

	WORK INSTRUCTION	
	PROCESS HEATERS TYPICAL FUNCTIONAL FLOW	
REVISION: 04	PROCEDURE NO.: WI-8.2.4.13	DATE EFFECTIVE: 02/10/25


	Operation Description	Documentation Clarifying Characteristics (as applicable for each operation)	Monitoring & Measurement Activities	Monitoring & Measurement Records/Check Lists
1	Element Filling	Element Spec Tube Tag	Verification of measurements to 1pc (dimensional & electrical) Verification of job number and materials	Order Tracker Initial element spec
2	Rolling	Element Spec	Visual identification of machine diameter Visual ongoing inspection of every element to insure good quality(straight)	Operation not recorded
3	Element Measuring	Element Spec	A random sample is measured following spec data Pieces are electrically checked following spec data	Results are written on the space provided in the spec to indicate operation is complete
4	Element Cutting	Element Spec	1 element verification on setup	Operation not recorded
5	Element Finning (As Applicable)	Element Spec Drawings	Verification of first 1pc based on setup	Order Tracker
6	Marking	Element Spec Drawings	Verification that marking matches drawing	Order Tracker
7	Annealing (at Tempco)	Element Spec Work Instruction	Verification of material and special instructions Verifications of material temperature	Order Tracker
8	Strip Back	Element Spec	Verification of first 1pc based on setup Ongoing random check	Operation not recorded
9	Annealing / Bright Annealing (As Applicable)	Element Spec	Outgoing: Verification of material and special instructions Incoming: Visual inspection of surface finish.	Order Tracker

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10	Electrical / Physical check	Element Spec Drawings	100% verification based on spec instructions (Resistance and hipot) If marking is required, verify legibility and accuracy	Order Tracker Element data is entered to PC
11	Forming Re Annealing Squeeze down Re Pressing	Drawings	Verification of 1 st pc based on engineering drawing Verification of measurement ongoing random sample	Order Tracker
12	Outsourced (if applicable) -Electropolishing	Drawing Specification Sheet – used internally	<ul style="list-style-type: none"> ▪ Review the product to ensure it matches the specification sheet ▪ Visual Verification 	Order Tracker Final Quality Inspection ensures visual compliance Supplier certifications are received as appropriate (e.g. ISO 9001 Certified)
13	Passivation (As Applicable)	Drawings Work Instructions	Visual verification prior to processing Copper Sulfate solution used to test 1pc from every lot	Order Tracker Passivation stamp on Drawing
14	Flange / Fitting Marking (As Applicable)	Drawings	Verification of information based on drawing instruction	Operation not recorded
15	Heater Assembly (As Applicable)	Drawings	Verification of information based on drawing (Physical, resistance, and hipot) Visual Verification based on setup	Order Tracker
16	Plasma Pipe Cutting (As Applicable)	Drawings	Verification of information based on drawing 1 st piece verification	Order Tracker
17	Brazing (As Applicable)	Drawings Work Instruction	1 st pc verification based on setup Ongoing random sample verification	Order Tracker
18	Welding (As Applicable)	Drawings Work Instruction	Verification of material and special instructions 1 st pc verification based on setup Ongoing random sample verification	Order Tracker

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19	Pressure test (As Applicable)	Drawings	100% pressure test based on drawing specifications 100% verification of weld and braze integrity	Order Tracker Pressure test information is entered into PC Pressure test sticker on drawing
20	Baking (As Applicable)	Work Instruction	Verification of oven temperature based on work instruction	Order Tracker
21	Painting (As Applicable)	Work Instruction	Visual ongoing inspection	Operation not recorded
22	Sealing (As Applicable)	Drawings Work instruction	Visual verification based on spec instructions Verification of seal based on work instruction	Order Tracker
23	Finishing	Drawings	Verifications of 1 st pc based on drawing/specification	Order Tracker
24	Final Testing	Spec/Drawings	Dimensional/ electrical verification of Drawing instruction Verification of materials Verification of measurements	Software data recording if required

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REVISION HISTORY

REVISION LEVEL	DATE OF REVISION	SECTIONS	DESCRIPTION OF CHANGE
00	01/27/09	All	Initial release
01	05/27/10	All	Added "Order Tracker" in #15 (Assembly) under Monitoring & Measurement
02	06/03/13	All	Incorrect numbering of Operations. The number 6 was skipped, 5 was followed by 7. Operations 7 to 23 became Operations 6 to 22.
03	05/07/19	All	Entire functional flow reviewed and revised to reflect current workflow. Plasma cut and finning added. WI-8.2.4-12 has been combined with WI-8.2.4-13 and is now obsolete.
04	02/10/25	All	Revised sections 1, 3, 4, 5, 6, 8, 9, 11, 15, 16, 17, 18, 19, & 22 Added Now section 12 "electropolishing" & "Painting" now section 21

AUTHORIZATION

POSITION	HELD BY	AUTHORIZATION SIGNATURE OR INITIALS
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