

From: **Quality Assurance HellermannTyton GmbH**

Subject: PPAP Approval signature deadline

Dear customer:

As you are aware the PPAP process is an integral part of our business. With that in mind, we are informing our customers who are requesting a PPAP that there is a 30 day (calendar) deadline to which we are expecting your reply back with a signed copy of the PSW with a disposition regarding it's validity. It is important that we maintain compliance to the current AIAG PPAP manual.

As a part of compliance a signed and approved PSW is essential for our records.

We reserve the right to consider that PPAP valid and complete, if we do not receive a signed copy of the PSW within 30 days (calendar).

Once you have received our PPAP information please e-mail us a copy of your disposition with the appropriate signatures as soon as possible to the following person:

nescha.lohse@HellermannTyton.de

Quality Assistant

phone: +49 (0) 4122 701 5726

Your cooperation is greatly appreciated!

Respecting the procedure as described above, the documentation with HellermannTyton PB-No.:			
99613	with submission date	23.09.2022	will be considered as complete and valid auto-
atically on	23.10.2022	unless otherwise disposed!	

HellermannTyton

99613

Performance Test Results

Blanket statements of conformance are unacceptable for any test results.

<u>CREATOR</u>	<u>TITLE</u>	<u>DATE</u>
i.A. N. Lohse	Quality Assistant	23-Sep-22

Current Material Certificate



HELLERMANN TYTON
6701 W GOOD HOPE RD
MILWAUKEE WI 53223
USA

A&R Houston c/o Celanese
4100 Malone Drive,
PASADENA TX 77507
USA

Type 4 Certificate of Analysis

CELCON M90 CF2001 NATURAL Z5

Customer Part No.: URACETAL9
Formula No.: M90
Catalog: 20000111
Color No.: CF2001
Produced at: Bishop, TX, USA

Cert Issue Date: 10 Aug 2021
Qty Shipped: 6,614,000 LB
Order Item /date: 2419155 30 / 15 Jan 2021
Delivery item/date: 87159501 900001 / 20 Aug 2021
Account #: 2092090
Customer PO No.: 147955
Rail car: .

Batch 0001560815

In reference to the above, this is to advise you that this is a standard product and meets the following requirements:

SPECIFICATIONS: ASTM D6778 POM213

BATCH RELEASE DATA		UoM	Value	Limit
Melt Flow Rate (MFR)	(ISO 1133-1, ASTM D1238)	g/10min	9.40	7.00 - 11.00
ANNUAL TESTS (REVISED ON)		UoM	Value	Limit
Charpy Notched Impact Strength	(23 Aug 2020)	kJ/m ²	5.90	min. 3.50
Tensile modulus	(23 Aug 2020)	MPa	2763	min. 2200
Tensile Stress at Yield	(23 Aug 2020)	MPa	65.2	min. 58.0
INITIAL CHARACTERIZATION		UoM	Value	Limit
Flammability		mm/min	24.0	max. 101.6
Density		g/cm ³	1.400	1.380 - 1.430
Melt Point @ 10 deg/min		°C	166.0	min. 160.0
DTUL @ 1.8MPa		°C	99.0	min. 80.0
Flexural modulus		MPa	2453	
Flexural Stress		MPa	73.0	

COMMENTS

Flammability is performed on a 100x355x1mm (4x14x0.04 in) plaque test specimen according to FMVSS302. Flammability is not a part of the ASTM D 6778 callout requirement, but is shown for informational purposes.

Flexural Modulus and Flexural Stress are not part of the ASTM D 6778 callout requirement, but are shown for informational purposes.

NOTE: ASTM D4181-POM213 IS SUPERCEDED BY ASTM D6778 POM213

"MVR is not a requirement for the ASTM D6778 callout specified. However, MVR can be estimated by the following formula utilizing the melt density of the product: $MVR (cm^3/10 \text{ minutes}) = MFR (g/10 \text{ minutes}) / 1.165 (g/cm^3)$."

Current Material Certificate



HELLERMANN TYTON
6701 W GOOD HOPE
MILWAUKEE WI 53224
Attention : QUALITY DEPARTMENT
Customer Part No: UR0HIRHSUV0

Ascend Performance Materials Operations LLC
Nylon Plastics and Polymers
3000 Chemstrand Road
Cantonment, FL 32533
Telephone : (850)968-7000

Certificate Date : 21-Jun-21
Delivery No : 382570758
Shipped Qty : 48,480.000 Lbs
21,074.258 Kgs
Customer P.O. No: 146595-83
Container : SLAY 5300

Certificate of Analysis

This certifies that Nylon Resin shipped to you from Ascend Performance Materials Operations LLC has been tested and found to meet required specifications.

This material was produced under a Quality System that meets ISO 9001:2015 and IATF 16949:2016 criteria.

If you have questions or concerns about this Certificate of Analysis, please contact Ascend Performance Materials Customer Operations at 1-888-927-2363.

This product meets the requirements of the following specifications: SAE J1639, SAE J1639 PA0171, ASTM D6779-PA0161-Z1Z2, ASTM D4066 PA0161, FMVSS 302, MS-DB-41 CPN 1826, ESB-M4D178-A2, WSS-M99P23-C1/C2, WSS-M99P9999-A1, WSSM4D706B1, WSS-M99P1111-A, WSS-M4D706-A4, WSK-M4D706-A, GMW16447P-PA66-T2, GMW16558P-PA66-T1 and GMP.PA66.015, Ford WQ 100C.

Material: VYDYNE 47H BK0644 Material No: 10404298 Batch No: JF17FY01 Date of Mfg: 17-Jun-2021

Ascend Performance Materials Operations LLC Specification

Lot Data Property	Test Method	Min	Max	Result	Units
Copper	STM 00667	125	250	206	PPM
Flammability @ 0.8mm	UL 94HB	P	P	P	N/A
Moisture	ASTM D6869	0.10	0.20	0.12	%
Strength @ Yld	ISO 527-1,2 / 1A	50	70	59	MPa

Note: This certificate is generated and controlled by electronic means. No signature is required. This document may not be reproduced, except in full, without written consent of the Nylon Plastics and Polymers Department, Ascend Performance Materials Operations LLC.

All information contained in this letter is provided for informational purposes only and is not meant to alter or waive the appropriate contractual product specifications. Moisture values are representative of the product at the time it was sampled. If numerical flame spread ratings appear herein, they are not intended to reflect the hazards presented by this or any other material under actual fire conditions. Each end user should determine whether potential fire hazards are associated with the finished product, and whether this resin is suitable for the particular end use.

This Certificate of Analysis is provided by Ascend Performance Materials (or its authorized distributor) to its direct purchaser only and is intended for internal use. It is not valid if resold, conveyed or otherwise transferred to another party without Ascend's prior written consent. Ascend makes no warranties and assumes no liability for any product or certification obtained from an unauthorized source. Contact Ascend at +1 713-315-5700 to confirm the validity of any third party supplier. Ascend and Vydine are registered trademarks of Ascend Performance Materials Operations LLC.

**POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS**

Part Description: Cable Ties (PFMEA) PFMEA Number: US-OP-APQP-1

Process Description: Inj Molding + Dim / Func / Performance FP + Packaging (w/hand insertion, auto & manual pack, water dosification if required) Process Responsibility: HellermannTyton Prepared by: QA PRP Team

Model Year(s) / Vehicle(s): NA Key Date: 12/10/2020 PFMEA Date Org: 12/10/2020 Rev. Date: See Footer

Core Team: Quality Assurance, Manufacturing, Automation, Receiving-Shipping Rev. Level: See Footer

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
1 QA Receiving Certificate of Analysis (C of A)	HT Spec or MTS and C of A	QA does not receive C of A	Delay in Manufacturing	5		C of A not listed on PO	4	P - WI-PUR-6	2	40	None						0
				5		Supplier forgot to send out C of A to HT QA	5	P - purchase order requirement	2	50	None						0
		Wrong HT Spec or MTS	Delay in manufacturing / Customer Dissatisfaction	5		Incorrect HT Spec or MTS on PO	4	P-Work instruction D-Visually verify to HT Spec or MTS in ERP System	2	40	None						0
		Information on C of A does not match HT Spec or MTS	Delay in Customer Shipment	5		HT Spec or MTS does not have the latest released revision.	4	P-Work instruction P-Change management D-Visually verify to HT Spec or MTS in ERP System	2	40	None						0
				5		Supplier only test to the latest released revision	4	P-Work instruction P-Change management D-Visually verify to HT Spec or MTS in ERP System	2	40	None						0
				5		Supplier does not test to the latest released revision	4	P-Work instruction P-Change management D-Visually verify to HT Spec or MTS in ERP System	2	40	None						0
		Timely update of ERP (JDE)	Delay in Customer Shipment	5		Manual operation and no system reminder.	3	P-Work instruction P-Change management D-Visually verify to HT Spec or MTS in ERP System	2	30	None						0
2 Incoming Receiving, QA Inspection (if required), & Movement to Storage	Verify material / parts have all information per PO	No Label	Loss of Traceability	5		Label falls off	3	D - Incoming Inspection P- Supplier PPAP	2	30	None						0
		Wrong Label	Wrong parts in inventory, delay in manufacturing	5		Wrong product was shipped	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0
		Incorrect material / part	Delay in Customer Shipment	5		Wrong product was shipped	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0
				5		Ordered Part Number entered incorrect	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0
		Wrong Quantity	Customer Dissatisfaction	4		Quantity of product shipped by supplier was incorrect	2	D - Incoming Inspection	2	16	None						0

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													Actions Taken	Severity	Occurrence	Detection	R P N
				4		Order quantity entered incorrect	2	D - Incoming Inspection	2	16	None						0
		Incorrect Packaging	Delay in Customer Shipment	5		Product received did not have correct packaging	3	D - Incoming Inspection	2	30	None						0
		Poor material / part Quality	Customer Dissatisfaction	7		Product received is non-conforming	2	D - Incoming Inspection P- Supplier PPAP	7	98	None						0
		Moisture Too High / Low	Delay in Customer Shipment	5		Damaged in transit	4	D - Incoming Inspection P- Supplier C of A D - Moisture Log & Share Point	2	40	None						0
		Wrong colorant received (if required)	Delay in Customer Shipment	5		Wrong product was shipped	2	P - ERP System, WI-SR-10.2-1, WI-QA-10.3-1	4	40	None						0
	Non-Silo resins & purchased components moved to storage	Non-Silo resins & purchased components not moved to storage	Delay in Manufacturing	5		Manual operation / operator error	3	D/P - ERP system / WI-SR-10.2-1	4	60	None						0
	Silo-resins moved to storage	Silo-resins not moved to storage	Delay in Manufacturing	5		Manual operation / operator error	2	D/P - ERP system / WI-MH-1	4	40	None						0
3 Cell Clearance	Clear Cell from Previously run job	Cell not cleared of equipment and / or materials from previously run job	Delay in manufacturing	5		Cell clearance not followed per Production Control System	2	D - Production Control System	4	40	None						0
			Wrong material used for product	8		Cell clearance not followed per Production Control System	2	D - Production Control System	4	64	None						0
4 Resin Movement, Resin Ratio Central Material Handling System Operation	Acceptable resin for production	Unacceptable Moisture Levels	Part Non-Compliance	7		Dryer malfunction	2	D - Dryer Alarms D/P - Moisture Testing P - Filter Cleaning	2	28	None						0
		Contamination	Part Non-Compliance	7		Foreign Matter in Material	2	D - Visual Inspections P - Material Handling Work Instruction w/ color-coded containers	6	84	None						0
			Part Non-Compliance	7		Incorrect resins/colorant Mixed Together	2	D - Visual Inspections P - Material Handling Work Instruction	5	70	None						0
		Incorrect Material	Part Non-Compliance	8		Wrong material hook-up at press	2	D/P - Visual to Work Order	5	80	None						0
5 Injection Molding / Cell, Work Order, Press, & Automation Set-up	Instructions for production	All Non-resin items not present at cell	Delay in Manufacturing	5		WI or ERP system not followed	2	P/D- ERP system & WI-SR-10.2-1	4	40	None						0
		Work order not signed off	Work order has incorrect BOM	8		Incorrect set-up BOM in (JDE)	5	D-Change over checklist P- IE Set-up BOM (IMLS)	2	80	None						0
			Incorrect BOM used	8		Wrong label on material	2	P-Work instruction D-Flag system	2	32	None						0

