Special Process: Welding System Assessment

Facility Name: American Metal & Plastics
Address:
450 32nd St SW
Grand Rapids, MI 49548

Phone Number: 616-452-6061		**Type(s) of Weld Processing at this Facility:**	
Fax Number: 616-452-3835		**Process Table A - Arc Welding**	
		Arc Stud/Fastener Welding	
Number of Welding Employees at this Facility: 8		Flux Cored Arc Welding	
		Gas Metal Arc Welding	**X**
Captive Weld Organization (Y/N)	**N**	Submerged Arc Welding	
		Shielded Metal Arc Welding	
Commercial Weld Organization	**N**	Plasma Arc Welding	
		Gas Tungsten Arc Welding	
Date of Assessment:	**15-Feb-2018**	Gas Metal Arc Braze Welding	
		Process Table B - Resistance Welding	
		Resistance Spot Welding	**X**
Date of Previous Assessment:	**21-Jan-2016**	Projection Welding	**X**
		Resistance Seam Welding	
		High-frequency Seam Welding	
		Induction Seam Welding	
		Mash Seam Welding	
		Flash Welding	
		Process Table C - Laser Welding	
		Nd YAG Welding	
		CO2 Welding	
		Diode Welding	
		Wire Fed	
		Process Table D - Solid State Welding	
		Inertia Friction Welding	
		Direct Drive Friction Welding	
		Friction Stir Welding	
		Flash Butt Welding	
		Resistance Butt Welding	
		Ultrasonic Welding	

Current Quality Certification(s) TS-16949

Date of Re-assessment (if necessary): 2/15/19

Personnel Contacted:

Name	Title	Phone	Email
David Visch	Engineering Manager	616-402-8450	dvisch@ampi-gr.com

Auditors/Assessors

Name	Company	Phone	Email
Kirk Parent	AMPI	616-452-6061 ext 287	kparent@ampi-gr.com

