STANDARDIZED WORK		APPROPRIATE WORK INSTRUCTIONS	VISUAL	ONE	PER SHIFT	PER DPNW-5.3-CS-P11- 00.09; DPNW-5.3-CS- P11-00.09F01	PER DPNW-5.3-CS- P11-00.09; DPNW-5.3- CS-P11-00.09F01
7	MOVE PARTIAL REELS TO REWIND AREA IF APPLICABLE	REWIND PRESS			PRESENCE OF PARTIAL REEL STICKER		PARTIAL REEL STICKER PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.12	CONTACT MANUFACTURING SUPERVISOR
7	MOVE TO FINISHED GOODS STORE OR REWIND AREA, AS APPLICABLE	NA			TEST & INSPECTION STATUS		OK TO SHIP STICKER	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	PER DPNW-5.3-MG- P11-00.12, DPNW-5.3- MG-P11-00.09; DPNW- 5.3-MG-P11-00.07; DPNW-5.3-MG-P11- 00.11; DPNW-5.3-CS- P11-00.17	NOTIFY SUPERVISOR
8	REWIND REELS	REWIND PRESS			TEST & INSPECTION STATUS		TRANSFER TAG PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38	CONTACT MANUFACTURING SUPERVISOR
8	REWIND FULL REELS FOR PRODUCTION	REWIND PRESS		PER PRODUCT SPECIFIC PRODUCT DRAWING			PER PART SPECIFIC DRAWING, PROCESS CARD	SCAN	ALL REELS	ALL REELS	DPNW-5.3-MG-P11- 00.38	CONTACT SUPERVISOR OR QUALITY DESIGNATE
8	REWIND PARTIAL REELS	REWIND PRESS		PART NUMBER			MATCHING PART NUMBERS	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38	CONTACT MANUFACTURING SUPERVISOR
9	REWIND AREA: MOVE TO FINISHED GOODS STORE	NA			TEST & INSPECTION		TRANSFER TAG PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38; DPNW-5.3-MG- P11-00.12	CONTACT MANUFACTURING SUPERVISOR
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN	NA			TEST & INSPECTION STATUS		OK TO SHIP STICKER PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33	RETURN TO MAKE AREA USING FORM DPNW-5.2-PC-WSH-

Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics			Special Char. Class	Methods					Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.	Control Method	
	LOCATION											00.33F01
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	NA		PART NUMBER			PART NUMBER ON REEL MATCHES PART NUMBER ON SCAN SHEET	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33; DPNW-5.3-MG- P11-00.12	SEGREGATE MATERIAL AND PLACE ON HOLD USING FORM DPNW-5.2-PC- WSH-00.33F02. NOTIFY QUALITY.
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	NA		PART NUMBER			MATCH MASTER PART NUMBER TO INDIVIDUAL CONTAINER PART NUMBER	SCAN	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33	CONTACT QUALITY COORDINATOR
11	PICK MATERIAL AND MOVE TO DOCK OR PACKOUT OR REWIND AS APPLICABLE	NA			PACKAGING		DAMAGE	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.30	NOTIFY STOREKEEPER
12	RE-PACK MATERIAL (IF APPLICABLE)	NA		PART NUMBER	LABEL		MATCH MASTER SERIAL NUMBER TO SERIAL ON BOX/CONTAINER	SCANNER	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.02; DPNW--5.4-PC- WSH-00.01; DPNW-5.2- PC-WSH-00.32; DPNW- 5.4-PC-P11-00.01; DPNW-5.4-PC-P11- 00.02; DPNW-5.4-PC- P11-00.03	ATTACH "SUSPECT MATERIAL" LABEL AND MOVE TO SUSPECT MATERIAL AREA.
12	RE-PACK MATERIAL(IF APPLICABLE)	NA		PART NUMBER	LABEL		MATCH SERIAL NUMBERS; MATCH PICK LIST INFORMATION	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.02; DPNW-5.2-PC- WSH-00.01; DPNW-5.2- PC-WSH-00.32; DPNW- 5.4-PC-P11-00.01; DPNW-5.4-PC-P11- 00.02; DPNW-5.4-PC- P11-00.03	ATTACH "SUSPECT MATERIAL LABEL" AND MOVE TO SUSPECT MATERIAL AREA.
13	MOVE TO DOCK	PICK LIST		PACKAGE CONDITION			NA	VISUAL	ALL BOXES/CONTAINERS	NA	DPNW-5.4-PC-P11- 00.04; DPNW-5.2-PC- WSH-00.32; DPNW-5.2- PC-WSH-00.03; DPNW- 5.2-PC-WSH-00.23	NOTIFY SUPERVISOR

CONTROL PLAN

Control Plan Category				Key Contact Name		Date (Orig)		Date (Rev)		Page 1		
☐ Prototype ☐ Pre-Launch ☒ Production				MILLER, LAURIE-JO		7-Apr-2003		5-Jun-2013				
Control Plan Number: METAL STAMPING HIGH SPEED AND MISC				Key Contact Phone 330-373-3499		Customer Engineering Approval (If Req'd)				Date (If Req'd)		
Part Number: (Delphi:10757690)				Ecl (Delphi:01)		Supplier / Plant Approval / Date MILLER, LAURIE-JO 5-Jun-2013				Customer Quality Approval (If Req'd)		Date (If Req'd)
Part Name / Description (Delphi:ASM TERM F APEX 2.8 SN)				Other supplier approval by (If Req'd)				Other Approval (If Req'd)				Date (If Req'd)
Supplier / Plant Delphi Packard Plant 11 USA				Supplier Code 107194362		Other Approval Date (If Req'd)						
Core team Members ELLSWORTH, MIKE 330-373-3047 STITT, RANDY W 330-373-3423 KOUNTZ, JOHN G. 330-373-7831 MILLER, LAURIE-JO 330-373-3499 FLAK, THOMAS E. 330-373-3664 MERCER, DAVID 330-373-5746 ANDERSON, MARK A 330-373-7357												
Manufacturing plant maintains listing of all Gage Numbers												

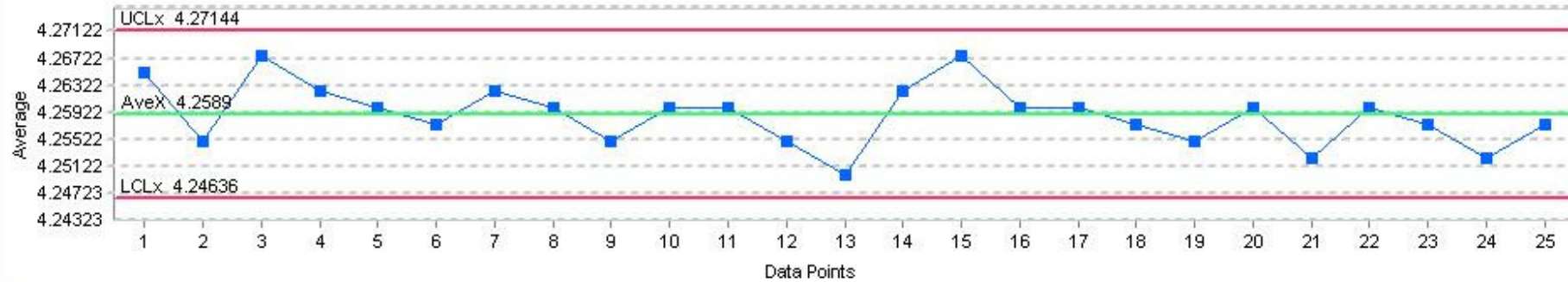
Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics			Special Char. Class	Methods					Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.	Control Method	
0.2	MOVE STOCK FROM DOCK TO SLIT STOCK STORE	NA					DAMAGE	VISUAL	ALL SKIDS	CONTINUOUSLY	INSPECT PER DPNW- 5.2-PC-WSH-00.20; DPNW-5.2-PC-WSH- 00.04	NOTIFY SUPERVISOR
0.2	MOVE STOCK FROM DOCK TO SLIT STOCK STORE	NA		STOCK PART NUMBER			PACKING SLIP MATCHES LABEL	VISUAL	ALL SKIDS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.04; DPNW-5.3-MG- P11-00.18	NOTIFY SUPERVISOR
0.5	MOVE STOCK TO PRESS FROM SLIT STOCK STORE	NA		STOCK PART NUMBER			STOCK PART NUMBER MATCHES PROCESS CARD	VISUAL	ALL COIL CHANGES	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
1	LOAD STOCK TO PRESS	NA		STOCK PART NUMBER			STOCK PART NUMBER MATCHES PROCESS CARD	VISUAL	ALL SET UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.14; DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11	ADJUST AND/OR NOTIFY QUALITY
1	LOAD STOCK TO PRESS	NA		PRODUCT PART NUMBER AND REVISION LEVEL	PRODUCT PROCESS CARD; PRODUCT VIG; PRODUCT PPC SHEET; PPAP APPROVAL		CORRECT PROCESS CARD; CORRECT VIG; CORRECT PPC SHEET; CORRECT PRODUCT REVISION LEVEL; PPAP APPROVAL	VISUAL	ALL SET UPS	CONTINUOUSLY	DPNW 5.3-MG-P11- 00.13	ADJUST AND/OR NOTIFY QUALITY
2	RUN (ASSEMBLE)SAMPLES ON PRESS FOR SETUP and RUN	STAMPING PRESS		PER PART SPECIFIC DRAWING	PER PART SPECIFIC PROCESS CARD		PART SPECIFIC PPC; PART SPECIFIC PRODUCT DRAWING, PER PROCESS CARD	PER PART SPECIFIC PPC, PER PROCESS CARD	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	DPNW-5.3-MG-P11- 00.14	ADJUST PROCESS
2	RUN(ASSEMBLE) PARTS ON PRESS FOR SET UP and RUN	STAMPING PRESS		PER PART SPECIFIC DRAWING		KPC as applicable	PART SPECIFIC PRODUCT DRAWING; PART SPECIFIC PPC	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	PER PART SPECIFIC PPC	DPNW-5.3-MG-P11- 00.14; DPGP-4.7-CS- 02	ADJUST AND/OR NOTIFY QUALITY
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP AND RUN	STAMPING PRESS		NA	SPRING FORMATION on 518, 472, and 622 DIES AS APPLICABLE		SPRING SHAPE	FORCE TESTING WITH SIGNATURE ANALYSIS	100%	CONTINUOUS	TOOL SET UP	FAIL PART
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SETUP and RUN	STAMPING PRESS		SPRING PRESENCE, for 518, 471, and 622 DIES, AS APPLICABLE			SPRING PRESENT	LASER	100%	CONTINUOUS	TOOL SET UP	REMOVE TERMINAL FROM REEL IF SPRING IS MISSING
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SETUP and RUN	STAMPING PRESS		PER PART SPECIFIC PROGRAM	GREASE, AS APPLICABLE		PRODUCT DRAWING	VISION (AS APPLICABLE), UV TRACER DETECTION AS APPLICABLE	100%	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.28	PER DPNW-5.3-MG-P11- 00.07; DPNW-5.3-MG- P11-00.11
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		PRODUCT PART NUMBER			CORRECT PRODUCT PART NUMBER MATCHES PROCESS CARD AND VIG	VISUAL	ALL START UPS; ALL SET UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		NA	CORRECT PACKAGING		PROCESS CARD	VISUAL	ALL START UPS; ALL SET UPS; ALL REEL CHANGES	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
2	RUN (ASSEMBLE) SAMPLES ON PRESS FOR SET UP and RUN	STAMPING PRESS		STOCK PART NUMBER	GREASE PART NUMBER		STOCK PART NUMBER MATCHES PROCESS CARD	VISUAL LABELS TO PROCESS CARD	ALL START UPS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.11; DPNW-5.3-MG- P11-00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
3	OPERATOR INSPECTS SAMPLES (ATTRIBUTES)	STAMPING PRESS		PER PART SPECIFIC VISUAL INSPECTION GUIDE (VIG)	LABEL, TICKET, PACKAGING, GREASE AS APPLICABLE		PER PART SPECIFIC PRODUCT DRAWING; VIG; PROCESS CARD; TICKET	VISUAL	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11	PER DPNW-5.3-MG- P11-00.07; DPNW-5.3- MG-P11-00.11	NOTIFY QUALITY COORDINATOR OR DESIGNATE
4	PPAP	STAMPING PRESS		PER PART SPECIFIC			PART SPECIFIC PRODUCT DRAWING	PER PART SPECIFIC PPC	PER AIAG PPAP REQUIREMENTS	PER AIAG PPAP REQUIREMENTS	PER AIAG PPAP MANUAL FOURTH	NOTIFY QUALITY COORDINATOR OR

Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics			Special Char. Class	Methods					Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.	Control Method	
				PRODUCT DRAWING				SHEET; PER PART SPECIFIC MAG; PER PART SPECIFIC VIG			EDITION; ePPAP; DPGP-4.8-CS-02; DPNW-5.3-MG-P11- 00.13; DPNW-5.3-MG- P11-00.13F1	DESIGNATE
5	UNLOAD REELS FROM PRESS TO SHIPPING SKID OR BOX	STAMPING PRESS			WINDING AND PACKAGING		PART SPECIFIC PRODUCT DRAWING; PROCESS CARD; VIG; MFG-74	VISUAL	ALL REELS	ALL REELS	VERIFY PER DPNW- 5.3-MG-P11-00.07; DPNW-5.3-MG-P11- 00.11	NOTIFY SUPERVISOR
6	INSPECT SAMPLES (DIMENSIONAL AND VISUAL)	STAMPING PRESS		PER PART SPECIFIC DRAWING		KPC as applicable	PART SPECIFIC PRODUCT DRAWING; PER PART SPECIFIC PPC, VIG	PER PART SPECIFIC PPC, MAG	PER PART SPECIFIC PPC	PER DPNW-5.3-MG- P11-00.11; DPNW-5.3- MG-P11-00.07; PER PART SPECIFIC PPC	VERIFY PER DPNW- 5.3-MG-P11-00.07; DPNW-5.3-MG-P11- 00.11; DPGP-4.8-CS- 02	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6	INSPECT SAMPLES (DIMENSIONAL AND VISUAL)	STAMPING PRESS		PER PART SPECIFIC PPC			PRODUCT DRAWING; PER PART SPECIFIC PPC; VIG	PER PART SPECIFIC PPC SHEET, MAG	PER PART SPECIFIC PPCT	PER PART SPECIFIC PPC; PER DPNW-5.3- MG-P11-00.11; DPNW-5.3-MG-P11- 00.07	VERIFY PER DPNW- 5.3-MG-P11-00.11; DPNW-5.3-MG-P11- 00.07	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6	UNLOAD REELS FROM PRESS TO SHIPPING SKID OR BOX	STAMPING PRESS		PART NUMBER	LABEL		PART NUMBER ON LABEL MATCHES PART NUMBER ON PROCESS CARD; PART NUMBERS ON SCAN SHEET MATCH; LABEL PRESENT ON SCAN SHEET FOR EACH REEL	VISUAL	ALL REELS	ALL REELS	DPNW-5.3-MG-P11- 00.07; DPNW-5.3-MG- P11-00.11	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6.1	PRESS AUDITS	STAMPING PRESS		PER PART SPECIFIC PPC SHEET	LABEL AND PACKAGING		REF. PART SPECIFIC PPC SHEET; VIG; PROCESS CARD	PER PART SPECIFIC PPC, VISUAL, MAG	PER DPNW-5.3-CS-P11- 00.02	PER DPNW-5.3-CS- P11-00.02	PER DPNW-5.3-CS- P11-00.02	NOTIFY QUALITY SUPERVISOR OR DESIGNATE
6.1	PRODUCT AUDITS	STAMPING PRESS		PER PART SPECIFIC PPC	LABEL AND PACKAGING		REF. PART SPECIFIC PPC, PRODUCT DRAWING, PROCESS CARD, VIG	PER PART SPECIFIC PPC; VISUAL, MAG	PER DPNW-5.3-CS-P11- 00.11	PER DPNW-5.3-CS- P11-00.11	PER DPNW-5.3-CS- P11-00.11F1; DPNW- 5.3-CS-P11-00.11	NOTIFY QUALITY SUPERVISOR PER DPNW-5.3-CS-P11- 00.11F1
6.1	AUDITOR DAILY PRODUCTION	STAMPING PRESS		PER PART SPECIFIC DRAWING			PER PART SPECIFIC VIG	VISUAL	PER DPNW-5.3-CS-P11- 00.02	DPNW-5.3-CS-P11- 00.02	PER DPNW-5.3-CS- P11-00.02	NOTIFY QUALITY SUPERVISOR OR DESIGNATE
6.2	ANNUAL LAYOUT	NA		PER PART SPECIFIC PRODUCT DRAWING			PART SPECIFIC PRODUCT DRAWING	DIMENSIONAL INSPECTION	AS REQUESTED	AS REQUESTED	PER CUSTOMER REQUEST	NOTIFY QUALITY COORDINATOR OR DESIGNATE
6.3	LAYERED AUDIT	NA		NA	STANDARDIZED WORK		APPROPRIATE WORK INSTRUCTIONS	VISUAL	ONE	PER SHIFT	PER DPNW-5.3-CS- P11-00.09; DPNW-5.3- CS-P11-00.09F01	PER DPNW-5.3-CS-P11- 00.09; DPNW-5.3-CS- P11-00.09F01
7	MOVE TO FINISHED GOODS STORE OR REWIND, AS APPLICABLE	NA			TEST & INSPECTION STATUS		OK TO SHIP STICKER	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	PER DPNW-5.3-MG- P11-00.12, DPNW-5.3- MG-P11-00.09; DPNW- 5.3-MG-P11-00.07; DPNW-5.3-MG-P11- 00.11; DPNW-5.3-CS- P11-00.17	NOTIFY SUPERVISOR
7	MOVE PARTIAL REELS TO REWIND AREA IF APPLICABLE	REWIND PRESS			PRESENCE OF PARTIAL REEL STICKER		PARTIAL REEL STICKER PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.12	CONTACT MANUFACTURING SUPERVISOR
8	REWIND REELS FOR PRODUCTION	REWIND PRESS		PER PART SPECIFIC PRODUCT DRAWING			PER PART SPECIFIC PRODUCT DRAWING, PROCESS CARD	SCAN	ALL REELS	ALL REELS	DPNW-5.3-MG-P11- 00.38	CONTACT SUPERVISOR OR QUALITY DESIGNATE
8	REWIND PARTIAL REELS	REWIND PRESS		PART NUMBER			MATCHING PART NUMBERS	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38	CONTACT MANUFACTURING SUPERVISOR
8	REWIND REELS	REWIND PRESS			TEST & INSPECTION STATUS		TRANSFER TAG PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38	CONTACT MANUFACTURING SUPERVISOR
9	REWIND AREA: MOVE TO FINISHED GOODS STORE	NA			TEST & INSPECTION		TRANSFER TAG PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.3-MG-P11- 00.38; DPNW-5.3-MG- P11-00.12	CONTACT MANUFACTURING SUPERVISOR
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	NA		PART NUMBER			MATCH MASTER PART NUMBER TO INDIVIDUAL CONTAINER PART NUMBER	SCAN	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33	CONTACT QUALITY COORDINATOR
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	NA		PART NUMBER			PART NUMBER ON REEL MATCHES PART NUMBER ON SCAN SHEET	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33; DPNW-5.3-MG- P11-00.12	SEGREGATE MATERIAL AND PLACE ON HOLD USING FORM DPNW-5.2- PC-WSH-00.33F02. NOTIFY QUALITY.

Part / Proc #	Process Name / Operation description	Machine, Device, Jig, Tools For Mfg.	Characteristics			Special Char. Class	Methods					Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample Size	Sample Freq.	Control Method	
10	RECEIVE FINISHED GOODS INTO TERMINAL STORE AND PLACE IN LOCATION	NA			TEST & INSPECTION STATUS		OK TO SHIP STICKER PRESENT	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.33	RETURN TO MAKE AREA USING FORM DPNW-5.2-PC-WSH- 00.33F01
11	PICK MATERIAL AND MOVE TO DOCK OR PACKOUT OR REWIND AS APPLICABLE	NA			PACKAGING		DAMAGE	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.30	NOTIFY STOREKEEPER
12	RE-PACK MATERIAL(IF APPLICABLE)	NA		PART NUMBER	LABEL		MATCH SERIAL NUMBERS; MATCH PICK LIST INFORMATION	VISUAL	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.02; DPNW-5.2-PC- WSH-00.01; DPNW- 5.2-PC-WSH-00.32; DPNW-5.4-PC-P11- 00.01; DPNW-5.4-PC- P11-00.02; DPNW-5.4- PC-P11-00.03	ATTACH "SUSPECT MATERIAL LABEL" AND MOVE TO SUSPECT MATERIAL AREA.
12	RE-PACK MATERIAL (IF APPLICABLE)	NA		PART NUMBER	LABEL		MATCH MASTER SERIAL NUMBER TO SERIAL ON BOX/CONTAINER	SCANNER	ALL BOXES/CONTAINERS	CONTINUOUSLY	DPNW-5.2-PC-WSH- 00.02; DPNW--5.4-PC- WSH-00.01; DPNW- 5.2-PC-WSH-00.32; DPNW-5.4-PC-P11- 00.01; DPNW-5.4-PC- P11-00.02; DPNW-5.4- PC-P11-00.03	ATTACH "SUSPECT MATERIAL" LABEL AND MOVE TO SUSPECT MATERIAL AREA.
13	MOVE TO DOCK	PICK LIST		PACKAGE CONDITION			NA	VISUAL	ALL BOXES/CONTAINERS	NA	DPNW-5.4-PC-P11- 00.04; DPNW-5.2-PC- WSH-00.32; DPNW- 5.2-PC-WSH-00.03; DPNW-5.2-PC-WSH- 00.23	NOTIFY SUPERVISOR