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													Actions Taken	Severity	Occurrence	Detection	R P N
				8		Operator Error	3	P-Work instruction D-Flag system	2	48	None						0
		Work Order Set Up Incorrectly	Delay in Manufacturing	5		Work Order read incorrectly	2	D/P - Work Order D - Set-up Verification	5	50	None						0
		Wrong work order used	Delay in Manufacturing	5		wrong work order sent to machine	2	D/P - Work Order D - Set-up Verification	5	50	None						0
		Incorrect Blending	Part Non-Compliance / Breakage and Color Match Failures	7		Material blender set incorrectly	2	D/P - Visual to Work Order D- Quality Tree P - First Piece Approvals	5	70	None						0
		Excess Plastic on Ties	Part Non-Compliance	6		Hot Excess Runner	2	D - Visual Inspections, Quality Tree P - In-process Inspections	7	84	None						0
				6		Improper start-up	2	D - Visual Inspection, Quality Tree D - LPA D/P - In-process & Cell Inspections P - First Piece Approvals	5	60	None						0
		Soft Insertions	Part Non-Compliance	6		Thermolator Malfunction	2	D - Visual Inspections D-Audible alarms added to all Thermolator to detect temp. dev. D - In-process Inspections P - First Piece Approvals D - Hand Insertion	3	36	None						0
				6		Incorrect Tonnage	2	D- Visual Inspections D- Hand Insertions P - First Piece Approvals P - In-process PM's	4	48	None						0
				6		Start-up/Cycle Interruptions	4	D- Visual Inspections D - In-process Inspections D- Hand Insertions	4	96	None						0
				6		Fast Cycle Time	2	D - Visual Inspection, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals	4	48	None						0
				6		Leader Pin/Sidelock Wear	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In Process PM	4	48	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Plugged Sprue Tips / Gates (Hot Manifold/Valve-Gated Molds)	Part Non-Compliance / Unbalanced Fill	7		Material Contamination	2	D- Visual Inspections, Quality Tree D - In-process Inspections P - Magnets in Hopper and Melt Filters on Nozzle	5	70	None						0
		Start up scrap packaged	Customer Dissatisfaction	4		Automation equipment started too early after start up of process re-start.	4	D - Visual Inspections P - Work Instructions P - Automation disable switch during changeover D/P - In-process & Cell Inspections	5	80	None						0
		Camera stops working	Customer Dissatisfaction	6		Mechanical, power failure, lenses blocked, conveyor belt dirty, component failure.	2	P - Master sample (Known Bad and Good parts)	2	24	None						0
		Pass Blocked Head, and Missing Pawl on part	Part non-compliance	7		Mechanical failure and background light	2	P - Master sample (Known Bad and Good parts)	2	28	None						0
		Rejecting Non-blocked Head and part with Pawl	High scrap rate	4		Mechanical failure and background light	2	P - Master sample (Known Bad and Good parts)	2	16	None						0
		Auto-degator stops working (if required)	Delay in Manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		End of Arm Tool stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		Auxiliary Assembly Equipment stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		Packaging Equipment stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
6 First Piece Approval Injection Molding Process	Manufacturing a conforming part per specifications	Sinks in heads and straps	Part Non-Compliance Tensile and Wire Bundle Failures	5		Insufficient Hold Pressure	2	D- Visual Inspections, Quality Tree P - First Piece Approvals	5	50	None						0
				5		Cycle Time Too Fast	2	D- Visual Inspections, Quality Tree P - First Piece Approvals	5	50	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Incorrect Blending	Part Non-Compliance / Breakage and Color Match Failures	5		Material Handling Error	2	D/P - Visual to Work Order, Quality Tree P - First Piece Approvals	5	50	None						0
		Burnt tips	Part Non-Compliance / Cosmetic Issues / Short	4		Plugged/Worn Vents	3	D- Visual Inspections, Quality Tree P - First Piece Approvals P - In process PM's using Ice Blasting	5	60	None						0
		Sticking in mold	Part Non-Compliance / Mold Damage	5		Excessive Mold Temperatures	2	D- Visual Inspections P - First Piece Approvals D - Audible alarms added to all Thermolators to detect temp. dev.	5	50	None						0
				5		Excessive Hold Pressure	2	D- Visual Inspections, Quality Tree P - First Piece Approvals	6	60	None						0
				5		Residue Build-Up	2	D- Visual Inspections, Quality Tree P - First Piece Approvals D - Audible alarms added to all Thermolators to detect temp. dev.	5	50	None						0
				5		Water hooked up incorrectly	2	D-Visual Inspections	7	70	None						0
				5		Packaging interruptions Degator Jams	3	D- Visual Inspections P - First Piece Approvals	5	75	None						0
				5		Heater band malfunctions	2	D- Visual Inspections D - In-process Inspections P - PM	5	50	None						0
		Excess Plastic on Ties	Part Non-Compliance	5		Hot Excess Runner	2	D - Visual Inspections, Quality Tree P - In-process Inspections P- First Piece Approvals	5	50	None						0
		Blocked / Misformed Head	Part Non-Compliance	5		Broken Insert/Ejector Blade	2	D - Visual Inspections, Quality Tree P - Final Inspection P - First Piece Approvals	5	50	None						0
		Cut Head	Part Non-Compliance	5		Automation Malfunction	2	D - Visual Inspections P - Inspections at the cell P - First Piece Approvals D - Alarms allowing Operators to scrap parts after cups are emptied	5	50	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Missing or Extended Pawl	Part Non-Compliance	5		Thermolator Malfunction	2	D - Visual Inspections D - In-process Inspections P - First Piece Approvals D - Hand Insertion D - Audible alarms added to all Thermolator to detect temp. dev.	3	30	None						0
				5		Restart(Mold Cleaning)	2	D/P- Visual Inspections D/P - Hand Insertion	5	50	None						0
				5		Improper start-up	2	D - Visual Inspections, Quality Tree D - LPA at startup P - Inspections at the cell	5	50	None						0
				5		Cycle Time Too Fast	2	D - Visual Inspections, Quality Tree P - Inspections at the cell	6	60	None						0
				5		Worn inserts	2	D - Visual Inspections P - Inspections at the cell P - PM Schedule	6	60	None						0
		Soft Insertions	Part Non-Compliance	5		Thermolator Malfunction	2	D - Visual Inspections D - In-process Inspections P - First Piece Approvals D - Hand Insertion D - Audible alarms added to all Thermolators to detect temp. dev.	3	30	None						0
				5		Cycle Time Too Fast	2	D - First Piece Approvals D - Visual Inspections, Quality Tree P - In-process Inspections	5	50	None						0
		Shorts	Part Non-Compliance / Cosmetic	5		Insufficient Injection Pressure compatibility of Press / mold	3	D- Visual Inspections P - First Piece Approvals P - In-process PM's	5	75	None						0
				5		Plugged/Worn Vents	3	D- Visual Inspections P - First Piece Approvals P - In-process PM's	5	75	None						0
				5		Residue Build-Up	2	D- Visual Inspections P - First Piece Approvals P - In-process PM's using Ice Blasting for mold cleaning	5	50	None						0
				5		Lot / Moisture Variations	2	D- Visual Inspections D - First Piece Approvals P - Material Certs P - Moisture Analysis	5	50	None						0

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													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Process Interruption	2	D- Visual Inspections D - First Piece Approvals P - Material Certs P - Moisture Analysis	5	50	None						0
		Flash	Part Non-Compliance / Insertion Failures / Cosmetic	5		Excessive Injection Pressure	3	D- Visual Inspections, Quality Tree D- Hand Insertions P - First Piece Approvals P - In-process PM's	4	60	None						0
				5		Incorrect Tonnage	2	D- Visual Inspections D- Hand Insertions P - First Piece Approvals P - In-process PM's P - Press Size Callout on Routing	4	40	None						0
				5		Water hook up incorrect on sub gated tools	4	D- Visual Inspections D - In-process Inspections D- Hand Insertions P - First Piece Approvals	4	80	None						0
				5		Start-up/Cycle Interruptions	3	D- Visual Inspections D - In-process Inspections D- Hand Insertions P - First Piece Approvals	4	60	None						0
				5		Clamp pressure on press	3	D- Visual Inspections D - In-process Inspections D- Hand Insertions P - First Piece Approvals	4	60	None						0
				5		Worn inserts	4	D- Visual Inspections D - Tool Tests D - In-process Inspections D- Hand Insertions P - First Piece Approvals	4	80	None						0
				5		Broken Insert/Ejector Blade	3	D- Visual Inspections, Quality Tree D - In-process Inspections D- Hand Insertions P - First Piece Approvals	4	60	None						0
		Breakage	Part Non-Compliance	5		Thermolator Malfunction	2	D - Visual Inspections D - Process Inspections P - First Piece Approvals D - Hand Insertion D - Audible alarms added to all Thermolators to detect temp. dev.	3	30	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Barrel Heat Malfunction	4	D - Visual Inspections D - In-process Inspections D - Parameter/Heat Checks D - Hand Insertions P - First Piece Approvals P - SPC Set-up to Trigger Faults	3	60	None						0
		Slippage	Part Non-Compliance / Strap Engagement Failure	6		Worn inserts	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals	5	60	None						0
				6		Fast Cycle Time	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals	5	60	None						0
				6		Dirty Inserts	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions D - Parameter/Heat Checks P - First Piece Approvals P - In-process PM	4	48	None						0
				6		High oil temperature on press due to insufficient water to cool	3	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In-process PM	4	72	None						0
		Mold Mismatch	Part Non-Compliance/High Insertion Force	6		Poor Mold Alignment	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In-process PM	4	48	None						0
				6		Leader Pin/Sidelock Wear	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In-process PM	4	48	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Deep ejector pins	Part Non-Compliance/High Insertion Force	3		Excessive Hold Pressure	3	D - Visual Inspections D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In Process PM	4	36	None						0
				3		Thermolator Malfunction	2	D - Visual Inspections D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In-process PM	4	24	None						0
				3		Fast Cycle Time	2	D - Visual Inspections, Quality Tree D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In-process PM	4	24	None						0
		Plugged Sprue Tips / Gates (Hot Manifold/Valve-Gated Molds)	Part Non-Compliance / Unbalanced Fill	3		Material Contamination	2	D- Visual Inspections D - In-process Inspections P - Magnets in Hopper and Melt Filters on Nozzle P - First Piece Approvals	5	30	None						0
				3		Mold Heater Malfunction	2	D- Visual Inspections D - In-process Inspections P - First Piece Approvals	5	30	None						0
				3		Valve Gate Malfunction	2	D- Visual Inspections D - In-process Inspections P - First Piece Approvals	5	30	None						0
		Elongated Sprues	Part Non-Compliance / Cut Heads and Missing Pawls	6		Inadequate Cooling	2	D- Visual Inspections D - In-process Inspections P - First Piece Approvals	5	60	None						0
		Start up scrap packaged	Customer Dissatisfaction	3		Automation equipment started too early after start up of process re-start.	3	P - Visual Inspections, Quality Tree P - Work Instructions, Training Manual P - Automation disable switch during changeover P - Inspections at the cell D - In-process Inspections	5	45	None						0
		Dimensional check shows out of tolerance condition (if required)	Part Non-Compliance	5		Excessive mold wear	2	P - Dimensional verification using calibrated gauging	4	40	None						0
				5		Process sheet not followed	2	P - Dimensional verification using calibrated gauging	4	40	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Functional check (if required) shows part does not perform as intended	Part Non-Compliance	6		Process sheet not followed	2	D - First Piece Acceptance Hung at the Cell	6	72	None						0
		Functional check (if required) shows part has damage	Part Non-Compliance	6		Process sheet not followed	2	D - First Piece Acceptance Hung at the Cell	6	72	None						0
		Performance Testing (if required) shows part does not meet specifications	Part Non-Compliance	6		Process sheet not followed	2	P - Performance verification using calibrated gauging	4	48	None						0
	Product Conforms per specifications before production	First Piece Not Hung	Delay in Manufacturing	3		Failure to hang First Piece	2	D/P - Tool Evaluation Sheet	6	36	None						0
	Revision level	Incorrect revision level produced	Customer Dissatisfaction	5		Work Order not compared to latest revision level drawing in JDE	2	D - First Piece Acceptance Hung at the Cell	6	60	None						0
7 Packaging & Labeling	Automated Packaging	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
	Manual Packaging + water (if required)	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
8 In-process Checks	In-process checks for hand insertions, process set-up, part quality - visual appearance	Checks not completed	Non-conforming products ship to customer	6		Process issues/Operator error	3	D-Operator check every other hour. D-Process Tech check every other hour. P-Prouction Control System/Work Order Log P-Work instruction /Process sheet	4	72	None						0
		Incorrect or Missing work order number on Bag	Traceability Loss	3		Printer Malfunction	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar	5	45	None						0
				3		Operator error	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar	5	45	None						0
		Incorrect or Missing Date Code on the Bag	Traceability Loss	3		Printer Malfunction	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar	5	45	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				3		Wrong/no date code on packaging - Operator Error	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar P - Work Instructions	5	45	None						0
		Degator Jams	Part Non-Compliance	5		Parts Not Aligned/cut heads	4	D - Visual Inspection p - Degator Guides P - Machine Alarms	4	80	None						0
			Loss Production	5		Dull Cutter Blades	2	D - Visual Inspection D - In-process Inspections P - PM P - Warped Sprue Detection	4	40	None						0
				5		Cylinder Failure	2	D - Visual Inspection D - In-process Inspections P - PM	4	40	None						0
		Incorrect Degator alignment	Cut Heads	5		Improper Set-up	2	D- Visual Inspection D - In-process Inspections P - Degator Guides - PM	5	50	None						0
						Manual Degator Jams	4	D- Visual Inspection D - In-process Inspections P - PM	4	80	None						0
						Automated Degator Jams	3	D- Visual Inspection D - In-process Inspections P - PM P- Degater Alarm	4	60	None						0
						Improper part feed	2	D- Visual Inspection D - In-process Inspections P - PM P- Degater Guides w/ Alarms	4	40	None						0
						Part missing from lead in edge of runner	2	D- Visual Inspection D - In-process Inspections P - PM P- Degater Alarm	4	40	None						0
		Greasy Parts Packaged	Part Non-Compliance	4		Robot Drags the Parts Across the Leader Pins	2	D - Visual Inspection D - In-process Inspections P - PM	5	40	None						0
		Incorrect Moisture in Bags	Part Non-Compliance / Parts Conditioned Incorrectly	5		Water Dosing system failure	2	D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance P - dosing system monitors flow	4	40	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Water Supply Not On	2	D - Monitoring Water P - Inspections at the cell	6	60	None						0
				5		Dirty or Clogged Filter	2	D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance P - dosing system monitors flow	4	40	None						0
				5		Improper Timer Setting	3	D - Monitoring Water P-dosing system monitors flow	4	60	None						0
				5		Bad Bag Seals leak water	2	D - Visual Inspection D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance	5	50	None						0
		Mis-labeling	Customer Dissatisfaction	3		Printer Ribbon not Inserted Properly	2	D - Visual Inspections P - Inspections at the cell P-Work order sign-off	7	42	None						0
				3		Wrong Labels Placed on Product	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	Implement work order log system for label check.	Trent Carlson 09/16/21	New work order log in place to verify per box correct label.	3	3	3	27
				3		Wrong Pre-labeled Bag for Product	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	None						0
				3		Excess Labels not Removed From Production Area	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	None						0
		Insufficient Bag Seals	Customer Dissatisfaction	3		Sealer Tape Worn	4	D - Visual Inspection P - Inspections at the cell P - Electronic Shift Log	6	72	None						0
				3		Bag Wrinkled/Bag Mil Thickness Inconsistencies	4	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				3		Sealer Malfunctions	2	D - Visual Inspection P - Inspections at the cell	7	42	None						0
				3		Material stuck on sealer	4	D - Visual Inspection P - Inspections at the cell P - Incoming Inspection	7	84	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				3		Improperly Adjusted Timer	4	P - Work Instruction D - Visual Inspection	7	84	None						0
				3		Teflon coating worn (Renncobaggers)	2	P - Work Instruction D - Visual Inspection P - In-process PM's	6	36	None						0
		Insufficient Packaging	Customer Dissatisfaction	3		Issues with the Bag Stock (Not Quantity)	3	D - Visual Inspection P - Inspections at the cell	7	63	None						0
				3		Insufficient Packaging Supplies	4	D - Visual Inspection P - Inspections at the cell	7	84	None						0
		Incorrect Quantity in Bag	Customer Dissatisfaction	4		Robot grippers failed to place parts	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Pick and Place Grippers Drop Parts	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Degator Jams	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Inconsistent Bag Width	2	P/D - Visual Inspection	8	64	None						0
		Missing or Incorrect Hang Hole	Customer Dissatisfaction	4		Bag register mark Inconsistencies	2	P/D - Visual Inspection	8	64	None						0
				4		Bags not Webbed Correctly	2	P/D - Visual Inspection	8	64	None						0
				4		Too Much Air in Bag	2	P/D - Visual Inspection	8	64	None						0
				4		Cylinder Failure	2	D - Visual Inspection P - PM	7	56	None						0
		Incorrect Quantity in Boxes	Customer Dissatisfaction	4		Improper Scale Set Up	3	D - Visual Inspections P - Inspections at the cell P - Bag Counter (T18R-C)	7	84	None						0
				4		Scale Out of Calibration	2	D - Visual Inspections P - Inspections at the cell P - Calibration Schedule	5	40	None						0
		Parts mixed	Customer Dissatisfaction	4		Operator mixed product from previous work order	2	D - Visual Inspection P - Inspections at the cell	7	56	None						0
9 QA Testing	Validation and documentation of product per specifications	Testing Incomplete	Part Non-Compliance	7		Testing Not Performed by QA	2	D/P - SPC software or WI, First Piece Acceptance. P- Daily Production Meeting	4	56	None						0
10 Layered Process Audit	Audit Production Process per Questions on LPA form F-PRD-9	Audit Missed	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-9	4	56	None						0
		Audit errors and/or incomplete audit	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-10	4	56	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
11 Inspection at the Cell	Product conforms per specifications throughout production run.	Bad Product Shipped	Customer Dissatisfaction	6		Inspections Not Performed	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				6		Bad Product not Found in Random Sampling	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
		Mis-labeling	Customer Dissatisfaction	3		Wrong Labels Placed on Product	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Wrong Pre-labeled Bag for Product	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Excess Labels not Removed From Production Area	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Wrong label provided	3	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	54	None						0
		Water Verification Incomplete	Part Non-Compliance	6		Water not Verified During Process Inspection	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
		Insufficient Bag Seals	Part non-compliance	3		Sealer Tape Worn	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Bag Wrinkled/Bag Mil Thickness Inconsistencies	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Sealer Malfunctions	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	36	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				3		Material stuck on sealer	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Improperly Adjusted Timer	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
		Incorrect Quantity in Bags	Customer Dissatisfaction	4		Scale issue	3	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off P - Calibration Schedule	5	60	None						0
				4		Operator error	3	P - Work Instructions D - Visual verification D- Share Point/Work Order Log	5	60	None						0
		Incorrect Quantity in Boxes	Customer Dissatisfaction	4		Improper Scale Set Up	3	D - Visual Inspections P - Share Point P - Bag Counter (T18R-C)	5	60	None						0
				4		Scale Out of Calibration	2	D - Visual Inspections P - Share Point P - Calibration Schedule	5	40	None						0
		Insufficient Packaging	Customer Dissatisfaction	3		Issues with the Bag Stock (Not Quantity)	3	D - Visual Inspection P - Share Point	7	63	None						0
				3		Insufficient Packaging Supplies	4	D - Visual Inspection P - Share Point	7	84	None						0
		Incorrect or Missing Date Code on the Box	Traceability Loss	3		Operator error	3	D - Visual Inspections P - Date Code Calendar P - Work Instructions P-Share Point/Work Order Log	5	45	None						0
12 Validation Testing (Annually if required)	Meet customer requirements	Annual Validation not Completed	Customer Dissatisfaction	5		Customer Specific Requirements Not Met	2	D/P - PPAP Matrix P-Training Quality Personnel	3	30	None						0
13 Finished Goods Movement	Move products from Injection Molding work station to Stock or Shipping Dock	Good product put in Hold	Delay shipment to customer	5		Incorrect cone put on product at Molding Work Station	2	D - Visual Inspections P -Hold ticket attached P-Work instructions	3	30	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Bad Product Shipped	Customer Dissatisfaction	7		Incorrect cone put on product at Molding Work Station	2	D - Visual Inspections P -Hold ticket attached P-Work instructions	6	84	None						0
	FIFO, Physical Inventory Location, ERP (JDE)	Incorrect receive in ERP	Inaccurate Inventory-Delay Production	5		Operator error	3	P-Work instructions D-Accounting verification D-Inventory cycle count	5	75	None						0
		Inventory put on wrong location	Inaccurate Inventory-Delay Production	5		Operator error	3	P-Rack label D-Inventory cycle count	5	75	None						0
		Damage during transfer	Delay in Customer Shipment	5		Operator error	3	P-Operator training D-Visual Inspections	6	90	None						0
14 Shipping to Warehouse or Customer	Ship Parts per Shipping Specifications	Shipped Incorrectly	Customer Dissatisfaction	4		Late Shipment	3	D/P - Visual Inspections	7	84	None						0
				5		Damaged from Handling	2	D/P - Visual Inspections	7	70	None						0
				5		Damaged Shipment in transit	2	D/P - Visual Inspections	7	70	None						0
				5		Customer Specific Requirements Not Met	2	P-Customer specific packaging requirement P-Work instructions D-Visual inspections	6	60	None						0
	Sales order	Incorrect data on Sales order	Customer Dissatisfaction	5		Operator error	2	D-Visual inspection D-ASN	5	50	None						0
	Manual shipping request	Incorrect data entered in ERP	Customer Dissatisfaction	5		Operator error	2	D-Visual inspection D-ASN	5	50	None						0
	Product package per specifications	Wrong Parts Picked	Customer Dissatisfaction	5		Operator Error	2	D - Staging Visual Inspection P - Pick List	5	50	None						0
		Wrong Quantity Picked	Customer Dissatisfaction	5		Wrong Quantity of Parts Picked	2	D- Visual inspection & sign off P - Staging Inspection	6	60	None						0
		Incorrect Packaging	Customer Dissatisfaction	5		Incorrect Packaging Specifications on Pick List	3	D - Staging Visual Inspection P - Pick List	5	75	None						0
	Product/box label per specifications	Put Label on Wrong Box	Customer Dissatisfaction	5		Operator error	3	D-Visual inspection & sign off D-Scan barcode D-ASN	4	60	None						0
	Ship product per customer requirements	No inventory available	Customer Dissatisfaction	5		Production delay-No FG inventory/Customer order late	3	D- ERP System P - Customer service communication to customer	4	60	None						0

**POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)**

PFMEA Number: **US-OP-APQP-2**

Part Name: Clips/Mounts/Brackets/Various Materials/Clamps

Process Description: Inj Molding + Dim / Func / Performance FP + Assy (Auto or Manual) + Packaging

Model Year(s) / Vehicle(s): NA

Core Team: Quality Assurance, Manufacturing, Automation, Receiving-Shipping

Process Responsibility: HellermannTyton

Key Date: 12/14/2020

Prepared by: Quality Assurance

PFMEA Date Org: 12/14/2020 Rev. Date: See Footer

Rev. Level: See Footer

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
1 QA Receiving Certificate of Analysis (C of A)	HT SPEC and C of A	QA does not receive C of A	Delay in Manufacturing	5		C of A not listed on PO	4	P - WI-PUR-6	2	40	None						0
				5		Supplier forgot to send out C of A to HT QA	5	P - purchase order requirement	2	50	None						0
		Wrong HT SPEC	Delay in manufacturing / Customer Dissatisfaction	5		Incorrect HT SPEC or MTS on PO	4	P-Work instruction D-Visually verify to SPEC in ERP System	2	40	None						0
		Information on C of A does not match HT SPEC	Delay in Customer Shipment	5		HT Spec or MTS does not have the latest released revision.	4	P-Work instruction P-Change management D-Visually verify to SPEC in ERP System	2	40	None						0
				5		Supplier only test to the latest released revision	4	P-Work instruction P-Change management D-Visually verify to SPEC in ERP System	2	40	None						0
				5		Supplier does not test to the latest released revision	4	P-Work instruction P-Change management D-Visually verify to SPEC in ERP System	2	40	None						0
		Timely update of ERP (JDE)	Delay in Customer Shipment	5		Manual operation and no system reminder.	3	P-Work instruction P-Change management D-Visually verify to SPEC in ERP System	2	30	None						0
2 Incoming Receiving, QA Inspection (if required), & Movement to Storage	Verify material / parts have all information per PO	No Label	Loss of Traceability	5		Label falls off	3	D - Incoming Inspection P- Supplier PPAP	2	30	None						0
		Wrong Label	Wrong parts in inventory, delay in manufacturing	5		Wrong product was shipped	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0
		Incorrect material / part	Delay in Customer Shipment	5		Wrong product was shipped	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0
				5		Ordered Part Number entered incorrect	2	D - Incoming Inspection P- PO in ERP System	5	50	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Wrong Quantity	Customer Dissatisfaction	4		Quantity of product shipped by supplier was incorrect	2	D - Incoming Inspection	2	16	None						0
				4		Order quantity entered incorrect	2	D - Incoming Inspection	2	16	None						0
		Incorrect Packaging	Delay in Customer Shipment	5		Product received did not have correct packaging	3	D - Incoming Inspection	2	30	None						0
		Poor material / part Quality	Customer Dissatisfaction	7		Product received is non-conforming	2	D - Incoming Inspection P- Supplier PPAP	7	98	None						0
		Moisture Too High / Low	Delay in Customer Shipment	5		Damaged in transit	4	D - Incoming Inspection P- Supplier C of A D - Moisture Log & Share Point	2	40	None						0
		Wrong colorant received (if required)	Delay in Customer Shipment	5		Wrong product was shipped	2	P - ERP System, WI-SR-10.2-1, WI-QA-10.3-1	4	40	None						0
		Non-Silo resins & purchased components moved to storage	Non-Silo resins & purchased components not moved to storage	5		Manual operation / operator error	2	D/P - ERP system / WI-SR-10.2-1	4	40	None						0
		Silo-resins moved to storage	Silo-resins not moved to storage	5		Manual operation / operator error	2	D/P - ERP system / WI-MH-1	4	40	None						0
3 Cell Clearance	Clear Cell from Previously run job	Cell not cleared of equipment and / or materials from previously run job	Delay in manufacturing	5		Change over checklist not followed	2	D - Production Control System	4	40	None						0
			Wrong material used for product	8		Change over checklist not followed	2	D - Production Control System	4	64	None						0
4 Resin Movement, Resin Ratio Central Material Handling System Operation	Acceptable resin for production	Unacceptable Moisture Levels	Part Non-Compliance	7		Dryer malfunction	2	D - Dryer Alarms D/P - Moisture Testing P - Filter Cleaning	2	28	None						0
		Contamination	Part Non-Compliance	7		Foreign Matter in Material	2	D - Visual Inspections P - Material Handling Work Instruction w/ color-coded containers	6	84	None						0
			Part Non-Compliance	7		Incorrect resins/colorant Mixed Together	2	D - Visual Inspections P - Material Handling Work Instruction	5	70	None						0
		Incorrect Material	Part Non-Compliance	8		Wrong material hook-up at press	2	D/P - Visual to Work Order	5	80	None						0
5 Injection Molding / Cell, Work Order, Press, & Automation Set-up	Instructions for production	All Non-resin items not present at cell	Delay in Manufacturing	5		WI or ERP system not followed	2	P/D- ERP system & WI-SR-10.2-1	4	40	None						0
		Work order not signed off	Word order has incorrect BOM	8		Incorrect set-up BOM in (JDE)	6	D-Change over checklist P- IE Set-up BOM (IMLS)	2	96	None						0
			Incorrect BOM used	8		Wrong label on material	2	P-Work instruction D-Flag system	2	32	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				8		Operator Error	3	P-Work instruction D-Flag system	2	48	None						0
		Work Order Set Up Incorrectly	Delay in Manufacturing	5		Work Order read incorrectly	2	D/P - Work Order D - Set-up Verification	5	50	None						0
		Wrong work order used	Delay in Manufacturing	5		wrong work order sent to machine	2	D/P - Work Order D - Set-up Verification	5	50	None						0
		Incorrect Blending	Part Non-Compliance / Breakage and Color Match Failures	5		Material blender set incorrectly	2	D/P - Visual to Work Order D- Quality Tree	7	70	None						0
		Excess Plastic on Parts	Part Non-Compliance	6		Hot Excess Runner	2	D - Visual Inspections, Quality Tree P - In-process Inspections	7	84	None						0
				6		Improper start-up	2	D - Visual Inspection, Quality Tree D - LPA D/P - In-process & Cell Inspections	5	60	None						0
		Soft Insertions	Part Non-Compliance	6		Thermolator Malfunction	1	D - Visual Inspections D-Audible alarms added to all Thermolator to detect temp. dev. D - In-process Inspections P - First Piece Approvals D - Hand Insertion	3	18	None						0
				6		Incorrect Tonnage	2	D- Visual Inspections P - First Piece Approvals P - In-process PM's	4	48	None						0
				6		Start-up/Cycle Interruptions	4	D- Visual Inspections D - In-process Inspections D- Hand Insertions	4	96	None						0
				6		Fast Cycle Time	2	D - Visual Inspection, Quality Tree D - In-process Inspections P - First Piece Approvals	4	48	None						0
				6		Leader Pin/Sidelock Wear	2	D - Visual Inspections, Quality Tree D - In-process Inspections P - First Piece Approvals P - In Process PM	4	48	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Plugged Sprue Tips / Gates (Hot Manifold/Valve-Gated Molds)	Part Non-Compliance / Unbalanced Fill	7		Material Contamination	2	D- Visual Inspections, Quality Tree D - In-process Inspections P - Magnets in Hopper and Melt Filters on Nozzle	5	70	None						0
		Start up scrap packaged	Customer Dissatisfaction	4		Automation equipment started too early after start up of process re-start.	4	D - Visual Inspections P - Work Instructions P - Automation disable switch during changeover D/P - In-process & Cell Inspections	5	80	None						0
		Camera stops working	Customer Dissatisfaction	6		Mechanical, power failure, lenses blocked, conveyor belt dirty, component failure.	2	P - Master sample (Known Bad and Good parts)	2	24	None						0
		Auto-degator stops working (if required)	Delay in Manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		End of Arm Tool stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		Auxiliary Assembly Equipment stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
		Packaging Equipment stops working (if required)	Delay in manufacturing	4		Mechanical failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	32	None						0
6 First Piece Approval Injection Molding Process	Manufacturing a conforming part per specifications	Incorrect Blending	Part Non-Compliance / Breakage and Color Match Failures	5		Material Handling Error	2	D/P - Visual to Work Order, Quality Tree	6	60	None						0
		Burnt tips	Part Non-Compliance / Cosmetic Issues / Short	3		Plugged/Worn Vents	3	D- Visual Inspections, Quality Tree P - First Piece Approvals P - In process PM's using Ice Blasting	6	54	None						0
		Sticking in mold	Part Non-Compliance / Mold Damage	5		Excessive Mold Temperatures	2	D- Visual Inspections P - First Piece Approvals D - Audible alarms added to all Thermolators to detect temp. dev.	5	50	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Excessive Hold Pressure	2	D- Visual Inspections, Quality Tree P - First Piece Approvals	6	60	None						0
				5		Residue Build-Up	2	D- Visual Inspections, Quality Tree P - First Piece Approvals D - Audible alarms added to all Thermolators to detect temp. dev.	5	50	None						0
				5		Water hooked up incorrectly	2	D-Visual Inspections	6	60	None						0
				3		Packaging interruptions Degator Jams	3	D- Visual Inspections P - First Piece Approvals	8	72	None						0
				5		Heater band malfunctions	2	D- Visual Inspections D - In-process Inspections P - PM	5	50	None						0
		Excess Plastic on Parts	Part Non-Compliance	5		Hot Excess Runner	2	D - Visual Inspections, Quality Tree P - In-process Inspections P- First Piece Approvals	5	50	None						0
		Shorts	Part Non-Compliance / Cosmetic	5		Insufficient Injection Pressure compatibility of Press / mold	3	D- Visual Inspections P - First Piece Approvals P - In-process PM's	5	75	None						0
				5		Plugged/Worn Vents	3	D- Visual Inspections P - First Piece Approvals P - In-process PM's	5	75	None						0
				5		Residue Build-Up	2	D- Visual Inspections P - First Piece Approvals P - In-process PM's using Ice Blasting for mold cleaning	5	50	None						0
				5		Lot / Moisture Variations	2	D- Visual Inspections D - First Piece Approvals P - Material Certs P - Moisture Analysis	5	50	None						0
				5		Process Interruption	2	D- Visual Inspections D - First Piece Approvals P - Material Certs P - Moisture Analysis	5	50	None						0
		Flash	Part Non-Compliance / Insertion Failures / Cosmetic	5		Excessive Injection Pressure	3	D- Visual Inspections, Quality Tree P - First Piece Approvals P - In-process PM's	5	75	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Incorrect Tonnage	2	D- Visual Inspections P - First Piece Approvals P - In-process PM's P - Press Size Callout on Routing	5	50	None						0
				5		Water hook up incorrect on sub gated tools	4	D- Visual Inspections D - In-process Inspections	4	80	None						0
				5		Start-up/Cycle Interruptions	3	D- Visual Inspections D - In-process Inspections	4	60	None						0
				5		Clamp pressure on press	3	D- Visual Inspections D - In-process Inspections	4	60	None						0
				5		Worn inserts	4	D- Visual Inspections D - Tool Tests D - In-process Inspections	3	60	None						0
				5		Broken Insert/Ejector Blade	3	D- Visual Inspections, Quality Tree D - In-process Inspections	5	75	None						0
		Mold Mismatch	Part Non-Compliance/High Insertion Force	6		Poor Mold Alignment	2	D - Visual Inspections, Quality Tree D - In-process Inspections P - First Piece Approvals P - In-process PM	5	60	None						0
				6		Leader Pin/Sidelock Wear	1	D - Visual Inspections, Quality Tree D - In-process Inspections P - First Piece Approvals P - In-process PM	6	36	None						0
		Deep ejector pins	Part Non-Compliance/High Insertion Force	3		Excessive Hold Pressure	3	D - Visual Inspections D - In-process Inspections D - Hand Insertions P - First Piece Approvals P - In Process PM	4	36	None						0
				3		Thermolator Malfunction	2	D - Visual Inspections D - In-process Inspections P - First Piece Approvals P - In-process PM	4	24	None						0
				3		Fast Cycle Time	2	D - Visual Inspections, Quality Tree D - In-process Inspections P - First Piece Approvals P - In-process PM	4	24	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Plugged Sprue Tips / Gates (Hot Manifold/Valve-Gated Molds)	Part Non-Compliance / Unbalanced Fill	3		Material Contamination	2	D- Visual Inspections D - In-process Inspections P - Magnets in Hopper and Melt Filters on Nozzle	5	30	None						0
				3		Mold Heater Malfunction	2	D- Visual Inspections D - In-process Inspections	5	30	None						0
				3		Valve Gate Malfunction	2	D- Visual Inspections D - In-process Inspections	5	30	None						0
		Exhausted Sprues	Part Non-Compliance / Cut Heads and Missing Parts	6		Inadequate Cooling	2	D- Visual Inspections D - In-process Inspections	5	60	None						0
		Start up scrap packaged	Customer Dissatisfaction	3		Automation equipment started too early after start up of process re-start.	3	P - Visual Inspections, Quality Tree P - Work Instructions, Training Manual P - Automation disable switch during changeover P - Inspections at the cell D - In-process Inspections	5	45	None						0
		Dimensional check shows out of tolerance condition (if required)	Part Non-Compliance	5		Excessive mold wear	2	P - Dimensional verification using calibrated gauging	4	40	None						0
				5		Process sheet not followed	2	P - Dimensional verification using calibrated gauging	4	40	None						0
		First Piece Not Hung	Delay in Manufacturing	3		Failure to hang First Piece	2	D/P - Tool Evaluation Sheet	6	36	None						0
		Functional check (if required) shows part has damage	Part Non-Compliance	6		Process sheet not followed	2	D - First Piece Acceptance Hung at the Cell	6	72	None						0
		Performance Testing (if required) shows part does not meet specifications	Part Non-Compliance	6		Process sheet not followed	2	P - Performance verification using calibrated gauging	4	48	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Incorrect revision level produced	Customer Dissatisfaction	5		Work Order not compared to latest revision level drawing in JDE	2	D - First Piece Acceptance Hung at the Cell	6	60	None						0
	Product Conforms per specifications before production	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
	Revision level	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
7 Assembly	Automated Assembly (if required)	Parts not assembled properly	Part Non-Compliance	6		Mechanical Failure	2	D - Visual Inspections D/P - In-process & Cell Inspections P - Automation Sensor	4	48	None						0
	Manual Assembly (if required)	Parts not assembled properly	Part Non-Compliance	6		Work Order or WI not followed	2	D - Visual Inspections D/P - In-process & Cell Inspections	6	72	None						0
8 Packaging & Labeling	Manual placement of parts onto cooling fixture or cooling conveyor (if required)	Parts not placed on cooling fixture or conveyor	Part Non-Compliance	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI	7	70	None						0
	Automated Packaging	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
	Manual Packaging + water (if required)	Product not properly packaged or labeled	Customer Dissatisfaction	5		Work Order or WI not followed	2	P/D - Visual to Work Order / WI-PRD-200	6	60	None						0
9 In-Process Checks	Package product per customers specifications	Incorrect or Missing Date Code on the Bag	Traceability Loss	3		Printer Malfunction	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar	5	45	None						0
				3		Wrong/no date code on packaging - Operator Error	3	D - Visual Inspections P - Inspections at the cell P - Date Code Calendar P - Work Instructions	5	45	None						0
		Degator Jams	Part Non-Compliance	5		Parts Not Aligned/cut heads	4	D - Visual Inspection p - Degator Guides P - Machine Alarms	4	80	None						0
			Loss Production	5		Dull Cutter Blades	2	D - Visual Inspection D - In-process Inspections P - PM P - Warped Sprue Detection	6	60	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				5		Cylinder Failure	2	D - Visual Inspection D - In-process Inspections P - PM	3	30	None						0
		Incorrect Degator alignment	Part Non-Compliance	5		Improper Set-up	2	D- Visual Inspection D - In-process Inspections P - Degator Guides - PM	5	50	None						0
						Manual Degator Jams	4	D- Visual Inspection D - In-process Inspections P - PM	4	80	None						0
						Automated Degator Jams	3	D- Visual Inspection D - In-process Inspections P - PM P- Degater Alarm	4	60	None						0
						Improper part feed	2	D- Visual Inspection D - In-process Inspections P - PM P- Degater Guides w/ Alarms	4	40	None						0
						Part missing from lead in edge of runner	2	D- Visual Inspection D - In-process Inspections P - PM P- Degater Alarm	4	40	None						0
		Greasy Parts Packaged	Part Non-Compliance	4		Robot Drags the Parts Across the Leader Pins	2	D - Visual Inspection D - In-process Inspections P - PM	5	40	None						0
		Functional check (if required) shows part does not perform as intended	Part Non-Compliance	6		Process sheet not followed	2	D-Operator check every other hour. D-Process Tech check every other hour. P-Prouction Control System/Work Order Log P-Work instruction /Process sheet	4	48	None						0
		Functional check (if required) shows part has damage	Part Non-Compliance	6		Process sheet not followed	2	D-Operator check every other hour. D-Process Tech check every other hour. P-Prouction Control System/Work Order Log P-Work instruction /Process sheet	4	48	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Incorrect Moisture in Bags	Part Non-Compliance / Parts Conditioned Incorrectly	5		Water Dosing system failure	2	D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance P - dosing system monitors flow	4	40	None						0
				5		Water Supply Not On	2	D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance P - dosing system monitors flow	6	60	None						0
				5		Dirty or Clogged Filter	2	D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance P - dosing system monitors flow	4	40	None						0
				5		Improper Timer Setting	3	D - Monitoring Water P-dosing system monitors flow	4	60	None						0
				5		Bad Bag Seals leak water	2	D - Visual Inspection D - Monitoring Water P - Inspections at the cell P - Preventative Maintenance	5	50	None						0
		Mis-labeling	Customer Dissatisfaction	3		Printer Ribbon not Inserted Properly	2	D - Visual Inspections P - Inspections at the cell P-Work order sign-off	7	42	None						0
				3		Wrong Labels Placed on Product	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	None						0
				3		Wrong Pre-labeled Bag for Product	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	None						0
				3		Excess Labels not Removed From Production Area	4	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	84	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				3		Wrong label provided	3	D - Visual Inspections P - Inspections at the cell P - LPA P-Work order sign-off	7	63	None						0
		Insufficient Bag Seals	Part Non-Compliance	3		Sealer Tape Worn	4	D - Visual Inspection P - Inspections at the cell P - Electronic Shift Log	6	72	None						0
				3		Bag Wrinkled/Bag Mil Thickness Inconsistencies	4	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				3		Sealer Malfunctions	2	D - Visual Inspection P - Inspections at the cell	7	42	None						0
				3		Material stuck on sealer	4	D - Visual Inspection P - Inspections at the cell P - Incoming Inspection	7	84	None						0
				3		Improperly Adjusted Timer	4	P - Work Instruction D - Visual Inspection	7	84	None						0
				3		Teflon coating worn (Renncobaggers)	2	P - Work Instruction D - Visual Inspection P - In-process PM's	6	36	None						0
		Insufficient Packaging	Customer Dissatisfaction	3		Issues with the Bag Stock (Not Quantity)	3	D - Visual Inspection P - Inspections at the cell	7	63	None						0
				3		Insufficient Packaging Supplies	4	D - Visual Inspection P - Inspections at the cell	7	84	None						0
		Incorrect Quantity in Bag	Customer Dissatisfaction	4		Robot grippers failed to place parts	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Pick and Place Grippers Drop Parts	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Degator Jams	3	D - Visual Inspection P - Inspections at the cell	7	84	None						0
				4		Inconsistent Bag Width	2	P/D - Visual Inspection	8	64	None						0
		Missing or Incorrect Hang Hole	Customer Dissatisfaction	4		Bag register mark Inconsistencies	2	P/D - Visual Inspection	8	64	None						0
				4		Bags not Webbed Correctly	2	P/D - Visual Inspection	8	64	None						0
				4		Too Much Air in Bag	2	P/D - Visual Inspection	8	64	None						0
				4		Cylinder Failure	2	D - Visual Inspection P - PM	7	56	None						0

