7 Condenser gluing procedure sheets for FM condensers

	Condenser gluing procedure sheet		company: AIDC		date: 24/12/08	
	Fill in by hand.		engineer: E. Zandi		location: AIDC	
Step	Action	Monitoring	Value	**Result**	Comment	√
1.	Record model (FM) for which the gluing preparations are prepared	Model	PW/SR/SW/PR	FM 1 - PW		
2.	Record degrease equipment used			/		
3.	**Degrease aluminium plates:** **bottom plate/top plate/strain relief bottom/strain relief top plate**				PERFORMED ON: DECEMBER 10TH	
4.	Put all the plates in a container for the degreasing			OK		
5.	Take out and store in a Kraft paper			OK		
6.	Record sandblast equipment used	Manufacturer, type/serial number	SHANG-PO SANDER CO., LTD S/N: 99168-6	MODEL: TM-R6F POWER 3 0220V		
7.	Record grit material used 180-220 dry grit	Manufacturer/grit size/material	180/220-Al2O3	180 Al_2O_3		
8.	**Sandblasting aluminium plates:** **bottom plate/top plate/strain relief bottom/strain relief top plate**				PERFORMED ON DECEMBER 10TH	

	Condenser gluing procedure sheet		company:		date:	
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Step	Action	Monitoring	Value	**Result**	Comment	√
9.	Sandblast with 45 psi : • (grooved side) **bottom plate** • (gluing side) **top plate** • (grooved side) **bottom strain relief plate** • (gluing side) **top strain relief plate**	Pressure	45 psi	45 psi		
10.	Remove all sanding residue by blowing dry oil-free air			OK		
11.	Store in a clean and dry place for further processing			OK		
12.	**SURFACE TREATMENT AND GLUING (should be done within 8 hours!!)**					
13.	Verify glue/adhesive expiry date	Record expiry date	> date of application 08 08/08	24 DECEMBER 2008	EXTENSION LIFE OF MASTERBOND GLUE BY SHEAR TEST → TO 27 JANUARY 2009	
14.	Verify all gluing can be performed within 8 hours after following surface treatments			OK		
15.	**SURFACE TREATMENT INCONEL 718 TUBES**	Record start time			THIS PROCESS IS PERFORMED DURING THE NIGHT OF 23 DECEMBER.	
16.	Verify the manifold tubes are closed with Swagelok connectors				GET READY AT 7.00 a.m. of 24TH DECEMBER	
17.	Vapour degreasing the TUBES with Trichloroethylene at 185-195°F (85-90.5 °C)				FOLLOWED THE SAME ~~OPERATIO~~ PROCESS OF EM AND QM CONDENSOR	

FOR SURFACE TREATMENT OF TUBES TIME IS 1 HOUR.

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
18.	Prepare a bath with solution as described in step 35. The bath should be deep enough to immerse the tubes in the bottom plate AND the strain relief tubes			/		
19.	Immerse the tubes in the bath for 5 min at 140 to 150 F (60 to 65 C) in sulfuric acid dichromate (the same that will be <u>used for preparing aluminium</u>): 1. H2SO4 : 276 ~ 313 g/l 2. Na2Cr2O7 : 59 ~ 90 g/l 3. Al : 1.5 g/l min 4. Cu : 150 mg/l min 5. Cr+3 : 1.9%/wmax 6. Cl : 300 ppm max 7. Etching rate : 0.24 ~ 0.50 mils/surface/hr	Record temperature	145 °F (62.5°C) Record weight hydrochloric acid, weight orthophosphoric acid, and weight\ hydrofluoric acid.	/		
20.	Put the tubes in a second bath with DI water and rinse thoroughly with water not over 65 °C	Record temperature and time	50°C	/		
21.	**Spray rinse with DI water at RT**	Record temperature and time		/		
22.	Dry in oven at not over 93 °C			/		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
23.	Put tubes in a Kraft paper, in a clean dry place. Handle all parts as little as possible and only with clean, lint free cotton or nylon fabric gloves			OK	FINISH TIME 7.00 a.m.	
24.	**SURFACE TREATMENT BOTTOM PLATE ALUMINIUM AND SUPPORT TOOL (pressure tubes, positioning pins, pressure plate, bonding plate, bonding tool pocket)**				THIS PROCESS WAS PERFORMED BY AIDC PEOPLE DURING THE NIGHT OF ~~23rd DECEMBER~~.	
25.	Vapour degreasing the plates with Trichloroethylene at 185-195°F (85-90.5 °C)				GOT READY AT 7.00 a.m.	
26.	Perform Hot AlKaline with Turco-4215S at 135-145°F (57-63 °C)				FOR SURFACE TREATMENT OF AL PLATE TIME IS 2 HOURS	
27.	Put the plate in a bath with DI water and hot rinse thoroughly with water at 110-130°F (43-54) °C	Record temperature and time		/		
28.	Spray rinse with DI water at RT	Record temperature and time		/		
29.	Immerse plates for 12-15 minutes at 151-160 °F (66-71 °C) in the following acid solution: 1. H2SO4 : 276 ~ 313 g/l 2. Na2Cr2O7 : 59 ~ 90 g/l 3. Al : 1.5 g/l min 4. Cu : 150 mg/l min 5. Cr+3 : 1.9%/wmax	Record weight acid solution, weight sulfuric acid and sodium dichromate/ Record temperature/record time	155.3 °F (68.5 °C)/ 13.5 min	/		

