



INSTRUCTIVO DE PUESTO DE TRABAJO

N° DE PARTE	REDACTO	APROBADO	FECHA	REVISIÓN	SECCION
390-05484-401 MF	DÁVILA	MAENZA D.	15/06/2021	D	PÁGINA 4

Figura A (1/1): Realizar plegado según la figura

DESARROLLO



FAdeA's
**MANUFACTURING
CAPABILITIES**



Fábrica Argentina de Aviones "Brig. San Martín" S. A.

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FAdEA's manufacturing capabilities are described in the following paragraphs. Composite material and tubebending capabilities are also included.

SHEET METAL

a. Hydro Bag forming

Machine type	Quantity	Maximum Pressure	Working Pressure	Dimensions LH	Dimensions RH
VERSON Hydraulic Press	1	5000 psi 10800 Tn U. S	350 Kg/cm ² 9747 Tn/metric	L _{max} :2690 mm W _{max} :665 mm H _{max} : 125 mm	L _{max} :2690 mm W _{max} :665 mm H _{max} : 125 mm
AVURE Hydraulic Press	1	88 [MPa]	80 [MPa]	Ø _{max} : 950 mm H _{max} : 222 mm H _{util} : 172 mm	Ø _{max} : 950 mm H _{max} : 222 mm H _{util} : 172 mm



VERSON Hydraulic Press



Sample part with mould



AVURE Hydraulic Press



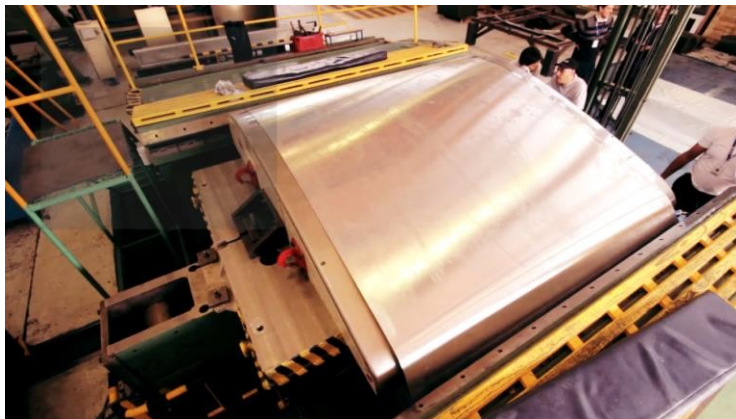
Sample part

b. Stretch forming

Machine Type	Quantity	Maximum Pressure	Jaws	Arms (mm)	Dimensions of table
HUFFORD PressA-12 Mod. 59	1	60 Ton	Qty: 2 Opening: 200 mm Force: 75 Tn	Qty: 2 Opening: 5.000 mm	Work length= 10.000 mm
LOIRE Press(PLC control)	1	125 - 250 Ton	Dist. H= 2.180 mm Dist l= 2.800 mm		L= 3.060 mm W= 400 mm Tilt 15º



HUFFORD Press



LOIRE Press – KC-390 Skin stretching



Sample part

c. Route/ Brake (Flat)

Machine Type	Quantity	Length	Width	Vert. Displ.	Cutting Thickness	Turning Speed (RPM)
ONSRUD Fixed Pantograph	1	900 mm	700 mm	200	0 - 5 mm	1200
ONSRUD Fixed Pantograph	1	3.700 mm	1.300 mm	50	0 - 5 mm	1400

d. Water Jet Machine

Machine Type	Max Cut Area (mm)		Max Cutting Thickness (mm)	Working Water Pressure (psi)
JET EDGE/INTERTECH	1220	3660	254	55000

Tolerance: 0,10 mm. (Renishaw Ball Bar certified)

Repeatability: 0,025 mm (Renishaw Ball Bar certified)

Software: Sigmanest

Cut Material: Metal cut: filtered water plus abrasive material

Composite/plastic Cut: Filtered Water



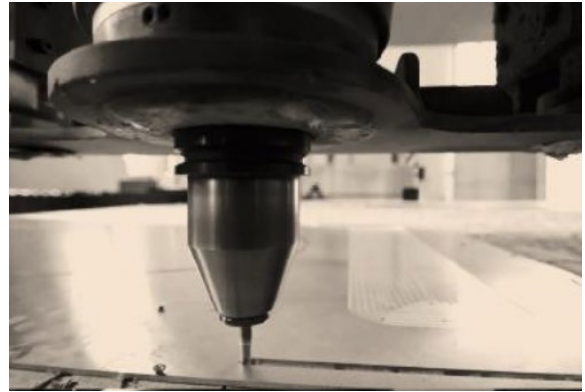
Water Jet Machine



Sample part

e. CNC Contour Drilling Machine

Machine Type	Qty of Machines	Qty of Axes Prog.	Max Cut Area (mm)		Max Weight on Table (KG)	Accuracy (mm)	Software
ME-PROMAES Contour Drilling Machine	1	3	2000	4000	5500	0.02	Sigmanest