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													Actions Taken	Severity	Occurrence	Detection	R P N
		Incorrect Quantity in Boxes	Customer Dissatisfaction	4		Improper Scale Set Up	3	D - Visual Inspections P Inspections at the cell P - Bag Counter (T18R-C)	7	84	None						0
				4		Scale Out of Calibration	2	D - Visual Inspections P - Inspections at the cell P - Calibration Schedule	5	40	None						0
		Parts mixed	Customer Dissatisfaction	4		Operator mixed product from previous work order	2	D - Visual Inspection P - Inspections at the cell	7	56	None						0
10 QA Testing	Validation and documentation of product per specifications	Audit Missed	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-9	4	56	None						0
		Audit errors and/or incomplete audit	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-10	4	56	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
11 Layered Process Audit	Audit Production Process per Questions on LPA form F-PRD-9	Audit Missed	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-9	4	56	None						0
		Audit errors and/or incomplete audit	Part Non-Compliance	7		Auditor error or improperly trained auditor	2	P - Auditor training & LPA form F-PRD-10	4	56	None						0
12 Inspection at the Cell	Product conforms per specifications throughout production run.	Mis-labeling	Customer Dissatisfaction	3		Wrong Labels Placed on Product	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Wrong Pre-labeled Bag for Product	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Excess Labels not Removed From Production Area	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Wrong label provided	3	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	54	None						0
		Water Verification Incomplete	Part Non-Compliance	6		Water not Verified During Process Inspection	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
		Insufficient Bag Seals	Part non-compliance	3		Sealer Tape Worn	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Bag Wrinkled/Bag Mil Thickness Inconsistencies	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
				3		Sealer Malfunctions	2	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	36	None						0
				3		Material stuck on sealer	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
				3		Improperly Adjusted Timer	4	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off	6	72	None						0
		Incorrect Quantity in Bags	Customer Dissatisfaction	4		Scale issue	3	D - Visual Inspections P - Share Point P - LPA P-Work order sign-off P - Calibration Schedule	5	60	None						0
				4		Operator error	3	P - Work Instructions D - Visual verification D- Share Point/Shift Log	5	60	None						0
		Incorrect Quantity in Boxes	Customer Dissatisfaction	4		Improper Scale Set Up	3	D - Visual Inspections P - Share Point P - Bag Counter (T18R-C)	5	60	None						0
				4		Scale Out of Calibration	2	D - Visual Inspections P - Share Point P - Calibration Schedule	5	40	None						0
		Insufficient Packaging	Customer Dissatisfaction	3		Issues with the Bag Stock (Not Quantity)	3	D - Visual Inspection P - Share Point	7	63	None						0
				3		Insufficient Packaging Supplies	4	D - Visual Inspection P - Share Point	7	84	None						0
		Incorrect or Missing Date Code on the Box	Traceability Loss	3		Operator error	3	D - Visual Inspections P - Date Code Calendar P - Work Instructions P-Share Point/Shift Log	5	45	None						0
		Annual Validation not Completed	Customer Dissatisfaction	5		Customer Specific Requirements Not Met	2	D/P - PPAP Matrix P-Training Quality Personnel	3	30	None						0
		Good product put in Hold	Delay shipment to customer	5		Incorrect cone put on product at Molding Work Station	2	D - Visual Inspections P -Hold ticket attached P-Work instructions	3	30	None						0
13 Validation Testing (Annually if required)	Meet customer requirements	Annual Validation not Completed	Customer Dissatisfaction	5		Customer Specific Requirements Not Met	2	D/P - PPAP Matrix P-Training Quality Personnel	3	30	None						0
14 Finished Goods Movement	Move products from Injection Molding work station to Stock or Shipping Dock	Good product put in Hold	Delay shipment to customer	5		Incorrect cone put on product at Molding Work Station	2	D - Visual Inspections P -Hold ticket attached P-Work instructions	3	30	None						0

Item & Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occurrence	Current Design Controls -Prevention -Detection	Detection	R P N	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Severity	Occurrence	Detection	R P N
		Bad Product Shipped	Customer Dissatisfaction	7		Incorrect cone put on product at Molding Work Station	2	D - Visual Inspections P - Hold ticket attached P-Work instructions	6	84	None						0
	FIFO, Physical Inventory Location, ERP (JDE)	Incorrect receive in ERP	Inaccurate Inventory-Delay Production	5		Operator error	3	P-Work instructions D-Accounting verification D-Inventory cycle count	5	75	None						0
		Inventory put on wrong location	Inaccurate Inventory-Delay Production	5		Operator error	3	P-Rack label D-Inventory cycle count	5	75	None						0
		Damage during transfer	Delay in Customer Shipment	5		Operator error	3	P-Operator training D-Visual Inspections	6	90	None						0
15 Shipping to Warehouse or Customer	Ship Parts per Shipping Specifications	Shipped Incorrectly	Customer Dissatisfaction	4		Late Shipment	3	D/P - Visual Inspections	7	84	None						0
				5		Damaged from Handling	2	D/P - Visual Inspections	7	70	None						0
				5		Damaged Shipment in transit	2	D/P - Visual Inspections	7	70	None						0
				5		Customer Specific Requirements Not Met	2	P-Customer specific packaging requirement P-Work instructions D-Visual inspections	6	60	None						0
	Sales order	Incorrect data on Sales order	Customer Dissatisfaction	5		Operator error	2	D-Visual inspection D-ASN	5	50	None						0
	Manual shipping request	Incorrect data entered in ERP	Customer Dissatisfaction	5		Operator error	2	D-Visual inspection D-ASN	5	50	None						0
	Product package per specifications	Wrong Parts Picked	Customer Dissatisfaction	5		Operator Error	2	D - Staging Visual Inspection P - Pick List	5	50	None						0
		Wrong Quantity Picked	Customer Dissatisfaction	5		Wrong Quantity of Parts Picked	2	D- Visual inspection & sign off P - Staging Inspection	6	60	None						0
		Incorrect Packaging	Customer Dissatisfaction	5		Incorrect Packaging Specifications on Pick List	3	D - Staging Visual Inspection P - Pick List	5	75	None						0
	Product/box label per specifications	Put Label on Wrong Box	Customer Dissatisfaction	5		Operator error	3	D-Visual inspection & sign off D-Scan barcode D-ASN	4	60	None						0
	Ship product per customer requirements	No inventory available	Customer Dissatisfaction	5		Production delay-No FG inventory/Customer order late	3	D- ERP System P - Customer service communication to customer	4	60	None						0

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func /
Performance FP + Packaging
(w/hand insertion, auto & manual
pack, water dosification if

Process Description: required)

HT Dwg.# and Rev: Various

Customer P/N and Rev: Various

Customer Name: Various

Program Name: Cable Ties

Created By: QA PRP Team

Creation Date: 12/10/20

PFD Number: US-OP-APQP-1

	Process	Move	Store	Inspect			
	■	◆	●	☒			
	"n"	"u"	"l"	"x"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
1	■				QA Receiving Certificate of Analysis	Material Resin Characteristics / Purchased Components	ERP System / WI-QA- 7.4
2	■				Incoming Receiving	Non-Silo Resin - Gaylord/Bags Only (Quantity)	ERP System
	■					Non-Silo Resin - Gaylord/Bags Only (Packaging Requirements)	WI-SR-10.2-1
	■				Incoming Receiving (Silo Storage System)	Resin - Silo	Moisture Log & Share Point
	■				Incoming Receiving (Purchased Components)	Purchased Parts, Customer Returned Product (RGA), Customer Tools Needing Service (RGA), Tooling Components, MRO Items (Quantity)	ERP System
	■					Packaging Requirements	WI-SR-10.2-1
				☒	QA Inspection (if required)	Resin - (Material Color)	ERP system WI-SR-10.3-1
		◆			Movement to Storage	Non-Silo Resins & Purchased Components	ERP System, WI-SR- 10.2-1
		◆			Movement to Storage	Silo-Resins	ERP System, WI-MH-1
3	■				Cell Clearance	Clear cell from previously run job	Production Control System
4		◆			Resin Movement	Move Resins to Material Handling System and Check Moistures in Resin Dryers	Material Process Log F- PRD-8.1-4 and Raw Material Moisture Content Test Log F-QA-10.3-9
	■				Resin Ratio	Resin Ratio and Colorant (if required)	Material Process Log F- PRD-8.1-4, and S-PRD 9.1-19