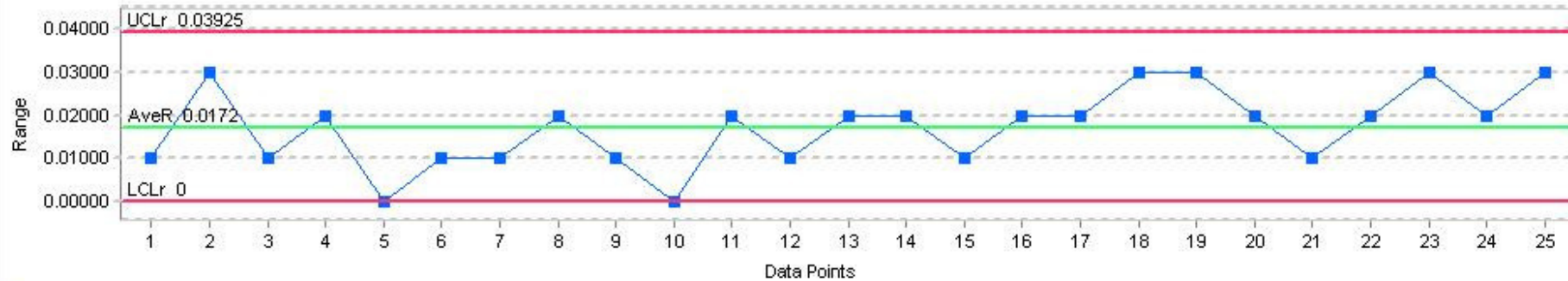
X	Two sided spec (bilateral)	One sided (MIN)	One sided (Max)	Number of readings per subgroup	4	PROCESS INFORMATION				
LOCATION PART	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:	03-JUL-13	Significant trends of data points:		X Chart	R Chart
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Increasing	RUN LENGTH	3	3
TOOL DIMENSION	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE				HOW MANY RUNS	1	1
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Decreasing	RUN LENGTH	4	3
	Tool number	00000471MAAF00A	# Cavities	1				HOW MANY RUNS	1	2
	Description	BODY WIDTH	Units	MM			Out of control limits		0	0
	SPEC	4.25	PLUS	0.05	MINUS	0.05	Consecutive data points above avg.		4	5
	Lwr Spec	4.2	NOMINAL	4.25	Upr Spec	4.3	Consecutive data points below avg.		3	3
	Explanation:									

Average (X-bar chart)



— Data Values

Range (R Chart)



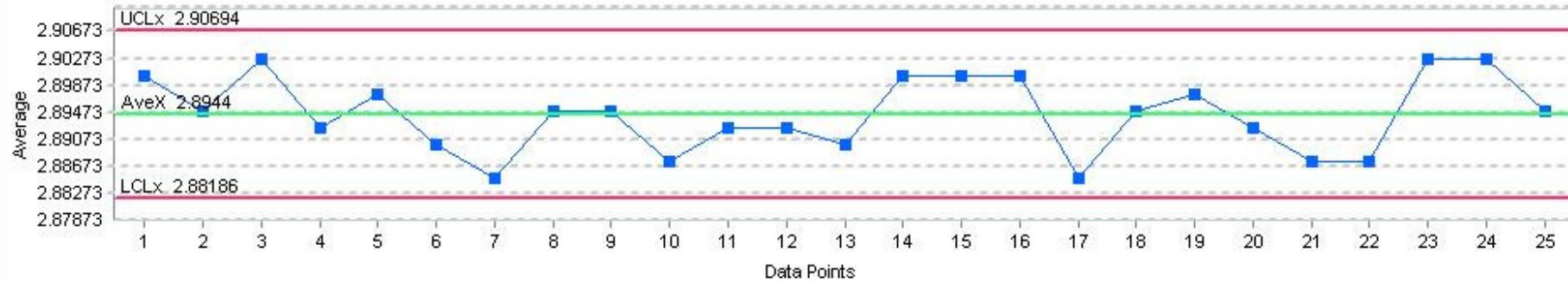
— Data Values

Process is Capable

S U B G R O U P S																					
n		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R E A D I N G S	1	4.26	4.26	4.27	4.27	4.26	4.26	4.26	4.25	4.25	4.26	4.26	4.25	4.25	4.26	4.26	4.26	4.27	4.26	4.26	4.26
	2	4.27	4.24	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.27	4.26	4.24	4.27	4.27	4.25	4.25	4.24	4.24	4.26
	3	4.26	4.25	4.27	4.27	4.26	4.25	4.27	4.26	4.26	4.26	4.26	4.25	4.25	4.25	4.27	4.27	4.26	4.27	4.27	4.25
	4	4.27	4.27	4.27	4.25	4.26	4.26	4.26	4.27	4.25	4.26	4.25	4.26	4.26	4.27	4.27	4.26	4.26	4.26	4.25	4.27
	5																				
	6																				
	7																				
	8																				
	9																				
	10																				
Average		4.265	4.255	4.2675	4.2625	4.26	4.2575	4.2625	4.26	4.255	4.26	4.26	4.255	4.25	4.2625	4.2675	4.26	4.26	4.2575	4.255	4.26
Range		0.01	0.03	0.01	0.02	0	0.01	0.01	0.02	0.01	0	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.02
n		21	22	23	24	25	N O T E S														
R E A D I N G S	1	4.25	4.27	4.27	4.24	4.25															
	2	4.25	4.27	4.26	4.25	4.27															
	3	4.26	4.25	4.26	4.26	4.24															
	4	4.25	4.25	4.24	4.26	4.27															
	5																				
	6																				
	7																				
	8																				
	9																				
	10																				
Average		4.2525	4.26	4.2575	4.2525	4.2575															
Range		0.01	0.02	0.03	0.02	0.03															

X	Two sided spec (bilateral)	One sided (MIN)	One sided (Max)	Number of readings per subgroup	4	PROCESS INFORMATION				
LOCATION PART	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:	03-JUL-13	Significant trends of data points:		X Chart	R Chart
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Increasing	RUN LENGTH	3	3
TOOL DIMENSION	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE				HOW MANY RUNS	1	1
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Decreasing	RUN LENGTH	3	3
	Tool number	00000471MAAF00A	# Cavities	1				HOW MANY RUNS	2	1
	Description	BODY HEIGHT	Units	MM			Out of control limits		0	0
	SPEC	2.9	PLUS	0.1	MINUS	0.1	Consecutive data points above avg.		3	5
	Lwr Spec	2.8	NOMINAL	2.9	Upr Spec	3	Consecutive data points below avg.		4	2
	Explanation:									

Average (X-bar chart)



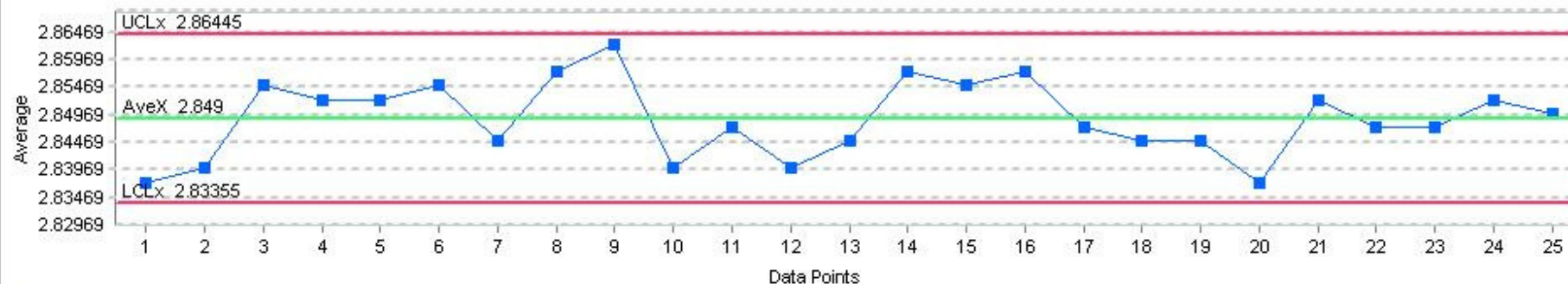
Range (R Chart)



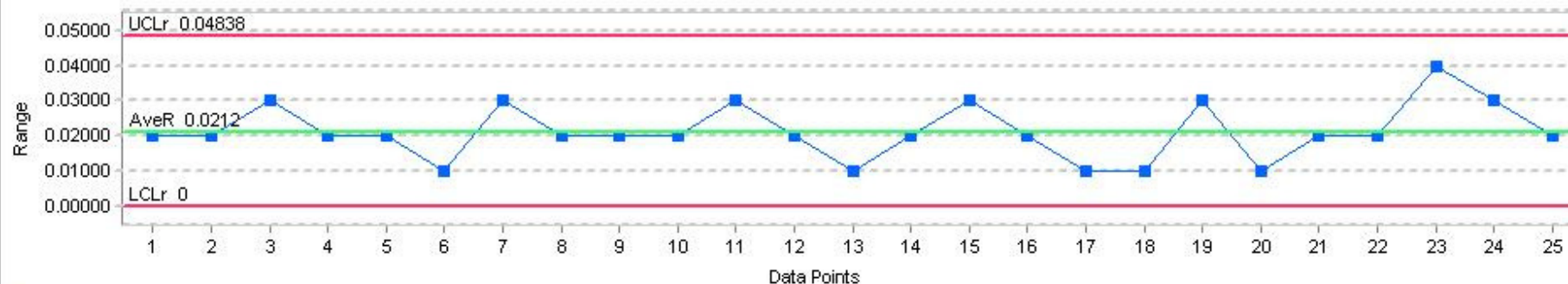
Part Certification

X	Two sided spec (bilateral)	One sided (MIN)	One sided (Max)	Number of readings per subgroup		4	PROCESS INFORMATION			
LOCATION PART TOOL DIMENSION	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:		Significant trends of data points:		X Chart	R Chart
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Increasing	RUN LENGTH	3	3
	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE				HOW MANY RUNS	2	1
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Decreasing	RUN LENGTH	3	3
	Tool number	00000471MAAF00B	# Cavities	1				HOW MANY RUNS	1	3
	Description	BODY HEIGHT	Units	MM			Out of control limits		0	0
	SPEC	2.9	PLUS	0.1	MINUS	0.1	Consecutive data points above avg.		4	2
	Lwr Spec	2.8	NOMINAL	2.9	Upr Spec	3	Consecutive data points below avg.		4	3
	Explanation:									

Average (X-bar chart)



Range (R Chart)



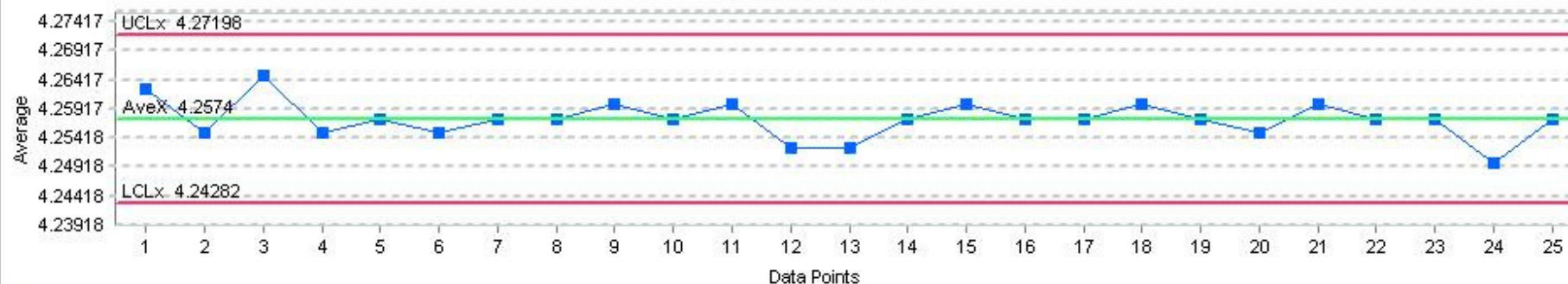
Process is Capable

LOCATION PART	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:		DESCRIPTIVE STATISTICS		VALUES
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Number of readings	100	
	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE			Lower spec limit (LSL)	2.8	
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Nominal	2.9	
	Tool number	00000471MAAF00B	# Cavities	1			Upper spec limit (USL)	3	
TOOL DIMENSION	Description	BODY HEIGHT	Units	MM			Total sum	284.9	
	SPEC	2.9	PLUS	0.1		MINUS	Average readings (X)	2.849	
	Lwr Spec	2.8	NOMINAL	2.9		Upr Spec	3	Maximum	2.87
	HISTOGRAM WITHOUT LIMITS Histogram Without Limits HISTOGRAM WITH LIMITS LSL USL						Minimum	2.83	
							Readings below LSL	0	
						Readings above USL	0		
						Average Range (R)	0.0212		
						D2 Value N = 4	2.059		
						Upper capability index (CPU)	4.8885		
						Lower capability index (CPL)	1.5863		
						Capability index (Cp)	3.2374		
						Process Capability (Cpk)	1.5863		
						Capability ratio (CR)	0.3089		
						Std Deviation (n-1)	0.01142		
						Std Deviation (n)	0.01136		
						Variance (n-1)	0.00013		
						Variance (n)	0.00013		
						Performance index (PP)	2.9189		
						Performance ratio (PR)	0.3426		
						Performance index (Ppk)	1.4302		