CNC Contour Drilling Machine

f. Joggle forming and Profile shaper

Machine Type	Quantity	Jaws Length (mm)	General Characteristics	Working Press	Profiles
PROMEKAN Shaper	1	700	Aperture: 190 mm Material: Aluminum Max Thickness: 1,6 mm T0	5 Tn	L - Z
DIAMINT Shaper	1	2520	Aperture: 60 mm Material: Aluminum, Steel Max Thickness: 3 mm T3	120 Tn	L - Z - C - Ω
BIPRESS Shaper	1	3200	Throat gap: 400 mm Worktable height: 800 mm Worktable width: 60 mm Ram stroke length: 200 mm Max shut height: 480 mm	1200 kN	Any



BIPRESS Shaper



Sample part

GRINDER MACHINE

Machine Type	Quantity	Diameter	Tip Heights	Stroke	Brand
Universal	3	Max 500 mm	330 mm	Max 1120	Cincinnati Tos Hostivar
Interior	6	Min 4 to 20 mm Max 20 to 150 mm	Max 460 mm	Min 30 mm Max 1000 mm	Heald 72 A Overbeck
Exterior	3		Min 701 mm Max 185 mm	Min 300 mm Max 1000 mm	Precimax Fortuna Weke
Planetary	4	Table: 600 x 220 500 x 300		Min 100 mmMax 180mm (Ver. Stroke)	Heald Abrasive Normatic Elb
Centerless	2	3 to 60 mm			Cincinnati Multimat
Burnishers	3	Min 20mm Max 120 mm		Min 100 mm Max 1000 mm	Alecar



Grinded sample parts

C.N.C. 3 & 5 AXIS

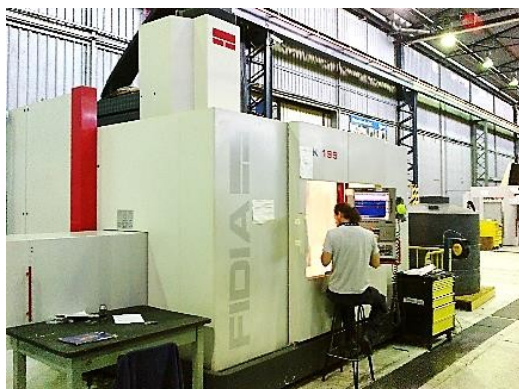
Type	Qty of Machines	Qty of Axes Prog.	Qty of Spindles and Position	Distance Between Spindles (mm)	Max Stroke (mm)	Feeding Speed (mm/min)	Rotation Speed (RPM)	Spindle Power (KW)	Max Weight on Table (KG/m ²)	CNC Type
DROOP & REIN GANTRY	1	3	3 Vertical	1300	X=18000 Y=2000 Z= 600	1-5000	20-4000	30	2000	Siemens 840
DROOP & REIN GANTRY	1	5	3 Vertical	1300	X=18000 Y=2000 Z= 600 A= +/- 25º B= +/- 25º	1-5000	20-4000	30	2000	Siemens 840
FIDIA	1	5	1 Vertical	-	X=2700 Y= 1100 Z= 1000	24000	24000	27	2600	FIDIA
FIDIA	1	5	1 Vertical	-	X=4200 Y= 2700 Z= 1000	30000	24000	55	-	FIDIA
FIDIA	2	5	1 Vertical	-	X=1650 Y=750 Z= 850	30000	24000	55	4800	FIDIA