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func /
Performance FP + Packaging
(w/hand insertion, auto & manual
pack, water dosification if

Process Description: required)

HT Dwg.# and Rev: Various

Customer P/N and Rev: Various

Customer Name: Various

Program Name: Cable Ties

Created By: QA PRP Team

Creation Date: 12/10/20

PFD Number: US-OP-APQP-1

	Process	Move	Store	Inspect			
	■	◆	●	☒			
	"n"	"u"	"l"	"x"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
5	■				Injection Molding / Cell Set-up	Inventory Parts - Transfer & Move Non-resin items to cell	ERP System
	■				Injection Molding / Work Order Set-up	Ensuring supplies on work order ready at cell, ensure scale & water set-up (if required)	Signed Set-up Stamp on Work Order / WI-PRD-200
	■				Injection Molding / Press Set-up	Mold Installation, Machine Set-up	Work Order / WI-PRD-9.0-2, Part specific Process Sheet F-PRD-9.6-1 and PLC
	■				Injection Molding / Automation Set-up - Camera / Vision System Inspection (if required)	In-process Cable Tie Inspection	Run Master Sample through the vision system (1X) per day (MP2)
	■				Injection Molding / Automation Set-up - Degator (if required)	In-process automatic runner degator	Signed Set-up Stamp on Work Order
	■				Injection Molding / Automation Set-up - EOAT (if required)	In-process End Of Arm Tool used to grab parts and / or runners	Signed Set-up Stamp on Work Order
	■				Injection Molding / Automation Set-up - Auxillary Assembly Equipment (if required)	In-process part assembly	Signed Set-up Stamp on Work Order
	■				Injection Molding / Automation Set-up - Packaging Equipment (if required)	In-process part packaging	Signed Set-up Stamp on Work Order
6				☒	First Piece Approval Visual Part Quality, Hand Insertions, Dimensionals Functional, and performance Checks (if required), Revision Level	Part Quality and Insertion Properties of Cable Ties, Revision Level	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3, and Hung at Press
7	■				Packaging and Labeling / Automated & Manually	Automated Packaging / Manual Packaging + water (if required)	Per work order / WI-PRD-200
8				☒	In Process Checks, Completed Hand Insertion, Visual Process set-up, Part Quality	Hand Insertions, Process Set-up, Part Quality - Visual Appearance	Production Control System, WI-PRD-200.7

US-OP-APQP-1-Cable Ties-Inj Molding + Dim FP + Packaging (w/hand insertion, auto & manual pack, water dosification if required)☐

Uncontrolled VIEW

Page 2 of 26

Rev #: 2

Rev. Date: 9/22/2021

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func /
Performance FP + Packaging
(w/hand insertion, auto & manual
pack, water dosification if

Process Description: required)

HT Dwg.# and Rev: Various

Customer P/N and Rev: Various

Customer Name: Various

Program Name: Cable Ties

Created By: QA PRP Team

Creation Date: 12/10/20

PFD Number: US-OP-APQP-1

	Process	Move	Store	Inspect			
	■	◆	●	☒			
	"n"	"u"	"l"	"x"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
	■				In-Process Checks	Visual Appearance, Amount of Water Added Per Bag (if required), Proper Bag Seal, Date Code Stamp, Bag and Box Labels, Hole Punch (if required), Scale / Conveyor Verification for Count	Inspection Label (Date Code Stamped & Operator ID) / Production Control System
9				☒	QA Testing	Part Quality, Test for Minimum Wire Bundle, Test for Tensile Strength, Force Testing - Push On, Push In, Pull Off, Pull Out (if required)	SPC Software, and / or F-QA-10.3-8
10				☒	Layered Process Audit	Production Process	Layered Process Audit Form F-PRD-9
11				☒	Inspection at the Cell	Part Quality, Box Label, Bag Label, Water Verification (if required), Proper Bag Seal, Quantity in Box, Packaging Requirements, Date Code Stamp / Printer	Share Point
12				☒	Validation Testing (Annually if Required)	Push In / Push On, Pull Out / Pull Off (if required), Dimensional, Test for Minimum Wire Bundle, Tensile Strength	SPC Software and Dimensional Study F-QA-10.4-2
13		◆			Finished Goods Movement	Move Parts to Stock or Shipping Dock	ERP System
14		◆		☒	Shipping to Warehouse or customer	Finished Goods Product, Label, Ship Wrap Material, Shipping Documents, ERP System	ERP System and Shipping Manifest (F-SR-15.1-3

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func /
 Performance FP + Assy (Auto or
 Manual) + Packaging
 Part Description: _____
 HT Dwg.# and Rev: _____ Various _____
 Customer P/N and Rev: _____ Various _____
 Customer Name: _____ Various _____

Clips/Mounts/Brackets/Various
 Materials/Clamps
 Program Name: _____
 Created By: _____ QA PRP Team _____
 Creation Date: _____ 12/14/20 _____
 PFD Number: _____ US-OP-APQP-2 _____

	Process "n"	Move "u"	Store "I"	Inspect "X"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
1	■				QA Receiving Certificate of Analysis	Material Resin Characteristics / Purchased Components	ERP System / WI-QA- 7.4
2	■				Incoming Receiving	Non-Silo Resin - Gaylord/Bags Only (Quantity)	ERP System
	■					Non-Silo Resin - Gaylord/Bags Only (Packaging Requirements)	WI-SR-10.2-1
	■				Incoming Receiving (Silo Storage System)	Resin - Silo only	Moisture Log & Share Point
	■				Incoming Receiving (Purchased Components)	Purchased Parts, Customer Returned Product (RGA), Customer Tools Needing Service (RGA), Tooling Components, MRO Items (Quantity)	ERP System
	■					Packaging Requirements	WI-SR-10.2-1
				☒	QA Inspection (if required)	Resin - Colorant	ERP system WI-SR-10.3-1
		◆			Movement to Storage	Non-Silo Resins & Purchased Components	ERP System
		◆				Silo-Resins	ERP System
3	■				Cell Clearance	Clear cell from previously run job	Change over checklist QS-WI-INJ-01
4		◆			Resin Movement	Move Resins to Material Handling System and Check Moistures in Resin Dryers	Material Process Log F- PRD-8.1-4 and Raw Material Moisture Content Test Log F-QA-10.3-9
	■				Resin Ratio	Resin Ratio and Colorant	Material Process Log F- PRD-8.1-4
5	■				Injection Molding / Cell Set-up - Manual Assembly Equipment (if required)	Inventory Parts - Transfer & Move Non- resin items to cell, In-process part assembly	ERP System / Signed Set-up Stamp on Work Order

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func /
 Performance FP + Assy (Auto or
 Manual) + Packaging
 Part Description: _____
 HT Dwg.# and Rev: _____ Various _____
 Customer P/N and Rev: _____ Various _____
 Customer Name: _____ Various _____

Clips/Mounts/Brackets/Various
 Materials/Clamps
 Program Name: _____
 Created By: _____ QA PRP Team _____
 Creation Date: _____ 12/14/20 _____
 PFD Number: _____ US-OP-APQP-2 _____

	Process	Move	Store	Inspect			
	■	◆	●	☒			
	"n"	"u"	"I"	"X"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
	■				Injection Molding / Work Order Set-Up	Ensuring supplies on work order ready at cell, ensure scale & water set-up (if required)	Signed Set-up Stamp on Work Order / WI-PRD-200
	■				Injection Molding / Press Set-up	Mold Installation, Machine Set-up, Cooling Fixture or Cooling Conveyor Set-up (if required)	Work Order / WI-PRD-9.0-2, Part specific Process Sheet F-PRD-9.6-1 and PLC
	■				Automation Set-up - Camera / Vision System Inspection (if required)	In-process Cable Tie Inspection	Run Master Sample through the vision system (1X) per day (MP2)
	■				Automation Set-up - Degator (if required)	In-process automatic runner degator	Signed Set-up Stamp on Work Order
	■				Automation Set-up - EOAT (if required)	In-process End Of Arm Tool used to grab parts and / or runners	Signed Set-up Stamp on Work Order
	■				Automation Set-up - Part Separator (if required)	In-process part separator	Signed Set-up Stamp on Work Order
	■				Automation Set-up - Auxiliary Assembly Equipment (if required)	In-process part assembly	Signed Set-up Stamp on Work Order
	■				Automation Set-up - Packaging Equipment (if required)	In-process part packaging	Signed Set-up Stamp on Work Order
6				☒	First Piece Approval - Visual Part Quality, Dimensionals and Functional, and Performance Checks (if required), Revision Level	Part Quality and Revision Level	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3, and Hung at Press
7	■				Assembly / Automated & Manually	Automated and/or Manual In-process Part Assembly	Work Order and/or Drawing

PROCESS FLOW DIAGRAM

Inj Molding + Dim / Func / Performance FP + Assy (Auto or Manual) + Packaging Part Description: _____ HT Dwg.# and Rev: _____ Customer P/N and Rev: _____ Customer Name: _____	Clips/Mounts/Brackets/Various Materials/Clamps Program Name: _____ Created By: _____ Creation Date: _____ PFD Number: _____
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	Process	Move	Store	Inspect			
	■	◆	●	☒			
	"n"	"u"	"l"	"x"	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
8	■				Packaging and Labeling / Automated & Manually	Automated Packaging / Manual Packaging + water (if required)	Per work order / WI-PRD-200
9				☒	In Process Checks / Visual Process set-up, Part Quality	Process Set-up, Part Quality - Visual Appearance	Production Control System
				☒	In-Process Checks	Apply part to Cooling Fixture or Cooling Conveyor (if required), Visual Appearance, Amount of Water Added Per Bag (if required), Proper Bag Seal, Date Code Stamp, Bag and Box Labels, Hole Punch (if required), Scale / Conveyor Verification for Count	Inspection Label (Date Code Stamped & Operator ID) / Production Control System
10				☒	QA Testing	Part Quality - Dimensional Check, Functional Check, and Performance Testing, (if required)	SPC Software
11				☒	Layered Process Audit	Production Process	Layered Process Audit Form F-PRD-9
12				☒	Inspection at the Cell	Part Quality, Box Label, Bag Label, Water Verification (if required), Proper Bag Seal, Quantity in Box, Packaging Requirements, Date Code Stamp / Printer	Share Point
13				☒	Validation Testing (Annually if Required)	Push In / Push On, Pull Out / Pull Off (if required), Dimensional, Functional (if required)	SPC Software / WI, and Dimensional Study F-QA-10.4-2
14		◆			Finished Goods Movement	Move Parts to Stock or Shipping Dock	ERP System

PROCESS FLOW DIAGRAM

Part Description:	Inj Molding + Dim / Func / Performance FP + Assy (Auto or Manual) + Packaging	Program Name:	Clips/Mounts/Brackets/Various Materials/Clamps
HT Dwg.# and Rev:	Various	Created By:	QA PRP Team
Customer P/N and Rev:	Various	Creation Date:	12/14/20
Customer Name:	Various	PFD Number:	US-OP-APQP-2

	Process	Move	Store	Inspect	Process Name/ Operation Description	Product/Process Characteristics	Control Methods
	■ "n"	◆ "u"	● "l"	☒ "x"			
15		◆		☒	Shipping to Warehouse or Customer	Finished Goods Product, Label, Ship Wrap Material, Shipping Documents, ERP System	ERP System and Shipping Manifest (F-SR- 15.1-3

<input type="checkbox"/> Prototype <input type="checkbox"/> Pre-Launch <input checked="" type="checkbox"/> Production													
Control Plan													
Control Plan Number: US-OP-APQP-1			Key Contact/Phone: 414.355.1130				Date (Orig.) 12/10/20		Date & Revision See Footer				
Process Description Inj Molding + Dim / Func / Performance FP + Packaging (W/hand insertion, auto & manual pack, water dosification if required)			Core Team: Quality Assurance, Manufacturing, Automation, Receiving-Shipping				Customer Engineering Approval/Date (If Req'd) NA						
Part Name/Description Cable Ties			Supplier/Plant Approval/Date 12/10/20				Customer Quality Approval/Date (If Req'd) NA						
Supplier/Plant: HellermannTyton MKE		Supplier Code: NA		Other Approval/Date (If Req'd) NA				Other Approval/Date (If Req'd) NA					
Quality Assurance		Material Handler/ICC		Automation Technician		Operator		Process/Mold Technician		Cell Lead and/or Team Supervisor		Shipping or Receiving	
Part / Process Number	Process Name / Operation Description	Machine, Device, Jig, Tools for MFG.	CHARACTERISTICS			Special Char. Class	Product/Process Specification/ Tolerance	Evaluation/ Measurement Technique	METHODS		Control Method	Reaction Plan	
			NO.	PRODUCT	PROCESS				SIZE				
									Size	Freq			
1	QA Receiving Certificate of Analysis		1	Material Resin Characteristics			Certificate of Analysis verify per MTS and DTL/D of FMVSS302	Visual Material Cert	Each Lot	Each Lot	ERP System / WI-QA-7.4	Notify purchasing Isolate Lot per PR-QA-13.1-2	
			2	Purchased Components			Certificate of Analysis	Visual Material Cert	Each Lot	Each Lot	ERP System / WI-QA-7.4	Notify purchasing Isolate Lot per PR-QA-13.1-2	
2	Incoming Receiving	Resin	1	Resin			Per Packing List and WI-SR-10.2-1, WI-MH-1	Visual Material #, Lot#, and Quantity / QA Approval in ERP system	Each Gaylord	Each Lot	ERP System	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2	
			2	Non-Silo Resin - Gaylord/Bags only (Packaging Requirements)			No damage on packaging	Gaylord/Bag Visual	Each Gaylord/Bag	Each Gaylord/Bag	WI-SR-10.2-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2	
			3	Resin -Silo only			Material SPEC WI-MH-1	Perform Moisture Test per TS-WI-MAX4000XL	Each Lot	Each Lot	Moisture Log and Share Point	Notify purchasing and plant management / Do Not Unload	
		Purchased Components	4	Purchased Parts, Customer Returned Product (RGA), Customer Tools needing Service (RGA), Tooling/Components, MRO Items (Quantity)			Per Quantity of Product on Packing List and PO	Visual Material #, Lot#, and Quantity / QA Approval in ERP system	Each Lot	Each Lot	ERP System	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2	
			5	Packaging Requirements			No damage on packaging	Visual	Each Lot	Each Lot	WI-SR-10.2-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2	
	QA Inspection (If Required)		6	Resin - Colorant			Per Color Chip and WI-SR-10.2-1	Material Visual	Each drum	Each drum	ERP System / WI-QA-10.3-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2	
	Movement to Storage		7	Non-silo resins & purchased components			Per WI-SR-10.2-1	Visual	Each packaging unit	Each packaging unit	ERP System	Notify Supervisor	