	Condenser gluing procedure sheet		company:		date:	
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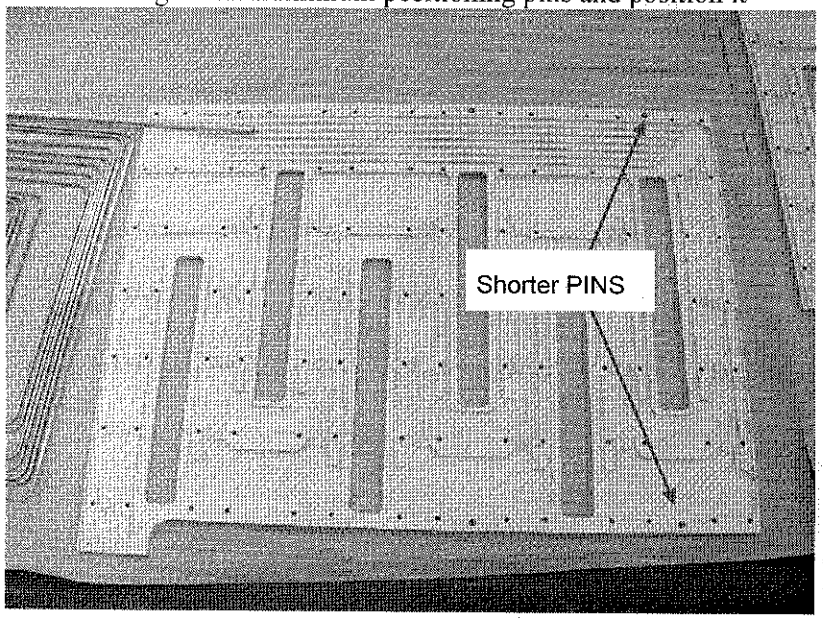
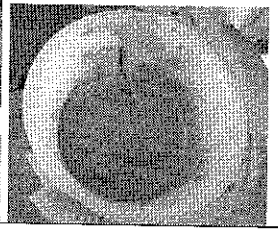
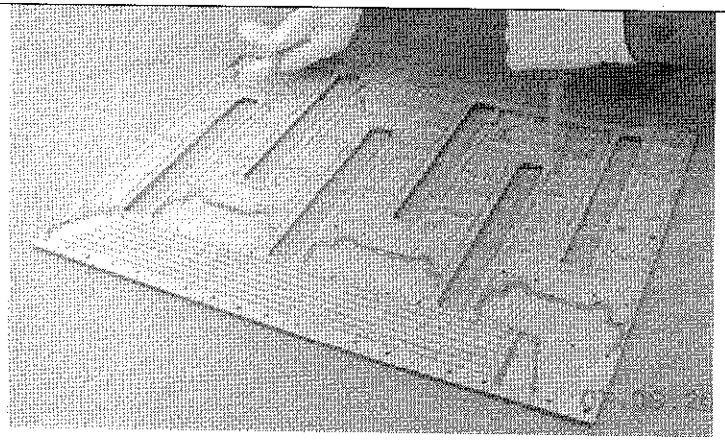
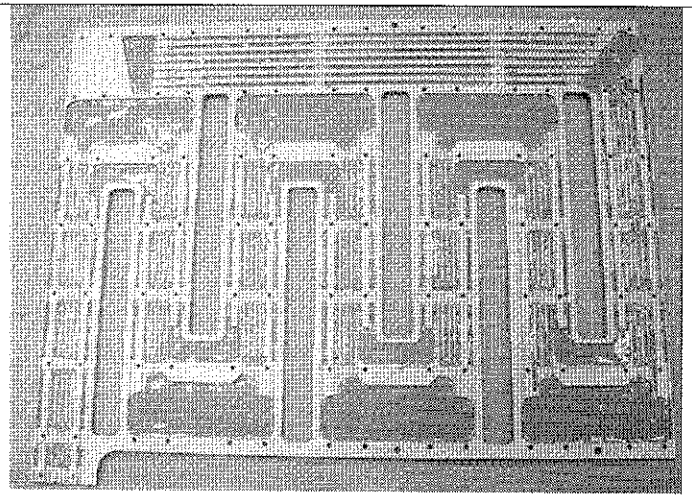
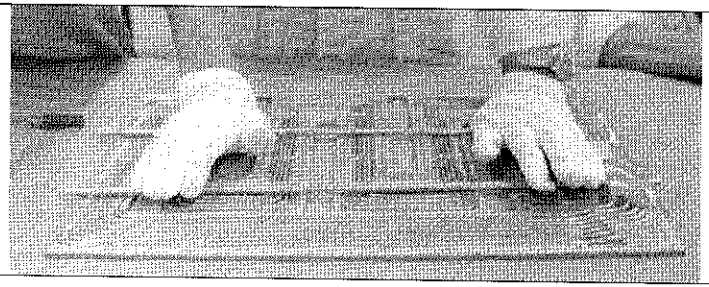
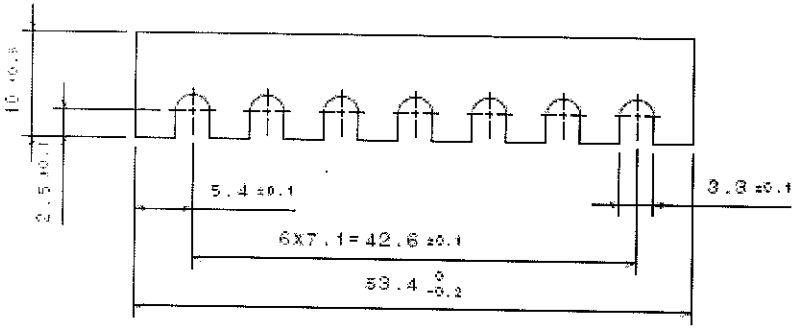
Step	Action	Monitoring	Value	**Result**	Comment	√
	6. Cl : 300 ppm max 7. Etching rate : 0.24 ~ 0.50 mils/surface/hr					
30.	Put the plates in a second bath with DI water and rinse thoroughly with water not over 149 °F(65 °C)	Record temperature and time	122°F (50°C)			
31.	Spray rinse with DI water at RT	Record temperature and time				
32.	Dry in oven					
33.	Put the plates in a Kraft paper, in a clean dry place. Handle all parts as little as possible and only with clean, lint free cotton or nylon fabric gloves				FINISHED TIME: 7:00 a.m	
34.	**APPLYING THE ADHESIVE**					
35.	Prepare working place and (support) rails, positioning pins, pressure tubes,dispenser, needles, 3M 850 tape, 3M 5490 tape					
36.	Put the aluminium bottom plates and Inconel tubes on a clean working table			OK		
37.	Put tubes in the Aluminium plate and apply aluminium tape on the surface of the tubes that comes out from the condenser (only for few cm). Then take out the tubes.			TAPE AL 3M 02-300	TO PREVENT GLUE ON THE INLET AND OUTLET TUBES	

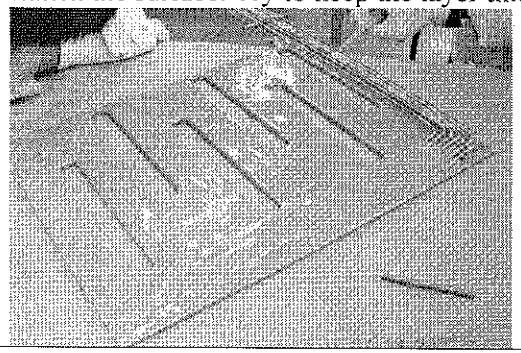
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
39.	Put release agent on aluminium positioning pins and position it 	Record release agent used				
40.	**Glue tubes to bottom plate**					
41.	Read and follow the instructions of the manufacturer for the adhesive MASTERBOND EP21TDC-2LO, especially wrt mix ratio and working life (90min). To be used only the amount of glue foreseen for 1 QM/FM	Record Mixing ratio applied		1:3	MIXING TIME: 1.20 a.m	

