



Terminal Crimp Process Verification Report

Thermtrol Report No.:		Tyco_63850-1_18AWG 16/30 Strd_BAOH01_06211	
Project Name:	VR Report	Customer:	
Project Type:	FPA	Preparing Location:	Vietnam
Requested By:		Request Date:	27-Feb-11
Prepared By:	TVN	Completion Date:	03-Mar-11

Thermtrol Product:	Wire Harness Ass'y	Thermtrol Plant:	Thermtrol (VSIP) Co., Ltd.
Customer Part #:	-	Thermtrol Part #:	-
Terminal Supplier:	Tyco	Terminal Supplier Part #:	63850-1

Wire Manufacturer:	BAOH01	Thermtrol Applicator #	AMP-128
Wire Description:	UL3321 Tinned copper	Supplier Applicator #	680347-1
AWG & Stranding	18AWG 16/30 Strd	Applicator Serial #	640563
Wire Insulation Range:	0.118 +/- 0.004 inch	Conductor Punch P/N	4-456406-7
Crimp Configuration	Single crimper	Insulation Punch P/N	1-456134-4
Conductor Crimp Range:	20 - 16 AWG	Insulation Anvil P/N	N/A
Insulation Crimp Range:	0.090 - 0.130 inch Dia.	Conductor Anvil P/N	4-683452-0
		# Strikes Recorded	New Tooling

Conclusions & Results:

This terminal meets all critical OEM application specifications, quality criteria and Thermtrol guidelines for acceptable crimps based on IPC- A620 and SAE/USCAR-21 specifications and it should be considered as acceptable for use in Customer Products.

Customer's Comments:

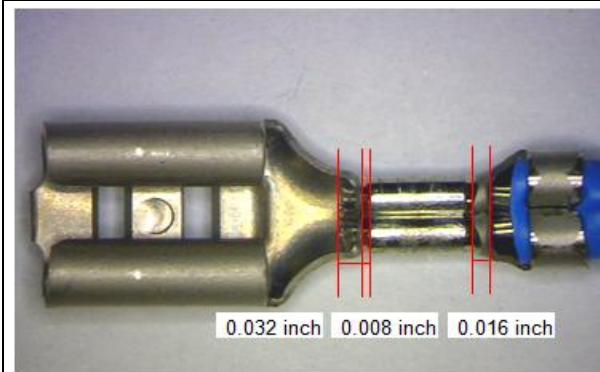
Report Prepared By:	LE VAN CHUNG		
Accepted By:	Customer Engineering	Date:	mm/dd/yy



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Prepared By:	TVN	Completion Date:	3-Mar-11

Configuration & Visual Inspection Photo



Observations:	
The overall crimp and terminal visual inspection: Based on visual inspection, classify this crimp as acceptable, process issue, or design issue.	
Check Points:	Classification
Terminal mating area is not damaged by the crimping process.	Acceptable
Deformation of the terminal from the crimping process is within supplier's specification.	Acceptable
Both the Insulation and Conductor are visible in the terminal inspection window.	Acceptable
There are no wire strand nicks.	Acceptable
The insulation has an even cut with no tearing (jagged edges).	Acceptable
Insulation does not extend into the conductor crimp.	Acceptable
Bell mouth(s) on conductor crimp meet supplier's specification.	Acceptable
Wire brush is visible, uniform, and evenly distributed.	Acceptable
Wire brush does not interfere with the terminal's mating section. Wire brush meets supplier's specification.	Acceptable
Visual inspection of terminal shows no signs of material cracking as a result of the crimping process.	Acceptable
Additional Comments:	

- Measurement Criteria
1. Thermtrol Visual Acceptance Criteria for Crimped Terminals
 2. IPC-A-620
 3. SAE/USCAR-21
 4. OEM Application/ Material Specifications and Crimping Guides