S U B G R O U P S																					
R E A D I N G S	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1	2.83	2.84	2.84	2.85	2.85	2.86	2.84	2.85	2.85	2.83	2.86	2.85	2.84	2.85	2.84	2.85	2.85	2.84	2.84	2.83
	2	2.85	2.84	2.86	2.86	2.86	2.85	2.86	2.87	2.87	2.84	2.86	2.83	2.85	2.85	2.85	2.85	2.85	2.85	2.83	2.84
	3	2.83	2.85	2.85	2.86	2.84	2.85	2.85	2.85	2.87	2.84	2.84	2.84	2.85	2.87	2.87	2.87	2.84	2.85	2.86	2.84
	4	2.84	2.83	2.87	2.84	2.86	2.86	2.83	2.86	2.86	2.85	2.83	2.84	2.84	2.86	2.86	2.86	2.85	2.84	2.85	2.84
	5																				
	6																				
	7																				
	8																				
	9																				
10																					
Average		2.8375	2.84	2.855	2.8525	2.8525	2.855	2.845	2.8575	2.8625	2.84	2.8475	2.84	2.845	2.8575	2.855	2.8575	2.8475	2.845	2.845	2.8375
Range		0.02	0.02	0.03	0.02	0.02	0.01	0.03	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.01	0.01	0.03	0.01
n		21	22	23	24	25	N O T E S														
R E A D I N G S	1	2.85	2.84	2.83	2.85	2.84															
	2	2.84	2.84	2.83	2.85	2.86															
	3	2.86	2.86	2.86	2.87	2.86															
	4	2.86	2.85	2.87	2.84	2.84															
	5																				
	6																				
	7																				
	8																				
	9																				
	10																				
Average		2.8525	2.8475	2.8475	2.8525	2.85															
Range		0.02	0.02	0.04	0.03	0.02															

X	Two sided spec (bilateral)	One sided (MIN)	One sided (Max)	Number of readings per subgroup		4	PROCESS INFORMATION			
LOCATION PART TOOL DIMENSION	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:		Significant trends of data points:		X Chart	R Chart
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Increasing	RUN LENGTH	3	3
	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE				HOW MANY RUNS	1	1
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Decreasing	RUN LENGTH	3	3
	Tool number	00000471MAAF00B	# Cavities					HOW MANY RUNS	1	1
	Description	BODY WIDTH	Units	MM			Out of control limits		0	0
	SPEC	4.25	PLUS	0.05	MINUS	0.05	Consecutive data points above avg.		6	2
	Lwr Spec	4.2	NOMINAL	4.25	Upr Spec	4.3	Consecutive data points below avg.		2	2
	Explanation:									

Average (X-bar chart)



■ Data Values

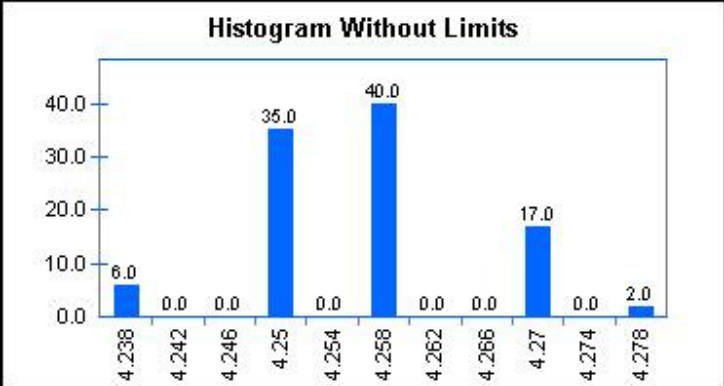
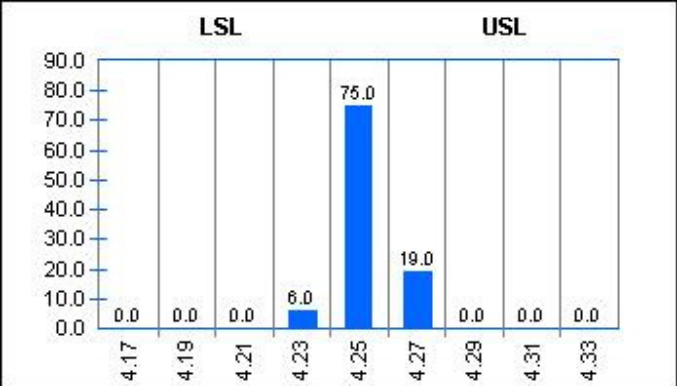
Range (R Chart)



■ Data Values

PROCESS CAPABILITY CERTIFICATION REPORT

Process is Capable

LOCATION PART	Plant	Delphi Packard USA 11	Dept:	10	Date of Study:		DESCRIPTIVE STATISTICS		VALUES												
	PartNbr(studied):	(Delphi:10757690)	Part Description	(Delphi:ASM TERM F APEX 2.8 SN)			Number of readings	100													
	PartNbr(similar):	MULTIPLE	Part Description	MULTIPLE																	
	Drawing number	15324842	Eng. chg. level	studied: (Delphi:01) similar: MULTIPLE			Lower spec limit (LSL)	4.2													
	Tool number	00000471MAAF00B	# Cavities	1			Nominal	4.25													
TOOL DIMENSION	Description	BODY WIDTH	Units	MM			Upper spec limit (USL)	4.3													
	SPEC	4.25	PLUS	0.05	MINUS	0.05	Total sum	425.74													
	Lwr Spec	4.2	NOMINAL	4.25	Upr Spec	4.3	Average readings (X)	4.2574													
							Maximum	4.28													
							Minimum	4.24													
HISTOGRAM WITHOUT LIMITS							Readings below LSL	0													
Histogram Without Limits 							Readings above USL	0													
							Average Range (R)		0.02												
HISTOGRAM WITH LIMITS							D2 Value N = 4	2.059													
LSL USL 							Upper capability index (CPU)	1.4619													
							Lower capability index (CPL)	1.9698													
							Capability index (Cp)	1.7158													
							Process Capability (Cpk)	1.4619													
							Capability ratio (CR)	0.5828													
							Std Deviation (n-1)	0.00883													
							Std Deviation (n)	0.00879													
							Variance (n-1)	0.00008													
							Variance (n)	0.00008													
							Performance index (PP)	1.8875													
							Performance ratio (PR)	0.5298													
							Performance index (Ppk)	1.6082													
S U B G R O U P S																					
	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R E A D I N G S	1	4.26	4.26	4.25	4.28	4.25	4.25	4.26	4.26	4.26	4.25	4.26	4.25	4.26	4.26	4.27	4.24	4.25	4.26	4.26	4.25
	2	4.27	4.26	4.27	4.24	4.27	4.26	4.27	4.25	4.27	4.25	4.25	4.24	4.25	4.27	4.26	4.26	4.25	4.25	4.27	4.25
	3	4.26	4.25	4.26	4.25	4.26	4.26	4.25	4.25	4.26	4.27	4.27	4.26	4.25	4.25	4.26	4.27	4.27	4.27	4.26	4.26
	4	4.26	4.25	4.28	4.25	4.25	4.25	4.25	4.27	4.25	4.26	4.26	4.26	4.25	4.25	4.25	4.26	4.26	4.26	4.24	4.26
	5																				
	6																				
	7																				
	8																				
	9																				
	10																				
Average		4.2625	4.255	4.265	4.255	4.2575	4.255	4.2575	4.2575	4.26	4.2575	4.26	4.2525	4.2525	4.2575	4.26	4.2575	4.2575	4.26	4.2575	4.255
Range		0.01	0.01	0.03	0.04	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.02	0.03	0.01
	n	21	22	23	24	25	N O T E S														
R E A D I N G S	1	4.26	4.26	4.27	4.25	4.25															
	2	4.27	4.26	4.26	4.25	4.25															
	3	4.25	4.25	4.24	4.26	4.27															
	4	4.26	4.26	4.26	4.24	4.26															
	5																				
	6																				
	7																				
	8																				
	9																				
	10																				
Average		4.26	4.2575	4.2575	4.25	4.2575															
Range		0.02	0.01	0.03	0.02	0.02															

REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒ Using TOLERANCE method

☐ Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	2	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic BODY LENGTH	Gage Number NA	Coord by FOWLER, C. E.
Tolerance 0.03 Units MM	Gage Name NIKON	Phone # 330-373-3336
Tolerance (Tol) 0.03	Gage ECL/Revision	Date Of Study

OPERATOR		P		A		R		T		RESULTS		
TRIAL	#	1	2	3	4	5	6	7	8	9	10	AVG
A	1	0.836	0.835	0.837	0.836	0.835	0.836	0.836	0.835	0.836	0.836	A1 0.8358
	2	0.836	0.836	0.836	0.835	0.836	0.836	0.836	0.836	0.836	0.835	A2 0.8358
	3	0.835	0.835	0.836	0.835	0.836	0.836	0.835	0.835	0.836	0.835	A3 0.8354
Average		0.83567	0.83533	0.83633	0.83533	0.83567	0.836	0.83567	0.83533	0.836	0.83533	XA 0.83567
Range		0.001	0.001	0.001	0.001	0.001	0	0.001	0.001	0	0.001	RA 0.0008
B	1	0.833	0.834	0.834	0.834	0.834	0.834	0.833	0.833	0.834	0.833	B1 0.8336
	2	0.834	0.833	0.834	0.834	0.834	0.833	0.834	0.832	0.835	0.833	B2 0.8336
	3	0.833	0.833	0.834	0.835	0.834	0.833	0.834	0.834	0.834	0.833	B3 0.8337
Average		0.83333	0.83333	0.834	0.83433	0.834	0.83333	0.83367	0.833	0.83433	0.833	XB 0.83363
Range		0.001	0.001	0	0.001	0	0.001	0.001	0.002	0.001	0	RB 0.0008
C	1											C1
	2											C2
	3											C3
Average												XC
Range												RC
Part Avg		0.8345	0.83433	0.83517	0.83483	0.83483	0.83467	0.83467	0.83417	0.83517	0.83417	xPART= 0.83465
Part Range												RPART= 0.001
R = RA + RB + RC / No of operators = 0.0008 + 0.0008 / 2												R= 0.0008
XDIFF = [Max (X)ABC] - [Min (X)ABC] = 0.83567 - 0.83363												XDIFF= 0.00203
UCLR= R * D4 = 0.0008 * 2.58												UCLR= 0.00206
LCLR= R * D3 = 0.0008 * 0												LCLR= 0
OPERATOR	NAME	TITLE				NOTE: The Total Tolerance Method should be used when the gage is used for product release.						
A	LOIS BURNETT	AUDITOR				When out of control conditions exist, analyze the data for Gage acceptability. The total						
B	NANCY	AUDITOR				variation method is generally used for variation reduction activities.						
C												
GOOD UNTIL GAGE ECL/revision CHANGE												
FROM DATA SHEET: R = 0.0008 XDIFF = 0.00203 RPART = 0.001												
Measurement Unit Analysis												
Repeatability - Equipment Variation (EV)												
EV = R * K1												
EV = 0.00244												
Trials K1												
3 3.05												
% EV = 100[EV/Tol]												
% EV = 8.13												
Reproducibility - Appraiser Variation (AV)												
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)]												
(n parts, r trials)												
AV = 0.00741												
Oper K2												
2 3.65												
% AV = 100[AV/Tol]												
% AV = 24.69												
Repeatability & Reproducibility (R & R)												
R&R = Square Root(EV2 + AV2)												
R&R = 0.0078												
% R&R = 100[R&R/Tol]												
% R&R = 26												
Part Variation (PV)												
PV = RPART*K3												
PV = 0.00162												
Parts K3												
10 1.62												
% PV = 100[PV/Tol]												
% PV = 5.4												
Total Variation (TV)												
TV = Square Root(R&R2 + PV2)												
TV = 0.00797												
Gage may be accepted, see next page.												
All Ranges OK												