Quality Assurance		Material Handler/ICC	Automation Technician		Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor		Shipping or Receiving		
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
			8	Silo - resins			Per WI-MH-1	Visual	Each Load	Each Load	ERP System	Notify-Supervisor
3	Cell Clearance		1		Clear Cell from Previously run job		Remove all equipment and materials used for previous production run.	Visual / Manually	Each set-up	Each set-up	Production Control System	Notify Supervisor
4	Resin Movement	Material Handling System	1		Move Resin to Material Handling System		Correct Resin is set up in the Material Handling System per Work Order	Visual	Each Resin Change	Each Resin Change	Material Process Log F-PRD-8.1-4	Notify Team Supervisor and QA, Isolate Lot per WI-PRD-13.1-3 & PR-QA-13.1-2
			2		Check moistures in Resin Dryers		Perform Moisture Test per TS-WI-MAX4000XL	Computrac Max 4000XL	1 Sample/ Dryer	One /Shift	Raw Material Moisture Content Test Log F-QA-10.3-9, Production Control System	Notify Production Team Supervisor and QA, Adjust Dryers and Re-check. Isolate Product per WI-PRD-13.1-3 & PR-QA-13.1-2
	Resin Ratio	Material Handling System	3		Resin Ratio		Set up Per Process sheet	Visual machine setting	Each Resin Change	Each Resin Change	Material Process Log F-PRD-8.1-4	Notify Production Team Supervisor and QA, Adjust Ratio Isolate, Product per WI-PRD-13.1-3 & PR-QA-13.1-2
			4		Colorant (if Required)		Mix Ratio Setting According to S-PRD 9.1-19 / Set Up Per Work Order	Visual machine setting	Each Lot	Each Colorant	Material Process Log F-PRD-8.1-4	Notify Production Team Supervisor and QA, Adjust Ratio, Isolate Product per WI-PRD-13.1-3 & PR-QA-13.1-2
5	Injection Molding / Cell Set-up		1	Inventory Parts	Transfer & Move Non-resin items to Cell		WI-SR-10.2-1 and ERP System	Visual	Each Work Order	Each Work Order	ERP System	Notify Supervisor
	Injection Molding / Work Order Set-Up		2		Ensuring supplies on work order ready at cell		Validate supplies per work order	Visual	Each Work Order	Each Work Order	Signed Set-Up Stamp on Work Order	Notify Supervisor / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
			3		Ensure scale & Water set-up (if required)		WI-PRD-200	Visual	Each Work Order	Each Work Order	Signed Set-Up Stamp on Work Order / WI-PRD-200	Notify Supervisor
	Injection Molding / Press Set-up	Mold Installation	4		Mold Installation		Per Work Order	WI-PRD-9.1-2	Each Set Up	Each Set Up	Work Order / WI-PRD-9.1-2	Notify Supervisor
		Injection Molding Machine	5		Machine Set-Up		Mattec, F-PRD-9.6-1: Part specific Process Sheet, WI-PRD-202: Process Technician Training Manual, F-PM-9.8-3, WI-PRD-9.1-10	Review of Set-Up Specs and fill out applicable sections of F-PM-9.8-3	Each Set Up	Each Set Up	Part specific Process Sheet F-PRD-9.6-1 and PLC	Adjust Process/Recheck, Isolate Product per WI-PRD-13.1-3 & PR-QA-13.1-2
	Injection Molding / Automation Set-up	Camera / Vision System Inspection (If Required)	6		In-process Cable Tie Inspection		No blocked Head or Missing Pawl	Vision system	Each cable tie	100%	Run Master Sample through the Vision System (1X) per day (MP2)	Adjust Process/Recheck, Isolate Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Degator (if Required)	7		In-process automatic runner degator		Runners removed with no cut heads	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor
		EOAT (if Required)	8		In-process End Of Arm Tool used to grab parts and/or runners		Parts and/or runner grabbed and placed as required	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor

Quality Assurance		Material Handler/ICC	Automation Technician		Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor		Shipping or Receiving		
Part / Process Number	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	SIZE		Control Method	
		Auxiliary Assembly Equipment (if Required)	9		In-process part assembly		Part assembled per work order and/or drawing	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor
		Packaging Equipment (If Required)	10		In-process part packaging		Package parts per work order	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor
6	First Piece Approval	First Piece Approval Visual	1	Part Quality			Check For Flash, Shorts, Blocked/cut Heads, Mismatch, Color(If Required)	Visual	1 Shot	Each Set Up	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Notify Team Supervisor/Process Tech, Adjust Process
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		First Piece Approval Hand Insertion	2	Insertion Properties of Cable Tie			No Hard Insertions, Slippage or Cracked Inserts Allowed. Breakage Testing According to ITS-0033	Hand Insertion Process Inspection Check Per ITS-0033	1 Shot	Each Set Up	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Notify Team Supervisor/Process Tech Adjust Process
												Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		First Piece Approval - Dimensionals Check (dimensions to drawing/SPC software - if Required)	3	Part Quality			Per Drawing / SPC Software	Calibrated Gauging	1 Shot	Each Set Up	SPC Software, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		First Piece Approval - Functional Check (functional check per SPC Software or WI - if required)	4	Part Quality			Per SPC Software or WI (if required)	Manually or with fixtures (if required)	1 Shot	Each Set up	SPC Software, WI, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		First Piece Approval - Performance Testing (performance test per SPC Software, WI, and/or ITS - if required)	5	Part Quality			Per SPC Software, WI and/or ITS (if required)	Force Tester - Specific ITS	1 Shot	Each Set up	SPC Software, WI, ITS, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-3
		Revision Level	6	Revision Level			Comparison of Drawing in JDE to Revision on Work Order	Visual	Each Set-up	Each Set-up	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Notify Engineering

Quality Assurance		Material Handler/ICC	Automation Technician		Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor		Shipping or Receiving		
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
7	Packaging and Labeling	Automated	1		Automated Packaging		Per Work Order	Visual	Each packaging unit	Each packaging unit	Per work order / WI-PRD-200	Notify Automation Technician
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Manually	2		Manual Packaging + water (if required)		Per Work Order	Visual	Each packaging unit	Each packaging unit	Per work order / WI-PRD-200	Notify Supervisor Technician
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
8	In-Process Checks	Injection Molding Machine	1	Hand Insertions			No Hard Insertions, Slippage or Cracked Inserts Allowed. Breakage Testing According to WI-PRD-200.7	Hand Insertion Process Inspection Check Per WI-PRD-200.7	1 Shot	Every two hours	Production Control System	WI-QA-10.3-2, WI-PRD-9.1-14, Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	2	Process Set-Up			Check control parameters, Work Order Matches MIU / Cavity Count Matches Actual / Cycle Time is to Standard or Adjusted Notes	Visual	Once	Per Shift	Production Control System	WI-QA-10.3-2, WI-PRD-9.1-14, Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	3	Part Quality			Check For Flash, Shorts, Mismatch, Blocked/cut Heads, Missing Pawl/Fir Tree, Burning/Splay, Broken Insert/Pin, and Color(If Required)	Visual	1 Shot	Every two hours (1X) per each start-up	Production Control System	WI-QA-10.3-2, WI-PRD-9.1-14, Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	4	Visual Appearance			Check Ties for Visual Defects - WI-PRD-200: Packaging Operator Training Manual	Visual	1 Shot	Every two hours	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Notify Supervisor, Processing Tech and QA (WI-PRD-13.1-3)
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Water in Bag (if required)	5	Amount of Water Added Per Bag			Per Work Order	Manually measure.	1 measurement	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Notify Supervisor and Quality Assurance / Adjust Process
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2

Quality Assurance		Material Handler/ICC	Automation Technician		Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor		Shipping or Receiving		
Part / Process Number	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	SIZE		Control Method	
								Size	Freq			
		Sealer	6	Proper Bag Seal			Bag Must Have a Complete and Un-Wrinkled Seal	Visual and Pull at Seams	1 bag	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor or QA
		Date Code	7	Date Code Stamp / Printer			Operator inspection Sticker Must Have Correct Date Code S-PRD-8.1-6	Visual	1 Label	Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Labels	8	Bag and Box Labels			Bag and Box Labels Must Match Work Order	Visual	One box One bag	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA
		Packaging Equipment	9	Hole Punch (Where Applicable)			Hole Punch Must Be Within Header Boundaries and Complete	Visual	1 bag	Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Scale / Conveyor Check (if required)	10	Scale / Conveyor Verification for Count			Verify Scale is Counting Correctly / Conveyor has correct number of parts	Using Scales to Package Product WI-PRD-16 or Hand Count	1 Scale	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
9	QA Testing	Injection Molding Machine	1	Part Quality			T18RA and T30RA ran through a tool with no issues	Tool	4 pcs welded together	Daily	Weekly Matrix F-QA-10.3-8 / SPC Software	Notify Team Supervisor/Process Tech Adjust Process
		Injection Molding Machine	2	Test for Minimum Wire Bundle			Minimum Wire Bundle Requirements Per Print	Wire Bundle Test - ITS-0023	per SPC software, WI, and/or ITS	per SPC software, WI, and/or ITS	SPC Software, WI, and/or ITS	Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	3	Test for Tensile Strength			Tensile Strength of Tie Must Meet Minimum Requirements Per Print	Tensile Tester - ITS-0011	per SPC software, WI, and/or ITS	per SPC software, WI, and/or ITS	SPC Software, WI, and/or ITS	Notify Team Supervisor/Process Tech Adjust Process
		Injection Molding Machine	4	Force Testing - Push On, Push In, Pull Off, Pull Out (If Required)			Per Print	Tensile Tester - ITS-0005 & ITS-0006	per SPC software, WI, and/or ITS	per SPC software, WI, and/or ITS	SPC Software, WI, and/or ITS	Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2

Quality Assurance		Material Handler/ICC	Automation Technician		Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor			Shipping or Receiving	
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
10	Layered Process Audit	Production Process	1		Production Process		Per questions on LPA form F-PRD-9	Visual	1	Shift	Layered Process Audit Form F-PRD-9	Adjust Process, Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2 (if applicable)
11	Inspection at the Cell	Injection Molding Machine	1	Part Quality			Check For Flash, Shorts, Blocked/cut Heads, Mismatch, Color (If Required)	Visual	1 Shot	Shift	Share Point	Notify Team Supervisor/Process Tech Adjust Process
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Labels	2	Box Label			Per Work Order Check for Correct Label Placement; (If Required)	Visual match	1 label	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Labels	3	Bag Label			Per Work Order Check for Correct Label Placement; (if Required)	Visual match	1 label	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Waters in Bag	4	Water Verification			Verify Water is in Bag (if Required)	Visual	1 Bag	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Sealer	5	Proper Bag Seal			Bag Must Have a Complete Seal (If Required)	Visual and Pull at Seams	1 bag	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Correct Amount of Parts in Box	6	Quantity in Box			Boxes Must Have Specified Amount of Bags and/or parts per Box	Hand Count / Scale verification	1 Sample	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Packaging	7	Packaging Requirements			Verify per Work Order correct Box	Visual	1 check	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Date Code	8	Date Code Stamp / Printer			Date Code Calendar S-PRD-8.1-6	Visual match	1 check	Shift	Share Point	Notify Team Supervisor
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2

Quality Assurance		Material Handler/ICC	Automation Technician			Operator		Process/Mold Technician	Cell Lead and/or Team Supervisor		Shipping or Receiving	
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
12	Validation Testing (Annually if required)	Injection Molding Machine	1	Push In / Push On Force (If Required)			Per Drawing / SQC Pack	Tensile Tester - ITS-0005 & ITS-0006	1 Shot	At Annual	SPC Software	Control of Non-Conforming Product/PR-QA-13.1-2
		Injection Molding Machine	2	Pull Out/Pull Off Force (If Required)			Per Drawing / SQC Pack	Tensile Tester - ITS-0005 & ITS-0006	1 Shot	At Annual	SPC Software	Control of Non-Conforming Product/PR-QA-13.1-2
		Injection Molding Machine	3	Dimensional			Perform Dimensional on the Part per Print	Calibrated Gages per Dimensional Study	1 shot	At Annual	Dimensional Study F-QA-10.4-2	Control of Non-Conforming Product/PR-QA-13.1-2
		Injection Molding Machine	4	Test for Minimum Wire Bundle			Minimum Wire Bundle Requirements Per Print	Wire Bundle Test - ITS-0023	1 Shot	At Annual	SPC Software	Control of Non-Conforming Product/PR-QA-13.1-2
		Injection Molding Machine	5	Tensile Strength			Tensile Strength of Tie Must Meet Minimum Requirements Per Print	Tensile Tester ITS-0011	1 Shot or 100pcs Minimum	At Annual	SPC Software	Control of Non-Conforming Product/PR-QA-13.1-2
13	Finished Goods Movement		1		Move Parts to Stock or Shipping Dock		Per ERP System	Visual	Each Skid	Each Skid	ERP System	Notify Supervisor
14	Shipping to Warehouse or Customer	Move	1	Finished Goods Product			WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Visual Per Pick List	Each Order	Per Pick List	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2
		Final Wrap and Label	2	Product, Label, and Ship Wrap Material			WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Visual Per Pick List	Each Order	Per Pick List	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2
		Shipping	3	Product, Shipping Documents, ERP System	Ship to customer		WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Per Packing Slip	Each Package	Per Shipment	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2

<input type="checkbox"/> Prototype <input type="checkbox"/> Pre-Launch <input checked="" type="checkbox"/> Production												
Control Plan												
Control Plan Number: US-OP-APQP-2				Key Contact/Phone: 414.355.1130				Date (Orig.) 12/14/20		Date (Rev.) See Footer		
Part Number/Latest Change Level: Clips/Mounts/Brackets/Various Materials/Clamps				Core Team: Quality Assurance, Engineering, Manufacturing, Processing				Customer Engineering Approval/Date (If Req'd) N/A				
Process Description Inj Molding + Dim / Func / Performance FP + Assy (Auto or Manual) + Packaging				Supplier/Plant Approval/Date 12/14/20				Customer Quality Approval/Date (If Req'd) N/A				
Supplier/Plant: HellermannTyton MKE		Supplier Code: N/A		Other Approval/Date (If Req'd) N/A				Other Approval/Date (If Req'd) N/A				
Quality Assurance		Automation Technician		Material Handler/ICC		Process/Mold Technician		Operator		Cell Lead and/or Team Supervisor		Shipping or Receiving
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
1	QA Receiving Certificate of Analysis		1	Material resin Characteristics			Certificate of Analysis verify per MTS and DTL/D of FMVSS302	Visual Material Cert	Each Lot	Each Lot	ERP System / WI-QA-7.4	Notify purchasing Isolate Lot per PR-QA-13.1-2
			2	Purchased Components			Certificate of Analysis verify per MTS	Visual Material Cert	Each Lot	Each Lot	ERP System / WI-QA-7.4	Notify purchasing Isolate Lot per PR-QA-13.1-2
2	Incoming Receiving	Resin	1	Resin			Per Packing List and WI-SR-10.2-1, WI-MH-1	Visual Material #, Lot#, and Quantity / QA Approval in ERP system	Each Gaylord	Each Lot	ERP System	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2
			2	Non-Silo Resin - Gaylord/Bags only (Packaging Requirements)			No damage on packaging	Gaylord/Bag Visual	Each Gaylord/Bag	Each Gaylord/Bag	WI-SR-10.2-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2
			3	Resin -Silo only			Material SPEC WI-MH-1	Perform Moisture Test per TS-WI-MAX400XL	Each Lot	Each Lot	Moisture Log and Share Point	Notify purchasing and plant management / Do Not Unload
		Purchased Components	4	Purchased Parts, Customer Returned Product (RGA), Customer Tools needing Service (RGA), Tooling/Components, MRO Items (Quantity)			Per Quantity of Product on Packing List and PO	Visual Material #, Lot#, and Quantity / QA Approval in ERP system	Each Lot	Each Lot	ERP System	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2
			5	Packaging Requirements			No damage on packaging	Visual	Each Lot	Each Lot	WI-SR-10.2-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2
	QA Inspection (If Required)		6	Resin - Colorant			Per Color Chip and WI-SR-10.2-1	Material Visual	Each drum	Each drum	ERP System / WI-QA-10.3-1	Notify purchasing and QA Isolate Lot per PR-QA-13.1-2
	Movement to Storage		7	Non-silo resins & purchased components			Per WI-SR-10.2-1	Visual	Each packaging unit	Each packaging unit	ERP System	Notify Supervisor
			8	Silo - resins			Per WI-MH-1	Visual	Each Load	Each Load	ERP System	Notify-Supervisor