Category	Measurement	Specification	Meets Criteria?
Bellmouth Brush End	0.008 inch	0.000 - 0.025 inch	Yes
Bellmouth Entry End	0.016 inch	Visible - 0.025 inch	Yes
Cut off Tab #1 (front)	0.014 inch	0.000 - 0.020 inch	Yes
Cut off Tab #2 (wire end)	0.012 inch	Visible - 0.020 inch	Yes
Brush Length	0.032 inch	Visible - 0.045 inch	Yes
Insulation Inspection Window comments	<i>Thermtrol specifies that in the insulation inspection window, the insulation and conductor lengths should be as close to 50/50 as possible. The insulation length should be at least 20% of the window length, and no more than 75% of the window length.</i>		
Conductor Crimp Seam - comments	The conductor crimp seam is closed and there is no evidence of loose conductor strands visible in the seam.		
Twist & Roll - comments	There is no evidence of twist, roll, or any other damage to the mating portion of the terminal.		

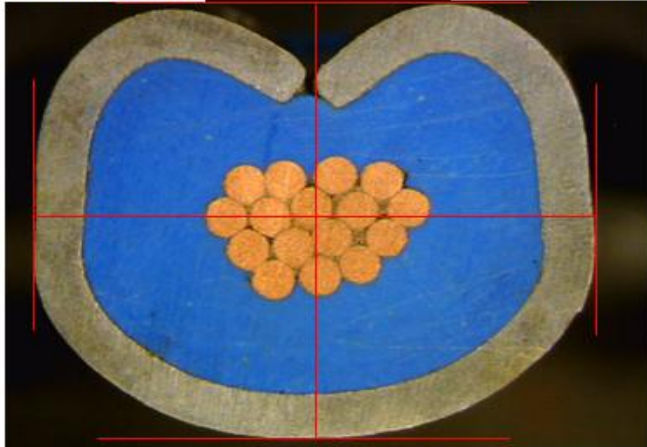


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Insulation Crimp Cross Section

CVH: 0.1337 inch CW: 0.1448 inch



Observations

Evaluation based on IPC A-620 sec. 5.1.1
Based on observations, classify this insulation crimp cross section as acceptable, process issue, or design issue.

Check points

Classification

Insulation crimp wings contact at least 180 degrees of the insulation surface.	Acceptable
End of each wing contacts the wire insulation. (Overlapping crimp has end of one wing in contact with insulation.)	Acceptable
None of the wings penetrate the insulation. (This is not allowed by Thermtrol)	Acceptable
Crimp is symmetrical.	Acceptable
No insulation extruded between the wing gaps. Wing gap is not greater than 45 degrees.	Acceptable

Additional Comments:

Category	Measurement	Specification**	Meets Criteria?
Height*	0.1337 inch	<i>0.130 +/- 0.005 inch</i>	Yes
Width*	0.1448 inch	<i>0.140 +/- 0.010 inch</i>	Yes

*Measurements are from a 1 piece sample set

** Reference Only

Measurement Criteria

1. IPC-A-620
2. SAE/USCAR-21
3. OEM Application / Specifications and Good Crimping Guides
4. C-4 - 7.4.4



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Conductor Crimp Cross Section

Cross Section Close to Conductor Crimp Center		Observations
C/H: 0.0499 inch C/W: 0.0930 inch Area: 0.00103 inch ²		Evaluation based on IPC A-620 sec. 5.1.1 Based on observations, classify this insulation crimp cross section as acceptable, process issue, or design issue.
	Check Points:	Classification
	Compression: No round strands. All strands are deformed.	Acceptable
	The crimp is symmetrical. The distance between wing tips is not greater than the material thickness of the terminal. Strands are evenly distributed.	Acceptable
	No air gaps in the conductor crimp.	Acceptable
	No cracks or breaks in the terminal material (normally linked to excessive extrusion.)	Acceptable
	Wings Locked. No gaps between wings. Wing tips do not contact bottom or side of terminal.	Acceptable
Burr Left Height: 0.0026 inch Burr Right Height: 0.0014 inch		
Additional Comments:		