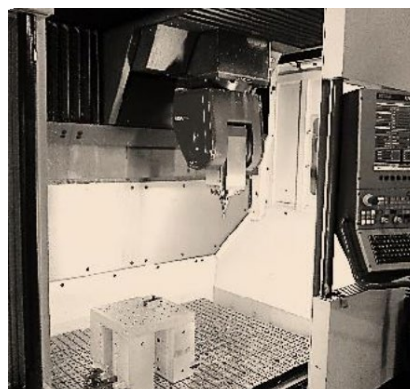
CNC Workshop General View



DROOP & REIN Gantry



FIDIA K199

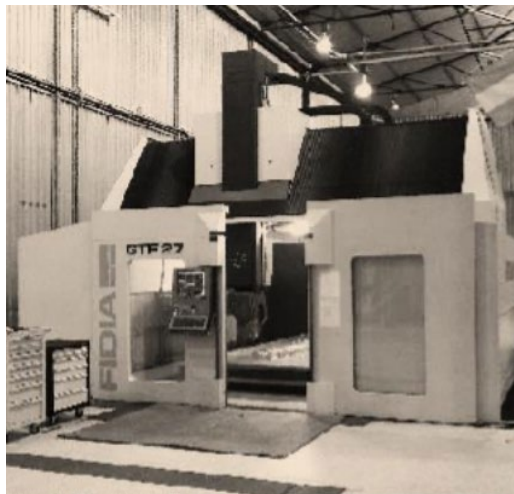
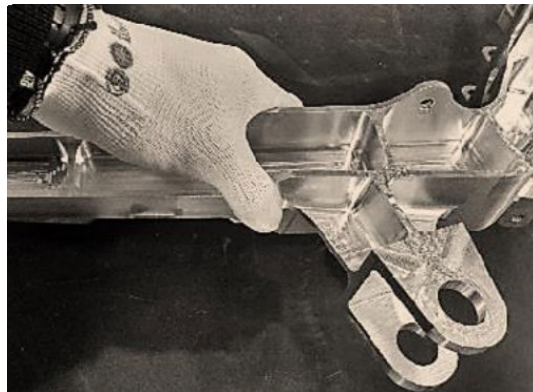




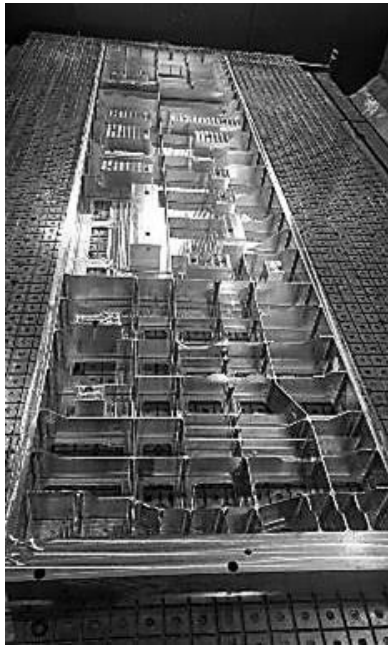
FIDIA K211



FIDIA K211 – Sample parts



FIDIA GTF27



FIDIA GTF27 Sample parts – 3.5 m long

Machine	Stroke Max (mm)	Speed (mm/min)	(rpm)	Power (Kw)	Max Weight on Table (Kg)
PROMECOR SMV10 STD	X:650Y:370 Z:600	3000	20 - 6000	7,5 (1 Head)	200
PROMECOR SMV10 ESP	X:1200Y:380 Z:600	3000	20 - 6000	7,5 (1 Head)	200

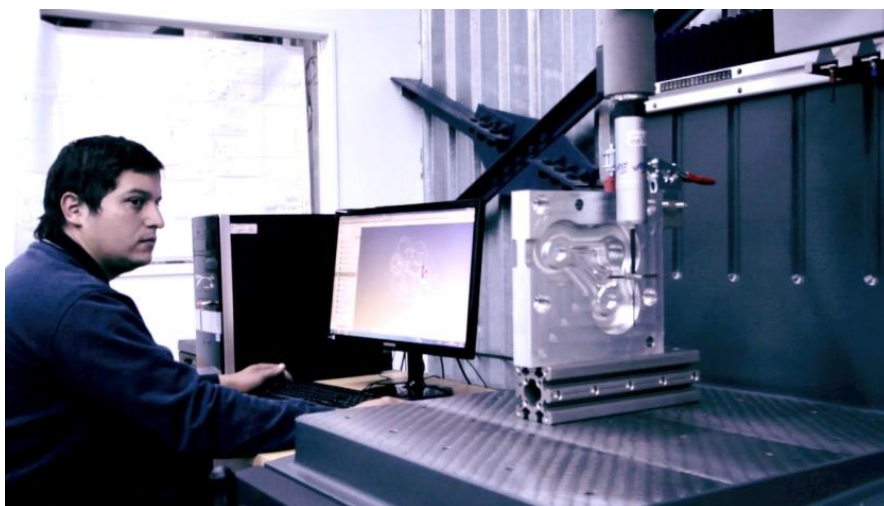
Turning CNC	Model	Distance between spindles	Spindle Pitch	Max. Diameter	Max. Speed
Hyundai	HIT 18	500 mm	70 mm	350 mm	6000 rpm
Hyundai	L280	720 mm	95 mm	410 mm	3000 rpm
Hyundai	L250A	410 mm	45 mm	350 mm	6000 rpm



HYUNDAI Turning CNC

INSPECTION MACHINES

Description	Quantity	Max. Capacity (mm)
DEA IOTA 1203 (5 AXIS – MANUAL)	1	X= 1430 Y= 1025 Z= 665
DEA GLOBAL 12210 (5 AXIS – AUTOMATIC)	1	X= 2200 Y=1200 Z= 1000
ZEISS DuraMax	1	X= 500 Y= 500 Z= 500
ZEISS MMZ B	1	X= 3000 Y= 7000 Z= 2000