Quality Assurance		Automation Technician	Material Handler/ICC		Process/Mold Technician		Operator		Cell Lead and/or Team Supervisor		Shipping or Receiving		
Part / Process Number	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	SIZE		Control Method		
									Size	Freq			
		EOAT (if Required)	10		In-process End Of Arm Tool used to grab parts and/or runners		Parts and/or runner grabbed and placed as required	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor	
		Part Separator (if required)	11		In-process part separator		Parts separated as required	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor	
		Assembly Equipment (if Required)	12		In-process part assembly		Part assembled per work order and/or drawing	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor	
		Packaging Equipment (If Required)	13		In-process part packaging		Package parts per work order	Visual	One Shot	Setup	Signed Setup stamp on work order	Notify Supervisor	
6	First Piece Approval	First Piece Approval - Visual	1	Part Quality			Check For Flash, Shorts, Mismatch, Color(If Required)	Visual	1 Shot	Each Set Up	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Notify Team Supervisor/Process Tech, Adjust Process	
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		First Piece Approval - Dimensionals Check (dimensions to drawing - if Required)	2	Part Quality			Per Drawing / SPC Software	Calibrated Gauging	1 Shot	Each Set Up	SPC Software, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		First Piece Approval - Functional Check (functional check per SPC Software or WI - if required)	3	Part Quality			Per SPC Software or WI (if required)	Manually or with fixtures (if required)	1 Shot	Each Set up	SPC Software, WI, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		First Piece Approval - Performance Testing (performance test per SPC Software, WI, and/or ITS - if required)	4	Part Quality			Per SPC Software, WI and/or ITS (if required)	Force Tester - Specific ITS	1 Shot	Each Set up	SPC Software, WI, ITS, First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-3	
		Revision Level	5	Revision Level			Comparison of Drawing in JDE to Revision on Work Order	Visual	Each Set-up	Each Set-up	First Piece Acceptance F-QA-10.3-5, WI-QA-10.3-3 and Hung at Press	Notify Engineering	
7	Assembly	Automated (if required)	1		Automated In-process part assembly		Part assembled per work order and/or drawing	Visual	Each Assembly	Each Assembly	Work order and/or drawing	Notify Automation Technician	
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	

Quality Assurance		Automation Technician	Material Handler/ICC			Process/Mold Technician		Operator		Cell Lead and/or Team Supervisor		Shipping or Receiving
Part / Process Number	Process Name / Operation Description	Machine, Device, Jig, Tools for MFG.	CHARACTERISTICS			Special Char. Class	Product/Process Specification/ Tolerance	Evaluation/ Measurement Technique	METHODS			Reaction Plan
			NO.	PRODUCT	PROCESS				SIZE		Control Method	
									Size	Freq		
		Manually (if required)	2		Manual In-process part assembly		Part assembled per work order and/or drawing	Visual	Each Assembly	Each Assembly	Work order and/or drawing	Notify Supervisor / Technician
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
8	Packaging and Labeling	Automated	1		Automated Packaging		Per Work Order	Visual	Each packaging unit	Each packaging unit	Per work order / WI-PRD-200	Notify Automation Technician
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Cooling fixture or Cooling conveyor (if required)	2	Part Quality			Apply part to cooling fixture or conveyor (if required)	Visual	Each part	Each part	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Notify Supervisor, Processing Tech and QA (WI-PRD-13.1-3)
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Manually	3		Manual Packaging + water (if required)		Per Work Order	Visual	Each packaging unit	Each packaging unit	Per work order / WI-PRD-200	Notify Supervisor / Technician
												Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
9	In-Process Checks	Injection Molding Machine	1	Process Set-Up			Check control parameters, Work Order Matches MIU / Cavity Count Matches Actual / Cycle Time is to Standard or Adjusted Notes	Visual	Once	Per Shift	Production Control System	WI-QA-10.3-2, WI-PRD-9.1-14, Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	2	Part Quality			Check For Flash, Shorts, Mismatch, Burning/Splay, Broken Insert/Pin, and Color(If Required)	Visual	1 Shot	Every two hours (1X) per each start-up	Production Control System	WI-QA-10.3-2, WI-PRD-9.1-14, Adjust Process/ Notify Supervisor and QA
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Injection Molding Machine	3	Visual Appearance			Check Parts for Visual Defects - Flash, Shorts, Mismatch, Burning/Splay, Broken insert/Pin, and Color (if required) WI-PRD-200: Packaging Operator Training Manual	Visual	1 Shot	Every two hours	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Notify Supervisor, Processing Tech and QA (WI-PRD-13.1-3)
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2
		Water in Bag (if required)	4	Amount of Water Added Per Bag			Per Work Order	Manually measure.	1 measurement	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Notify Supervisor and Quality Assurance / Adjust Process
												Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2

Quality Assurance		Automation Technician		Material Handler/ICC		Process/Mold Technician		Operator		Cell Lead and/or Team Supervisor		Shipping or Receiving	
Part / Process Number	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	SIZE		Control Method		
									Size	Freq			
		Sealer	5	Proper Bag Seal			Bag Must Have a Complete and Un-Wrinkled Seal	Visual and Pull at Seams	1 bag	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor or QA Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		Date Code	6	Date Code Stamp / Printer			Operator inspection Sticker Must Have Correct Date Code S-PRD-8.1-6	Visual	1 Label	Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		Labels	7	Bag and Box Labels			Bag and Box Labels Must Match Work Order	Visual	One box One bag	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		Packaging Equipment	8	Hole Punch (Where Applicable)			Hole Punch Must Be Within Header Boundaries and Complete	Visual	1 bag	Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
		Scale / Conveyor Check (if required)	9	Scale / Conveyor Verification for Count			Verify Scale is Counting Correctly / Conveyor has correct number of parts	Using Scales to Package Product WI-PRD-16 or Hand Count	1 Scale	Twice Per Shift	Inspection Label (Date Code Stamped & Operator ID) / Production Control System	Adjust Process/ Notify Supervisor and QA Recheck / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
10	QA Testing	Injection Molding Machine	1	Dimensionals Check (dimensions to drawing/SPC software - if Required)			Per SPC Software or WI (if required)	Calibrated Gauging	per SPC software or WI	per SPC software or WI	SPC Software or WI	Notify Team Supervisor/Process Tech Adjust Process	
												Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
			2	Functional Check (functional check per SPC Software or WI - if required)			Per SPC Software or WI (if required)	Manually or with fixtures (if required)	per SPC software or WI	per SPC software or WI	SPC Software or WI	Notify Team Supervisor/Process Tech Adjust Process	
												Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
			3	Performance Testing (performance test per SPC Software, WI, and/or ITS - if required)			Per SPC Software, WI, or ITS (if required)	Force Tester - Specific ITS	per SPC software, WI, and/or ITS	per SPC software, WI, and/or ITS	SPC Software, WI, and/or ITS	Notify Team Supervisor/Process Tech Adjust Process	
												Retest / Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2	
11	Layered Process Audit	Production Process	1		Production Process		Per questions on LPA form F-PRD-9	Visual	1	Shift	Layered Process Audit Form F-PRD-9	Adjust Process, Control of Non-Conforming Product per WI-PRD-13.1-3 & PR-QA-13.1-2 (if applicable)	
12	Inspection at Cell	Injection Molding Machine	1	Part Quality			Check for Burns, Shorts, Flash and Warp	Work Order	1 Shot	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Labels	2	Box Label			Per Work Order Check for Correct Label Placement; if Required	Visual match	1 label	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	

Quality Assurance		Automation Technician	Material Handler/ICC		Process/Mold Technician		Operator		Cell Lead and/or Team Supervisor		Shipping or Receiving	
Part / Process Number	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	SIZE		Control Method	
									Size	Freq		
		Labels	3	Bag Label		Per Work Order Check for Correct Label Placement; if Required	Visual match	1 label	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Waters in Bag	4	Water Verification (If required)		Verify Water is in Bag where required	Visual	1 Bag	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Sealer	5	Proper Bag Seal		Bag Must Have a Complete Seal Where Required	Visual and Pull at Seams	1 bag	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Correct Amount of Parts in Box	6	Quantity in Box		Boxes Must Have Specified Amount of Bags per Box	Hand Count	1 Sample	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Packaging	7	Packaging Requirements		Verify per Work Order correct Box	Visual	1 check	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
		Stamp	8	Date Code Stamp / Printer		S-PRD-8.1-6	Visual match	1 check	Shift	Share Point	Control of Non-Conforming Product PR-QA-13.1-2	
13	Validation Testing (Annually if required)	Injection Molding Machine	1	Dimensional		Perform Dimensional on the Part per Drawing	Calibrated Gauging	1 shot	At Annual	Dimensional Study F-QA-10.4-2 / Drawing	Control of Non-Conforming Product/PR-QA-13.1-2	
		Injection Molding Machine	2	Functional Check (if required)		Perform Functional check per SPC Software or WI (if required)	Manually or with fixtures (if required)	1 shot	At Annual	SPC Software / WI	Control of Non-Conforming Product/PR-QA-13.1-2	
		Injection Molding Machine	3	Performance Testing (If Required)		Perform Performance Testing Per Drawing / SPC Software, ITS (if required)	Force Tester - Specific ITS	1 Shot	At Annual	SPC Software, ITS / Drawing	Control of Non-Conforming Product/PR-QA-13.1-2	
14	Finished Goods Movement		1		Move Parts to Stock or Shipping Dock	Per ERP System	Visual	Each Skid	Each Skid	ERP System	Notify Supervisor	
15	Shipping to Warehouse or Customer	Move	1	Finished Goods Product		WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Visual Per Pick List	Each Order	Per Pick List	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2	
		Final Wrap and Label	2	Product, Label, and Ship Wrap Material		WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Visual Per Pick List	Each Order	Per Pick List	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2	
		Shipping	3	Product, Shipping Documents, ERP System	Ship to customer	WI-SR-15.2-1, F-SR-15.1-3 and ERP System	Per Packing Slip	Each Package	Per Shipment	ERP System and Shipping Manifest (F-SR-15.1-3)	Notify Shipping/Receiving Supervisor. Isolate products per Control of Non-Conforming Product PR-QA-13.1-2	

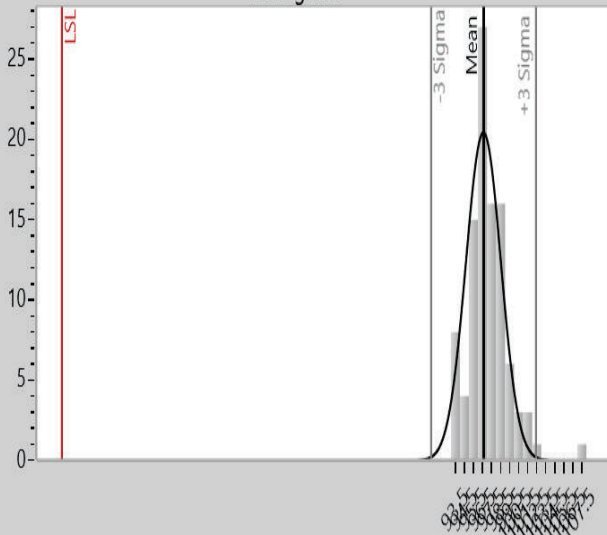
Initial Process Study

HT Part No. T50R	Customer Part No. 15601574	Part Description T50R STANDARD CABLE TIE	Supplier HellermannTyton
Drawing No. CT2050007CST	Drawing Date 4/15/2015	Drawing Revision 11	
Production Date 7/7/2021	Material UR0HIRHSUV0	Inspection Facility HT-Milwaukee	Inspector JD

Study	Sample	Data								
Loop Tensile Strength Min 50 lbf	1-9	93.00	96.00	96.00	96.00	96.00	95.00	95.00	96.00	98.00
	10-18	93.00	95.00	94.00	94.00	96.00	93.00	93.00	96.00	97.00
	19-27	99.00	93.00	96.00	98.00	97.00	95.00	97.00	94.00	96.00
	28-36	97.00	93.00	94.00	95.00	95.00	96.00	97.00	95.00	96.00
	37-45	93.00	98.00	96.00	97.00	95.00	101.00	93.00	98.00	96.00
	46-54	98.00	98.00	96.00	96.00	99.00	95.00	98.00	95.00	96.00
	55-63	96.00	97.00	96.00	97.00	96.00	95.00	99.00	97.00	98.00
	64-72	95.00	95.00	100.00	96.00	96.00	97.00	100.00	107.00	96.00
	73-81	102.00	101.00	96.00	95.00	98.00	98.00	97.00	99.00	98.00
	82-90	97.00	97.00	99.00	98.00	96.00	98.00	95.00	98.00	98.00
	91-99	96.00	101.00	98.00	96.00	99.00	97.00	96.00	100.00	97.00
	100-108	97.00								

UR0HIRHSUV0 TENSILE CAPABILITY Tensile Strength (lbf)

Histogram



Basic Statistics

100 data values
Maximum 107
Mean 96.630
Minimum 93
Sigma of the individuals 2.196
Dpm (e) 0
Within 1 Sigma (e) 74.000%
Within 2 Sigma (e) 95.000%
Within 3 Sigma (e) 99.000%

Subgroup Statistics

Estimated Sigma	mR = 2 1.934
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Statistics

Performance Statistics	
Pp	N/A
Ppk	7.079

Capability Statistics	
Cp	N/A
Cpk	8.036
Cpm	N/A

Specifications	
Upper Spec	
Target Spec	
Lower Spec	50

Out-of-spec	
Below	0.000%
Total	0.000%

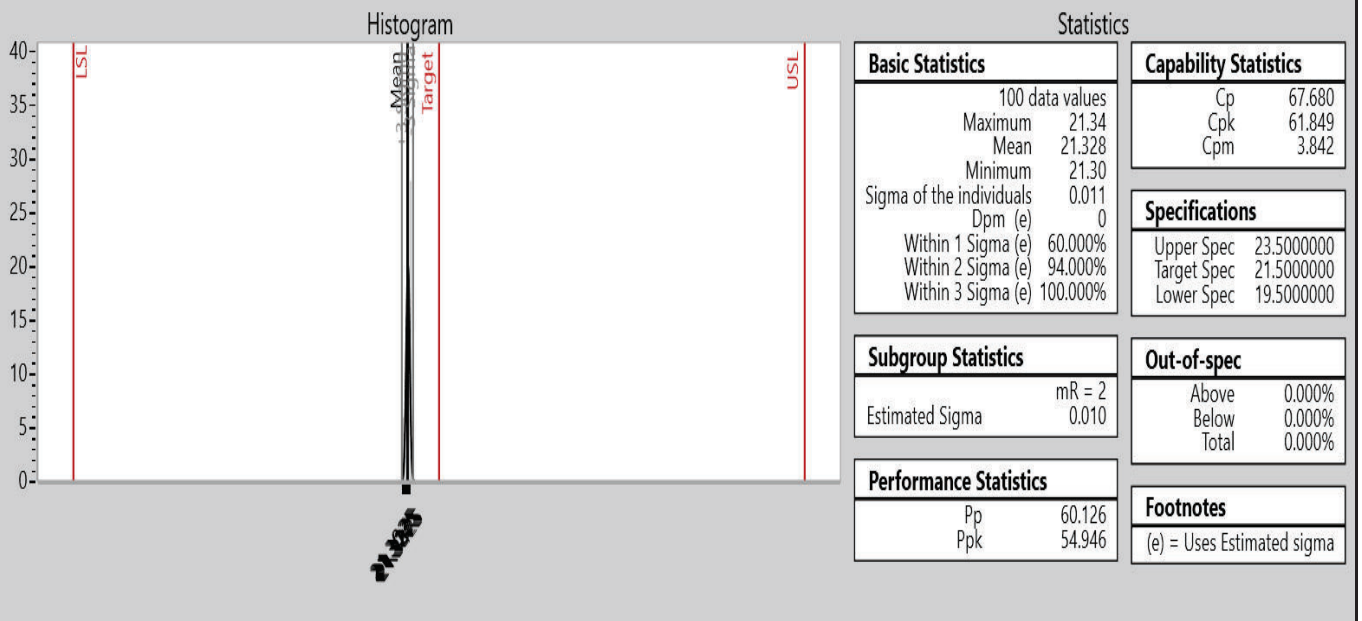
Footnotes	
(e) = Uses Estimated sigma	

Initial Process Study

HT Part No. SBS6UM90-POM-BK (151-01047)	Customer Part No. 15601574	Part Description 6mm STUD MOUNT 21.5mm LONG	Supplier HellermannTyton
Drawing No. 12-0637-041-CSU	Drawing Date 1/8/2019	Drawing Revision 05.2	
Production Date 10/22/2021	Material URACETAL9	Inspection Facility HT-Milwaukee	Inspector TM