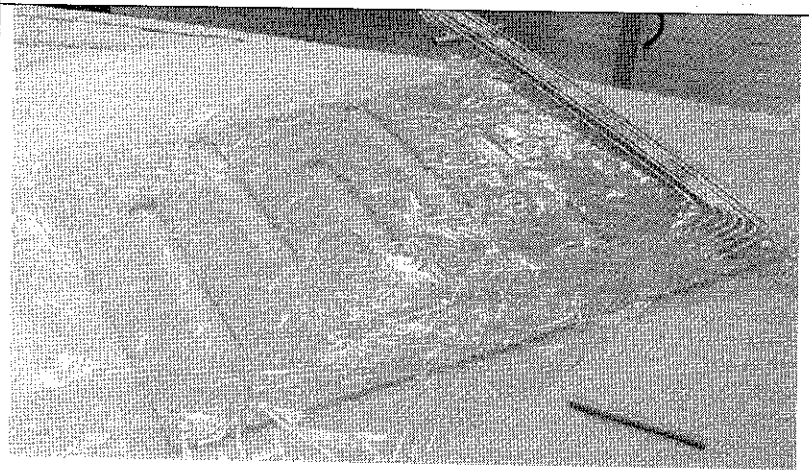
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
	bottom condenser plate.					
42.	To avoid bubble air in the glue, perform the following for each time a new amount of glue is mixed: • Mix the A and B compound • Pull a vacuum, repeatedly, i.e. pull-relax, pull-relax, pull-relax... (at least 15 minutes) 		15 min	10 min OK	PUT DIRECTLY THE GUN WITH GLUE INTO VACUUM TO AVOID AIR FINISH TIME AFER PULL & RELAX: 9:48 a.m.	
43.	Apply the glue on the bottom of the pockets and in the edges (of bottom plate) carefully by a gun with a tip dispenser of approximately 0.9mm.	Record time of application of glue		9.53 a.m		

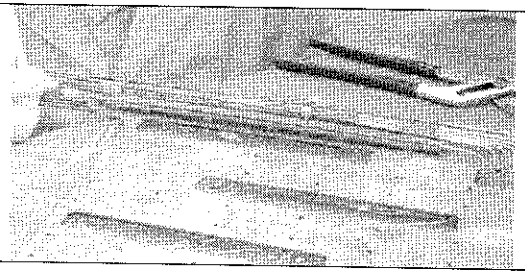
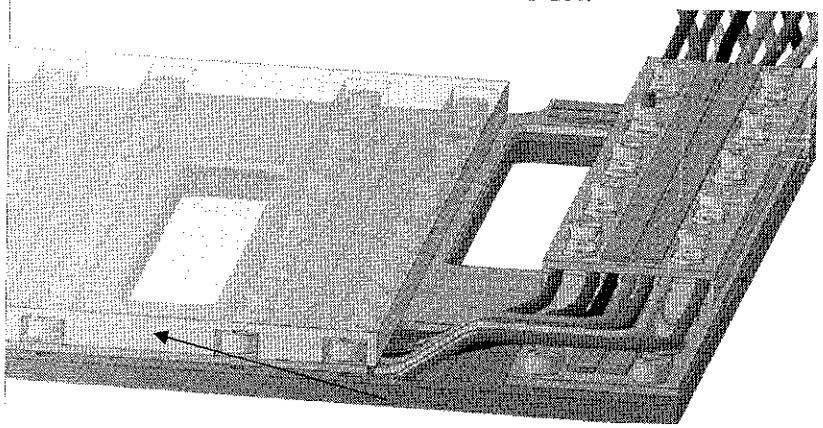
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
	 Cut with a slope the tip dispenser to enlarge the gluing area and fill the bottom of the pockets completely.			OK		
44.	Put also a small layer of glue in the grooves, always with the cut tip dispenser. However put no glue on the grooves for bonding top plate "teeth" :these parts are for pushing the tubes in right position and should have no glue.			OK		

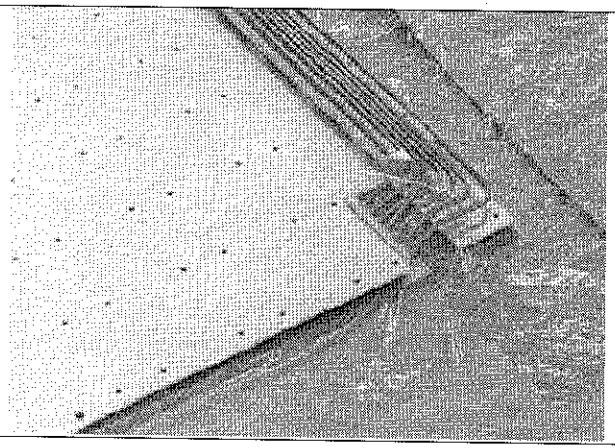
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK	FINISH TIME: 10:20	
45.	Put the tubes and press them in place using the tubes frame (they will be used very temporarily). Use rulers/knives and press them by hand. (see appendix A for drawings and sketches)			OK		

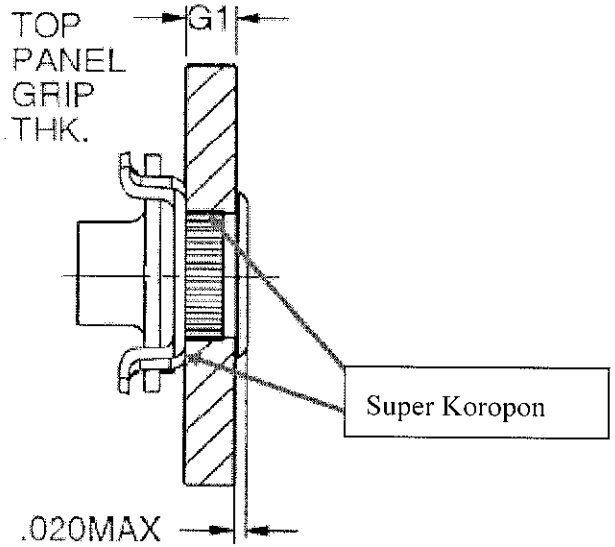
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
						
46.	Apply release agent on the bonding pocket tool to let it be removed after the gluing and position it. 			OK	NEW MIXING GLUE: 10.30 a.m FINISH POUR & RELAX INTO VACCUUM: 10.35 a.m	
47.	Gently remove the rulers or frame which press the tubes into the plate					