Number of "Not Satisfactory" Findings= 0

Number of "Needs Immediate Action" Findings= 0

Number of "Fail" Findings in the Job Audit(s)= 0

Special Process: Welding System Assessment

				Assessment			
Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
Section 1 - Management Responsibility & Quality Planning							
1.1	Is there a dedicated and qualified technical welding person on-site?	To ensure readily available expertise, there shall be a dedicated and qualified welding person on site. This individual shall be one of the following: Degreed Welding Engineer, or equivalent science degree, Certified Welding Inspector from approved internationally recognized body, or person agreed upon between customer and supplier. This person shall be a full-time employee and the position shall be reflected in the organization chart. A job description shall exist identifying the qualifications for the position including metallurgical and welding knowledge. The qualifications shall include a minimum of 5 years experience in welding operations or a combination of a minimum of 5 years of formal metallurgical education and welding experience.			**X**		
1.2	Is there a responsibility matrix to ensure that all key management and supervisory functions are performed by qualified personnel?	The organization shall maintain a responsibility matrix identifying all key management and supervisory functions and the qualified personnel who may perform such functions. It shall identify both primary and secondary (backup) personnel for the key functions (as defined by the organization). This matrix shall be readily available to management and customer at all times.			**X**		
1.3	Do you use only qualified welders (personnel)?	The organization shall provide employee training for all welding operations specific to their job function. All welding employees, including backup and temporary employees, shall be trained. Documented evidence shall be maintained showing the employees were trained; the evidence shall include an assessment of the effectiveness of the training, must prove knowledge of the customer's specific requirements and internal standards, and where appropriate, employee certification, such as for a manual welder. Management and customer shall define the qualification requirements for each function and ongoing or follow-up training shall also be addressed.			**X**		
1.4	How do you maintain welder certification?	Required qualification maintenance. If the welder has not welded in the specific operation in a 6 month time frame, the welder must be requalified to that operation. Based on the welder's quality performance, it must be established when retraining and requalification of the individual must be performed.			**X**		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.5	Is set-up practice in compliance with documented work instructions?	Set-up verification to the procedures (as example: equipment settings, clamping sequence, weld sequence, direction of travel and other process controls) in compliance to documented work instructions.			**X**		
1.6	Does the welding organization perform advanced quality planning?	The organization shall incorporate a documented advance quality planning procedure. A feasibility study shall be performed and internally approved for each part. Similar parts can be grouped into part families for this effort as defined by the organization. After the part approval process is approved by the customer, no process changes are allowed unless approved by the customer. The welding organization shall contact the customer when clarification of process changes is required. This clarification of process changes shall be documented.			**X**		
1.7	Are welding FMEA's up to date and reflecting current processing?	The organization shall incorporate the use of a documented Failure Mode and Effects Analysis (FMEA) procedure and ensure the FMEA's are updated to reflect current part quality status. The FMEA shall be written for each part or part family or they may be process-specific and written for each process. In any case, they shall address all process steps from part receipt to part shipment and all key welding process parameters as defined by the organization. A cross-functional team shall be used in the development of the FMEA. All special characteristics, as defined by the organization and its customers, shall be identified, defined, and addressed in the FMEA.			**X**		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.8	Are welding process control plans up to date and reflecting current processing?	The organization shall incorporate the use of a documented Control Plan procedure and ensure the Control Plans are updated to reflect current controls. The Control Plans shall be written for each part or part family or they may be process-specific and written for each process. They shall address all process steps from part receipt to part shipment and identify all equipment used and all essential welding process parameters as defined by the relevant individual process tables or non-essential as agreed upon between supplier and customer. A cross-functional team, including a production operator, shall be used in the development of Control Plans, which shall be consistent with all associated documentation such as work instructions, shop travelers, and FMEA's. All special characteristics, as defined by the organization and its customers, shall be identified, defined, and addressed in the Control Plans. Sample sizes and frequencies for evaluation of process and product characteristics shall also be addressed consistent with the minimum requirements listed in the Process Tables.			**X**		
1.9	Are all welding related and referenced specifications current and available? For example: SAE, AIAG, ASTM, ASME, AWS, ISO, General Motors, Honda, Ford, Toyota and Chrysler.	To ensure all customer requirements are both understood and satisfied, the organization shall have all specifically related welding and customer referenced standards and specifications available for use and a method to ensure that they are current. Such standards and specifications may include, but are not limited to, those relevant documents published by SAE, AIAG, ASTM, ASME, AWS, ISO, General Motors, Honda, Ford, Toyota, and Chrysler. The organization shall have a process to ensure the timely review, distribution, and implementation of all customer and industry engineering standards/specifications and changes based on customer-required schedule. Timely review should be as soon as possible and shall not exceed two working weeks. The organization shall document this process of review and implementation, and it shall address how customer and industry documents are obtained, how they are maintained within the organization, how the current status is established, and how the relevant information is cascaded to the shop floor within the two-week period. The organization shall identify who is responsible for performing these tasks.			**X**		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.10	Is there a written process specification for all active processes?	The welding organization shall have written process specifications for all active processes and repair processes which identify all steps of the process including relevant operating parameters. Examples of operating parameters as defined by the relevant process tables. Such parameters shall not only be defined, they shall have operating tolerances as defined by the organization in order to maintain process control. These process specifications may take the form of work instructions, job card, set-up sheets, or other similar documents.			**X**		
1.11	Has a valid product capability study been performed initially and after process changes?	The organization shall perform product capability studies for the initial validation of each process, after relocation of any process equipment, and after a major process change of any equipment or parameter. The organization and customer shall define what constitutes a major process change. Initial product capability studies shall be conducted for all welding processes per each process path defined in scope of work and in accordance with customer requirements. In the absence of customer requirements, the organization shall establish acceptable ranges for measures of capability. An action plan shall exist to address the steps to be followed in case capability indices fall outside customer requirements or established ranges. Each process path includes all combinations of equipment that are integrated in the performance of a welding process, e.g., weld cell with A and B side fixture feeding another weld cell with A and B side fixture or multiple machines. Capability study techniques shall include boundary sample conditions as defined by the control plan that are robust and meet all customer requirements. Example, any combination of tolerances as defined by Process Tables.			**X**		
1.12	Does the welding organization monitor and analyze data over time, and react to this data?	The analysis of products or processes over time can yield vital information for defect prevention efforts. The organization shall have a system to collect, analyze, and react to product or essential process data over time. Methods of analysis shall include ongoing trend or historical data analysis of product or process parameters. The organization shall determine which parameters to include in such analysis.			**X**		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.13	Is management reviewing the weld control system at a frequency determined by the control plan?	Management shall review the weld process control systems. The management review shall include efforts to detect out-of-control conditions or alarm conditions. The process of reviewing the control system shall be documented and recorded in the control plan.			X		
1.14	Are internal assessments being completed on an annual basis, at a minimum, using AIAG WSA?	The organization shall conduct internal assessments on an annual basis, at a minimum, using the AIAG WSA. Concerns shall be addressed in a timely manner.			X		
1.15	Does the Quality Department review, address, and document customer and internal concerns?	The quality management system shall include a process for documenting, reviewing, and addressing customer concerns and any other concerns internal to the organization. A disciplined problem-solving approach shall be used.			X		
1.16	Is there a continual improvement plan applicable to each process defined in the scope of the assessment?	The welding organization shall define a process for continual improvement for their welding processes identified in the scope of the WSA. The continual improvement process shall be designed to bring about improvements in quality and productivity. Identified actions shall be prioritized and shall include timing (estimated completion dates). The organization shall show evidence of program effectiveness.			X		
1.17	Does the Quality Manager or designee authorize the disposition of material from quarantine status?	The Quality Manager or designee is responsible for authorizing and documenting the disposition of quarantined material.			X		
1.18	Are there procedures or work instructions available to the welding personnel that define the welding process?	There shall be procedures or work instructions available to welding personnel covering the welding process. These procedures or work instructions shall include methods of addressing potential emergencies (such as power failure), equipment start-up, equipment shut-down, product segregation (See 2.8), product inspection, safety, house-keeping, and general operating procedures. These procedures or work instructions shall be accessible to shop floor personnel.			X		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.19	Is there a preventive maintenance program? Is maintenance data being utilized to form a predictive maintenance program?	The organization shall have a documented preventive maintenance program for process equipment (as identified by the Process Tables). The program shall be a closed-loop process that tracks maintenance efforts from request to completion to assessment of effectiveness. Equipment operators shall have the opportunity to report problems, and problems shall also be handled in a closed-loop manner. Company data, e.g., downtime, quality rejects, first-time-through capability, recurring maintenance work orders, and operator-reported problems, shall be used to improve the preventive maintenance program. Maintenance data shall be collected and analyzed as part of a predictive maintenance program.			X		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
1.20	Has the welding organization developed a critical spare part list and are the parts available to minimize production disruptions?	The welding organization shall develop and maintain a critical spare parts list and shall ensure the availability of such parts to minimize production disruptions.			X		
1.21	How does the organization document and respond to quality spills, nonconformance, customer concerns?	Reaction plans are to be followed per the control plan and PFMEA or, in the case of newly indentified issues PFMEA and control plan must be updated to reflect the new failure mode and reaction steps taken.			X		
1.22	What is the process deviation requirements of your customer?	If there are to be changes in process outside of the current control plan and last agreed upon process and parts sign off, do you know what your customer requirements are, have you notified your customer, and do you have customer approval prior to making the change?			X		
1.23	Is there a system in place to authorize reprocessing and repair? Is it documented?	The quality management system shall include a documented process for reprocessing and repair that shall include authorization from a customer designated individual. The process shall describe product characteristics for which reprocessing is allowed as well as those characteristics for which reprocessing is not permissible. Any reprocessing activity shall require a new processing control sheet issued by qualified technical personnel denoting the necessary welding modifications. Records shall clearly indicate when and how any material has been reprocessed. The Quality Manager or a designee shall authorize the release of reprocessed product.			X		