ZEISS DuraMax



ZEISS MMZ B

JOGGLE MILLING MACHINES

Machine Type	Qty	Table	Transv. Mov.	Horiz. Mov.	Vert. Mov	Brand
Universal	11	610 x 270 To 1100 x 320	Min 150 mm Max 500 mm	Min 300 mm Max 700 mm	Min 260 mm Max 700 mm	Schaublin 300 Maho1000 Maho 300 G. Dofour
Horizontal	10	1300 x 300 To 1560 x 350	Min 280 mm Max 320 mm	Min 500 mm Max 1000 mm	Min 400 mm Max 500 mm	Cincinnati
Vertical	2	3500 x 700 To 2200 x 720	Min 250 mm Max 700 mm	Min 750 mm Max 2000 mm	Min 300 mm Max 600 mm	Zayer3000 BF Zayer 77 AF
Copier	1	1200 x 230 To 2500 x 600	Min 280 mm Max 600 mm	Min 500 mm Max 2200 mm	Min 300 mm Max 400 mm	Rambaudi

GUN DRILLING

Machine	Quantity	Features
ACIERA Drill	1	4 Headstocks
ACIERA Drill	1	2 Headstocks-bits up to 25 mm
MOVUNI Drill	2	Drill bits up to 15 mm
HERBERT Stand Drill	3	Drill bits up to 22 mm
CARLTON Radial Drill	1	1000 mm arm 508 mm x 508 mm table 90° tilt - drill bits up to 40mm
ARCHDALE Radial Drill	1	1200 mm arm 1200 mm x 600 mm table drill bits up to 45 mm

LATHES

g. Semiautomatic

Machine	Quantity	e/h Dist.	Turning	Bar Passage
Semiautomatic Lathe	28	Min 200 mm Max 1200 mm	Min 80 mm Max 260 mm	Min 28 mm

h. Parallel

Machine Type	Qty	Dist. Bet. Tips	Turning			Bar Passage Dia
			Neck	Bed	Slide	
LANG	2	2000 & 1850	500 & 420 Width 220 and 200	300 & 250	150 & 140	97 & 88
TOSTRECIN	13	Min 730 Max 2000	Min 320 - Max 350 Min width 250	Min 180 - Max 250	Min 180 - Max 130	Min 40- Max 50
TURRI	1	820		200	105	50

i. Automatic

Machine Type	Qty
TRAUB	1
SCHAUBLIN	1

HEAT TREATMENT

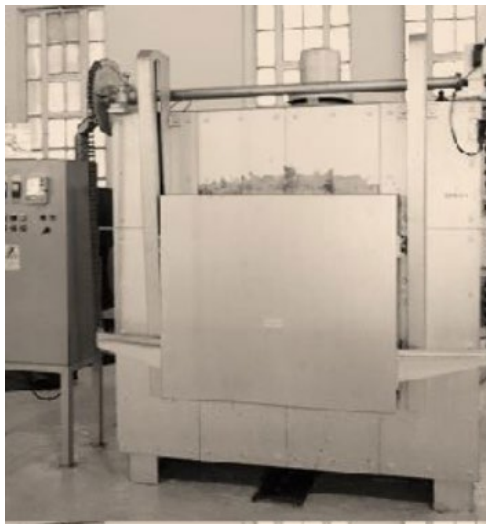
Machine Type	Qty	Length (mm)	Width (mm)	Height (mm)	Diam. (mm)	Max. Temp. (C°)	Remarks
EBNER Electric Furnace	1	-	-	8500	1300	650	For annealing, solubilizing and artificial aging in duraluminum 2024- 6065- 7475- 7050
RUSS Electric Furnace	1	1500	880	600	-	600	For annealing, solubilizing and artificial aging in duraluminum 2024- 6065- 7475- 7050
EFCO Electric Furnace	1	1150	800	600	-	600	For annealing, solubilizing and artificial aging in duraluminum 2024- 6065- 7475- 7050
COMBUSTOL Electric Furnace	1	6000	1500	2500	-	600	For annealing, solubilizing and artificial aging in duraluminum 2024- 6065- 7475- 7050
Subzero Chamber	1	6000	3000	2500	-	- 35	To preserve sheet metal after heat treatment. Access Gate: 2100 x 2100 (mm)
Subzero Chamber	1	4000	3000	2200	-	-24	To preserve sheet metal after heat treatment. Access Gate: 2100 x 2100 (mm)



EBNER Electric Furnace



EFCO Electric Furnace



RUSS Electric Furnace



Subzero Chamber



COMBUSTOL Electric Furnace

Machine Type	Qty	Length (mm)	Width (mm)	Height (mm)	Diam. (mm)	Max. Temp. (Cº)	Remarks
VAPOCARB Electric Furnace	1	-	-	690	310	950	For annealing, normalizing and quenching in carbon steels and low alloy steels
VAPOCARB Electric Furnace	1	-	-	400	270	600	For tempering, stress relief, dehydrogenation (embrittlement relief) in carbon steels and low alloy steels. Precipitation hardening and stress relief of precipitation hardening corrosion resistant steels.
CALTEC Electric Furnace	1	1220	610	915	-	1200	For annealing, normalizing and quenching in carbon steels and low alloy steels