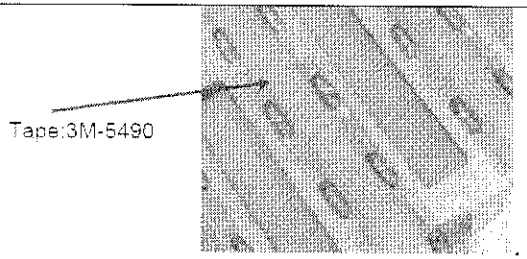
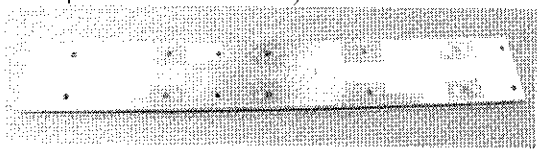
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
48.	Completely fill the bottom plate with cut tip dispenser and a spatula to flatten the surface. Try to keep the layer thickness ≤0.5 mm 			OK	STOP TO USE THE FIRST BATCH OF GLUE BECAUSE OVER WORKING TIME. START TO USE THE NEW BATCH 14:00. AT 14.37 START TO USE NEW GLUE (NOT VACUUMED) ONLY TO FLAT WITH A SPATULA THE SURFACE	
49.	Remove, where possible, the exceeding glue			OK		
50.	Put a release film over the surface of the bottom plate and position the bonding plate over the bottom plate, using the position pins			OK		

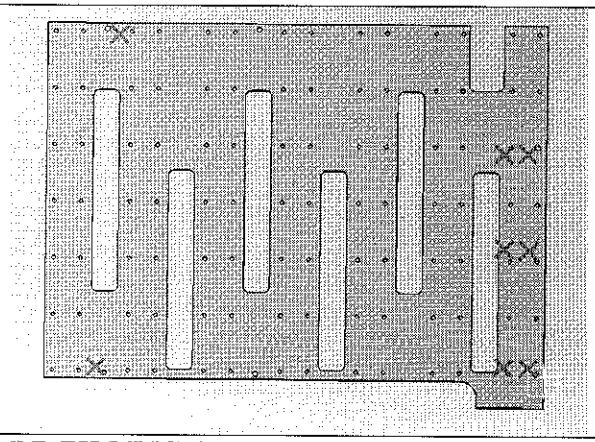
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
					OK	
51.	Insert the bottom strain relief (covered with the release film) over the bonding top plate, using 2 positioning screws, to support the tubes during the vacuum bag and to prevent excessive bending of the tubes.				STRAIN RELIEF IS NOT COVERED WITH RELEASE FILM	

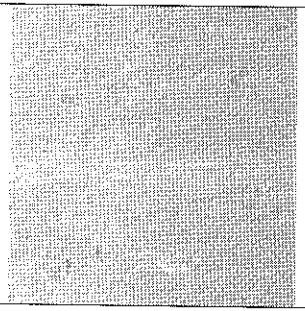
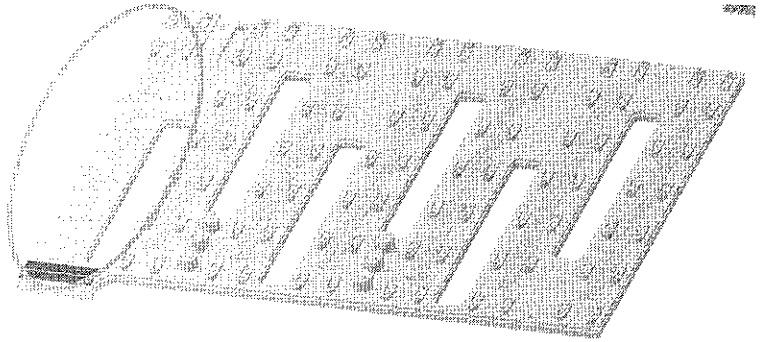
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK	A SMALL SUPPORT IS ADDED ON THE POCKET SIDE TO AVOID BENDING OF THE TUBES	
52.	Position the pressure plate over the top bonding plate (no nutplates are present in this step). NOTE: THE PRESSURE PLATE HAS BEEN MODIFIED TO ALLOW PINS GO THROUGH. 				ANOTHER PRESSURE PLATE ADDED.	

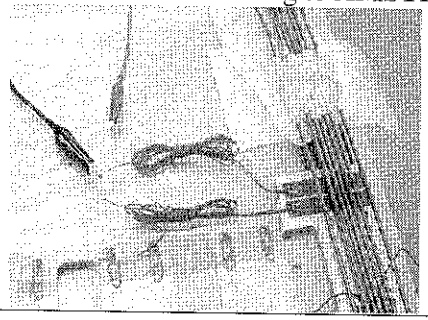
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
					TOTAL GLUE USED: 550 ml	
53.	Put all the assembly on a vacuum bag and cure for 1 day			OK		
54.	**SURFACE TREATMENT and NUTPLATE INSTALLATION ON TOP PLATE**				DATE: 31st DECEMBER 2008	
55.	Perform the surface treatment of ONLY TOP plate following the procedure of the Bottom plate (from step to 28 to 36).				SURFACE TREATMENT IS PERFORMED BY NDC PEOPLE DURING THE NIGHT OF 30th DECEMBER. READY AT:	
56.	Paint the contact surface between nutplate and top plate holes with Super Koropon Primer Base 515-700 (Don't add MEK, just use small amount of Super Koropon in a little cup and then refill when finished). Install the 88 nutplates using the installation tool DCBT8600-06				START INSTALLATION 8.05 a.m	

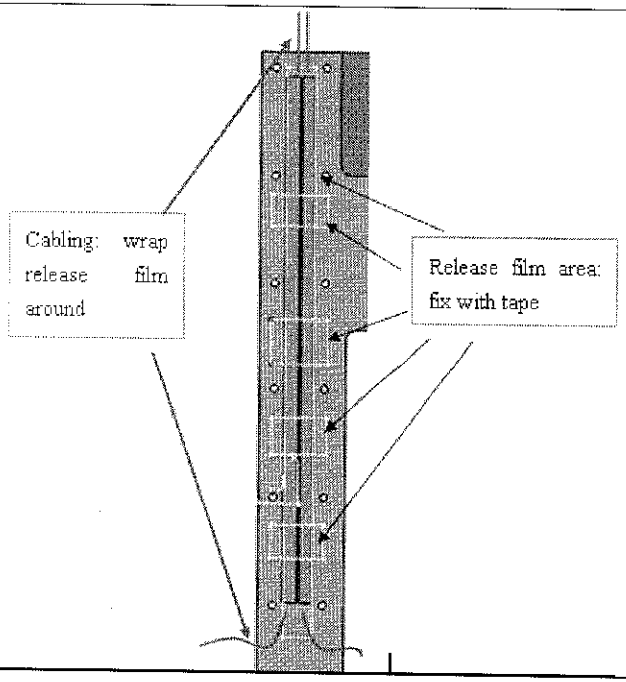
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
					• INSTALLATION TOOL BROKEN AT 8.40 → CHANGE THE TIP WITH A NEW ONE • FINISH TIME: 9.20 • CHECK THE FLOATING OF THE NUTPLATES • TOO MUCH PRIMER CAN STOP THE FLOATIN → PUT LESS!!	
57.	Apply 3M 5490 tape on top plate: • To the border line • in the central reducing mass holes • On the TS and heaters location • Over the nutplates					