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Section 2 - Floor and Material Handling Responsibility							
2.1	Does the facility ensure that the data entered in the receiving system matches the information on the customer's shipping documents?	It is critical that all customer requirements and lot identification be adequately transferred to internal welding documents. The facility shall ensure that the data entered in the receiving system match the information on the customer's shipping documents. Documented processes and evidence of compliance shall exist, e.g., shop travelers, work orders, etc. Sometimes the material received does not precisely correspond to customer shipping documents. The facility shall have a detailed process in place to resolve receiving discrepancies. The requirements stated above also apply to captive welding departments. This process refers to receiving and shipping the parts in and out of the welding department.			**X**		
2.2	Is product clearly identified and staged throughout the welding process?	Procedures for part and container identification help to avoid incorrect processing or mixing of lots. Appropriate location and staging within the facility also help to ensure that orders are not shipped until all required operations are performed. Customer product shall be clearly identified and staged throughout the welding process. Non-welded, in-process, and finished product shall be properly segregated and identified. All material shall be staged in a dedicated and clearly defined area.			**X**		
2.3	Is lot traceability and integrity maintained throughout all processes?	Out-going lot(s) shall be traceable to the incoming lot(s). The discipline of precisely identifying lots and linking all pertinent information to them enhances the ability to do root cause analysis and continual improvement.			**X**		
2.4	Are procedures adequate to prevent movement of non-conforming product into the production system?	The control of suspect or non-conforming product is required to prevent inadvertent shipment or contamination of other lots. Procedures shall be adequate to prevent movement of non-conforming product into the production system. Procedures shall exist addressing proper disposition, product identification, and tracking of material flow in and out of the hold area. A non-conforming hold area shall be clearly designated to maintain segregation of such material.			**X**		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
2.5	Are containers free of inappropriate material and contaminants?	Containers handling customer product shall be free of inappropriate material and contaminants. After emptying and before re-using containers, containers shall be inspected to ensure that all parts and inappropriate material have been removed. The source of inappropriate material shall be identified and addressed. This is to ensure that no nonconforming welded parts or inappropriate material contaminate the finished lot.			X		
2.6	Is part loading specified, documented and controlled?	Loading parameters shall be specified, documented, and controlled. Examples include part load sequence and clamp sequence.			X		
2.7	Is there a containment reaction plan and are operators trained in the process?	Operators shall be trained in material handling, containment action, and product segregation in the event of an equipment emergency including power failure. Training shall be documented. Work instructions specifically addressing potential types of equipment emergencies and failures shall be accessible to and understood by equipment operators. These instructions shall address containment/reaction plans related to all elements of the welding process. Evidence shall exist showing disposition and traceability of affected product. Unplanned or emergency downtime greatly raises the risk of improper processing.			X		
2.8	Is the handling, storage and packaging adequate to preserve product quality?	The welder's loading system, in-process handling, and shipping process shall be assessed for risk of part damage or other quality concerns. Other practices such as stacking of overloaded containers can also increase the risk of part damage.			X		
2.9	Are plant cleanliness, housekeeping, environmental and working conditions conducive to control and improved quality?	Plant cleanliness, housekeeping, environmental, and working conditions shall be conducive to controlling and improving quality. The welding organization shall evaluate such conditions and their effect on quality. A housekeeping policy shall be clearly defined and executed. The facility shall be reviewed for conditions that are detrimental to quality processing such as loose parts on floor, contaminants, oil, inadequate plant lighting, fumes, etc.			X		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
2.10	Are parts free from contaminants that would be detrimental to the quality of the welding processes, subsequent processes, or the product?	Parts shall be free from contaminants that are detrimental to the quality of the welding processes, subsequent processes, or the product. If applicable, pre-wash and post-wash parameters shall be monitored and documented.			X		
Section 3 - Equipment / Facilities/Controls							
3.1	Are the facilities sufficient for the welding operation?	This could include but is not limited to, facilities capabilities such as safely, environmental regulations/practice, sufficient incoming power (balance and loading), air (sizing, filtering and cleanliness), water, power supply grounding per OEM and regulatory specifications, gas mixing system (equipment and sizing), ventilation, and adequate lighting.			X		
3.2	Are the power supplies sufficiently sized?	The power supply should be adequate for the manufacturing process with consideration not limited to output energy, duty cycle, cooling, flow rates and grounding.			X		
3.3	Are process equipment calibrations and/or verification certified, documented, available, and current?	The calibration and certification of the process equipment shall be checked at regular specified intervals. Refer to the applicable Process Tables.			X		
3.4	Has a preventative maintenance program been established and documented?	Supplier shall have a preventative maintenance program that is documented and implemented. Refer to Section 1.19 and the applicable Process Tables.			X		
3.5	Have the necessary replacement parts and process consumables been identified and made readily available?	The replacement parts and process consumables shall be identified, maintained in the appropriate volumes and proper storage. Consumables must be on the customer's approved source list (if applicable). Refer to the applicable Process Tables, Section 2.0 and Section 1.19. This shall be captured in tools such as the set up procedure, PFMEA and Control Plans. It should be included in the layered process audit or other similar type quality review process.			X		
3.6	Are the process, equipment, and safety alarm checks being tested at the required frequency or after any repair or rebuild?	The welding operation shall have a list of welding process, equipment, and safety alarms. These alarms shall be individually tested at the required frequency as listed in the control plan, and after any repair, process change or rebuild. These checks shall be documented.			X		