VAPOCARB Electric Furnace



VAPOCARB Electric Furnace



CALTEC Electric Furnace

SURFACE FINISHING

Surface Treatment	Qty	Length (mm)	Width (mm)	Height (mm)	Vat / Cabin	Remarks
Chromium Anodizing	1	9250	1250	2250	Vat	For parts of aluminum and its alloys
Chemical Conversion (Alodine)	1	6000	1200	3000	Vat	For parts of aluminum and its alloys
Passivation	1	800	650	900	Vat	For parts of stainless steel
Cadmium Plating	1	1190	900	900	Vat	For parts of steel and copper alloys



Chromium Anodizing



Chemical Conversion



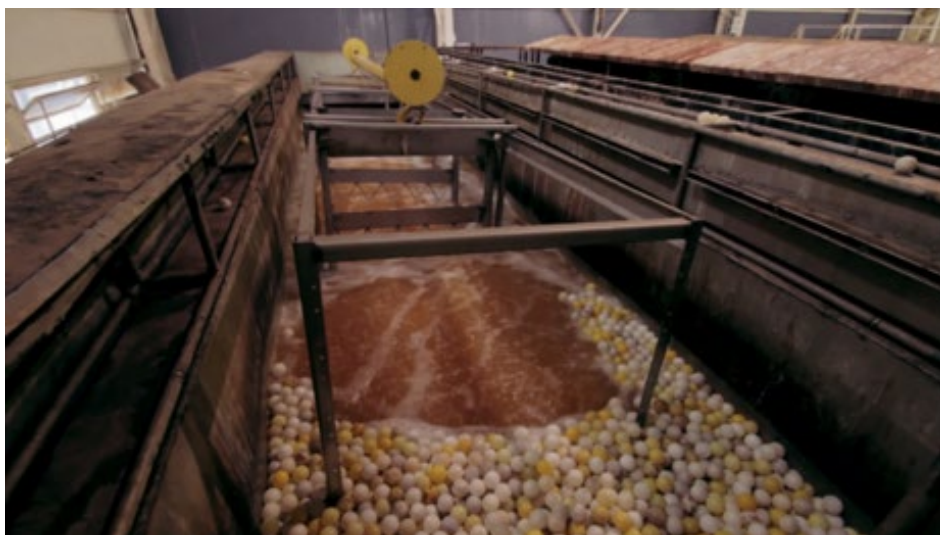
Cadmium Plating



Passivation

CHEMICAL MILLING

Surface Treatment	Qty	Length (mm)	Width (mm)	Height (mm)	Vat / Cabin	Remarks
Chemical Milling	1	6000	1200	3000	Vat	For parts of aluminum and its alloys



Chemical Milling



Sample part (3.5 x 3m)

SHOT PEENING (LIQUID HONING PROCESS)

Aluminum parts and alloys surface are compacted through wet shot peening using pressure glass microbeads.

Cabin dimensions			
Quantity	Length (mm)	Width (mm)	Height (mm)
1	4000	1000	2000



Liquid Honing cabin



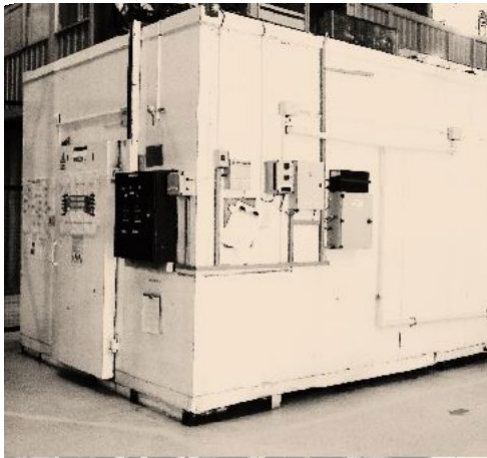
Processed part (minimum thickness 1.2mm)