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	2	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic BODY LENGTH	Gage Number NA	Coord by FOWLER, C. E.
Tolerance 0.03 Units MM	Gage Name NIKON	Phone # 330-373-3336
Tolerance (Tol) 0.03	Gage ECL/Revision	Date Of Study

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

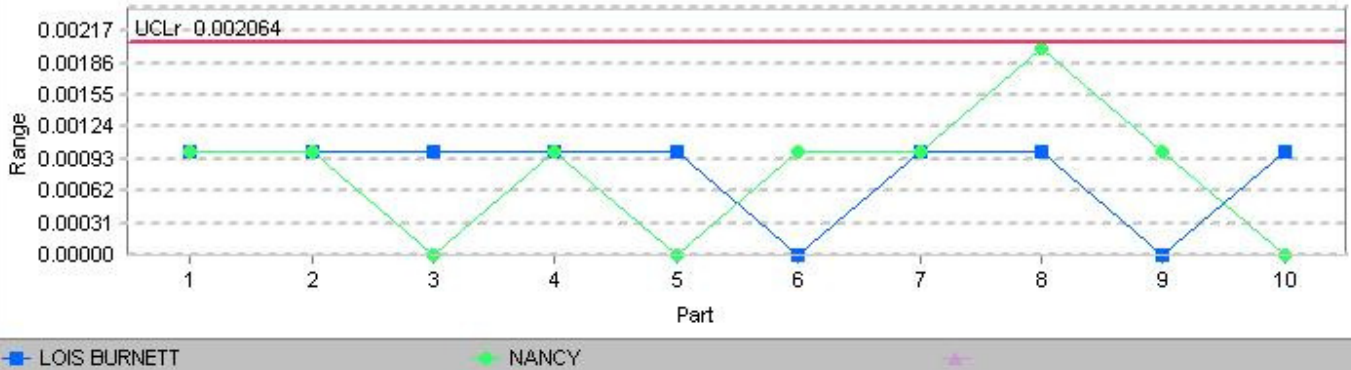
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	=	RPN#	X	%GRR/100
35.1	=	135	X	0.25999

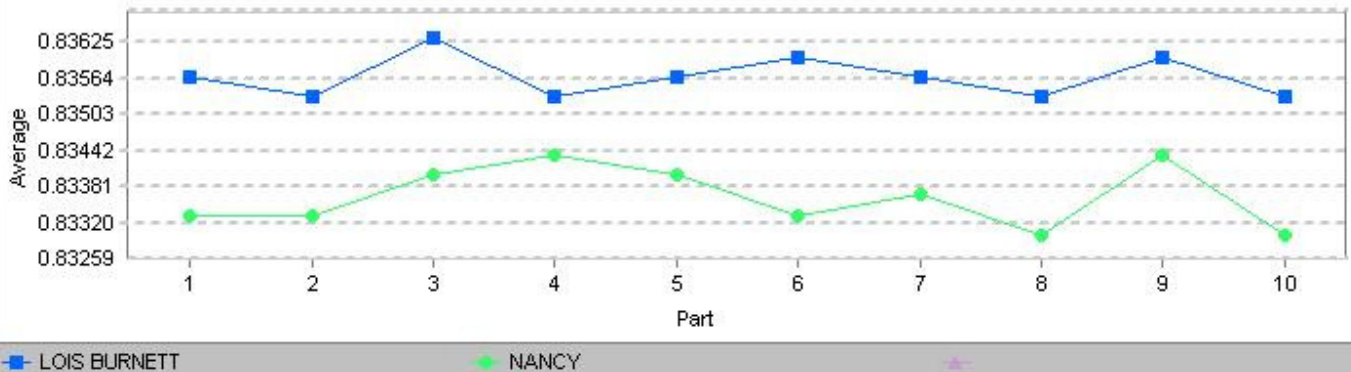
CONCLUSION IS...

GAGE APPROVED, USE IT

Range Chart by Operator



Average Run Chart



Notes:

REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒ Using TOLERANCE method

☐ Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic CORE WING WIDTH	Gage Number NONE	Coord by FOWLER, C. E.
Tolerance 0.03 Units IN	Gage Name VERNIER	Phone # 330-373-3336
Tolerance (Tol) 0.03	Gage ECL/Revision	Date Of Study

OPERATOR		P		A		R		T				RESULTS	
TRIAL	#	1	2	3	4	5	6	7	8	9	10		AVG
A	1	0.139	0.148	0.1515	0.139	0.1475	0.15	0.1505	0.139	0.1385	0.1415	A1	0.14445
	2	0.14	0.149	0.15	0.1395	0.1485	0.1485	0.1495	0.1405	0.1405	0.1395	A2	0.14455
	3	0.1395	0.1485	0.15	0.1395	0.149	0.1475	0.151	0.1395	0.1395	0.1395	A3	0.14435
	Average	0.1395	0.1485	0.1505	0.13933	0.14833	0.14867	0.15033	0.13967	0.1395	0.14017	XA	0.14445
Range	0.001	0.001	0.0015	0.0005	0.0015	0.0025	0.0015	0.0015	0.0015	0.002	0.002	RA	0.0015
B	1	0.141	0.147	0.149	0.138	0.146	0.147	0.149	0.138	0.138	0.139	B1	0.1432
	2	0.139	0.147	0.149	0.139	0.147	0.148	0.149	0.139	0.14	0.139	B2	0.1436
	3	0.1385	0.147	0.1495	0.1395	0.147	0.148	0.149	0.139	0.1385	0.14	B3	0.1436
	Average	0.1395	0.147	0.14917	0.13883	0.14667	0.14767	0.149	0.13867	0.13883	0.13933	XB	0.14347
Range	0.0025	0	0.0005	0.0015	0.001	0.001	0	0.001	0.002	0.001	RB	0.00105	
C	1	0.1385	0.148	0.149	0.138	0.1485	0.1485	0.1495	0.1385	0.1375	0.138	C1	0.1434
	2	0.1385	0.147	0.149	0.139	0.147	0.1475	0.149	0.1375	0.1385	0.1395	C2	0.14325
	3	0.139	0.1475	0.1495	0.1385	0.148	0.148	0.149	0.1385	0.1385	0.138	C3	0.14345
	Average	0.13867	0.1475	0.14917	0.1385	0.14783	0.148	0.14917	0.13817	0.13817	0.1385	XC	0.14337
Range	0.0005	0.001	0.0005	0.001	0.0015	0.001	0.0005	0.001	0.001	0.0015	RC	0.00095	
Part Avg		0.13922	0.14767	0.14961	0.13889	0.14761	0.14811	0.1495	0.13883	0.13883	0.13933	xPART=	0.14376
Part Range												RPART=	0.01078
R = RA + RB + RC / No of operators =					0.0015	+	0.00105	+	0.00095	/	3	R=	0.00117
XDIFF = [Max (X)ABC] - [Min (X)ABC] =					0.14445	-	0.14337					XDIFF=	0.00108
UCLR=		R	*	D4 =	0.00117	-	2.58					UCLR=	0.00301
LCLR=		R	*	D3 =	0.00117	*	0					LCLR=	0

OPERATOR	NAME	TITLE	NOTE: The Total Tolerance Method should be used when the gage is used for product release.
A	BEV C.	QUALITY ENGINEER	When out of control conditions exist, analyze the data for Gage acceptability. The total
B	JOAN	AUDITOR	variation method is generally used for variation reduction activities.
C	ALLIE	AUDITOR	
GOOD UNTIL GAGE ECL/revision CHANGE			

FROM DATA SHEET:	R = 0.00117	XDIFF = 0.00108	RPART = 0.01078
Measurement Unit Analysis			
Repeatability - Equipment Variation (EV)			
EV = R * K1			% EV = 100[EV/Tol]
EV = 0.00356	Trials 3	K1 3.05	% EV = 11.86
Reproducibility - Appraiser Variation (AV)			
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)]	(n parts, r trials)		% AV = 100[AV/Tol]
AV = 0.00285	Oper 3	K2 2.7	% AV = 9.51
Repeatability & Reproducibility (R & R)			
R&R = Square Root(EV2 + AV2)			% R&R = 100[R&R/Tol]
R&R = 0.00456			% R&R = 15.2
Part Variation (PV)			
PV = RPART*K3	Parts 10	K3 1.62	% PV = 100[PV/Tol]
PV = 0.01746			% PV = 58.2
Total Variation (TV)			
TV = Square Root(R&R2 + PV2)			Gage may be accepted, see next page.
TV = 0.01805			All Ranges OK

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic CORE WING WIDTH	Gage Number NONE	Coord by FOWLER, C. E.
Tolerance 0.03 Units IN	Gage Name VERNIER	Phone # 330-373-3336
Tolerance (Tol) 0.03	Gage ECL/Revision	Date Of Study

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

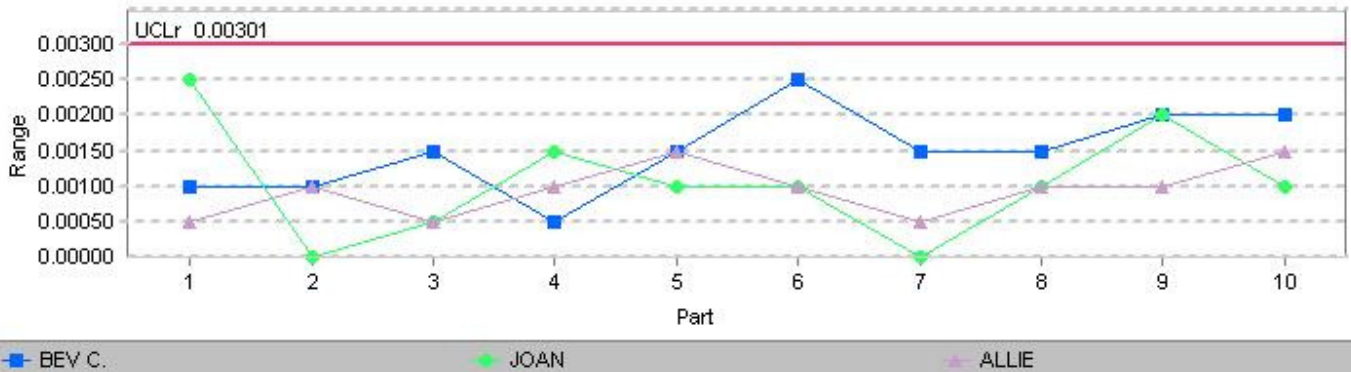
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	=	RPN#	X	%GRR/100
3.65	=	24	X	0.15201