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Section 4 - TOOLING/FIXTURING							
4.1	Is there a record of the design and set-up of the fixture?	Supplier shall have documentation of the fixture design, that are stored properly and accessible. Proper identification and revision level on the fixture or related to the fixture. Documented fixture set-up (i.e., clamps, pins, locating devices)			X		
4.2	Is the positioning of each part being controlled?	A method to detect proper fixture and part position is required for each part, such as the use of proximity switches, optical sensors, mechanical probes, part presence or poke yokes., etc.			X		
4.3	Has fixturing/tooling preventative maintenance program been established?	Supplier shall have a preventative maintenance program that is documented and implemented. Refer to Section 1.18 and the applicable Process Tables. Examples: cleaning, degreasing, and fixturing integrity.			X		
4.4	Are the fixture components robust?	Gas, air, sensors, control cables, etc. are adequately protected for the process environment.			X		
4.5	Are the tooling components designed for the welding process?	Fixturing/tooling was developed considering movement, reach, accessibility, tool center point, maintenance, and ergonomics (manual, automatic, and robotics)			X		
Section 5 - PROCESS CONTROLS AND CONFIRMATION							
5.1	Does welding operation include the following?	Identify the process control equipment necessary to monitor, control and provide feedback on all essential process variables as listed below and in the applicable Process Tables.			X		
5.1.1		Logic has been established to effectively identify and address process or equipment faults.			X		
5.1.2		With over rides or resets, logs must be maintained.			X		
5.1.3		Weld faults audible, visible and line shut down.			X		
5.1.4		At weld cycle interrupt, part must not be removed or passed until dispositioned by appropriate personnel.			X		
5.1.5		Calibration of meters and system controls.			X		
5.1.6		Inter-locking of previous operations have occurred and quality of parts has been verified before the next operation begins.			X		
5.1.7		Secure backups of all programs and procedures (electronic preferred).			X		
5.1.8		High/Low limit alarms established by actual data.			X		
5.1.9		Process variables have been defined and developed by data and shown to be statistically capable.			X		

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Question Number	**Question**	**Requirements and Guidance**	**Objective Evidence**	**N/A**	**Satisfactory**	**Not Satisfactory**	**Needs Immediate Action**
5.1.10		Acceptable traceability (sequence/date coding)			X		
5.1.11		All tooling and process changes are documented.			X		
5.1.12		Documented welding procedures for each weld location and each process variable.			X		
5.1.13		Change over procedure (filler material, fixtures)			X		
5.1.14		Must have documented start-up and shut-down procedure.			X		
5.2	Are process control parameters monitored at established frequencies?	Process control parameters shall be monitored per frequencies established in the control plan. An appropriate person shall verify the process control parameters. Management review is required per Question 1.13.			X		
5.3	How does the organization review and react to out of control/specification parameters?	Are there documented reaction plans with appropriate levels of containment for both out of control and out of tolerance process parameters? Is there documented evidence that reaction plans are followed?			X		
5.4	How does the organization handle changes to process control parameters after initial customer approval?	There shall be a hierarchy established for making and approving process changes. Each process should be acted on according to the level of change. Review process changes with your customer.			X		
5.5	Are In-Process and Final Tests performed at established frequencies?	In-Process and Final Tests shall be performed per frequencies in the control plan as agreed upon between the supplier and the customer.			X		
5.6	Are weld quality requirements clearly defined per customer specifications?	Weld quality requirements per internal and customer specifications, such as but not limited to the following testing methodology:			X		
5.6.1		Cut and etch		X			
5.6.2		Part location, warping, gap, and dimensional requirements			X		
5.6.3		Correct number of welds			X		
5.6.4		Weld length/size		X			
5.6.5		Weld location		X			
5.6.6		Non Destructive Testing (NDT)		X			
5.6.7		Spatter, undercut, porosity, discontinuities,…			X		
5.6.8		Weld direction confirmation		X			
5.6.9		Destructive testing			X		
5.6.10		Additional testing		X			

Section 6 - Job Audit

Job Identity:

Customer:	Meridian
Shop Order Number:	NA
Part Number:	1181101000
Part Description:	KAB OB bracket
Base Metal Specifications:	CRS
Filler Metal Specification (if required):	NA
Welding Process(es):	Resistance

Question #	Job Audit Question	Related WSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
6.1	Has the welding operation identified the process control equipment necessary to monitor, control and provide feedback on all essential process variables as listed in the applicable Process Tables?	1.8 5.1 5.2	Weld pull test	Weld pull test	Meets specification	Pass
6.2	Has the logic been established to effectively identify and address process or equipment faults?	5.1	Manual set up	Challenge parts	Maintenance log	Pass
6.3	Are over rides or resets logs maintained?	5.1.2	Per QMS	Maintenance log	recorded	Pass
6.4	Are weld faults audible, visible and does the line shut down?	5.1.3	Visible	Challenge parts	Maintenance log	Pass
6.5	If the weld cycle is interrupted, is the part controlled or contained until dispositioned by appropriate personnel?	2.7 5.1.4	Error proof lock out	Password protected	Supervisor pin	Pass
6.6	Are the meters and feed back controls calibrated per established frequencies?	5.1.5 3.3	Manufacturers Specifications	Internal Calibration	On file	Pass
6.7	If applicable, is there an inter-locking of the previous operation and has the quality of parts been verified?	5.1.6	NA	NA	NA	NA

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Question #	Job Audit Question	Related WSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
6.8	Are there secure backups of all programs and procedures (electronic preferred)?	5.1.7	IATF QMS	Secure server with backup	document control	Pass
6.9	Are high/low limit alarms established by actual data.	5.1.8 5.1.1	Job set-up	Check fixture test	Tensile test	Pass
6.10	Have process variables been defined and developed by data and shown to be statistically capable?	5.1.9	Job set-up	Check fixture test	Tensile test	Pass
6.11	Is there acceptable traceability (sequence/date coding)?	5.1.10 5.1.11 2.3 2.7	Job set-up	Lot control form	complete	Pass
6.12	Is there traceability of all process and tooling changes?	4.1 5.1.11 5.4	Job set-up	work instructions	complete	Pass
6.13	Are there documented welding procedures for each weld location and each process variable?	5.1.12 1.5 1.10	Job set-up	work instructions	complete	Pass
6.14	Is there a documented change over procedure (filler material, fixtures)?	1.5 5.1.13 3.6	NA	NA	NA	Pass
6.15	Is there a documented start-up and shut-down procedure?	1.5 1.10 5.1.14	Job set-up	work instructions	complete	Pass