COMPOSITE MATERIALS

Process	Installation / Machine	Technical Characteristics
Storage or raw material	Freezer	Dimensions: 5,4 x 2,9 x 3,2 m Working temperature: -12 a -20°C
	Freezer	Dimensions: 4 x 4 x 4 m Working temperature: -16 a -20°C
Pre-preg: cutting and laminate	Manual cutting	With template
	Pre-preg cutting machine 1	Dimensions table: 6,4 x 1,8 m
	Pre-preg cutting machine 2	Dimensions table: 4.19 x 1.7 m (Cut length on demand)
	Clean room 1	Surface: 350 m2
	Clean room 2	Surface: 450 m2
	Freezer	Dimensions: 3 x 3 x 2 m
	Laser projection	Quantity: 6
Curing	Autoclave Scholz	Dimensions: diameter 2,5 m—length: 6 mMax. working temperature: 250°C Heating System: Hot oil pressurization system: airVacuum Monitoring Automatic Cycle Programming Device Automatic Compensation for Temperature Differences
	Autoclave Olmar	Dimensions: diameter 2,5m—length: 11mMax. working temperature: 250°C Heating System: electric resistance air pressurization system: Nitrogen Vacuum Monitoring Automatic Cycle Programming Device Automatic Compensation for Temperature Differences
Finishing of parts	Manual machines	For drilling, countersinking, cutting and riveting procedures
	5-axis Contouring	Dimensions: 4 x 4 x 2 m Accuracy: 0,025 mm
Inspection	Tap-test and Backlight Visual Inspection	
	Ultrasound machine Automation Industries	Working dimensions: 4 x 1 x 1 m Ultrasonic techniques: Pulse-echo, c-scan Ultrasound Instrument: Reflectoscope M90
	Portable ultrasound equipment Bondmaster 1000e	Ultrasonic techniques: emission and reception (radiofrequency, impulses and scanning), mechanical impedance analysis (MIA) and resonance

Laboratory:

- Composite covering (CATIA CPM/Magestic)
- Cutting, Kitting and nesting design for fabrics (nylon, polyester, pre-pregs , dry fibers).
- Manufacturing process development
- Part qualification and production tryout.
- Raw materials incoming inspection and revalidation
- CNC Machining Programming