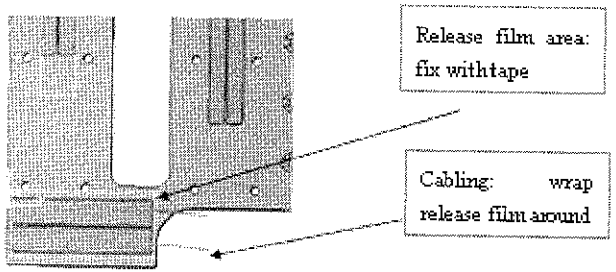
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
	 The tape will be taken out to remove the exceeding glue.			ok		
58.	Apply small square size pieces of the 3M 850 on holes of the top plate (Inner side, the one that will be glued) as in the following picture (only for square size reference).  NO TAPE ON: • JIG PIN POSITION • STRAIN RELIEF PIN POSITION			ok		

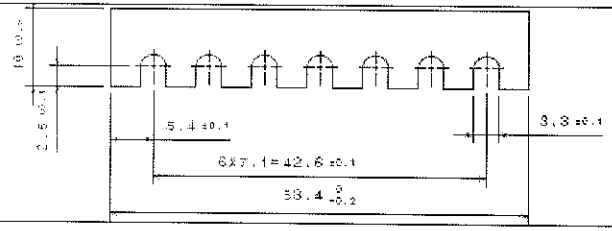
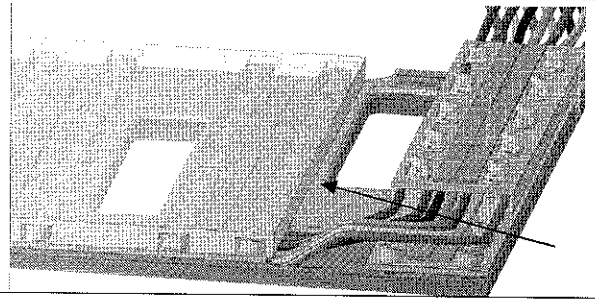
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
						
	RE-FILLING CHECK , INSTALL FOIL HEATERS ON TOP plate (STRAIN RELIEF SIDE)and GLUING TOP PLATE TO BOTTOM PLATE-				31/12/08	
59.	open the vacuum bag and remove: • the short pins on the strain relief side • the bottom strain relief, • the bonding top plate • the release film			OK		
60.	Check if voids are in the gluing surface, using a needle and a knife. If yes, enlarge the little air bubble areas using a drill and re-fill with glue.			OK		

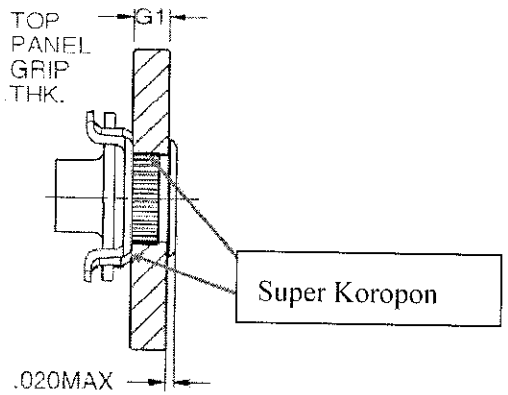
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK		
61.	Install the foil heater on top plate: • #2 liquid line foil heaters -FHK203 Kapton Thermofoil heater (red in the picture) • #2 condenser foil heater -HK 27565 Kapton Thermofoil heater (yellow in the picture) 			OK		

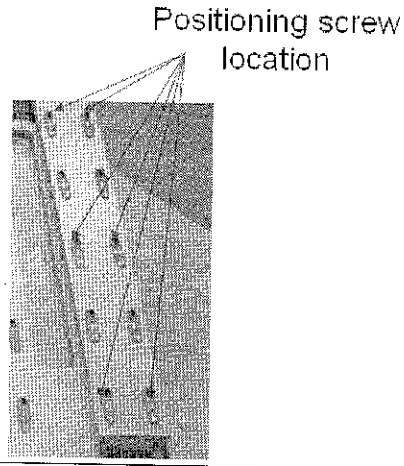
	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
62.	Remove the tape on the top plate on the strain relief side, where the heaters have to be installed.			OK		
63.	Install heaters according to **AMSTR_NLR_PR-043 procedure** 			OK		
64.	Protect the HK 27565 heater and cable with release film according to the following schematic, using release film and tape to fix.			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK	ONLY 1 PIECE OF RELEASE FILM OVER THE OVERALL LENGTH OF THE HEATERS	
65.	Protect the FHK203 heater and cable with release film according to the following schematic, using release film and tape to fix.					

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				DK		
66.	Use tape to fix the heater cable to the plate, to avoid stressing the foil heater wire connection			OK		
67.	Apply the adhesive MASTERBOND EP21TDC-2LO according to manufacturers instructions on the top plate	Record Mixing ratio applied	1:3		MIXING TIME: 13:06 => 150 mol VACUUM & RELAX: 13:29 (finish) ~~REFILL BOTTOM PLATE~~ MIXING NEW GLUE: 13:40 => 150 ml FINISH PULL & RELAX: 14:00	
68.	Position top plate on bottom plate within accuracy by using D=5mm positioning pins.					
69.	Insert the bottom strain relief (covered with the release film) on the top plate. with positioning screws, to support the tubes during the vacuum bag and to prevent excessive bending of the tubes.			OK		
70.	Apply the bonding tool pocket			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK		
71.	Position the pressure plate over the top plate NOTE: THE PRESSURE PLATE HAS BEEN MODIFIED TO ALLOW PINS GO THROUGH. 			OK		
72.	Put all the assembly on a vacuum bag and cure for 1 day			OK	FINISH: 12:43. TOTAL GLUE USED: 300 gr	
	SURFACE TREATMENT OF BOTTOM AND TOP STRAIN RELIEVES AND NUTPLATE INSTALLATION				6TH JANUARY 2008	
73.	Open the vacuum bag, remove the pressure plate and the tape from the top plate surface			OK	• THE BONDING POCKET TOOL WAS NOT IN THE RIGHT POSITION → PRESSURE PLATE CANNOT TOUCH TOP PLATE → THIS AREA WILL BE REFILLED • GLUE ON HEATERS → TO CHECK IF IT IS BETTER TO USE TEFLON TAPE OR RELEASE FILM	