Section 6 - Job Audit

Job Identity:

Customer:	Meridian
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Part Number:	1181101000
Part Description:	KAB OB bracket
Base Metal Specifications:	CRS
Filler Metal Specification (if required):	NA
Welding Process(es):	Resistance

Question #	Job Audit Question	Related WSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
6.16	Are process control parameters monitored at established frequencies?	5.2	Job set-up	work instructions	complete	Pass
6.17	Are there documented reaction plans with appropriate levels of containment to both out of control and out of tolerance process parameters and provide documented evidence that reaction plans are followed?	5.3 1.21 5.6 1.8 2.7	Job set-up	Nonconforming product procedure	complete	Pass
6.18	How does the organization handle changes to process control parameters after initial customer approval and how do you notify your customer?	1.6 5.4 1.22 1.16	PFMEA/control plan	PFMEA/control plan	No occurrence on this job.	Pass
6.19	Are In-Process and Final Tests performed at established frequencies?	1.8 5.5	Job set-up	product testing per attribute sheet	complete	Pass
6.20	Are weld quality requirements clearly defined per customer specifications?	1.9 5.6	Each part may have one or more requirements determined by the welding specification. Parts must meet each requirement. List requirements below and validate.			
6.20.1	Test Type:					
	Test Method:					
	Test Frequency and Quantity:					
	Specification:					
6.20.2	Test Type:					
	Test Method:					

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Part Description:	KAB OB bracket
Base Metal Specifications:	CRS
Filler Metal Specification (if required):	NA
Welding Process(es):	Resistance

Question #	Job Audit Question	Related WSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
	Test Frequency and Quantity:					
	Specification:					

Section 6 - Job Audit

Job Identity:

Customer:	Meridian
Shop Order Number:	NA
Part Number:	1181101000
Part Description:	KAB OB bracket
Base Metal Specifications:	CRS
Filler Metal Specification (if required):	NA
Welding Process(es):	Resistance

Question #	Job Audit Question	Related WSA Question #	Customer or Internal Requirement	Job (Shop) Order or Reference Documentation Requirement	Actual Condition (Objective Evidence)	Pass / Fail / N/A
6.20.3	Test Type:					
	Test Method:					
	Test Frequency and Quantity:					
	Specification:					
6.20.4	Test Type:					
	Test Method:					
	Test Frequency and Quantity:					
	Specification:					

1.18E+09

1.18E+09

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1.18E+09

1.18E+09

PROCESS TABLE A- Arc Welding Processes

All control of variables given below are subordinate to customer specific requirements.

The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify welding is conforming to the customer's requirements.

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X indicates an essential variable which shall be documented and controlled.
✓ indicates that procedure should be reviewed and documented when necessary.

Item #	Related WSA Question #	Category/Process Steps	Arc Stud/ Fastener Welding (SW)	Flux-Cored Arc Welding (FCAW)	Gas Metal Arc Welding (GMAW)	Submerged Arc Welding (SAW)	Shielded Metal Arc Welding (SMAW)	Plasma Arc Welding (PAW)	Gas Tungsten Arc Welding (GTAW)	Gas Metal Arc Braze Welding
1.0	**1.7, 1.8**	**Arc welding specific essential variables which shall be addressed in the FMEA, control plan and welding procedures**								
A1.1		Arc voltage		x	x	x		x	x	x
A1.2		Amperage	x	x	x	x	x	x	x	x
A1.3		Current type (AC/DCEN/DCEP)	x	x	x	x	x	x	x	x
A1.4		Wire feed speed		x	x	x		x[1]	x[1]	x
A1.5		Pulse setting variables specific to the OEM of the welding equipment must be documented and controlled.			x			x	x	x
A1.6		Stud gun/torch position work angle, travel angle	x	x	x	x	x	x	x	x
A1.7		Contact tip-to-work distance		x	x	x				x
A1.8		Electrode-to-work distance					✓	x	x	
A1.9		Lift height of stud	x							
A1.10		Fastener coating (determines current type)	x							
A1.11		Plunge control mode force or position	x							
A1.12		Flux classification and depth				x				
A1.13		Flux removal and reclaimation plan				x				
A1.14		Gas flow pre-flow, post-flow, rate and type(s)	x[2]	x[2]	x			x	x	x
A1.15		Electrode and/or filler metal type, diameter, and classicifacation	x	x	x	x	x	x[1]	x[1]	x
A1.16		Travel speed		x	x	x	✓	x	x	x
A1.17		Gas nozzle size and type	x[2]	x[2]	x			x	x	x

PROCESS TABLE A- Arc Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Arc Stud/ Fastener Welding (SW)	Flux-Cored Arc Welding (FCAW)	Gas Metal Arc Welding (GMAW)	Submerged Arc Welding (SAW)	Shielded Metal Arc Welding (SMAW)	Plasma Arc Welding (PAW)	Gas Tungsten Arc Welding (GTAW)	Gas Metal Arc Braze Welding
A1.18		Arc starting parameters		x	x	x	✓	x	x	x
A1.19		Arc end parameters		x	x	x		x	x	x
A1.20		Wire burnback settings		x	x	x				x
A1.21		Plunge depth	x							
A1.22		Arc time	x	x[3]	x[3]			x[3]	x[3]	
A1.23		Fastener geometry per material type	x							
A1.24	What are your procedures for:	Nozzle cleaning and cleaners, replacement		✓	✓	✓		✓	✓	✓
A1.25		Tip changes		✓	✓	✓		✓		✓
A1.26		Wire liners/conduits cleaning and replacing		✓	✓	✓				✓
A1.27		Drive roll changes		✓	✓	✓				✓
A1.28		Wire guide tube change		✓	✓	✓				✓
A1.29		Antispatter Application (spray/dip and equipment)		✓	✓					✓
A1.30		Electrode and stud collet change	✓						✓	
A1.31		O rings in gas system maintenance	✓	✓	✓			✓	✓	✓
A1.32		Gas delivery and mixing system	x[2]	x[2]	x			x	x	x
A1.33		Flux delivery systems maintenance				✓				
A1.34		Flux removal (screens size and magnetic separators)				✓				
A1.35		Electrode sharpening						✓	✓	
A1.36		Slag removal		x		x	x			
A1.37		Wire dereelers maintenance		✓	✓	✓				✓
A1.38		Wire brake adjustment		✓	✓	✓				✓
A1.39		Integrity of ground system	✓	✓	✓	✓	✓	✓	✓	✓

