QA Plan Summary
NCSX Modular Coil Winding Form Machining

Spec Ref	Activity	Visual Mfg Ref.	Ref Procedure	Witness/Hold Point	Reporting/Documentation Req
	Manufacturing Planning- QA planning- Production Support	65707/1.0 -Sub:0 Op#:10			
	Final Inspection----Prepare part for source inspection.----Review and complete QA data package per QAP and the requirements of the product specification NCSX-CSPEC-141-03-05 September 23- 2004.--Contact CFT to review data package prior to notifying source inspection.	65707/1.0 -Sub:0 Op#:20		Hold Point	
	Source Inspection	65707/1.0 -Sub:0 Op#:30		Hold Point	
5.1	Package and Ship----Weigh the finished part and metal stamp the value in pounds on the casting in the area marked on the customer drawing.----Part must be protected and wrapped in plastic prior to inserting into the crate.----Part is to be shipped to PPPL in Princeton- NJ per QAP shipping address.----Crate must be marked/stenciled per the MTM drawing.	65707/1.0 -Sub:0 Op#:40			
4.2.1; 4.2.2; 4.2.2.3; 4.2.2.4	Receive customer supplied material. --Verify the receipt of quality documentation for the casting.--Check off IDC noting receipt of material and receipt of quality documentation.----Certification: METALTEK QA DATA PACKAGE--Part Number: SE141-116--Part Description: PRODUCTION WINDING FORM TYPE-C	65707/1.0 -Sub:1 Op#:10			Certification / IDC:1
	-	65707/1.0 -Sub:1 Op#:10 Pc:10			Material Certification
	Setup the machining fixture on the rotary table. Load casting into the machining fixture with the initial pickup pads facing up. Indicate the pickup pads and orient the casting for machining. ----Rough machine the top flange face and the outer periphery leaving .25- +.060/-.000-. The outside surfaces of the flange will serve as qualifiers for the next operation. Record the qualifier dimensions on the IDC.----Install the lifting holes per the MTM drawing.----Remove the casting from the machining fixture and flip over with the bottom flange facing up. Re-load into the machining fixture. Pickup the qualifiers and orient the casting for machining.----Rough machine the bottom flange face leaving .25- +.060/-.000-. ----Rough machine the poloidal break leaving a minimum of .25- of stock per side.----Install temporary shim filling in the poloidal break and hold together with temporary c-clamps.--	65707/1.0 -Sub:1 Op#:20			/ IDC:1
	Setup the machining fixture with the casting installed bottom flange face up. Pickup qualifiers and orient the casting for machining.----Rough machine the -T- and wings to .25- minimum stock envelope. Run a probe pass to verify stock envelope. ----Check off the IDC with stock range result from probe pass.--	65707/1.0 -Sub:1 Op#:30			/ IDC:2
4.2.5	With casting still on the machine- perform an in-process inspection of the magnetic permeability of the material using the Severn Permeability Indicator Gage. Inspect a minimum of (8) points on the rough machined flange face and an additional (8) points on the rough machined -T- section. Record the upper and lower range values on the IDC's. Values that exceed 1.02 must be documented with a non-conformance record and dispositioned prior to continuing.	65707/1.0 -Sub:1 Op#:40	Mag permeability inspection procedure TBD		/ IDC:1
	Remove the casting from the machining fixture and flip over with the top flange facing up. Re-load the casting into the machining fixture. Pickup the qualifiers and orient the casting for machining.----Rough machine -T- and wings to .25- minimum stock envelope. Run a probe pass to verify stock envelope.--	65707/1.0 -Sub:1 Op#:50			/ IDC:1
4.2.5	With casting still on the machine- perform an in-process inspection of the magnetic permeability of the material using the Severn Permeability Indicator Gage. Inspect a minimum of (8) points on the rough machined flange face and an additional (8) points on the rough machined -T- section. Record the upper and lower range values on the IDC's. Values that exceed 1.02 must be documented with a non-conformance record and dispositioned prior to continuing.	65707/1.0 -Sub:1 Op#:60	Mag permeability inspection procedure TBD		/ IDC:1
	Finish machine the -T- section and wings. Run a probe pass to inspect the surface for stock.----Remove the casting from the machining fixture and flip over with the bottom flange facing up. Re-load the casting into the machining fixture. Pickup the qualifiers and orient the casting for machining.----Finish machine the -T- section and wings. Run a probe pass to inspect the surface for stock.--	65707/1.0 -Sub:1 Op#:70			