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
74.	Remove the PINS only strain relieves side.				REMOVED PROTECTION OVER HEATERS	
75.	Perform the surface treatment of TOP and BOTTOM strain relieves following the procedure of the Bottom plate (from step to 28 to 36)			OK	FINISH TIME: 7:00 a.m.	
76.	Paint the contact surface between nutplate and TOP strain relief holes with Super Koropon Primer Base 515-700 (Don't add MEK, just use small amount of Super Koropon in a little cup and then refill when finished). Install the 10 nutplates using the installation tool DCBT8600-06 			OK	START: 8.10 a.m. FINISH: 8.20 a.m.	
77.	Remove the nut on the nutplates that will be used for the positioning screws, using the removal tool				REMOVED ONLY ON 3 NUTS BECAUSE THE REMOVE TOOL WAS NOT WORKING PROPERLY	

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
						
78.	Clean inlet tubes on the pocket area				NOT PERFORMED	

	Condenser gluing procedure sheet		company:		date:	
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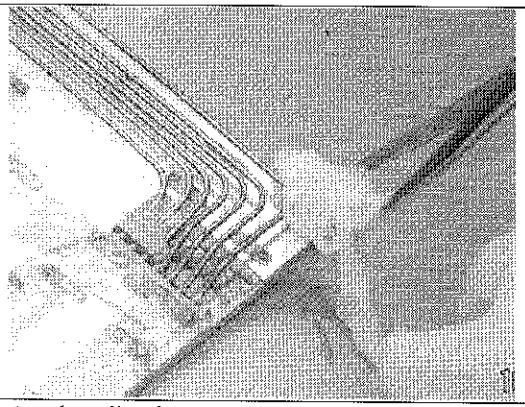
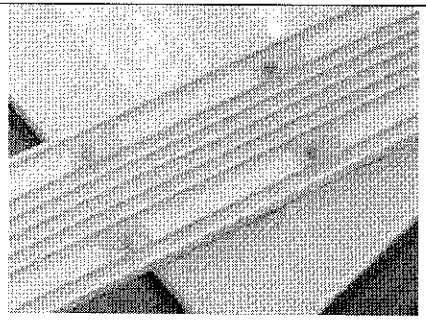
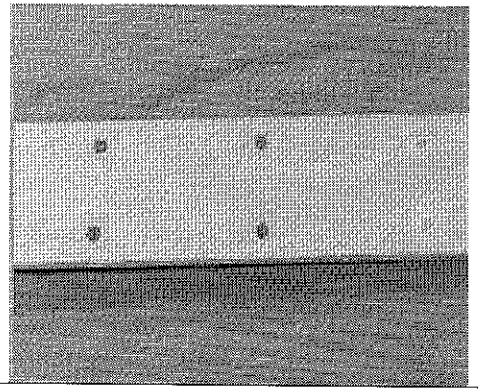
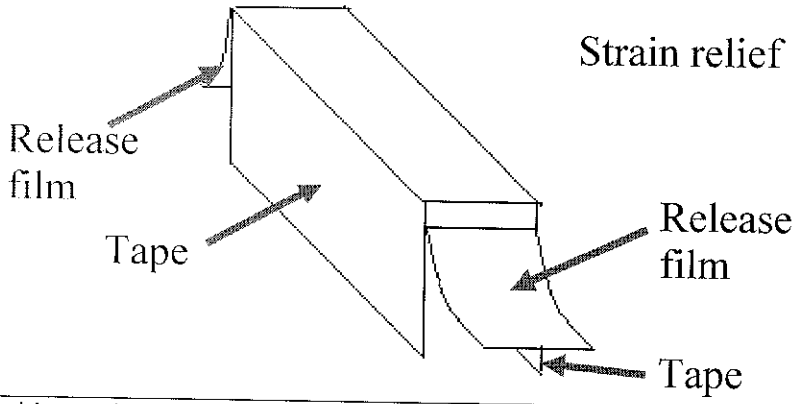
Step	Action	Monitoring	Value	**Result**	Comment	√
						
79.	Apply adhesive tape 3M 5490 on the border line and on the surfaces of the bottom and top strain relieves (on the area where heaters will be installed)			OK		
80.	Apply small square size pieces of the 3M 850 on holes of the bottom strain relief (Inner side, the one that will be glued): don't put the tape on the positioning screw holes.			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK		
81.	Apply small square size pieces of the 3M 850 on holes of the top strain relief (Inner side, the one that will be glued): don't put the tape on the positioning screw holes. 			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
82.	Apply the adhesive MASTERBOND EP21TDC-2LO according to manufacturers instructions, in the grooves and all the internal surface of the bottom strain relief.	Record Mixing ratio applied			- VACUUM PROCESS	
83.	Cover the strain relief as in the following picture to protect the foil heaters already installed. 				- AL TAPE AT INLET / OUTLET TUBES AND ON BACK SIDE OF STRAIN RELIEF TO AVOID GLUE OVER THE HEATERS - USE AL TAPE	
84.	Position and assemble the bottom strain relief on top plate, avoiding tubes touch the glue. Put the 2 positioning screws from the bottom side of the condenser to let the bottom strain relief be in the right position.			OK	NO NECESSARY	