PROCESS TABLE A- Arc Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Arc Stud/ Fastener Welding (SW)	Flux-Cored Arc Welding (FCAW)	Gas Metal Arc Welding (GMAW)	Submerged Arc Welding (SAW)	Shielded Metal Arc Welding (SMAW)	Plasma Arc Welding (PAW)	Gas Tungsten Arc Welding (GTAW)	Gas Metal Arc Braze Welding

x[1]: Processes can be used both with and without filler metal.
x[2]: These welding processes are designated for either gas shielded, self shielded or gasless.
x[3]: Arc Spot welding applicactions only.

PROCESS TABLE B- Resistance Welding Processes

All control of variables given below are subordinate to customer specific requirements.

The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify welding is conforming to the customer's requirements.

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Item #	Related WSA Question #	Category/Process Steps	Resistance Spot Welding (RSW)	Projection Welding (PW)	Resistance Seam Welding (RSEW)	High-Frequency Seam Welding (RSEW-HF)	Induction Seam Welding (RSEW-I)	Mash Seam Welding (RSEW-MS)	Flash Welding* (FW)
2.0	**1.7, 1.8**	**Resistance welding specific essential variables which shall be addressed in the FMEA, control plan and welding procedures**							
B2.1		Weld force	X	X	X			X	X
B2.2		Clamp force			✓			✓	✓
B2.3		Forge force	✓	✓		✓			
B2.4		Forge delay	✓	✓					
B2.5		Amperage	X	X	X			X	
B2.6		Voltage	X	X	X			X	✓
B2.7		Power				✓	✓		
B2.8		Frequency	X	X	X	X	X	X	X
B2.9		Pulsation	X	X	X			X	
B2.10		Squeeze time/cycles	X	X	X			X	
B2.11		Weld time/cycles	X	X	X			X	X
B2.12		Hold time/cycles	X	X	X			X	X
B2.13		Quench time/cycles	✓	✓	✓	✓	✓	✓	✓
B2.14		Temper time	✓	✓	✓	✓	✓	✓	✓
B2.15		Cool time/cycles	X	X	X			X	
B2.16		Upslope time/cycles	X	X	X	X	X	X	X

PROCESS TABLE B- Resistance Welding Processes

All control of variables given below are subordinate to customer specific requirements.

The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify welding is conforming to the customer's requirements.

Dashes below indicate "not applicable".
X indicates an essential variable which shall be documented and controlled.
✓ indicates that procedure should be reviewed and documented when necessary.

Item #	Related WSA Question #	Category/Process Steps	Resistance Spot Welding (RSW)	Projection Welding (PW)	Resistance Seam Welding (RSEW)	High-Frequency Seam Welding (RSEW-HF)	Induction Seam Welding (RSEW-I)	Mash Seam Welding (RSEW-MS)	Flash Welding* (FW)
B2.17		Stepper programs	X						
B2.18		Tip/electrode/wheel dressing	X	X	X	X		X	X
B2.19		Weld travel speed			X	X	X	X	
B2.20		Adequate electrode follow up in weld force / distance	X	X					X
B2.21		System cooling-transformers, electrodes, etc.	X	X	X	X	X	X	X
B2.22		Tip/electrode/wheel/coil change frequency	X	X	X	X	X	X	X
B2.23		Tip/electrode/wheel/coil alignment	X	X	X	X	X	X	X
B2.24	What are your procedures for:	Electrode selection/type (material type etc.)	✓	✓	✓	✓		✓	✓
B2.25		Electrode geometry	✓	✓	✓	✓		✓	✓
B2.26		Induction coil geometry					✓		
B2.27		Secondary loop electrical conductors (cables, leaf shunts, etc.) and mechanical joints maintenance	✓	✓	✓	✓	✓	✓	✓
B2.28		Projection weld geometry and size		✓					

*Flash Welding is a Solid State process, however, the process controls most resemble a resistance weld process.
Refer to Table D for other requirements on Flash Welding

PROCESS TABLE C- Laser Welding Processes

All control of variables given below are subordinate to customer specific requirements.

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Item #	Related WSA Question #	Category/Process Steps	Nd YAG (LBW)	CO2 (LBW)	DIODE (LBW)	With Wire Feed System
3.0	**1.7, 1.8**	**Welding specific essential variables which shall be addressed in the FMEA, control plan and welding procedures**				
		Equipment				
C3.1		Beam quality	X	X	X	X
C3.2		Optic cleanliness	X	X	X	X
C3.3		Cross jet or laser knife	X	X	X	X
C3.4		Beam configuration (split, single)	X	X	X	X
C3.5		Focal length	X	X	X	X
C3.6		Beam spot size	X	X	X	X
C3.7		Gas tube angle/arrangement	X	X	X	X
C3.8		Optics purge gas (flow and quality)		X		X
C3.9		Mirror cleanliness	X	X		X
C3.10		Mirror degradation	X	X		X
C3.11		Beam sharing	X	X	X	X
C3.12		Split beam	X	X	X	X
C3.13		Tip changes				X
C3.14		O rings in gas system				X