Center Wire Crimp Analysis			
Category	Measurement	Specification	Meets Criteria?
Height*	0.0499 inch	0.049 +/- 0.002 inch	Yes
Width*	0.0930 inch	0.090 +/- 0.005 inch	Yes
Pull Test**	43.8967 lbs	> 20 lbs	Yes
Wire Barrel Flash / Extrusion	Left burr - 0.0026 inch Right burr - 0.0014 inch	0.010 inch Max	Yes
Wire CMA	1600.00	1324.96 - 1900.96	Yes
Strand Count	16	16	Yes
Strand Diameter	0.0100 inch	0.0100 inch	Yes
Crimp Compression*	18.43%	10% <= 30%***	Yes

*Measurements are from a 1 piece sample set

**Measurements are the mean of a 30 piece sample set.

***For copper wire material only

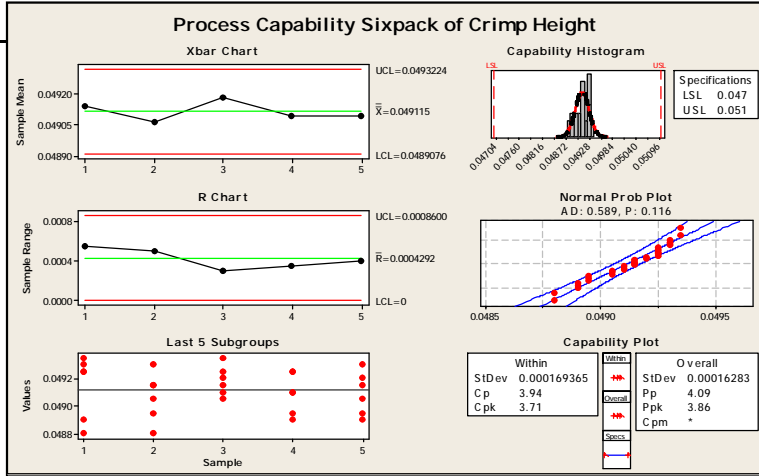
Measurement Criteria

1. IPC-A-620
2. SAE/USCAR-21
3. OEM Application / Specifications, UL 758 and Good Crimping Guides
4. C-4 - 7.3.4



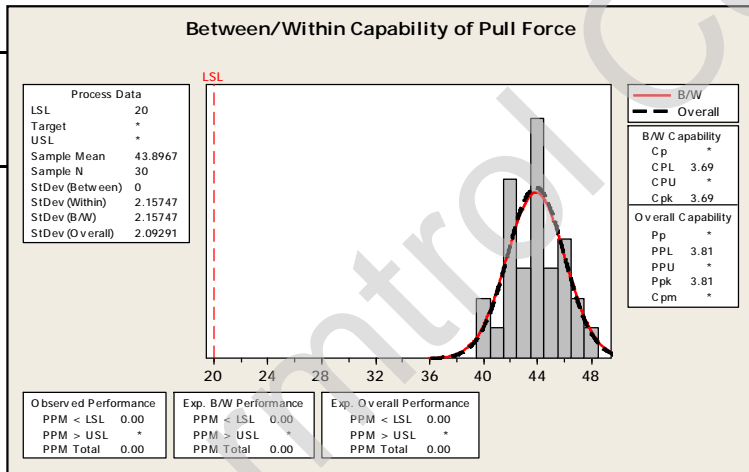
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0.04930	0.04925
0.04890	0.04925
0.04880	0.04935
0.04905	0.04915
0.04930	0.04880
0.04895	0.04915
0.04910	0.04925
0.04920	0.04915
0.04935	0.04905
0.04895	0.04910
0.04925	0.04890
0.04925	0.04910
0.04895	0.04890
0.04930	0.04905
0.04920	0.04915