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	Setup the machining fixture with the casting installed. Pickup the qualifiers and orient the part for machining. Finish machine both flange faces and the periphery. Install all of the holes in the part including the poloidal break. Back spot face all of the holes per the customer drawing. Machine the inspection fiducials per the MTM drawing. Finish machine the poloidal break to drawing requirements. Remove the casting from the machining fixture.	65707/1.0 -Sub:1 Op#:80			
4.2.5	Inspect the magnetic permeability of the entire casting using the Severn Permeability Indicator Gage. All as cast surfaces must be inspected on a 6- x 6- grid. Record range of actual values on IDC. All machined surfaces must be inspected on a 2- x 2- grid. Record range of actual values on IDC. Permeability measurements shall be per supplementary requirements S24 of ASTM A703/A703M and S1 of ASTM A800/800M except the results will be expressed as relative permeability (μ) rather than ferrite content (FN). Values that exceed 1.02 must be documented with a non-conformance record and dispositioned prior to continuing.	65707/1.0 -Sub:1 Op#:90	Mag permeability inspection procedure TBD		/ IDC:2
4.2.7.2	PT 100% of the part as-cast surfaces as well as finished machine surfaces.----Specification: ASTM A903/A903M----Method: ASTM E165----Acceptance Criteria: ASTM A903/A903M Level II for as cast surfaces----Acceptance Criteria: ASTM A903/A903M Level I for machined surfaces including the entire -T- section (high stress areas)----Certification: MTM certification to include the information per Supplementary Requirements S1 of ASTM A903/A903M--MTM NDT Cert: LPI CERTIFICATION	65707/1.0 -Sub:1 Op#:100	PT procedure TBD		MTM NDT Cert
4.2.8.2	RT all of the -T- sections of the part that are elevated beyond the outermost portions of the top and bottom flange faces. These -T- sections are considered to be the -high stress areas- defined by the customer. Inspect other -T- sections as necessary to satisfy approx. 10% of the entire -T- section region.----Hand sketch a layout of all film locations on sheet (1) of the customer drawing SE141-116 rev. 2 to maintain shot and film traceability.----Specifications: ASTM A703/A703M Supplementary Requirement S5----Procedure/Method: ASTM E94 and ASTM E142 (use of a wire penetrameter may be necessary instead of the hole type to ensure objective 1% of thickness resolution/sensitivity)----Acceptance Criteria: Thickness < 2- ASTM E446 comparative plates----Acceptance Criteria: Thickness > 2- but < 4.5- ASTM E186 comparative plates----Scan RT certification- and hand sketched map and link in QAP to this operation.----Certification: RADIOGRAPHIC INSPECTION--Map(s): CUSTOMER DRAWING Rev: --Part Number: SE141-116--Part Description: WINDING FORM TYPE-C--Material Type: 316 SST--Material Thickness: VARIES	65707/1.0 -Sub:1 Op#:110	RT procedure TBD		Certification / Map(s)
4.2.4; 4.2.6	Setup and inspect the part 100% per the drawing requirements.--Record dimensions as required per the IDC's.--	65707/1.0 -Sub:1 Op#:120			/ IDC:98
5.2	Clean the casting thoroughly to remove all coolant- oil- tapping fluid etc... Rinse the part thoroughly and wipe down with isopropyl alcohol to remove any residue or film.----Install the poloidal break shim assembly and accompanying hardware and insulation per the assembly drawing.	65707/1.0 -Sub:1 Op#:130	Cleaning procedure TBD		
4.2.3	Perform electrical resistance test.----Wire all of the bolts together. Set one jumper directly on casting flange and one on the bolts. Record resistance between the bolt combination and the casting in kohms on IDC.----Set one jumper on the poloidal joint midplane and one on each of the bolts. Record range of resistance in kohms on IDC.	65707/1.0 -Sub:1 Op#:140			/ IDC:2
	Receive Customer supplied casting	65707/1.0 -Sub:2 Op#:10			Material Certification
	-	65707/1.0 -Sub:2 Op#:10 Pc:10			Material Certification
	Machine the shim complete per the drawing and CNC programs.	65707/1.0 -Sub:2 Op#:20			
	Assemble all of the insulating sleeves into the shim and bond using loctite 411.	65707/1.0 -Sub:2 Op#:30			
	Receive material	65707/1.0 -Sub:3 Op#:10			Certificate of Conformance
	-	65707/1.0 -Sub:3 Op#:10 Pc:10			Material Certification
	Machine per the drawing for slip fit with mating detail.	65707/1.0 -Sub:3 Op#:20			
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			
	-	65707/1.0 -Sub:4 Op#:10 Pc:10			Material Certification
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			
	-	65707/1.0 -Sub:4 Op#:10 Pc:20			Material Certification
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			

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	-	65707/1.0 -Sub:4 Op#:10 Pc:30			Material Certification
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			
	-	65707/1.0 -Sub:4 Op#:10 Pc:40			Material Certification
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			
	-	65707/1.0 -Sub:4 Op#:10 Pc:50			Material Certification
	Receive material -- Notify CFT and forward material to CFT.	65707/1.0 -Sub:4 Op#:10			Certificate of Conformance / Dimensional Report / Material Certification
	-	65707/1.0 -Sub:4 Op#:10 Pc:60			Material Certification