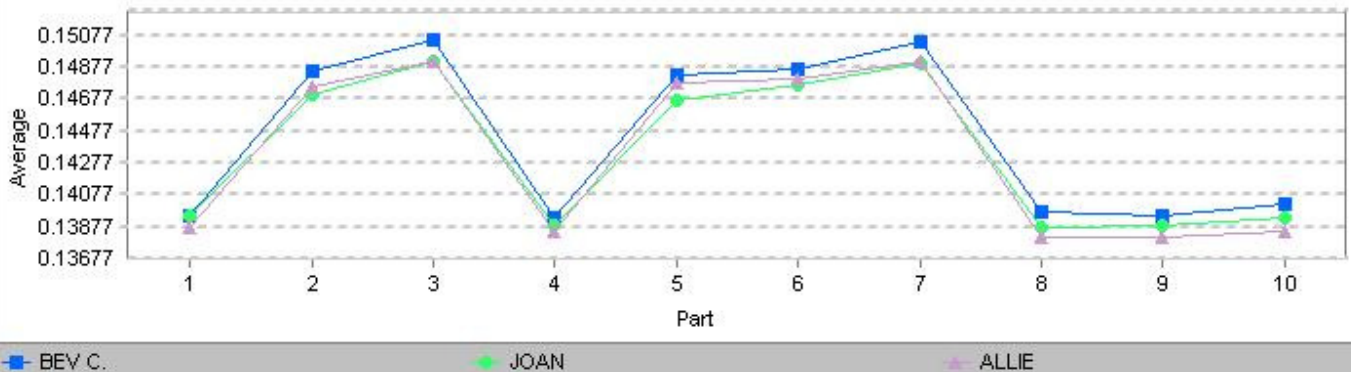
CONCLUSION IS...

GAGE APPROVED, USE IT

Range Chart by Operator



Average Run Chart



Notes:



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic KNURL	Gage Number E2109-11	Coord by MATSKO, DANIEL J.
Tolerance 0.1 Units MM	Gage Name FLASH	Phone # 330-373-3336
Tolerance (Tol) 0.1	Gage ECL/Revision	Date Of Study 03-JUN-08

OPERATOR		P			A		R		T			RESULTS		
TRIAL	#	1	2	3	4	5	6	7	8	9	10	AVG		
A	1	0.086	0.083	0.095	0.09	0.09	0.087	0.09	0.084	0.091	0.093	A1	0.0889	
	2	0.09	0.081	0.094	0.094	0.093	0.086	0.087	0.081	0.097	0.091	A2	0.0894	
	3	0.084	0.084	0.09	0.09	0.094	0.087	0.093	0.086	0.092	0.093	A3	0.0893	
	Average	0.08667	0.08267	0.093	0.09133	0.09233	0.08667	0.09	0.08367	0.09333	0.09233	XA	0.0892	
Range		0.006	0.003	0.005	0.004	0.004	0.001	0.006	0.005	0.006	0.002	RA	0.0042	
B	1	0.092	0.086	0.09	0.094	0.09	0.085	0.092	0.086	0.098	0.089	B1	0.0902	
	2	0.091	0.087	0.09	0.095	0.097	0.09	0.09	0.081	0.099	0.09	B2	0.091	
	3	0.087	0.081	0.09	0.097	0.092	0.088	0.091	0.081	0.092	0.087	B3	0.0886	
	Average	0.09	0.08467	0.09	0.09533	0.093	0.08767	0.091	0.08267	0.09633	0.08867	XB	0.08993	
Range		0.005	0.006	0	0.003	0.007	0.005	0.002	0.005	0.007	0.003	RB	0.0043	
C	1	0.091	0.08	0.091	0.09	0.093	0.09	0.092	0.087	0.096	0.093	C1	0.0903	
	2	0.085	0.079	0.089	0.09	0.088	0.089	0.091	0.089	0.096	0.091	C2	0.0887	
	3	0.089	0.077	0.092	0.091	0.095	0.087	0.09	0.084	0.096	0.09	C3	0.0891	
	Average	0.08833	0.07867	0.09067	0.09033	0.092	0.08867	0.091	0.08667	0.096	0.09133	XC	0.08937	
Range		0.006	0.003	0.003	0.001	0.007	0.003	0.002	0.005	0	0.003	RC	0.0033	
Part Avg		0.08833	0.082	0.09122	0.09233	0.09244	0.08767	0.09067	0.08433	0.09522	0.09078	xPART= 0.0895		
Part Range												RPART= 0.01322		
R = RA + RB + RC / No of operators =					0.0042	+	0.0043	+	0.0033	/	3	R= 0.00393		
XDIFF = [Max (X)ABC] - [Min (X)ABC] =					0.08993	-	0.0892						XDIFF= 0.00073	
UCLR=		R	*	D4 =	0.00393	*	2.58						UCLR= 0.01015	
LCLR=		R	*	D3 =	0.00393	*	0						LCLR= 0	

OPERATOR	NAME	TITLE	NOTE: The Total Tolerance Method should be used when the gage is used for product release.
A	KELLEY CASSIDY	QC MEASUREMENT TRAINER	When out of control conditions exist, analyze the data for Gage acceptability. The total
B	MARIA HILDERBRAND	QC MEASUREMENT TRAINER	variation method is generally used for variation reduction activities.
C	CINDY FRANK	QC COORDINATOR /TRAINER	

GOOD UNTIL GAGE ECL/revision CHANGE		
FROM DATA SHEET: R = 0.00393 XDIFF = 0.00073 RPART = 0.01322		
Measurement Unit Analysis		
Repeatability - Equipment Variation (EV)		
EV = R * K1		
EV = 0.012		
Reproducibility - Appraiser Variation (AV)		
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)]		
AV = 0		
Repeatability & Reproducibility (R & R)		
R&R = Square Root(EV2 + AV2)		
R&R = 0.012		
Part Variation (PV)		
PV = RPART*K3		
PV = 0.02142		
Total Variation (TV)		
TV = Square Root(R&R2 + PV2)		
TV = 0.02455		



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic KNURL	Gage Number E2109-11	Coord by MATSKO, DANIEL J.
Tolerance 0.1 Units MM	Gage Name FLASH	Phone # 330-373-3336
Tolerance (Tol) 0.1	Gage ECL/Revision	Date Of Study 03-JUN-08

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

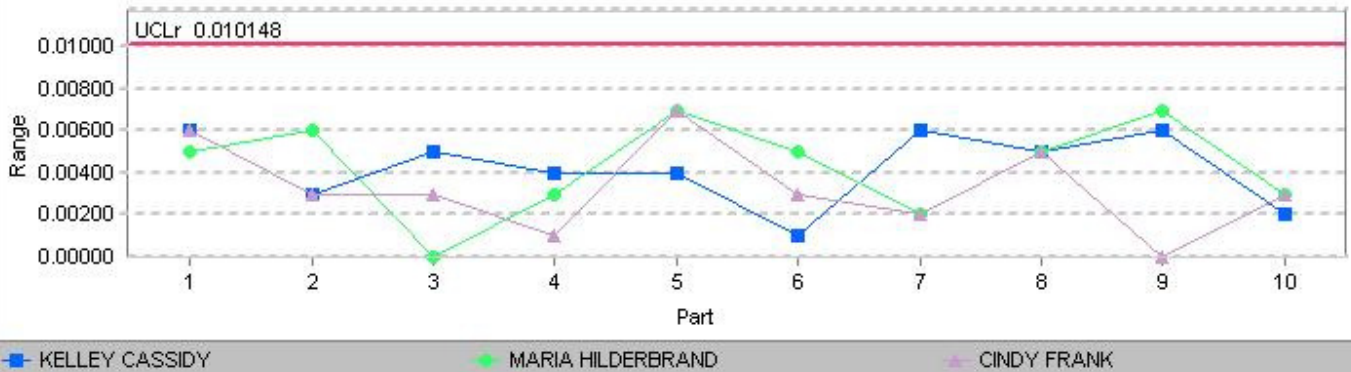
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	= RPN#	X	%GRR/100
5.04	=	42	X 0.11997

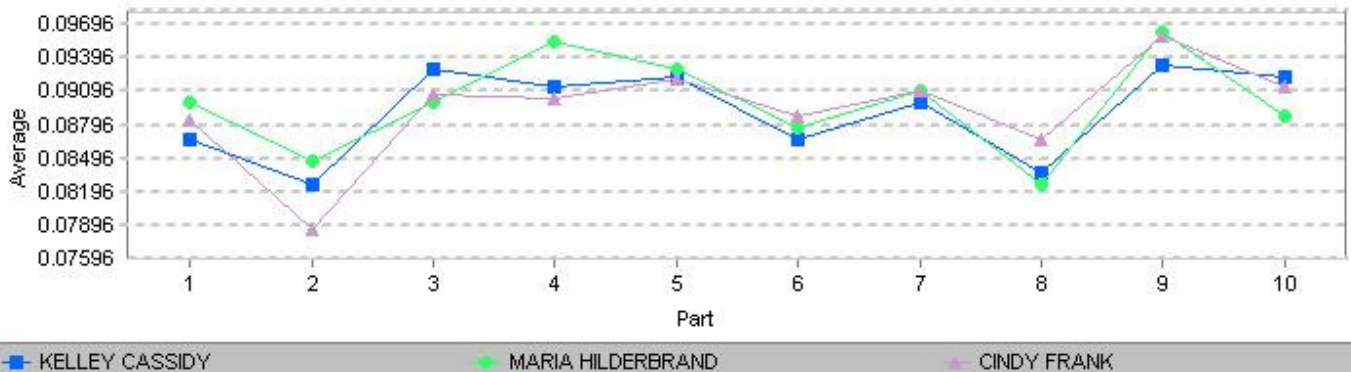
CONCLUSION IS...