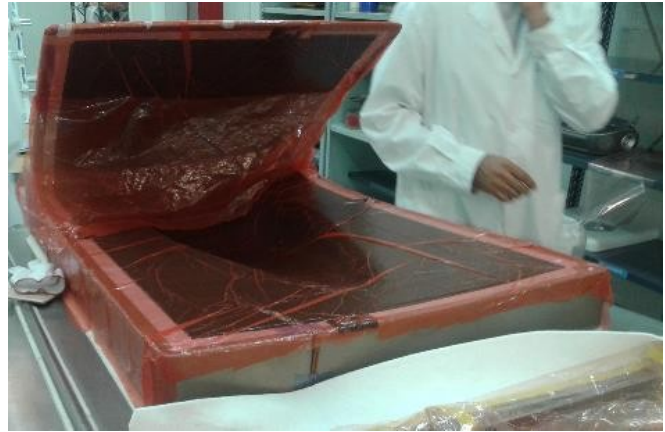


Freezers



Clean Rooms

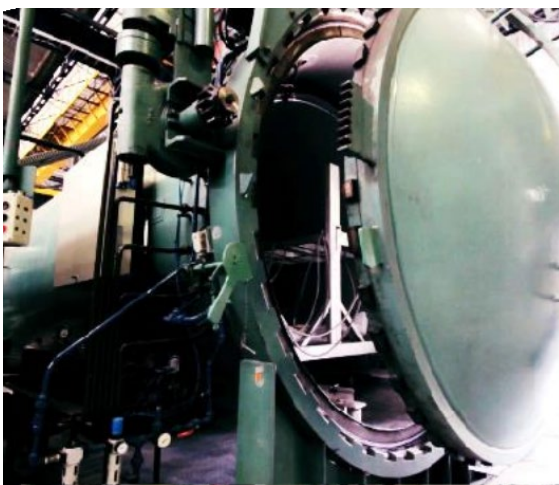
Composites – Example Parts



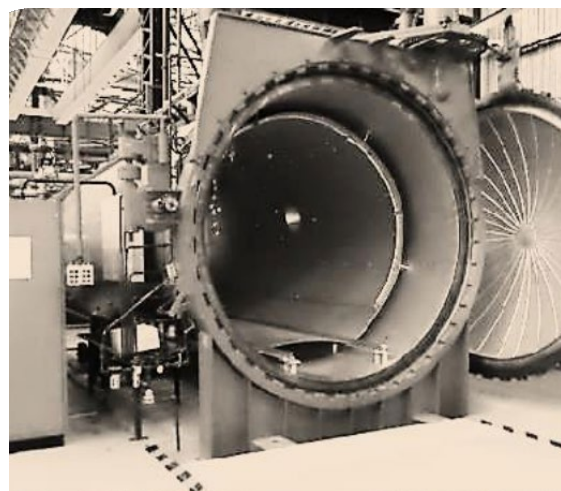
Vacuum Bags

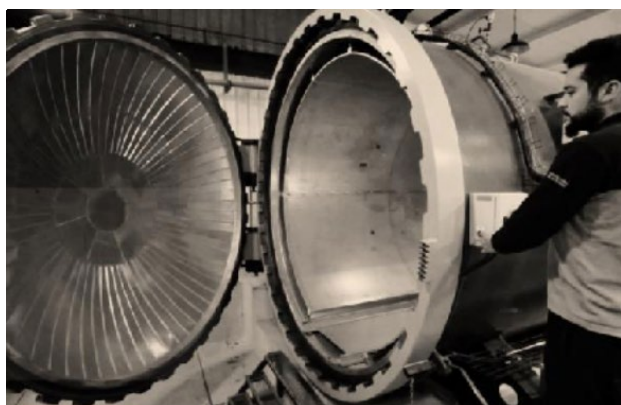


Aramid Honeycomb & Carbon Fiber Spoiler



SCHOLZ Autoclave





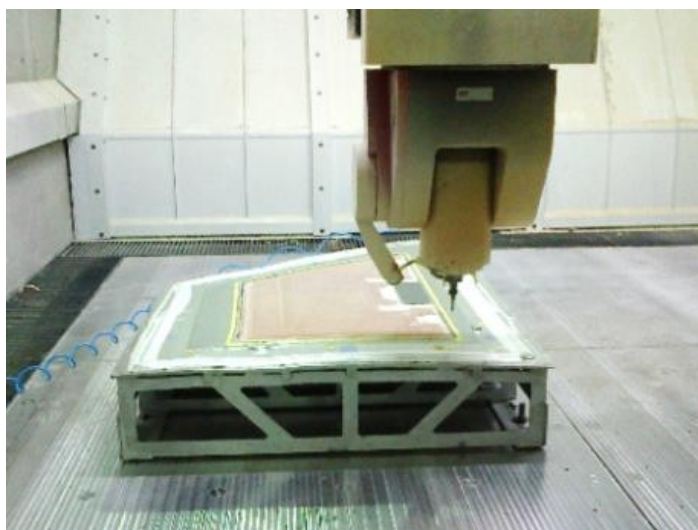
OLMAR Autoclave



Pre-preg Cutting Machine 1



Pre-preg Cutting Machine 2



5-axis Contouring

WELDING

Machine	Quantity	Ampere
TIG Welder	1	300
TIG Welder	3	250

TUBE BENDING

Machine	Quantity	Characteristics
AUTOMATIC TUBE BENDING MACHINE	1	✓ 2" ½ tube, 190,5 pulley radius, aluminum only ✓ 2" tube, 152,4 pulley radius, for steel and aluminum ✓ 1" ½ tube, 114,3 and 57 pulley radius, for steel and aluminum ✓ 1" ¼, 64 and 50 pulley radius, for steel and aluminum ✓ 1", 120 and 75 radius, for aluminum and steel ✓ ¾" tube, 57,15 and 30 radius, for steel and aluminum
SEMI-AUTOMATIC TUBE BENDING MACHINE	1	✓ 6,35 x 0,56 mm tube, 18,5 pulley radius ✓ 6,35 x 0,51 mm tube, 18,5 mm pulley radius ✓ 9,53 x 0,51 mm tube, 29,5 mm pulley radius ✓ 9,53 x 0,56 mm tube, 29,5 mm pulley radius ✓ 7,94 x 0,71 mm tube, 23,5 mm pulley radius ✓ 12,7 x 0,71 mm tube, 18,5 and 35,1 mm pulley radius ✓ 16 x 0,71 mm tube, 47 mm pulley radius



Sample machines and parts

PAINTING

Machine Type	Qty	Length (mm)	Width (mm)	Height (mm)	Max. Temp. (Cº)
Painting Cabin for Metal Parts	1	6600	3500	2910	60
Painting Cabin for Metal Parts	1	6900	3500	2910	45
Painting Cabin for Metal Parts	1	14500	18500	6000	45
Oven & Painting Cabin for Composite Parts	1	7100	4100	3000	80
Drying Cabin	1	6000	2700	3000	100



Painting Cabin for Metal Parts



Oven & Painting Cabin for Composite Parts



Drying Cabin



FAdeA

FAdeA's
QUALIFIED PROCESSES

MACHINING WORKSHOP

Qualified Process	Personnel	Applicable Standard
BUSHING INSTALLATION	7	EMBRAER NE 32-003
BEARING INSTALLATION	2	EMBRAER NE 31-002
THREADED INSERTS INSTALLATION	2	EMBRAER NE06-028
STRAIGHTENING BY FLAP PEENING	4	EMBRAER NE03-076 MIL-R-81841
VIBRATORY BARREL FINNINSHING	NA	EMBRAER NE 44-006