PROCESS TABLE C- Laser Welding Processes

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X indicates an essential variable which shall be documented and controlled.
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Item #	Related WSA Question #	Category/Process Steps	Nd YAG (LBW)	CO2 (LBW)	DIODE (LBW)	With Wire Feed System
C3.15		Gas nozzle				X
C3.16		Torch angles				X
C3.17		Chillers (internal - external)	X	X	X	X
C3.18		- Flow rate	X	X	X	X
C3.19		- Water quality	X	X	X	X
C3.20		- Type of coolant	X	X	X	X
C3.21		- Additive concentration	X	X	X	X
C3.22		- Temperature control (rate of change and range)	X	X	X	X
C3.23		Wire feed system				X
C3.24		- Wire feed speed				X
C3.25		- Wire liners/conduits cleaning and replacing				X
C3.26		- Drive roll changes				X
C3.27		- Wire guide tube				X
C3.28		- Wire derealers				X
C3.29		- Wire brake adjustment				X
C3.30		- Wire cleaners/wipers				X
C3.31		- Contact tip to work distance				X
C3.32		- Wire position to laser focal point				X

PROCESS TABLE C- Laser Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Nd YAG (LBW)	CO2 (LBW)	DIODE (LBW)	With Wire Feed System
		Beam Delivery				
C3.33		Direct			X	X
C3.34		Fiber	X		X	X
C3.35		- Fiber diameter	X		X	X
C3.36		- Fiber lengths	X		X	X
C3.37		- Bend radius	X		X	X
C3.38		- Condition of fiber	X		X	X
C3.39		- Fiber ends (condition of fiber ends)	X		X	X
C3.40		- Fiber end cooling	X		X	X
C3.41		Mirror		X		X
C3.42		- Power loss though the delivery system		X		X
C3.43		- Alignment		X		X
C3.44		- Cleanliness		X		X
C3.45		- Coatings of mirror		X		X
C3.46		- Mirror type		X		X
C3.47		- Optic and mirror cooling		X		X
		Process Variables				
C3.48		Shielding gas type - flow rate	X	X	X	X
C3.49		Weld travel speed control (rate of change, and velocity control)	X	X	X	X
C3.50		Power Output Control	X	X	X	X

PROCESS TABLE C- Laser Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Nd YAG (LBW)	CO2 (LBW)	DIODE (LBW)	With Wire Feed System
C3.51		Power ramping/program (start, weld, end)	X	X	X	X
C3.52		Power at the work piece	X	X	X	X
C3.53		Offset of beam to joint	X	X	X	X
C3.54		Continuous wave	X	X	X	X
C3.55		Pulsation	X	X	X	X
C3.56		Angle of Incidence	X	X	X	X
C3.57		Focus point	X	X	X	X
C3.58		Direction of welding (trailing or lead)	X	X	X	X
C3.59		Beam quality burn-in	X	X	X	X
C3.60		Power output control calibration	X	X	X	X
C3.61		Plasma suppression		X		X
C3.62		- Monitoring Back scatter for control process	✓	✓	✓	✓
		Fixtures/Part				
C3.63		- Stability and/or vibration isolation	X	X	X	X
C3.64		- Articulation system (smoothness of motion and accuracy)	X	X	X	X
C3.65	What are your procedures for controlling:	Part fit up	✓	✓	✓	✓
C3.66		Seam tracking	✓	✓	✓	✓
C3.67		Edge condition	✓	✓	✓	✓
C3.68		Coatings	✓	✓	✓	✓

PROCESS TABLE D - Solid State Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Inertia Friction Welding (FRW-I)	Direct Drive Friction Welding (FRW-DD)	Friction Stir Welding (FSW)	Flash Butt Welding (FW)	Resistance Butt Welding (UW)	Ultrasonic Welding
4.0	**1.7, 1.8**	**Welding specific essential variables which shall be addressed in the FMEA, control plan and welding procedures**						
D4.1		Tolerances on axial alignment	**X**	**X**	**X**			
D4.2		Faying surface area	**X**	**X**	**X**			
D4.3		Faying surface cleanliness	**X**	**X**	**X**			
D4.4		Initial spindal speed	**X**	**X**	**X**			
D4.5		Welding spindal speed			**X**			
D4.6		Spindal torque - to not damage equipment	**X**	**X**	**X**			
D4.7		Flywheels; total moment of inertia	**X**					
D4.8		Spindle clamp pressure	**X**	**X**	**X**			
D4.9		Fixture clamp pressure	**X**	**X**	**X**			
D4.10		Part stickout	**X**	**X**				
		Preheat (First friction phase) if needed						
D4.11		-Projection on faying surface	**X**[1]	**X**[1]				
D4.12		-Preheat force	**X**[1]	**X**[1]				
D4.13		-Preheat time or RPM	**X**[1]	**X**[1]				
D4.14		Preheat burnoff length-amount of dimension loss during preheat		**X**[1]		**X**	**X**	
		Weld Heat (Second friction phase)						
D4.15		-Friction weld force	**X**	**X**				
D4.16		-Friction speed at which forging begins	**X**	**X**				

PROCESS TABLE D - Solid State Welding Processes

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		Forging Stage						
D4.17		-Forging speed	X	X				
D4.18		-Forge force	X	X				
D4.19		-Forge time		X				
D4.20		-Forge length if limited upset is used		X				
D4.21		-Forge delay		X				
D4.22		-Upset distance		X				
D4.23		-Upset removal / management	X	X				
D4.24		-Upset hold time	X	X				
D4.25		-Upset rate	X	X				
D4.26		-Friction upset distance and time		X				
D4.27		Brake setting or stopping time dimensions and tolerences		X				
D4.28		Brake force		X				
D4.29		Brake delay prior to upset		X				
D4.30		Final position		X				
D4.31		Postweld heat treatment if needed based on materials joined	✓	✓	✓			
D4.32		Protective atmosphere if necessary for the base material	✓					
D4.33		Total burnoff-amount of dimension loss during total process		X		X	X	