GAGE APPROVED, USE IT

Range Chart by Operator



Average Run Chart



Notes:

REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒ Using TOLERANCE method

☐ Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic BODY HEIGHT	Gage Number E2223-11	Coord by ALBERINO, VERONICA
Tolerance 0.15 Units MM	Gage Name MITUTOYO COMPARATOR	Phone # 330-373-5258
Tolerance (Tol) 0.15	Gage ECL/Revision	Date Of Study

OPERATOR		P		A		R		T		RESULTS			
TRIAL	#	1	2	3	4	5	6	7	8	9	10	AVG	
A	1	2.569	2.58	2.58	2.577	2.582	2.556	2.541	2.588	2.578	2.545	A1 2.5696	
	2	2.56	2.574	2.583	2.574	2.586	2.554	2.542	2.588	2.581	2.548	A2 2.569	
	3	2.557	2.577	2.576	2.575	2.58	2.554	2.541	2.588	2.577	2.549	A3 2.5674	
	Average	2.562	2.577	2.57967	2.57533	2.58267	2.55467	2.54133	2.588	2.57867	2.54733	XA 2.56867	
Range	0.012	0.006	0.007	0.003	0.006	0.002	0.001	0	0.004	0.004	RA 0.0045		
B	1	2.562	2.582	2.585	2.577	2.578	2.554	2.54	2.593	2.58	2.541	B1 2.5692	
	2	2.557	2.579	2.573	2.577	2.571	2.545	2.537	2.586	2.577	2.538	B2 2.564	
	3	2.562	2.578	2.576	2.565	2.577	2.548	2.536	2.596	2.584	2.537	B3 2.5659	
	Average	2.56033	2.57967	2.578	2.573	2.57533	2.549	2.53767	2.59167	2.58033	2.53867	XB 2.56637	
Range	0.005	0.004	0.012	0.012	0.007	0.009	0.004	0.01	0.007	0.004	RB 0.0074		
C	1	2.557	2.56	2.567	2.568	2.576	2.567	2.54	2.581	2.578	2.544	C1 2.5638	
	2	2.556	2.562	2.569	2.566	2.576	2.567	2.543	2.577	2.58	2.539	C2 2.5635	
	3	2.559	2.561	2.566	2.57	2.575	2.565	2.539	2.579	2.576	2.541	C3 2.5631	
	Average	2.55733	2.561	2.56733	2.568	2.57567	2.56633	2.54067	2.579	2.578	2.54133	XC 2.56347	
Range	0.003	0.002	0.003	0.004	0.001	0.002	0.004	0.004	0.004	0.005	RC 0.0032		
Part Avg	2.55989	2.57256	2.575	2.57211	2.57789	2.55667	2.53989	2.58622	2.579	2.54244	xPART= 2.56617		
Part Range												RPART= 0.04633	
R = RA + RB + RC / No of operators =					0.0045	+	0.0074	+	0.0032	/	3	R= 0.00503	
XDIFF = [Max (X)ABC] - [Min (X)ABC] =					2.56867	-	2.56347						XDIFF= 0.0052
UCLR=		R	*	D4 =	0.00503	*	2.58						UCLR= 0.01299
LCLR=		R	*	D3 =	0.00503	*	0						LCLR= 0

OPERATOR	NAME	TITLE	NOTE: The Total Tolerance Method should be used when the gage is used for product release.
A	AUDITOR 1	AUDITOR	When out of control conditions exist, analyze the data for Gage acceptability. The total
B	AUDITOR 2	AUDITOR	variation method is generally used for variation reduction activities.
C	AUDITOR 3	AUDITOR	

GOOD UNTIL GAGE ECL/revision CHANGE			
FROM DATA SHEET: R = 0.00503 XDIFF = 0.0052 RPART = 0.04633			
Measurement Unit Analysis			
Repeatability - Equipment Variation (EV)			
EV = R * K1			% EV = 100[EV/Tol]
EV = 0.01535			% EV = 10.23
Reproducibility - Appraiser Variation (AV)			
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)]			% AV = 100[AV/Tol]
AV = 0.01376			% AV = 9.17
Repeatability & Reproducibility (R & R)			
R&R = Square Root(EV2 + AV2)			% R&R = 100[R&R/Tol]
R&R = 0.02061			% R&R = 13.74
Part Variation (PV)			
PV = RPART*K3			% PV = 100[PV/Tol]
PV = 0.07506			% PV = 50.04
Total Variation (TV)			
TV = Square Root(R&R2 + PV2)			Gage may be accepted, see next page.
TV = 0.07784			All Ranges OK

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Resolution	Plant Delphi Packard USA 11
Characteristic BODY HEIGHT	Gage Number E2223-11	Coord by	ALBERINO, VERONICA
Tolerance 0.15 Units MM	Gage Name MITUTOYO COMPARATOR	Calibration	Phone # 330-373-5258
Tolerance (Tol) 0.15	Gage ECL/Revision	Tolerance	Date Of Study

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

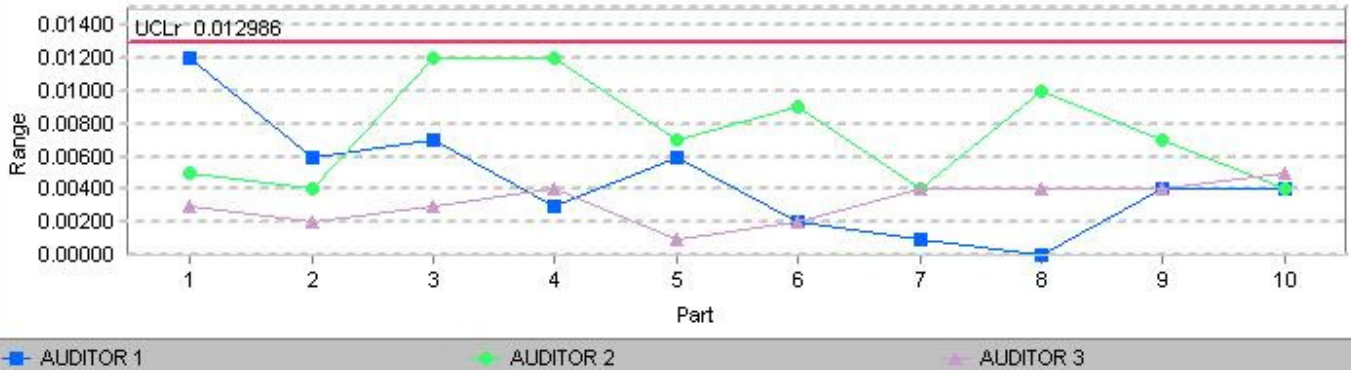
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	=	RPN#	X	%GRR/100
5.5	=	40	X	0.13743

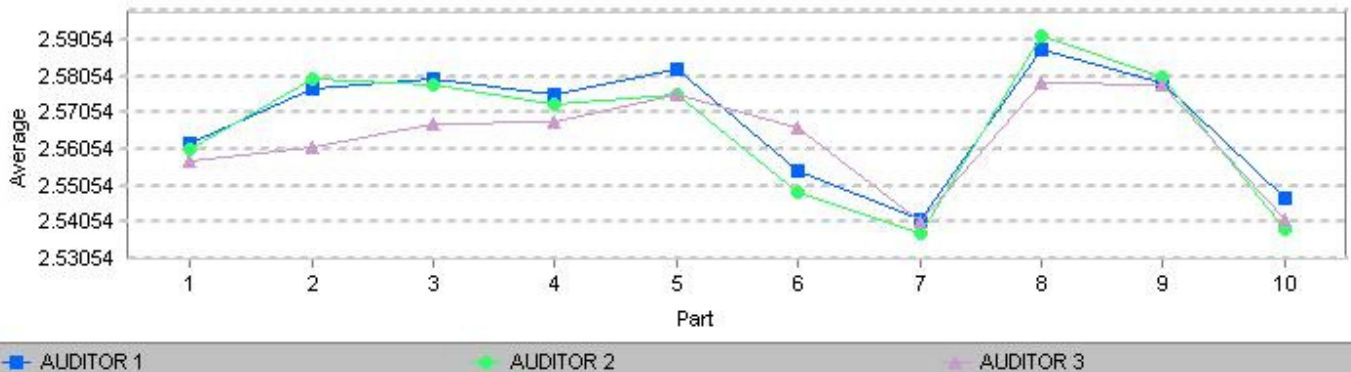
CONCLUSION IS...

GAGE APPROVED, USE IT

Range Chart by Operator



Average Run Chart



Notes:



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	2	OK
K2	Number of Operators	Must be either 2 or 3	2	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic SERRATION	Gage Number E5108-11	Coord by ALBERINO, VERONICA
Tolerance 0.1 Units MM	Gage Name OLYMPUS MICROSCOPE	Phone # 330-373-5258
Tolerance (Tol) 0.1	Gage ECL/Revision	Date Of Study

OPERATOR											RESULTS				
TRIAL	#	1	2	3	4	5	6	7	8	9	10		AVG		
A	1	0.046	0.043	0.035	0.035	0.035	0.043	0.075	0.065	0.046	0.032	A1	0.0455		
	2	0.045	0.039	0.031	0.034	0.036	0.05	0.07	0.068	0.046	0.044	A2	0.0463		
	3											A3			
Average		0.0455	0.041	0.033	0.0345	0.0355	0.0465	0.0725	0.0665	0.046	0.038	XA	0.0459		
Range		0.001	0.004	0.004	0.001	0.001	0.007	0.005	0.003	0	0.012	RA	0.0038		
B	1	0.041	0.043	0.036	0.036	0.035	0.046	0.057	0.061	0.05	0.031	B1	0.0436		
	2	0.044	0.036	0.035	0.03	0.035	0.045	0.053	0.067	0.039	0.031	B2	0.0415		
	3											B3			
Average		0.0425	0.0395	0.0355	0.033	0.035	0.0455	0.055	0.064	0.0445	0.031	XB	0.04255		
Range		0.003	0.007	0.001	0.006	0	0.001	0.004	0.006	0.011	0	RB	0.0039		
C	1											C1			
	2											C2			
	3											C3			
Average												XC			
Range												RC			
Part Avg		0.044	0.04025	0.03425	0.03375	0.03525	0.046	0.06375	0.06525	0.04525	0.0345	xPART=	0.04423		
Part Range												RPART=	0.0315		
R = RA + RB + RC / No of operators =					0.0038	+	0.0039	+	/			2	R=	0.00385	
XDIFF = [Max (X)ABC] - [Min (X)ABC] =					0.0459	-	0.04255							XDIFF=	0.00335
UCLR= R *					0.00385	*	3.27							UCLR=	0.01259
LCLR= R *					0.00385	*	0							LCLR=	0

OPERATOR	NAME	TITLE	NOTE: The Total Tolerance Method should be used when the gage is used for product release.
A	LUTHER STUBBS	TECH	When out of control conditions exist, analyze the data for Gage acceptability. The total
B	CHRISTINE HURAYT	ENGINEER	variation method is generally used for variation reduction activities.
C			

GOOD UNTIL GAGE ECL/revision CHANGE

FROM DATA SHEET:		R = 0.00385		XDIFF = 0.00335		RPART = 0.0315	
Measurement Unit Analysis							
Repeatability - Equipment Variation (EV)							
EV = R * K1				% EV = 100[EV/Tol]			
EV = 0.01756		Trials 2		K1 4.56		% EV = 17.56	
Reproducibility - Appraiser Variation (AV)							
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)]				(n parts, r trials)		% AV = 100[AV/Tol]	
AV = 0.01158		Oper 2		K2 3.65		% AV = 11.58	
Repeatability & Reproducibility (R & R)							
R&R = Square Root(EV2 + AV2)				% R&R = 100[R&R/Tol]			
R&R = 0.02103				% R&R = 21.03			
Part Variation (PV)							
PV = RPART*K3		Parts 10		K3 1.62		% PV = 100[PV/Tol]	
PV = 0.05103						% PV = 51.03	
Total Variation (TV)							
TV = Square Root(R&R2 + PV2)				Gage may be accepted, see next page.			
TV = 0.05519				All Ranges OK			



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	2	OK
K2	Number of Operators	Must be either 2 or 3	2	OK
K3	Number of Parts	Can be any value between 2 and 10	10	OK