	Condenser gluing procedure sheet		company:		date:	
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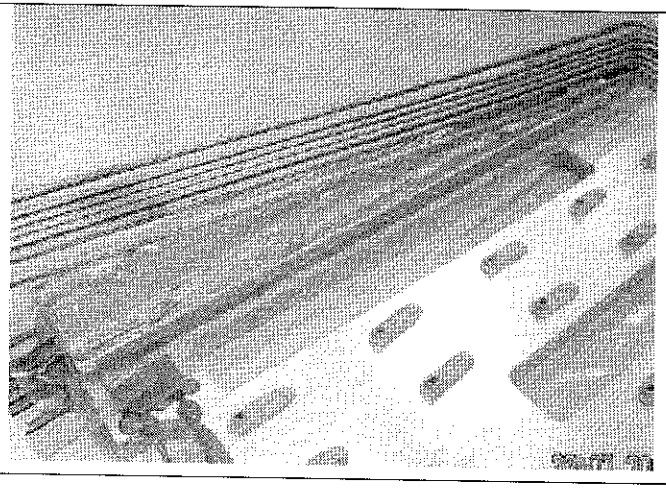
Step	Action	Monitoring	Value	**Result**	Comment	√
					START APPLY GLUE INTO BOTTOM STRAIN RELIEF: 10:34 LESS GLUE IN THE CHANNEL (MAYBE NOT ENOUGH!!)	
85.	Press tubes into bottom strain relief and refill a new glue layer					

	Condenser gluing procedure sheet		company:		date:	
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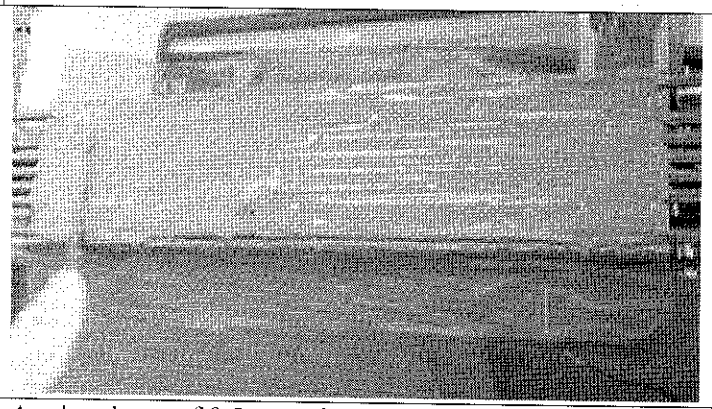
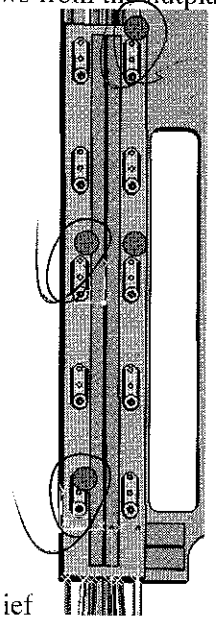
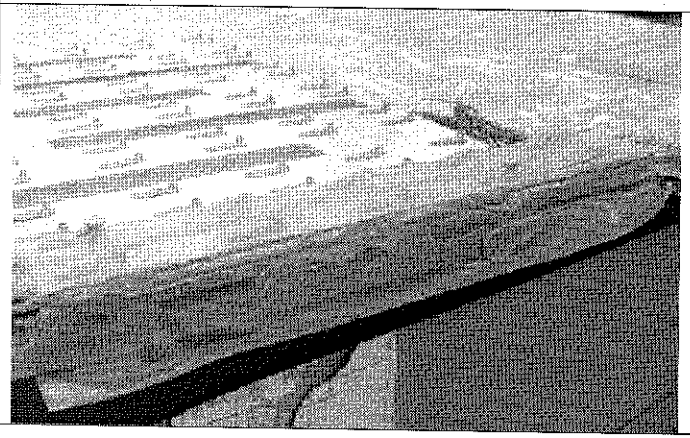
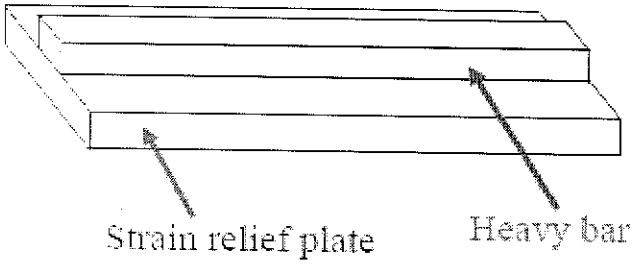
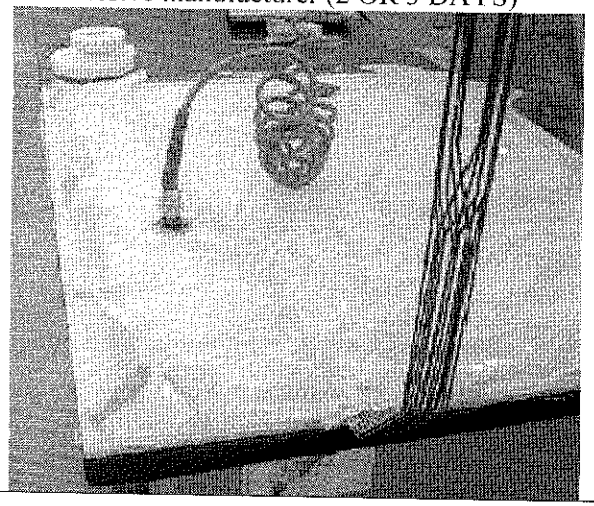
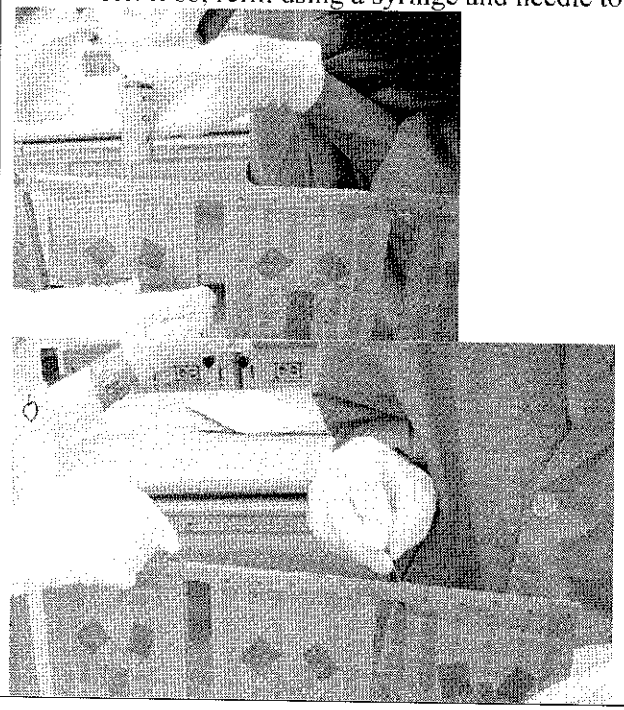
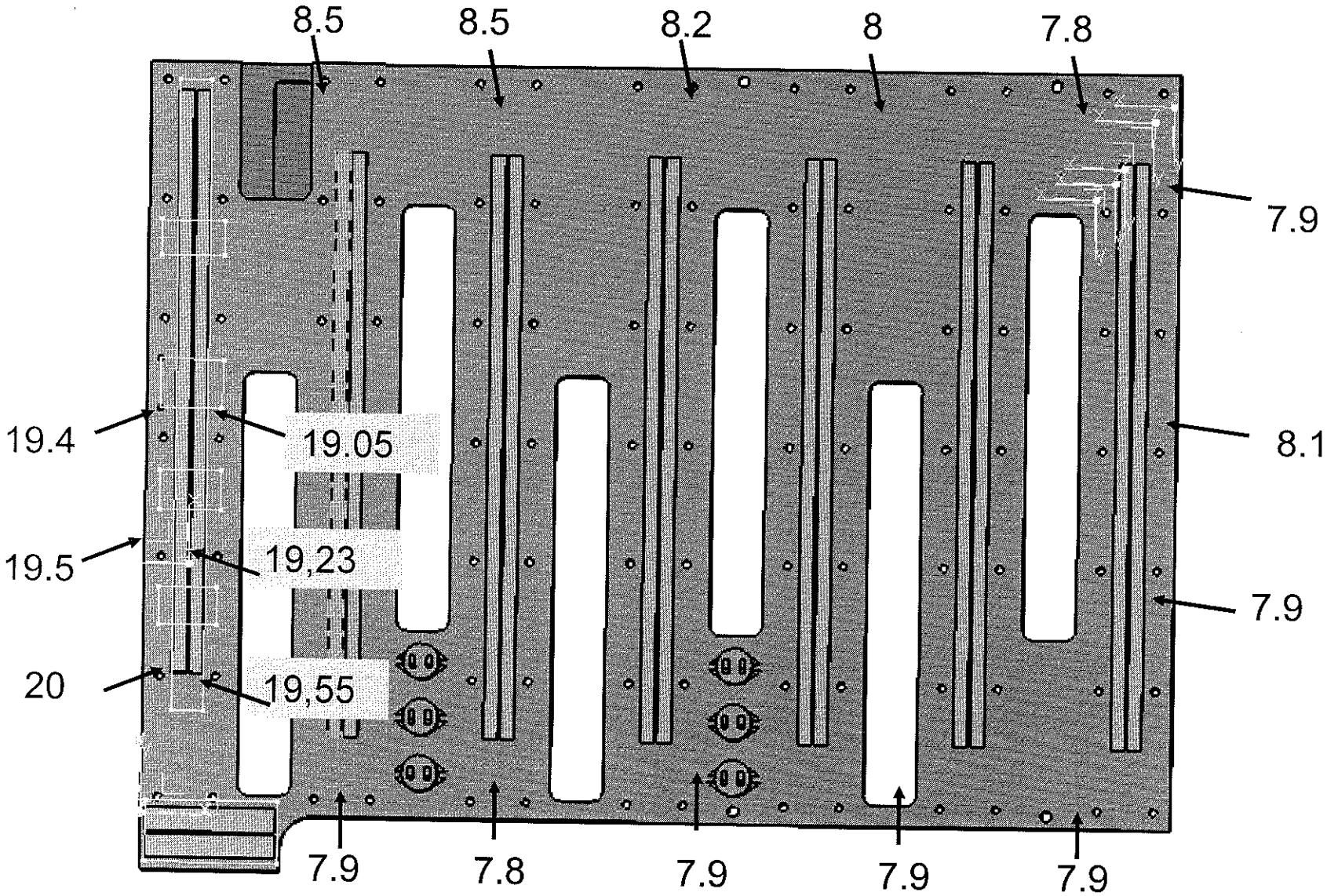
Step	Action	Monitoring	Value	**Result**	Comment	√
				OK		
86.	Apply a layer of 0.5 mm glue on the top strain relief and put the top strain relief to bottom strain relief.			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
87.	Apply 4 positioning screws from the nutplate side on the top strain elief  Positioning screw				ONLY 3 PINS FROM BOTTOM ⇒ NEXT CONDENSER INSERT PINS FROM TOP	
88.	Press top strain relief to bottom strain relief			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
						