Version: 14.1



43.59	44.29
43.61	45.48
43.14	40.16
41.52	45.64
44.45	42.81
40.48	43.32
44.33	41.79
45.72	42.21
46.07	47.96
46.90	41.67
40.63	46.33
44.44	45.15
44.47	43.97
41.98	42.23
45.12	47.44

Statistical Software Used: Minitab

Version: 14.1



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Wire Description:	UL 3321 Tinned	AWG & Stranding:	18AWG 16/30
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Wire Insulation Cross Section & Visual Photo

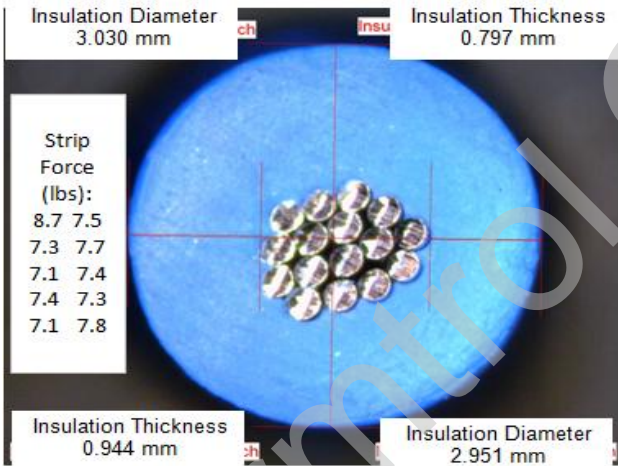


Observations:

The overall wire visual inspection:
Based on visual inspection, classify this wire as acceptable, process issue, or design issue.

Check Points:	Classification
Insulation diameter is within supplier's specification.	Acceptable
Insulation thickness is within supplier's specification.	Acceptable
Wire CMA is within supplier's specification.	Acceptable
Number of strands is within supplier's specification.	Acceptable
Strand diameter is within supplier's specification.	Acceptable
Wires strands is tinned/ non-tinned as per the specified specification.	Acceptable

Additional Comments:



Measurement Criteria

1. Thermtrol Visual Acceptance Criteria
2. Customer prints
3. Customer specifications
4. UL Specifications

Category	Measurement	Specification	Meets Criteria?
Insulation Diameter *	2.991 mm	<i>3.0 +/- 0.1 mm</i>	Yes
Insulation Thickness *	0.871 mm	<i>0.69 mm Min</i>	Yes
Wire CMA	1600	<i>1324.96 - 1900.96</i>	Yes
Strand Count	16	<i>16</i>	Yes
Strand Diameter	0.0100 inch	<i>0.0100 inch</i>	Yes
Tinned or Non-Tinned	Tinned	<i>Tinned</i>	Yes
Strip Force (min. and average value of 10 samples) **	7.1 lbs Min 7.5 lbs Average	-	-

Notes:

1. * Measurements are average of two values as shown in the picture above
2. Wire color in the pictures of wire insulation cross section above may be different from wire color used in crimping studies and actual products, however they are all the same UL style, wire size, strand count, insulation diameter, insulation thickness.
3. ** Strip Force Test Method: 1) Test Sample: Take a 4.5 inch sample with 1.5 inch bare at both ends and 1.5 inches insulated. 2) If the stripability force on two or more of ten specimens tested does not meet the limits of the applicable material specification or if the average stripability force does not meet the limits, the material shall be rejected.



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This verification report only shows that the design is centered and the manufacturing process is capable.

By signing below, supplier is certifying to Customer the following:

- 1) The information and data contained within this report is true and accurate.
- 2) A day-to-day process control plan is in place that assures parts are produced to a Cpk of 2 or better.
- 3) This verification report and the supplier's day-to-day process control plan will be included with the FPA submittal to the Customer using division.

<u>Certified By:</u>	Signature		<u>Date:</u>	
	Print Name	CAO HUNG SON Authorized Supplier Representative		3-Mar-11 dd-mmm-yy
	Phone	+84-650-3782873	Email	chson@thermtrol.com