Study	Sample	Data								
Dimension & Tolerance 21.5 +/- 2.0 mm	1-9	21.33	21.30	21.33	21.33	21.34	21.34	21.34	21.32	21.30
	10-18	21.30	21.34	21.33	21.33	21.34	21.34	21.33	21.33	21.32
	19-27	21.30	21.32	21.33	21.33	21.33	21.33	21.33	21.32	21.33
	28-36	21.34	21.32	21.33	21.32	21.34	21.33	21.33	21.33	21.32
	37-45	21.34	21.33	21.32	21.31	21.33	21.34	21.33	21.33	21.32
	46-54	21.32	21.33	21.33	21.33	21.34	21.34	21.32	21.32	21.33
	55-63	21.32	21.34	21.33	21.33	21.32	21.33	21.32	21.33	21.33
	64-72	21.33	21.33	21.34	21.34	21.32	21.34	21.32	21.31	21.34
	73-81	21.33	21.33	21.34	21.34	21.30	21.32	21.34	21.31	21.34
	82-90	21.34	21.32	21.33	21.31	21.34	21.32	21.34	21.34	21.30
	91-99	21.31	21.34	21.34	21.33	21.33	21.33	21.34	21.33	21.32
	100-108	21.31								

URACETAL9 DIMENSION CAPABILITY Height (21.5 +/- 2.0mm)



Gage R&R USA

R&R Study Results Using Specifications

1/11/2021

Gage number:	TGM-888	Done by:	April Gary
Gage description:	Digital Caliper	Part name:	BS6U
Gage type:	Caliper	Characteristics:	Height
Study name:	Annual Gage R & R	Specifications:	LSL=19.5 Nominal=21.5 USL=23.5
Study date:	01/07/2021	Number of Distinct Cate	57.2191

Objective:

Comment:

Interpretation guidelines

< 10%	generally considered to be an acceptable measurement system
10%-30%	may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
> 30%	considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis	Specification Spread (USL-LSL)/
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Repeatability - Equipment Variation (EV)

EV = 0.01594824	%EV = 2.392236
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Reproducibility - Appraiser Variation (AV)

AV = 0.003920693	%AV = 0.588104
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Repeatability & Reproducibility (R&R)

R&R = 0.0164231	%R&R = 2.463464
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Part Variation (PV)

PV = 0.6664644	%PV = 99.96966
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Specification Spread (USL-LSL)/

(USL - LSL) = 0.6666667

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
April	1	21.43	21.42	21.44	21.41	21.43	21.44	21.43	21.43	21.41	21.45
April	2	21.45	21.42	21.43	21.44	21.43	21.45	21.4	21.46	21.41	21.44
April	3	21.43	21.44	21.46	21.42	21.39	21.45	21.41	21.43	21.42	21.45
Sam	1	21.46	21.43	21.45	21.43	21.43	21.41	21.42	21.42	21.44	21.41
Sam	2	21.44	21.42	21.42	21.4	21.44	21.38	21.41	21.45	21.39	21.39
Sam	3	21.44	21.43	21.4	21.43	21.43	21.43	21.41	21.43	21.38	21.42
Felicia	1	21.46	21.43	21.44	21.44	21.4	21.43	21.4	21.43	21.39	21.44
Felicia	2	21.43	21.41	21.43	21.42	21.43	21.4	21.42	21.44	21.44	21.43
Felicia	3	21.43	21.42	21.41	21.42	21.4	21.42	21.4	21.41	21.4	21.45

Gage R&R USA

R&R Study Results Using Specifications

1/7/2021

Gage number:	TGM-917	Done by:	April Gary
Gage description:	Digital Scale	Part name:	133-01340
Gage type:	Scale	Characteristics:	weight
Study name:	Annual Gage R & R	Specifications:	LSL=141.3 Nominal=143.4 USL=145.5
Study date:	01/07/2021	Number of Distinct Cate	14.34138

Objective:

Comment:

Interpretation guidelines

< 10%	generally considered to be an acceptable measurement system
10%-30%	may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
> 30%	considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis Specification Spread (USL-LSL)10%

Repeatability - Equipment Variation (EV)
EV = 0.05512843 %EV = 7.875495

Reproducibility - Appraiser Variation (AV)
AV = 0.04064414 %AV = 5.80631

Repeatability & Reproducibility (R&R)
R&R = 0.06849153 %R&R = 9.784511

Part Variation (PV)
PV = 0.6966407 %PV = 99.52016

Specification Spread (USL-LSL)
(USL - LSL)10% = 0.6999995

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
April	1	145.5	143.7	145.4	143.6	145.5	143.6	145.4	143.6	145.3	143.6
April	2	145.5	143.8	145.5	143.5	145.5	143.6	145.4	143.7	145.5	143.6
April	3	145.5	143.7	145.4	143.6	145.4	143.7	145.3	143.6	145.5	143.7
Sam	1	145.4	143.6	145.3	143.5	145.3	143.6	145.4	143.4	145.3	143.6
Sam	2	145.5	143.7	145.4	143.4	145.4	143.6	145.3	143.5	145.4	143.5
Sam	3	145.5	143.7	145.4	143.5	145.4	143.6	145.2	143.5	145.4	143.5
Felicia	1	145.4	143.6	145.3	143.5	145.5	143.6	145.4	143.5	145.3	143.5
Felicia	2	145.4	143.6	145.4	143.5	145.4	143.6	145.3	143.6	145.5	143.5
Felicia	3	145.5	143.6	145.4	143.5	145.4	143.6	145.3	143.6	145.4	143.4

Gage R&R USA

R&R Study Results Using Specifications

1/8/2021

Gage number:	TGM-988	Done by:	April Gary
Gage description:	Global Performance 7-10-7	Part name:	133-00878
Gage type:	CMM Coordinate Measuring Machine	Characteristics:	
Study name:	Annual Gage R & R	Specifications:	LSL=97.85 Nominal=97.85 USL=98.05
Study date:	01/08/2021	Number of Distinct Cate	20.41457

Objective:

Comment:

Interpretation guidelines

< 10% generally considered to be an acceptable measurement system
 10%-30% may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
 > 30% considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis	Specification Spread (USL-LSL)
Repeatability - Equipment Variation (EV) EV = 0.00228942	%EV = 3.434116
Reproducibility - Appraiser Variation (AV) AV = 0.003982459	%AV = 5.973665
Repeatability & Reproducibility (R&R) R&R = 0.004593628	%R&R = 6.890416
Part Variation (PV) PV = 0.06650847	%PV = 99.76232

Specification Spread (USL-LSL)
 (USL - LSL) = 0.06666692

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
Kelly	1	97.9652	98.0049	98.131	97.9914	98.1238	98.0363	97.9892	97.9869	97.9821	98.1249
Kelly	2	97.9665	98.008	98.1287	97.9873	98.121	98.0342	97.9864	97.9812	97.9795	98.1267
Kelly	3	97.9688	98.0012	98.136	97.9943	98.1274	98.035	97.994	97.9872	97.9838	98.1318
Sam	1	97.9715	97.9991	98.1284	97.9866	98.1199	98.0331	97.9847	97.9768	97.9745	98.1231
Sam	2	97.9661	98.006	98.1283	97.9869	98.1215	98.0332	97.986	97.9781	97.9759	98.1242
Sam	3	97.969	98.0022	98.1312	97.9886	98.1216	98.0327	97.987	97.9785	97.976	98.1254
Rob	1	97.9659	98.0004	98.1248	97.9803	98.1176	98.0313	97.9783	97.9688	97.9747	98.1231
Rob	2	97.9653	98.0029	98.1251	97.9791	98.1125	98.0301	97.9803	97.9748	97.9726	98.1209
Rob	3	97.9655	97.9981	98.1231	97.9794	98.1137	98.0282	97.981	97.9738	97.9713	98.1227

Gage R&R USA

R&R Study Results Using Specifications

1/11/2021

Gage number:	TGM-983	Done by:	April Gary
Gage description:	Indicator	Part name:	SBS8U
Gage type:	Indicator	Characteristics:	HEIGHT
Study name:	Annual Gage R & R	Specifications:	LSL=19.5 Nominal=21.5 USL=23.5
Study date:	01/07/2021	Number of Distinct Cate	70.28216

Objective:

Comment:

Interpretation guidelines

< 10% generally considered to be an acceptable measurement system
 10%-30% may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
 > 30% considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis	Specification Spread (USL-LSL)/
Repeatability - Equipment Variation (EV)	
EV = 0.01191175	%EV = 1.786762
Reproducibility - Appraiser Variation (AV)	
AV = 0.008076173	%AV = 0.0114259
Repeatability & Reproducibility (R&R)	
R&R = 0.01337197	%R&R = 2.005795
Part Variation (PV)	
PV = 0.6665326	%PV = 99.97988

Specification Spread (USL-LSL)/
 (USL - LSL) = 0.6666667

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
April	1	21.474	21.451	21.47	21.4	21.417	21.48	21.423	21.441	21.439	21.501
April	2	21.483	21.46	21.488	21.4	21.421	21.453	21.443	21.433	21.41	21.484
April	3	21.466	21.459	21.458	21.417	21.418	21.456	21.417	21.439	21.427	21.495
Felicia	1	21.441	21.444	21.451	21.413	21.421	21.42	21.419	21.443	21.421	21.451
Felicia	2	21.441	21.441	21.449	21.429	21.413	21.437	21.441	21.415	21.439	21.455
Felicia	3	21.46	21.448	21.451	21.427	21.417	21.452	21.442	21.423	21.424	21.424
Sam	1	21.444	21.449	21.459	21.427	21.403	21.45	21.426	21.431	21.396	21.464
Sam	2	21.484	21.445	21.446	21.395	21.411	21.481	21.407	21.408	21.414	21.471
Sam	3	21.447	21.443	21.454	21.426	21.404	21.478	21.396	21.421	21.419	21.434

Gage R&R USA

R&R Study Results Using Specifications

1/8/2021

Gage number:	TGM-1325	Done by:	April Gary
Gage description:	Artifact	Part name:	133-00878
Gage type:	CT Scanner Artifact	Characteristics:	WIDTH
Study name:	Annual Gage R & R	Specifications:	LSL=10.6 Nominal=10.85 USL=11.1
Study date:	01/08/2021	Number of Distinct Cate	29.50656

Objective:

Comment:

Interpretation guidelines

< 10% generally considered to be an acceptable measurement system
 10%-30% may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
 > 30% considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis	Specification Spread (USL-LSL)/
Repeatability - Equipment Variation (EV) EV = 0.003815655	%EV = 4.578786
Reproducibility - Appraiser Variation (AV) AV = 0.001123519	%AV = 1.348223
Repeatability & Reproducibility (R&R) R&R = 0.003977627	%R&R = 4.773152
Part Variation (PV) PV = 0.08323835	%PV = 99.88602

Specification Spread (USL-LSL)/
(USL - LSL) = 0.08333334

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
Joseph	1	10.9022	10.9052	10.884	10.7757	10.8663	10.9206	10.8999	10.8872	10.4341	10.8906
Joseph	2	10.8957	10.8979	10.8891	10.7747	10.8642	10.9109	10.8994	10.8843	10.4421	10.8888
Joseph	3	10.9	10.8977	10.8845	10.7671	10.861	10.9172	10.9031	10.8912	10.4337	10.8862
James	1	10.903	10.9058	10.8884	10.7642	10.8687	10.9198	10.8952	10.8934	10.4378	10.8846
James	2	10.9	10.9009	10.8799	10.7704	10.8745	10.9239	10.9056	10.8957	10.435	10.8914
James	3	10.906	10.8987	10.8826	10.7722	10.8674	10.9228	10.9021	10.8944	10.4372	10.889
Gwen	1	10.899	10.9032	10.8839	10.7697	10.8662	10.9298	10.9077	10.8861	10.4401	10.8865
Gwen	2	10.9051	10.9005	10.8813	10.774	10.8761	10.9188	10.9035	10.891	10.4345	10.8855
Gwen	3	10.9032	10.9035	10.885	10.775	10.875	10.9212	10.9029	10.8949	10.4353	10.8919

Gage R&R USA

R&R Study Results Using Specifications

10/19/2021

Gage number:	TGM-850	Done by:	April Gary
Gage description:	Tensile Tester	Part name:	T30L
Gage type:	Tensile Tester	Characteristics:	Tensile Strength
Study name:	Annual Gage R & R	Specifications:	LSL=30 Nominal=80 USL=130
Study date:	10/18/2021	Number of Distinct Cate=	14

Objective:

Comment:

	Interpretation guidelines
< 10%	generally considered to be an acceptable measurement system
10%-30%	may be acceptable based upon importance of application, cost of measurement device, cost of repair etc.
> 30%	considered to be not acceptable - every effort should be made to improve the measurement system

Results based on specifications

Measurement Unit Analysis	Specification Spread (USL-LSL)/%σ
Repeatability - Equipment Variation (EV) EV = 1.595	%EV = %9.569
Reproducibility - Appraiser Variation (AV) AV = 0.2215	%AV = %1.329
Repeatability & Reproducibility (R&R) R&R = 1.61	%R&R = %9.661
Part Variation (PV) PV = 16.59	%PV = %99.53

Specification Spread (USL-LSL)/%σ
(USL - LSL)/%σ = %9

Appraiser	Replicati	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8	Part 9	Part 10
April G	1	54.985	53.118	54.136	58.405	55.546	55.201	52.107	52.716	53.689	50.729
April G	2	50.04	49.662	50.84	55.855	54.514	53.832	51.43	51.729	53.139	50.352
April G	3	51.641	48.023	50.536	55.646	55.018	54.876	52.676	52.843	53.236	50.832
Felicia B	1	53.103	50.849	52.485	59.326	55.244	52.349	53.454	52.044	53.201	49.938
Felicia B	2	49.82	50.356	52.428	54.914	55.121	52.633	51.946	52.899	53.194	48.927
Felicia B	3	50.234	50.394	52.661	56.243	54.224	53.766	52.689	53.529	53.51	49.962
Marreall	1	51.839	50.796	53.052	58.948	54.574	51.873	51.141	52.323	52.354	54.539
Marreall	2	52.184	52.481	51.937	52.299	54.136	52.084	49.258	49.242	48.863	47.878
Marreall	3	52.201	48.647	49.019	58.646	52.098	55.479	49.59	58.849	52.767	47.281