89.	Remove the 2 positioning screws from the bottom side of the condenser and apply to the nutplate side of top strain relief				NO NECESSARY	
90.	Position the heavy bar over the top strain relief to have a uniform glue layer			OK		

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
						
91.	Put all the assembly on a vacuum bag for the time period mentioned by the adhesive manufacturer (2 OR 3 DAYS) 			OK	FINISH: 11:00 a.m TOTAL GLUE USED: 133 g	

	Condenser gluing procedure sheet		company:		date: 7/01/09	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
	EDGE REFILLING CHECK					
92.	Open the vacuum bag and check if the no voids are along the edges of the condenser. If so, refill using a syringe and needle to push the glue inside. 			OK	- NO VOIDS - NO NECESSARY TO REFILL. - LEAVE GLUE ON ENTRANCE AND BACKSIDE OF STRAIN RELIEF - REFILLING ON POCKET SIDE DONE AT 15.00 ~~at~~ of 7th JANUARY.	

	Condenser gluing procedure sheet		company:		date:	
	Fill in by hand.		engineer:		location:	
Step	Action	Monitoring	Value	**Result**	Comment	√
	DRILLING THE HOLES					
93.	Open the vacuum bag and perform visual inspection of the gluing	Check glue thickness on sides	Uniform glue thickness on	OK	→ SEE ATTACHED DRAWING	
94.	After curing time, remove the tapes and the pins from the condenser surface. Remove exceeding glue as better as it is possible.	· DRILL SIZE: 3.7 mm " " 5.0 mm		OK	· DON'T REMOVE THE TAPE ON TOP AND BOTTOM PLATE	
95.	Drill the holes of the condenser to remove the glue inside (from bottom to top plate, to avoid going through the nutplate thread)				· IT IS BETTER PROTECT HEATERS WHILE DRILLING · STRAIN RELIEF SIDE NOT ON-LINE	
	INSTALLATION OF FOIL HEATERS ON TOP PLATE AND TOP STRAIN RELIEF					
96.	Apply the remaining foil heaters on top plate and top strain relief according to the procedure AMSTR-NLR-PR-043			OK	PERFORMED ON 8TH JANUARY	
97.	Remove the tape on the condenser plates				- PERFORMED ON 7TH JANUARY	
98.	**WIEGHT RECORD**					
99.	Put the condenser on a balance and record the weight	Record the weight measured		OK	h. 152,12g	
100.	End	THICKNESS RECORD → SEE		ATTACHED	PICTURE	

Thickness value FM1 (mm)