PROCESS TABLE D - Solid State Welding Processes

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		FSW						
D4.34		Primary control (position or force)			X			
D4.35		Tool to weld joint alignment during length of travel			X			
		Tool						
D4.36		-Pin to shoulder ratio			X			
D4.37		-Pin length			X			
D4.38		-Included angle for pin			X			
D4.39		-Included angle for shoulder			X			
D4.40		-Thread on pin surface			X			
D4.41		-Pin material			X			
		Plunge Practice						
D4.42		-Speed of plunge			X			
D4.43		-Spindal speed during plunge			X			
D4.44		-Preheat dwell time after plunge			X			
D4.45		-Plunge force			X			
		Weld						
D4.46		-Weld force			X			
D4.47		-Travel speed			X			
D4.48		-Tool tilt angle			X			
D4.49		-Weld spindal speed			X			
		Weld termination						
D4.50		-Exit motion of tool such as tilt angle rotation			X			

PROCESS TABLE D - Solid State Welding Processes

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D4.51		-Spindal speed at tool extraction			X			
D4.52		-Dwell at end of travel			X			

PROCESS TABLE D - Solid State Welding Processes

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		FBW RBW						
D4.53		Electrode design-eliminate die burns				X	X	
D4.54		Electrode/Die cleanliness				X	X	
D4.55		Electrode/Die clamping pressure				X	X	
D4.56		Part cleanliness and scale removal				X	X	
D4.57		Part alignment				X	X	
D4.58		Joint geometry preporation				X	X	
D4.59		Initial martial stickout or extension beyond electrodes				X	X	
		Preheat						
D4.60		-Preheat force				X	X	
D4.61		-Tap selection				X	X	
D4.62		-Percent heat				X	X	
D4.63		-Off time during initial die opening				X		
		Initial Flashing						
D4.64		-Initial die opening				X		
D4.65		-Initial flashing rate				X		
D4.66		-Type of platten movement (linear or parabolic)				X		
D4.67		-Voltage				X		
D4.68		-Initial flashing distance or time				X		
D4.69		-Percent heat				X		
D4.70		-Tap selection				X		

PROCESS TABLE D - Solid State Welding Processes

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Item #	Related WSA Question #	Category/Process Steps	Inertia Friction Welding (FRW-I)	Direct Drive Friction Welding (FRW-DD)	Friction Stir Welding (FSW)	Flash Butt Welding (FW)	Resistance Butt Welding (UW)	Ultrasonic Welding
		Flashing						
D4.71		-Flashing rate				X		
D4.72		-Type of platten movement (linear or parabolic)				X		
D4.73		-Voltage				X		
D4.74		-Flashing distance or time				X		
D4.75		-Percent heat				X		
D4.76		-Tap selection				X		
		Weld Stage 1						
D4.77		-Percent heat					X	
D4.78		-Tap selection voltage					X	
D4.79		-Force					X	
D4.80		-Pulsation (on, off and number of pulses)					X	
D4.81		-Off time before stage change					X	
		Weld Stage 2 (can be multiple stages with different parameters)						
D4.82		-Percent heat					X	
D4.83		-Tap selection voltage					X	
D4.84		-Force					X	
D4.85		-Pulsation (on, off and number of pulses)					X	

PROCESS TABLE D - Solid State Welding Processes

All control of variables given below are subordinate to customer specific requirements.

The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify welding is conforming to the customer's requirements.

Dashes below indicate "not applicable".
X indicates an essential variable which shall be documented and controlled.
✓ indicates that procedure should be reviewed and documented when necessary.

Item #	Related WSA Question #	Category/Process Steps	Inertia Friction Welding (FRW-I)	Direct Drive Friction Welding (FRW-DD)	Friction Stir Welding (FSW)	Flash Butt Welding (FW)	Resistance Butt Welding (UW)	Ultrasonic Welding
		Forge/Upset						
D4.86		-Forge rate				X	X	
D4.87		-Forge force				X	X	
D4.88		-Forge distance / total upset				X	X	
D4.89		-Upset time				X	X	
D4.90		-Upset current				X	X	
D4.91		-Flashing voltage cut off				X		
D4.92		-Flashing removal / management				X	X	
		Post weld heat treatment if needed						
D4.93		-Heat treatment clamping distance				✓	✓	
D4.94		-Quench time				✓	✓	
D4.95		-Tap selection				✓	✓	
D4.96		-Precent heat				✓	✓	
D4.97		-Temper time				✓	✓	
D4.98		Final die opening				X	X	
		Ultrasonic Metal weld						
D4.99		Tap selection / design of ribbon structure						✓
D4.100		Frequency of power supply for application (40/30/20kHz)						✓
D4.101		Fixture & part design with max dimension deviation and material specs						✓

PROCESS TABLE D - Solid State Welding Processes

All control of variables given below are subordinate to customer specific requirements.

The customer may have additional requirements, e.g., inspection testing, greater frequencies, etc. When performing the job audit, the auditor shall verify welding is conforming to the customer's requirements.

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Item #	Related WSA Question #	Category/Process Steps	Inertia Friction Welding (FRW-I)	Direct Drive Friction Welding (FRW-DD)	Friction Stir Welding (FSW)	Flash Butt Welding (FW)	Resistance Butt Welding (UW)	Ultrasonic Welding
		Upset and Monitoring (windowing)						
D4.102		Welding-Energy						X
D4.103		Welding-Time						X
D4.104		Welding-Amplitude						X
D4.105		Welding-Force						X
D4.106		Welding-Current						X
D4.107		Welding pre Height and travel (compaction)						X
D4.108		Energy with height compensation						X
D4.109		Weld Head Cooling						✓
D4.110		Environmental conditions control (i.e., temperature, humidity, dust, etc.)						✓
D4.111		TAP/Die cleanliness						✓
D4.112		TAP/Die clamping pressure						✓
D4.113		Part cleanliness and scale removal						✓
D4.114		Part alignment						✓

x^1: If required to achieve heat balance. Example thin part to thick part or various hardnesses.