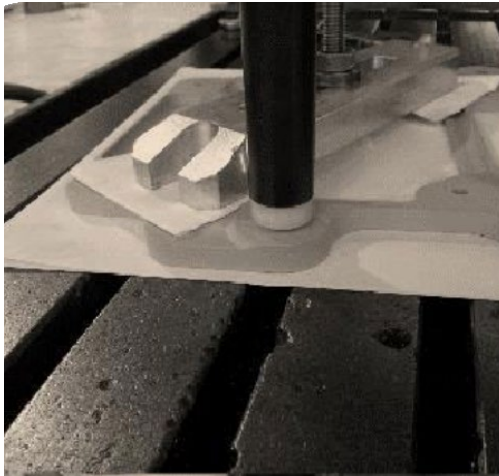
BUSHING INSTALLATION



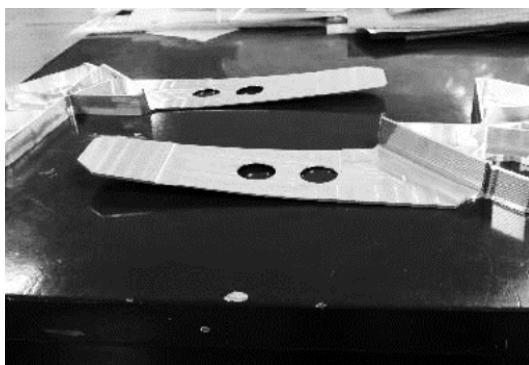
BEARING INSTALLATION



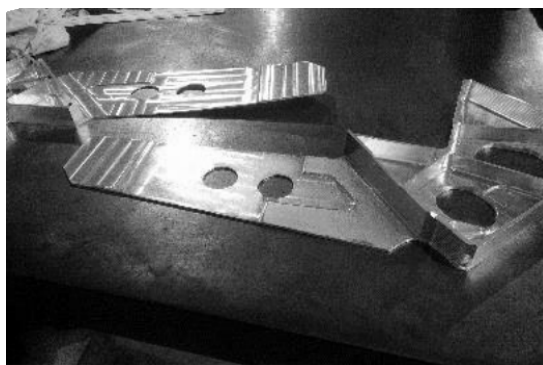
THREADED INSERTS INSTALLATION



STRAIGHTENING BY FLAP PEENING



Before straightening



After straightening

VIBRATORY BARREL FINNISHING



Small cabin – WALTHER-TROWAL CC315



Large cabin – WALTHER-TROWAL V1250L

CHEMICAL PROCESSES

Qualified Process	Applicable Standard
EPOXY PRIMER	NE40-143
DILUTABLE EPOXY PRIMER, NONCHROMATED, FLUID RESISTANT FOR COMPOSITE PARTS	NE40-276
HIGH SOLIDS POLYURETHANE AND METALLIC ENAMEL	NE40-160
HIGH SOLIDS POLYURETHANE, SEMI-GLOSS, FLAT AND CAMOUFLAGE	NE40-274
CHROMIC ACID ANODIZING	NE40-030
ALODINE	NE40-006
NICKEL PLATING BY ELECTRODEPOSITION	NE40-028
CLEANING (METALLIC PARTS)	NE40-012
CONVENTIONAL CADMIUM BY ELECTRODEPOSITION	NE40-010
CADMIUM PLATING - REPAIR BY BRUSH	NE40-150
DEHYDROGENATION OF STEEL PARTS	NE40-045
PASSIVATION (STAINLESS STEEL)	NE40-081
CHEMICAL MILLING	NE41-013
STEEL - QUENCHING AND TEMPERING	NE40-043
FORMING AND STRAIGHTENING (ALUMINUM PARTS)	NE03-076
ALUMINUM AND ITS ALLOYS	NE40-001
ALUMINUM AND ITS ALLOYS - SOLUTION HEAT TREATMENT	NE40-002
ALUMINUM AND ITS ALLOYS - ARTIFICIAL AGING	NE40-003
LIQUID PENETRANT INSPECTION	NE07-001
MANUFACTURE LAMINATE WITH CORE	NE40-188
MANUFACTURE SOLID LAMINATE	NE40-185
COMPOSITE MATERIALS - REQUIREMENTS OF PARTS	NE20-032
INSTALL INSERTS, ADHESIVE INJECTION	NE06-042
APPLY MOLDABLE PLASTIC / SOLID SHIM	NE20-036
PRECIPITATION HARDENING CORROSION RESISTANT STEEL - HEAT TREATMENT	NE40-051
ALUMINUM AND ITS ALLOYS - FUSION WELDING (TIG)	NE40-133
POLYURETHANE PROTECTIVE ADHESIVE FILM - APPLICATION REQUIREMENTS	NE40-154
WATERBORNE URETHANE INTERIOR TOPCOAT (MEP 10-073) - APPLICATION REQUIREMENTS	NE40-157
TITANIUM PARTS, FORMING AND STRAIGHTENING	NE40-175
SOLID LAMINATE PREIMPREGNATED WITH EPOXY OR PHENOLIC RESIN, CURING AT 121°C (250°F) - AUTOCLAVE PROCESS - REQUIREMENTS AND MANUFACTURING PROCEDURES	NE40-183
STRUCTURAL BONDING - CLEANING OF LAMINATES AND NON-METALLIC HONEYCOMB CORES	NE40-209
FORMING AND STRAIGHTENING (ALUMINUM PARTS) - HOT FORMING	NE03-076



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