GAGE APPROVED, USE IT

Part Number (Delphi:10757690)	Part Name ASM TERM F APEX 2.8 SN	Plant Delphi Packard USA 11
Characteristic SERRATION	Gage Number E5108-11	Coord by ALBERINO, VERONICA
Tolerance 0.1 Units MM	Gage Name OLYMPUS MICROSCOPE	Phone # 330-373-5258
Tolerance (Tol) 0.1	Gage ECL/Revision	Date Of Study

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

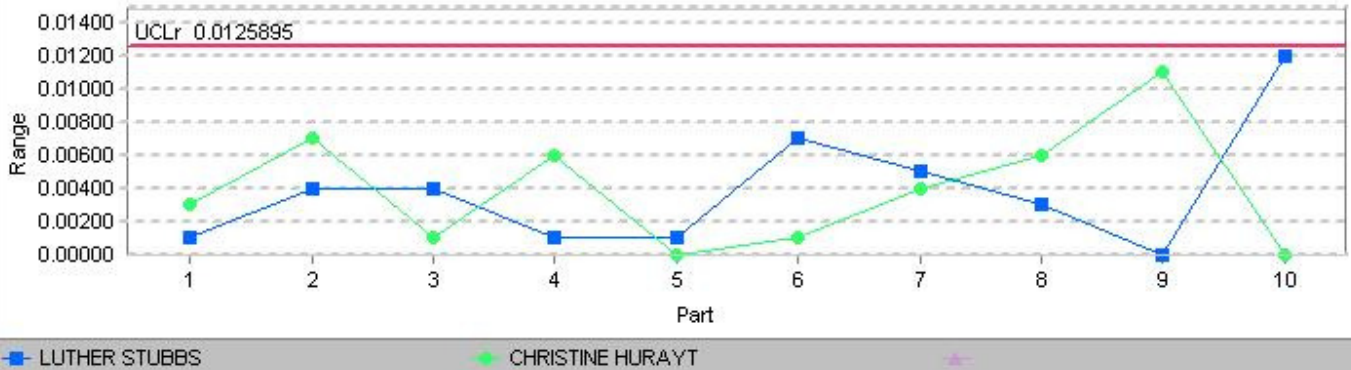
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	=	RPN#	X	%GRR/100
5.89	=	28	X	0.21031

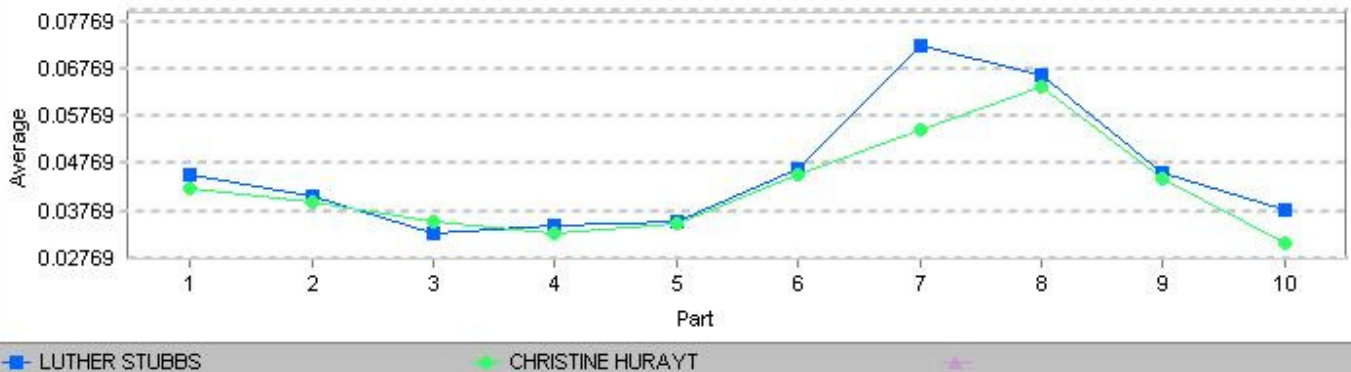
CONCLUSION IS...

GAGE APPROVED, USE IT

Range Chart by Operator



Average Run Chart



Notes:



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	2	OK

Part Number (Delphi:10757690)	Part Name	ASM TERM F APEX 2.8 SN	Plant	Delphi Packard USA 11
Characteristic GAP	Gage Number	1116 PRESS PPT VISION SYSTEM	Coord by	MILLER, LAURIE-JO
Tolerance 0.125 Units MM	Gage Name	PPT M40 VISION SYSTEM	Phone #	330-373-3499
Tolerance (Tol) 0.125	Gage ECL/Revision	NA	Date Of Study	18-JUL-12

OPERATOR	P	A	R	T						RESULTS	
TRIAL #	1	2	3	4	5	6	7	8	9	10	AVG
A 1											A1
2											A2
3											A3
Average											XA
Range											RA
B 1											B1
2											B2
3											B3
Average											XB
Range											RB
C 1											C1
2											C2
3											C3
Average											XC
Range											RC
Part Avg											xPART=
Part Range											RPART=
R = RA + RB + RC / No of operators = + + / 3											R=
XDIFF = [Max (X)ABC] - [Min (X)ABC] = 0.0459 - 0.04255											XDIFF=
UCLR= R * D4 = 2.58											UCLR= 0
LCLR= R * D3 = 0											LCLR= 0
OPERATOR	NAME	TITLE		NOTE: The Total Tolerance Method should be used when the gage is used for product release.							
A				When out of control conditions exist, analyze the data for Gage acceptability. The total							
B				variation method is generally used for variation reduction activities.							
C											
GOOD UNTIL GAGE ECL/revision CHANGE											
FROM DATA SHEET: R = XDIFF = RPART =											
Measurement Unit Analysis											
Repeatability - Equipment Variation (EV)											
EV = R * K1 % EV = 100[EV/Tol]											
EV = Trials K1 % EV =											
3 3.05											
Reproducibility - Appraiser Variation (AV)											
AV = Square Root[(XDIFF*K2)2 - (EV2/nr)] (n parts, r trials) % AV = 100[AV/Tol]											
AV = Oper K2 % AV =											
3 2.7											
Repeatability & Reproducibility (R & R)											
R&R = Square Root(EV2 + AV2) % R&R = 100[R&R/Tol]											
R&R = % R&R =											
Part Variation (PV)											
PV = RPART*K3 Parts K3 % PV = 100[PV/Tol]											
PV = 2 3.65 % PV =											
Total Variation (TV)											
TV = Square Root(R&R2 + PV2)											
TV =											



REPEATABILITY AND REPRODUCIBILITY ANALYSIS REPORT

NON DESTRUCTIVE TEST

Part Certification

☒	Using TOLERANCE method
☐	Using Part to Part variation

PLEASE SPECIFY THE FOLLOWING PARAMETERS AND COMPLETE THE FORM ACCORDINGLY PARAMETERS ARE

K1	Number of Trials	Must be either 2 or 3	3	OK
K2	Number of Operators	Must be either 2 or 3	3	OK
K3	Number of Parts	Can be any value between 2 and 10	2	OK

Part Number (Delphi:10757690)	Part Name	ASM TERM F APEX 2.8 SN	Plant	Delphi Packard USA 11
Characteristic GAP	Gage Number	1116 PRESS PPT VISION SYSTEM	Coord by	MILLER, LAURIE-JO
Tolerance 0.125 Units MM	Gage Name	PPT M40 VISION SYSTEM	Phone #	330-373-3499
Tolerance (Tol) 0.125	Gage ECL/Revision	NA	Date Of Study	18-JUL-12
		Resolution		
		Calibration		
		Tolerance		

Guidelines for acceptance of gage repeatability and reproducibility (%R&R):

UNDER 10% ERROR: Gage system OK

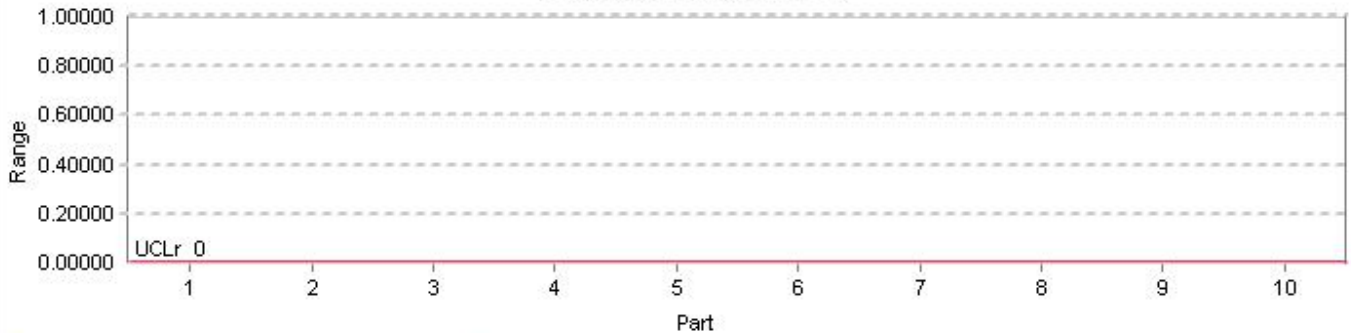
10% to 30% ERROR: May be acceptable based upon importance of application. Calculate breakpoint = $RPN \times (\% \text{ Gage R\&R}/100)$ and check that is less than 37.8 and (% Gage R&R) less than 30%. See next page for conclusion of usage.

OVER 30% ERROR: Gage system needs improvement. Identify the problems and have them corrected.

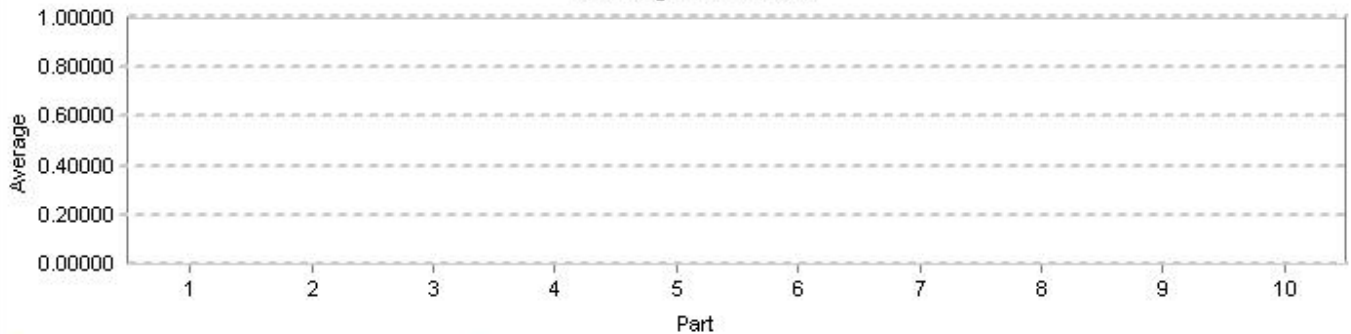
DETERMINE THE RISK PRIORITY NUMBER (RPN) FROM THE FMEA ASSOCIATED WITH THE DIMENSION BEING GAGED. TYPE THE RPN# UNDER THE RPN # FIELD PROVIDED (RIGHT) AND FOLLOW INSTRUCTION OF USAGE IN NEXT ROW.

BREAKPOINT	=	RPN#	X	%GRR/100
	=		X	

Range Chart by Operator



Average Run Chart



Notes: