

GMI
AERO

2017

06

Catalogue for ...
COMPOSITE REPAIR
& FABRICATION
EXPERTISE FOR
MRO & OEM
innovation - services - training

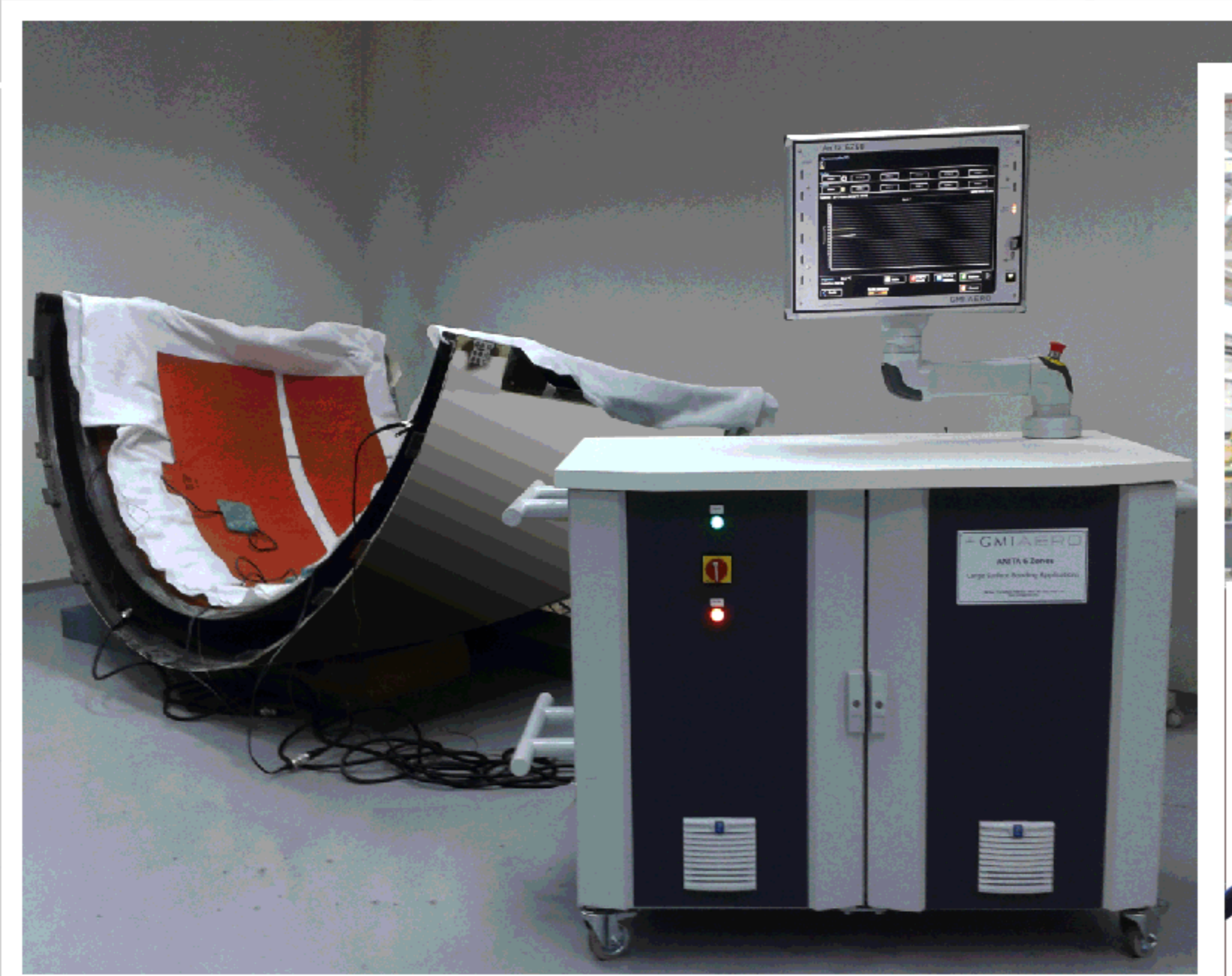


**Bonding
Consoles**

Toolings

**Heating
Systems**

Training





GMI
AERO

Innovation in Technology for Aircraft Maintenance and Fabrication

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TRAINING
SPECIFICATIONS
MANUAL

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(1) ANITA BONDING CONSOLE SERIES

The **ANITA** Bonding and Heat Controller Series cover a wide range of needs as expressed by MROs and Aircraft part constructors.

It benefits of all long time established knowledge of the company in composite repair and fabrication.

They are selected by constructors like **Airbus, Dassault Aviation, Bombardier, Boeing**, or MROs like **Nordam, Goodrich, SIAEC, HAECO, AIR FRANCE Industries**,...

The repair model family offers both capabilities for **workshop** use as well as for **flight line** operations.

They integrate sophisticated software and electronics, however remain **very simple** for the operator to use through **tactile screen** with implicit dialogues.

For quality control, **USB** key data transfer and innovative pdf automatic **data reporting** are available.

Several models are now available with **1, 4, 6 or 18 heating zones** according to the nature of part to be repaired.

1 PRODUCTION OVERVIEW

Standard Workshop Version

Flight Line Version

Version **4 zones** - 4 repairs portable

Version **6 zones** - 6 repairs + Power



Version **2 ZONES**
- Type NG
- Type EZ09 Workshop
- Type EZH14 Flight Line



Version **1 Zone**
- Type QS1Z Workshop
- Type QSH1Z Flight Line



Version **Rapid for Quick Jobs as a Heat Controllers**
- Type AR
To execute immediately a set-point
Can be configured according to operations 1 2,3 zones ...



Battle Field Model
1 zone
Can be also delivered in ATEX version



THE WORKSHOP ANITA MODELS

2 THE WORKSHOP ANITA MODELS

2.1 THE ANITA NG9201 - 1 REPAIR 1 OR 2 ZONES

Item	P/N	Description
2101	GMING9201	<p>Two zone model for 1 advanced repair.</p> <ul style="list-style-type: none"> - 6 thermocouples - Printer - Vacuum venturi pump mounted - Sensing of bag vacuum - Immediate programming and run intuitive procedures - Very robust for field operation - Size: 350 x 220 x 220 mm, Weight 9 Kg - Total Power 6000 Watts - Anitalk PC software for supervision and data logging and reporting - Delivered complete with its accessory case

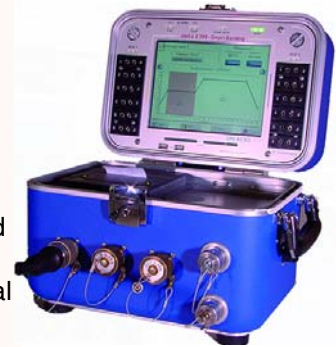


Consumable for printer

2102	GMIOTI010-01	A box of 20 paper rolls
2103	GMIOTI010-02	A box of 10 ink ribbons

2.2 THE ANITA EZ09 - 2 REPAIRS - 2 ZONES

Item	P/N	Description
2201	GMIEZ0901	<p>The Anita EZ09 is designed with a Touch Screen Panel supported by a highly versatile dialogue software....</p> <ul style="list-style-type: none"> -All screens with intuitive orders for - for Easy Programming, - quick set to run - rich control features selection - automatic Report production on Curing Cycles and more... - 12 Thermocouples, extension to 24 with an external scanner. <p>Possible to run 2 repairs different or Dual Zone repairs possible.</p> <ul style="list-style-type: none"> - USB storage, - delivered complete with accessories in a nice case (see picture below <p>see detailed specs in annex click here see also transportation and storage containers - See " § 6" on page 12. see also options below : scanner and remote control tablet</p>



2202	GMIEZAC0901-V*	<p>accessory console delivered together with the Anita console as above;</p> <p>*V= 1 for 120 Volts environment *V = 2 for 230 Volts environment</p> <p>with necessary electrical cables, hoses, valves, vacuum hoses, thermocouples..</p>
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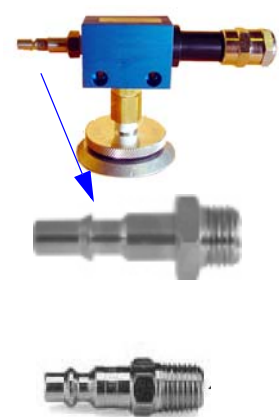


Consumable for printer

2203	GMIOTI010-01	A box of 20 paper rolls
2204	GMIOTI010-02	A box of 10 ink ribbons

For the vacuum generation for the Anita EZ, one can use an electrical pump or a compressed air venturi pump as below. For electrical pump see the specific chapter.

2205	GMIOTPVV010	<p>Vacuum bag valve with a venturi pump mounted. This set can be easily mounted on the vacuum bag. Excellent flow. Delivered with its silencer. with standard male connector brand Staubli Model with french connection for compressed air Staubli</p>
2206	GMIOTPVV011	<p>same as above with brand male connector US - Atlas Copco for compressed air input</p>



THE WORKSHOP ANITA MODELS

2.2.1 TOP DEVELOPMENT FOR ANITA EZ09

To enrich the use of the Anita EZ09 in several contexts of work : very large repairs , use in hangars , positioned with recess access , GMI has developed two complementary instruments :

- an extension of thermocouple sensing capability
- a tablet for remote control

THERMOCOUPLE EXTENSION - A 12 TC SCANNER

Item	P/N	Description
2211	GMIEZS012- J* *or K according to your choice	To extend the capacity of temperature measurement by connexion of a scanner of Capacity 12 T/C . Wireless linked to the Anita. - The scanner can easily be positioned close to the repair and this is useful in case of difficult access , the Anita being positioned at distance.. - Capacity 12= 2 x 6 thermocouples J or K , engineered at the order.. - Detected automatically by the Anita. - With this scanner , total capacity of Thermocouples handled by Anita is : 24 for 1 large repair or 12 Thermocouples per zone for a repair with 2 zones
2212		adaptation possible to the field version ANITAEZH1401 - see further



TABLET FOR REMOTE CONTROL OF ANITA EZ09

Item	P/N	Description
2213	GMIEZR010	We offer now the possibility to dialogue at distance with the Anita EZ through a latest technology wifi linking the Anita to a remote Tablet This feature is unique to ease the work of the operator in field operations. Alarms are also transferred at distance visually on the remote screen and loudly through a speaker.
2214		adaptation possible to the field version ANITAEZH1401 - see further



2.3 THE ANITA 1 ZONE QUICK START

Item	P/N	Description
2301	GMIQS1Z-T*	<p>Model 1 repair 1 heating zone With an exclusive software for Fully Automatic Control of Temperature Cycle</p> <p>Complete Model :</p> <ul style="list-style-type: none"> - 6 Thermocouples (J or K) - 1 heating zone 30 Amp under 230 or 120 Volts - Vacuum pump venturi included or not on request - Vacuum sensing return line - Screen for easy programming and actions - Programs can be preregistered . - USB Key for data transfer and Automatic Reporting <p>Note : a model ATEX flight line is also available - see following paragraph</p>



THE WORKSHOP ANITA MODELS

2.4 ANITA 4 ZONES - UP TO 4 INDEPENDENT REPAIRS

Item	P/N	Description
2401	GMIEZ4Z01	<p>Anita 4 zones with 4 independent heating channels for: 1 repair up to 4 zones or 4 repairs independent in program and time. This is an extension of our famous 2 zone version EZ09.</p> <p>Useful for:</p> <ul style="list-style-type: none">- intensive repair on parts with multiple impacts- Radome Repair- when blankets have 3 to 4 zones- helicopter blade repair <p>Main specs</p> <ul style="list-style-type: none">• Temperature measurements: through thermocouples, type J or K according to choice at the order.• Vacuum circuits: 4• Total power capacity: 30 Amp x 230 Volts• Each zone equipped with a power capacity of: 20 amps.• USB connection



3 FLIGHT LINE ANITA MODELS

3.1 MODEL EZH - FOR 2 REPAIRS

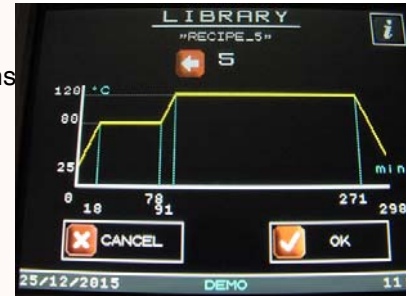
Item	P/N	Description
3101	GMIEZHE04	For conducting bonding on the aircraft if explosive proof conditions apply This model is based on Model OT above See accessories in relevant chapter
		Delivered complete with its accessory console including electrical cables, hoses, thermocouples, valves,...
		For the filtration of compressed air to vent the console in order to comply with regulation, see the filter against oil and water proposed as below
3102	GMIOTPF022	Container for filter and filter against oil and water. Connects directly to the air source and to the Anita
311	GMIOTPF022-1	spare cartridge against water and oil for filter above
3111	GMIOTPVV010	Vacuum bag valve with a venturi pump mounted. This set can be easily mounted on the vacuum bag. Excellent flow. Delivered with its silencer. with standard male connector brand Staubli Model with french connection for compressed air input connector male Staubli
3112	GMIOTPVV010	As above but with the atlas copco connector for compressed air input
3113	GMIOTI010-01	A box of 20 paper rolls for printer
3114	GMIOTI010-02	A box of 10 ink ribbons for printer
		Container for easy storage and transportation of the



FLIGHT LINE ANITA MODELS

3.2 ANITA 1 ZONE - QUICK START FLIGHTLINE MODEL T

Item	P/N	Description
3201	GMIQSH1Z-T*	Version Flight Line of the workshop model 1 repair 1 zone -
	where T = J or K according to thermocouple type selected	<p>Complete Model :</p> <ul style="list-style-type: none"> - 6 Thermocouples (J or K) - 1 heating zone 30 Amp under 230 or 120 Volts - Vacuum pump venturi included or not on request - Vacuum sensing return line - Screen for easy programming and actions - Programs can be preregistered - USB Key





4 ANITA SERIES RAPID

.... As Heat Controllers

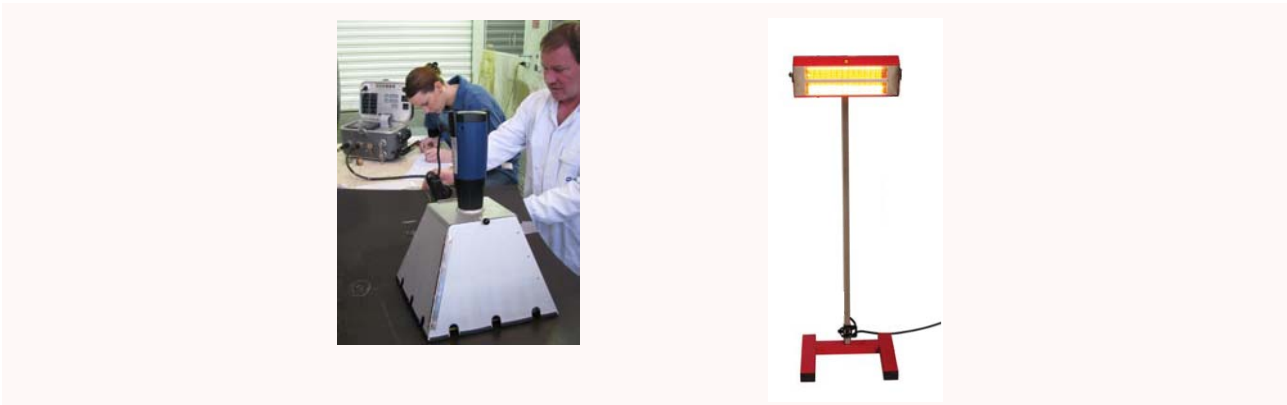
This model is designed to offer to the users a **quick and low cost** way to control heat sources. This Anita of the series **Rapid** will control for an immediate run after a quick and easy set up various heat applications : use of heat gun, radiant lamp, mould heaters ,...

These models are useful for composite repair activities and composite part manufacturing processes.

Item	P/N	Description
4001	GMIAR010	<p>Immediate set up</p> <ul style="list-style-type: none">• 1 heating zones 230 ou 120 Volts• 16 Amp power output• 1 preset set point through a PC software• 4 thermocouples (J or K)• Various configuration possible for control of<ul style="list-style-type: none">– heat blanket– infra red lamp– heat gun



Typical systems below to be connected to the Anita Rapid.....



ANITA BATTLE FIELD MODEL

5 ANITA BATTLE FIELD MODEL

Item	P/N	Description
5001	GMICC010	Anita Battle field context Designed as a Press Button equipment. Several innovative features. Consult us
5002	GMIHBIS045-1Z-V V= 1 for 120 Volts V=@ for 230 Volts	Heating system for battle field context Seal dimensions; diameter: 45 cm Heating area diameter: 35 cm 1 electric zone To be controlled by: - either a standard Anita EZ or NG - by the battle field Anita Model as above

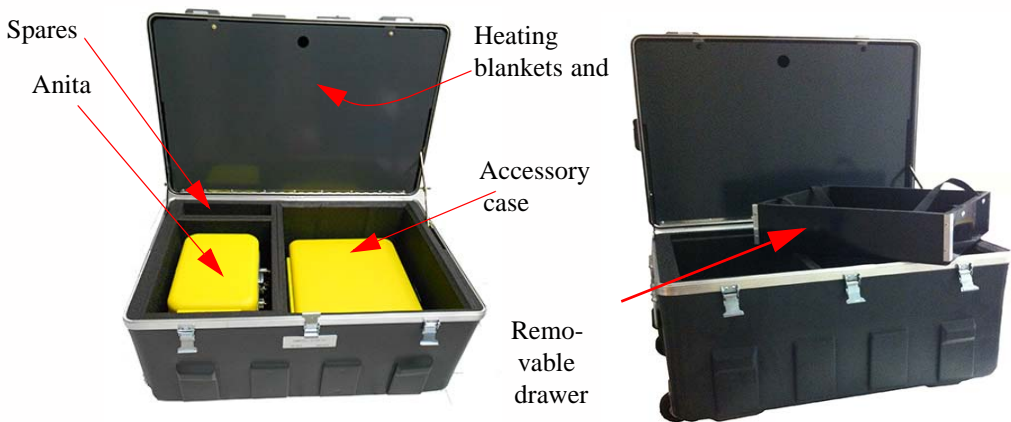


6 ANITA CONTAINERS

For storage and transport

6.1 LARGE STORAGE CONTAINER

Item	P/N	Description
6101	GMIEZC012	<p>Large container for storage and transport Can group Anita + several accessories including blankets - see below Valid for all Anitas: - NG; EZ or EZH ,QS and QSH Dimensions : L x W x H cm : 82 x 58 x 50 - Weight when empty 17 Kg</p>



6.2 FOR EASY TRANSPORT OF ANITA EZ09

Item	P/N	Description
6201	GMIEZC011	<p>Easy to handle container when travelling by air ; can be registered You can install one Anita EZ09 and its cables and hoses Dimensions ext : L x w x H cm : 50 x 45 x 40 - Weight when empty : approx 8 Kg</p>



ANITA 6 ZONES - HIGH POWER - 6 REPAIRS

7 ANITA 6 ZONES - HIGH POWER - 6 REPAIRS

APPLICATIONS TO REVERSERS AND OTHER LARGE REPAIR WORKS

Item	P/N	Description
7001	GMI6Z40-V	As a bench, this model is for various applications from radome to reversers . Anita 6 zones with 6 independent heating channels for: 1 repair up to 6 zones or 6 repairs independent in program and time with various combination of zones. This bench is powered under three phases to offer a large power capacity of: 40 Kwatt total power ; each of 6 zones with a capacity of 230 Volts x 30 Amp.
	where V is the 3 phase voltage	
		<p>Intensive repair on parts with multiple impacts</p> <ul style="list-style-type: none"> - Radome Repair - Reverser repairs : Transcowls and Corecowls - complex repair when blankets have 3 to 4 zones, - helicopter blade repair • 36 Temperature measurements: through thermocouples, type J or K according to choice at the order. • Vacuum circuits: 6

This equipment allows also to conduct **6 independent repairs** at different times according to different cycles.



For Reverser and Radome multi zone blankets see the corresponding Heat Blanket Section

8 ANITA 18 ZONES

To repair very large surfaces of structures of class I, GMI has designed a specific bonding control equipment with **18 zones**.

This equipment combines a sophisticated instrumentation with smart software for cycle programming and configuration of the repair parameters. A power system is specially designed to offer powering capabilities to the 18 zones covering several square meters.

Item Description

8001 System with **18 zone** capability .
Power per zone **230 V x 20 Amp**.

up to **80** Thermocouples

up to 7 vacuum sensing lines

measurement of autoclave pressure in case of using a vessel for pressure compaction

Automatic report fabrication



PORTABLE SYSTEM FOR PRESSURISATION OF REPAIR PATCH

9 PORTABLE SYSTEM FOR PRESSURISATION OF REPAIR PATCH

Item	P/N	Description
9001	GMIOL010-V*	<p>OLGA</p> <p>Portable system for pressurisation of advanced composite repair bonding</p> <p>Composed of:</p> <ul style="list-style-type: none"> - the pressurisation tool with its flexible pads for adaptation to contoured parts, - the pressure and vacuum generator with safety function controller
	where V = 1 for 120 volts V= 2 for 230 volts	


10 METAL BONDING - SURFACE TREATMENT

Item	P/N	Description
10001	GMIGL010-V	<p>Gilda Console for aluminium surface treatment; performs phosphoric solution anodizing</p>
	where V = 1 for 120 volts V= 2 for 230 volts	



11 GENERAL INSTRUMENTS FOR HEATING PROCESSES

11.1 ANISCAN4 - SMALL TEMPERATURE PORTABLE SCANNER

Item	P/N	Description
11101 GMISC04-J or -K		<p>Aniscan4 Scanner for 4 thermocouple channels Type J or Type K at the order With USB key to collect the cycle data. Can be used when heat is developed by autonomous bonders, radiant panels...</p> <p>several other scanners are available depending of number of channels of thermocouples and vacuum lines.</p>



(2) HEATING BLANKETS & OTHER HEATING SYSTEMS

The list below describes the more frequently requested products.

In this chapter you will find this variety of heating means and specialised heating blankets :

13 - STANDARD FLEXIBLE BLANKETS	20
14 - BLANKETS STRETCHABLE OR CONFORMABLE	22
15 - BLANKETS FOR FLIGHT LINE OPERATIONS	23
16 - HIGH TEMPERATURE BLANKETS FOR REPAIR UP TO 235 °C	24
17 - LARGE AND VERY LARGE (HIGH POWER) BLANKETS	25
18 - RADOME SHAPED BLANKETS.....	27
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20 - BLANKET SPECIFIC FOR CFM56 ABRADABLE LINER BONDING	34
21 - AIR INLET BLANKETS	35
22 - INFRA RED LAMPS AND SYSTEMS	36
23 - FOLDABLE OVEN WITH HOT AIR FOR ANITA CONSOLES.....	39
24 - AUTONOMOUS HEATING BLANKETS AND CONTROLLERS	40

For other needs , please consult us.

12 HEATING BLANKETS - GENERAL OFFER

12.1 INTRODUCTION TO VARIOUS CATEGORIES

We give here a list of classes of heating blankets designed and produced according to their use:

1. For hot bonding of composite repair processes
2. For general heat application whenever it is useful to improve productivity by heating a resin, a sealant,....
3. For heating parts in a composite manufacturing process: heating moulds, structures,....

The following table presents the various classes of blankets used in the repair process. These classes differ because of temperature limits and one class offers more flexibility when it is necessary to conform to a non developable surface. Also we have designed several heating blankets having a pre-determined shape for specific applications : radome repair, reverser repair,

Also blankets are designed differently for flight line applications. We produce thus ATEX blankets.

12.2 BLANKET VARIETY OFFERED

Standard = Flexible

They constitute the basic tools for composite repair as they are flexible and resistant to external aggressions.

They are made with silicone reinforced with glass fibre.

We can offer:

- Blankets **rectangular** or **circular** or **ovals**
- **120** or **230** Volts monophase
- High DC voltage
- **1** or **2 zones** design or more
- **small** or **very large** dimensions

Can be ordered with a Thermal Uniformity certificate



Conformable or Stretchable

Stretchable in one privileged dimension

To be used for areas with double curvature.



Blankets for flight line applications

They are more rigid than the flexible ones used in workshop, however still applicable easily on curved surfaces



Radome Blankets Shaped.

Several models available according to aircraft.



HEATING BLANKETS - GENERAL OFFER

Very large blankets powered through boosters
Specific Applications for Reversers and Air inlets



HEATERS

Autonomous blankets that function with specific autonomous controllers
for simple jobs: **interiors**, heating of moulds for lay up operations...



13 STANDARD FLEXIBLE BLANKETS

13.1 RECTANGULAR

Item P/N Dimensions in cm

Standard = flexible
 made with silicone reinforced with glass fibre 1 or 2 zones
 Blankets rectangular - for circular see following table
 For stretchable items see other lower table
 Here below a list of classical ordered dimensions
 Several other dimensions possible under request.
 All our blankets are mounted with a circular connector compatible with our bonder
 Anita Cables (see picture)



13101	GMIHB015015-1Z-V*	15 X 15	1 electrical zone
13102	GMIHB020020-1Z-V*	20 X 20	1 electrical zone
13103	GMIHB020030-1Z-V*	20 X 30	1 electrical zone
13104	GMIHB020040-1Z-V*	20 X 40	1 electrical zone
13105	GMIHB025025-1Z-V*	25 X 25	1 electrical zone
13106	GMIHB025040-1Z-V*	25 X 40	1 electrical zone
13107	GMIHB025050-1Z-V*	25 X 50	1 electrical zone
13108	GMIHB030030-1Z-V*	30 X 30	1 electrical zone
13109	GMIHB030050-1Z-V*	30 X 50	1 electrical zone
131010	GMIHB030060-1Z-V*	30 x 60	1 electrical zone
131011	GMIHB030070-1Z-V*	30 x 70	1 electrical zone
131012	GMIHB040040-1Z-V*	40 X 40	1 electrical zone
131013	GMIHB040060-1Z-V*	40 X 60	1 electrical zone
131014	GMIHB040080-2Z-V*	40 X 80	2 electrical zones
131015	GMIHB050050-1Z-V*	50 X 50	1 electrical zone
131016	GMIHB050075-1Z-V*	50 X 75	1 electrical zone
131017	GMIHB050090-2Z-V*	50 X 90	2 electrical zones
131018	GMIHB060060-1Z-V*	60 X 60	1 electrical zone
131019	GMIHB060080-2Z-V*	60 X 80	2 electrical zones
131020	GMIHB070070-1Z-V*	70 X 70	1 electrical zone
131021	GMIHB070090-2Z-V*	70 X 90	2 electrical zones



*V=1 for 120 Volts; =2 for 230 Volts
 For example a blanket 25 x 25 cm under 230 Volts ==> GMIHB025025-1Z-2

13.2 CERTIFICATION

Boeing specifies for its own use, blankets according to certain specifications dealing with temperature distribution. These performances can only be achieved if the resistance wire is routed

STANDARD FLEXIBLE BLANKETS

with a maximum of density and regularity.

GMI manufactures its blankets to meet this specification recommendation.

The blanket is delivered with a sticker that reveals its native resistance value after checking that it corresponds to the calculated value of construction. This sticker is attached to the blanket.

For standard blanket of regular shapes (other cases, consult us) , GMI can also deliver the blanket , under request , with a thermal uniformity certificate per Boeing specs D6-56273.

13.3 BLANKETS STANDARD CIRCULAR

Item	P/N	Dimensions in cm	Remarks
13301	GMIHB020-1Z-V*	20	1 electrical zone
13302	GMIHB025-1Z-V*	25	1 electrical zone
13303	GMIHB030-1Z-V*	30	1 electrical zone
13304	GMIHB035-1Z-V*	35	1 electrical zone
13305	GMIHB040-1Z-V*	40	1 electrical zone
13306	GMIHB045-1Z-V*	45	1 electrical zone
13307	GMIHB050-1Z-V*	50	1 electrical zone
13308	GMIHB055-1Z-V*	55	1 electrical zone
13309	GMIHB060-1Z-V*	60	1 electrical zone
133010	GMIHB070-1Z-V*	70	1 electrical zone
133011	GMIHB080-1Z-2	80	1 electrical zone 230 Volts recommended
133012	GMIHB090-1Z-2	90	1 electrical zone 230 Volts recommended

*V=1 for 120 Volts; =2 for 230 Volts

For example a blanket diam 40 cm under 230 Volts ==> GMIHB040-1Z-2

Several other dimensions are possible... up to 90 cm

14 BLANKETS STRETCHABLE OR CONFORMABLE**Item P/N Dimensions in cm**

Blankets with silicone non reinforced; stretchable and conformable



14001	GMIHBC015015-1Z-V*	15 x 15	1 electrical zone
14002	GMIHBC020020-1Z-V*	08 x 25	1 electrical zone
14003	GMIHBC025025-1Z-V*	25 x 25	1 electrical zone
14004	GMIHBC030030-1Z-V*	30x 30	1 electrical zone
14005	GMIHBC035035-1Z-V*	35 x 35	1 electrical zone
14006	GMIHBC040040-1Z-V*	40 x 40	1 electrical zone
14007	GMIHBC020040-1Z-V*	20 x 40	1 electrical zone
14008	GMIHBC045045-1Z-V*	45 x 45	1 electrical zone
14009	GMIHBC050050-1Z-V*	50 X 50	1 electrical zone
140010	GMIHBC060060-1Z-V*	60 X 60	1 electrical zone

*V=1 for 120 Volts; =2 for 230 Volts

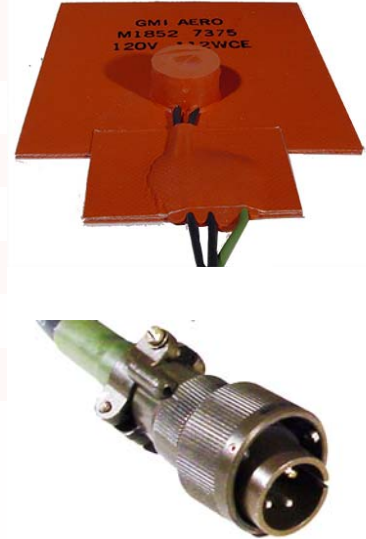
For example a blanket 25 x 25 cm under 230 Volts ==> GMIHBC02025 -1Z-2

Maximum dimensions in stretchable blankets: 60 cm X 60 cm /24 x 24 inches; please advise

15 BLANKETS FOR FLIGHT LINE OPERATIONS

15.1 FOR LATEST MODELS OF ANITA LIKE GMIEZH AND QSH

Item	P/N	Dimensions in cm	
These blankets despite ground mesh embedded remain still flexible. They must be used with the specific console for explosive atmosphere Anita EZH14 or LPH01- Other dimensions possible			
15101	GMIHBH015015-1Z-V*-T*	15 X 15	1 electrical zone
15102	GMIHBH020020-1Z-V*-T*	20 x 20	1 electrical zone
15103	GMIHBH025025-1Z-V*-T*	25 X 25	1 electrical zone
15104	GMIHBH030030-1Z-V*-T*	30 X 30	1 electrical zone
15105	GMIHBH040040-1Z-V*-T*	40 X 40	1 electrical zone
15106	GMIHBH050050-1Z-V*-T*	50 X 50	1 electrical zone
15107	GMIHBH015050-1Z-V*-T*	15 x 50	1 electrical zone



* where V = 1 for 120 Volts and 2 for 230 Volts
 * where T stands for optional thermostat mounted at 200°C.

15.2 FOR OLDER MODEL ANITA OTHE04

Item	P/N	Dimensions in cm	
These blankets despite ground mesh embedded remain still flexible. They must be used with the specific console for explosive atmosphere Anita OTHE04- Other dimensions possible. Below P/N for Blankets under 230 Volts			
15201	GMIHB015015-1Z-2-G	15 X 15	1 electrical zone
15202	GMIHB020020-1Z-2-G	20 x 20	1 electrical zone
15203	GMIHB025025-1Z-2-G	25 X 25	1 electrical zone
15204	GMIHB030030-1Z-2-G	30 X 30	1 electrical zone
15205	GMIHB040040-1Z-2-G	40 X 40	1 electrical zone
15206	GMIHB050050-1Z-2-G	50 X 50	1 electrical zone
15207	GMIHB015050-1Z-2-G	15 x 50	1 electrical zone

16 HIGH TEMPERATURE BLANKETS FOR REPAIR UP TO 235 °C**Item P/N Dimensions in cm**

Blankets with silicone reinforced

These blankets have the aspect and mechanical properties as the standard blankets above è

Maximum temperature of repairs to be around 235°C

some useful dimensions below under 230 Volts; other dimensions possible

16001	GMIHBT015015-1Z-2	15 x 15	1 electrical zone
16002	GMIHBT020020-1Z-2	08 x 25	1 electrical zone
16003	GMIHBT025025-1Z-2	25 x 25	1 electrical zone
16004	GMIHBT030030-1Z-2	30x 30	1 electrical zone
16005	GMIHBT035035-1Z-2	35 x 35	1 electrical zone
16006	GMIHBT040040-1Z-2	40 x 40	1 electrical zone
16007	GMIHBT020040-1Z-2	20 x 40	1 electrical zone
16008	GMIHBT045045-1Z-2	45 x 45	1 electrical zone
16009	GMIHBT050050-1Z-2	50 X 50	1 electrical zone

17 LARGE AND VERY LARGE (HIGH POWER) BLANKETS

Generally above 1 square meter, when total power is above 6000 watts.
Two technologies are available according to our continuous development research program.

17.1 BLANKETS HIGH POWER UNDER THREE PHASE DESIGN

Blankets of very large power are designed under 3 Phases.
 These blankets need the use of the Power Booster as listed below. They are designed under 3 phases 380 or 415 Volts (specific needs possible).
 We give here only an example of possible dimensions.

Item	P/N	Dimensions in cm	
17101	GMIHB100150-2Z-3-V*	100 x 150	In 2 zones
17102	GMIHB100200-2Z-3-V*	100 x 200	In 2 zones

* where V= 415 Volts or other to be specified
 Many other models available, please consult us

17.2 3 PHASE POWER AMPLIFIER FOR BLANKETS 3 PHASE DESIGN

This model is for blankets having been designed under 3 phase voltage circuit

Item	P/N	Description
17201	GMIANB102	This allows connection to Anita consoles of blankets very large requiring more than 6000 watts. In this context, the amplifier is powered under 3 phase voltage 380 or 415 VAC - 16KW 2 independent channels Connects to Anita NG, OT, EZ, ES... For very large blankets see above Other Boosters are available for higher power



17202		Other model possible Here 2 zones independent with 3 connexions possible per zone
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17.3 BLANKETS HIGH POWER - DC DESIGN

New since 2012. GMI has also developed new technology capability in switching DC power.
 The blankets are designed for a DC electrical powering. The blankets have a simplified wiring compared to the one necessary under 3 phase design. These blankets need a

LARGE AND VERY LARGE (HIGH POWER) BLANKETS

DC Power Booster-Converter as described below
We give here only an example of possible dimensions.

Item	P/N	Dimensions in cm	
17301	GMIHBD100150-2Z- V*	100 x 150	In 2 zones
17302	GMIHBD100200-2Z- V*	100 x 200	In 2 zones

* Where V = 380; 410; or 480 VAC as power in to the DC Power converter and amplifier
Many other models available, please consult us

17.4 POWER CONVERTER 3 PHASE - TO DC FOR DC DESIGNED BLANKETS -

Item	P/N	Description
17401	GMI BDC010-V*	This allows connection to Anita consoles of blankets very large requiring more than 6000 watts and designed under DC voltage. Allows connection to 3 Phase Voltage: - 380-410 VAC or 480 VAC Capacity: 32 KW , 2 independent channels 16KW each Connects to Anita NG, OT, EZ, ES... For adapted very large blankets see relevant chapter above



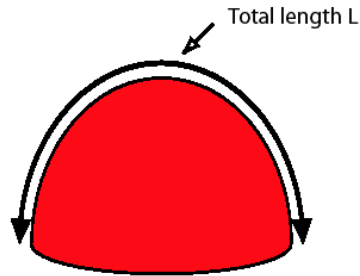
18 RADOME SHAPED BLANKETS

GMI can offer a wide range of moulded blankets shaped to radomes of Boeing, Airbus, Bombardier CRJ, ATR. Consult us

18.1 DEFINITIONS FOR BLANKET IDENTIFICATION

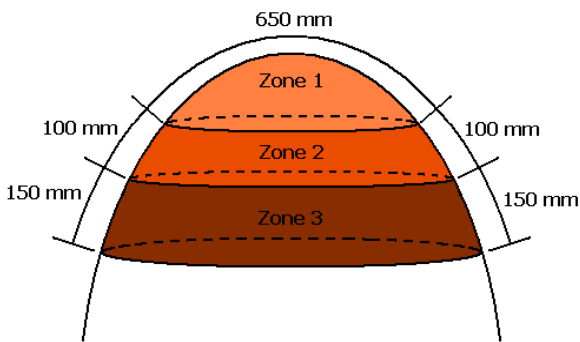
A. DEVELOPED LENGTH

see the image below for definition of L.

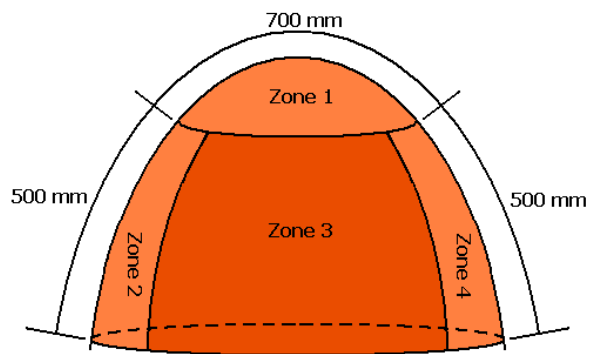


B. SECTOR AND CONCENTRIC ZONES

The radome can be designed either with a **concentric zoning** or a **sector zoning**; see the pictures below. They can be also designed in one electric zone covering only the tip of a flange area of the radome.



Total developed length : 1 150 mm (# 45 inches)
3 concentric heating zones



Total developed length : 1700 mm (# 55 inches)
4 heating zones in sectors

18.2 AIRBUS MODELS**18.2.1 A320 NARROW BODY FAMILY(A319, A320, A321)**

Item	P/N	Description
18211	GMIHBR320-E4S-170-2	For External skin in 4 Sectors ; overall length 170 cm
18212	GMIHBR320-I4S-170-2	For Internal skin in 4 Sectors ; overall length 170 cm
18213	GMIHBR320-E3C-170-2	For External skin in 3 Concentric Zones ; overall length 170 cm
18214	GMIHBR320-I3C-170-2	For Internal skin In 3 Concentric Zones ; overall length 170 cm
18215	GMIHBR320-E3C-120-2	For External skin in 3 Concentric Zones ; overall length 120 cm
18216	GMIHBR320-I3C-120-2	For Internal skin In 3 Concentric Zones ; overall length 120 cm

18.2.2 A340 WIDE BODY FAMILY (A330, A340)

Item	P/N	Description
18221	GMIHBR340-E4S-170-2	For External skin in 4 Sectors ; overall length 170 cm
18222	GMIHBR340-I4S-170-2	For Internal skin in 4 Sectors ; overall length 170 cm
18223	GMIHBR340-E3C-170-2	For External skin in 3 Concentric Zones ; overall length 170 cm
18224	GMIHBR340-I3C-170-2	For Internal skin In 3 Concentric Zones ; overall length 170 cm
18225	GMIHBR340-E3C-115-2	For External skin in 3 Concentric Zones ; overall length 115 cm
18226	GMIHBR340-I3C-115-2	For Internal skin In 3 Concentric Zones ; overall length 115 cm

18.3 AIRBUS -TIP COVERAGE- A320 -A340- A380

These blankets can fit internal or external skins because they are reversible

Item	P/N	Description
18301	GMIHBR320-1Z-650-2	For Airbus A320 - .developed length of 65 cm
18302	GMIHBR340-1Z-650-2	For Airbus A340 - developed length of 65 cm
18303	GMIHBR380-1Z-800-2	For Airbus A380 - developed length of 80 cm

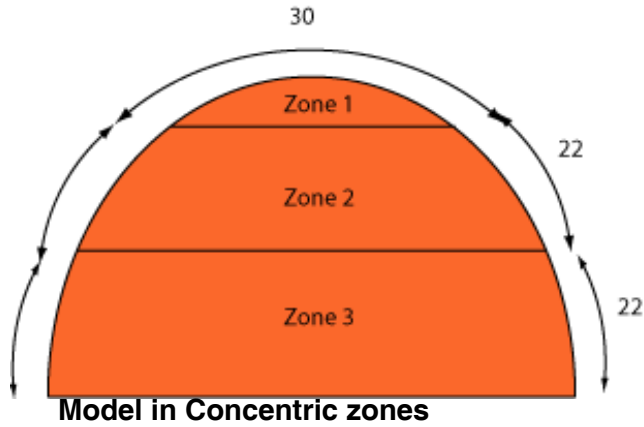
18.4 BOEING RADOME MODELS

Item	P/N	Description
18401	GMIHBR747-I3C-125-2	For Boeing 747 - Internal Skin - Developed length 1250 mm - in 3 electrical concentric zones 220 Volts
18402	GMIHBR747-E3C-125-2	For Boeing 747 - External Skin - Developed length:1250 mm - in 3 electrical concentric zones 220 Volts
18403	GMIHBR737-I-4S-110-2	For Boeing 737 - Internal Skin - Developed length 1100 mm - in 4 electrical sectors 220 Volts
18404	GMIHBR737-E-4S-110-2	For Boeing 737 - External Skin - Developed length 1100 mm - in 4 electrical sectors 220 Volts
18405	GMIHBR777-E-4S-90-2	For Boeing 777 - Internal Skin - Developed length 900 mm - in 4 electrical sectors 220 Volts

18.5 ATR 42 OR ATR 72 RADOME MODELS

The radome blankets are proposed in **3 concentric zones** or **4 sectors**. See dimensions below in cm. Each design is offered for installation on **internal** skin or **external** skin

Item	P/N	Description
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Models in Concentric zones

18501	GMIHBR72--I3C-120-2	For ATR 42/72 - Internal Skin - Developed length 1200 mm - in 3 electrical concentric zones 220 Volts
18502	GMIHBR72-E3C-120-2	For ATR 42/72 - External Skin - Developed length 1200 mm - in 3 electrical concentric zones 220 Volts

18.6 BOMBARDIER CRJ RADOME MODELS

Item	P/N	Description
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18601	GMIHBRCRJ-E2C-046-X	for external skin X = 1 for 120 Volts X = 2 for 220 volts - Developed length 460 mm - in 2 electric zones; concentric
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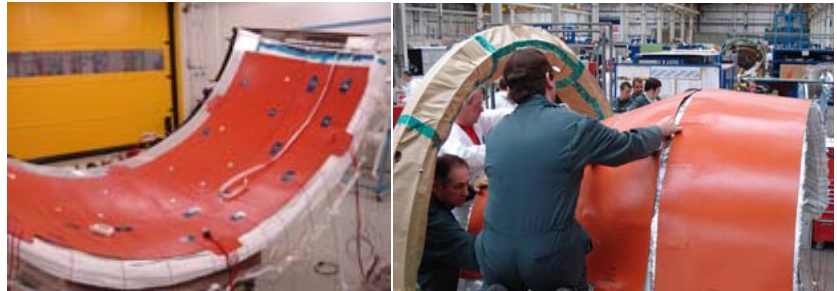


18602	GMIHBRCRJ-I2C-046-X	for internal skin X = 1 for 120 Volts X = 2 for 220 volts - Developed length 460 mm - in 2 electric zones; concentric
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19 BLANKETS FOR REVERSERS

This new family is to be used with our System Anita **6Z40** for Reverser Repair - see chapter A
All blanket electrical circuits per zone described below are under 230 Volts monophase

HEATERS



19.1 GENERAL PROGRAM FOR COMPLETE TCOWLS AND CORECOWLS

Item	P/N	Description
FOR CF6-80C2		
For Transcowls		
19101	GMIHBTR-CF6-G-2	Set of 2 blankets for T/C Grumman Left or Right- each blanket in 3 zones - 230 volts monophase
19102	GMIHBTR-CF6-MM-2	Set of 2 blankets for T/C Martin Marietta Left or Right- each blanket in 3 zones - 230 volts monophase
For Corecowls		
19103	GMIHBTR-CF6-1-2	Set of 3 Blankets for Corecowl LEFT Side - 230 volts monophase
19104	GMIHBTR-CF6-2-2	Set of 3 Blankets for Corecowl RIGHT Side - 230 volts monophase
FOR CF6-80E1 - FOR AIRBUS A310		
For Transcowls		
19105	GMIHBTR-CF6-80E1-V2	Set of 2 blankets for Translating Sleeve CF6-80E1 for A330
For PW4000 - For AIRBUS A310		
For Transcowls		
19106	GMIHBTR-PW4000-310-2	A set of 2 blankets for T/COWL left or right - total 6 zones - 230 volts monophase
For Corecowls		
1911	GMIHBTR-PW4000-310- 1-2	A set of 3 blankets for Corecowl Left - total 6 zones - 230 volts monophase
1912	GMIHBTR-PW4000-310-2-2	A set of 3 blankets for Corecowl Right - total 6 zones - 230 volts monophase
For PW4168 - For AIRBUS A330		
For Transcowls		
1913	GMIHBTR-PW4168-330-2	A set of 2 blankets for T/COWL left or right - total 6 zones - 230 volts monophase
For CORECOWLS		
19131	GMIHBTR-PW4168-330-1-2	A set of 3 blankets for Corecowl Left - total 6 zones - 230 volts monophase
19132	GMIHBTR-PW4168-330-2-2	A set of 3 blankets for Corecowl Right - total 6 zones - 230 volts monophase

19.2 BLANKETS FOR T/COWL CF6-80C2 PER SEGMENT**Item P/N Description**

In case the customer does not want to proceed to complete skin overhaul, we can propose blankets covering only the sectors.

If we sketch the skin of the T/C with 6 sectors, the table below gives the P/N of the independent blankets. They are **230 Volts** monophasic and can be controlled by our Anita Consoles or by the 6 Zones Anita



19201	GMIHBTR06-01-1Z-2	1 Blanket for segment 1 - Left Rear side
19202	GMIHBTR06-02-1Z-2	1 Blanket for segment 2 - Central Rear side
19203	GMIHBTR06-03-1Z-2	1 Blanket for segment 3 - Right Rear side
19204	GMIHBTR06-04-1Z-2	1 Blanket for segment 4 - Left Front Side
19205	GMIHBTR06-05-1Z-2	1 Blanket for segment 5 Central Front side
19206	GMIHBTR06-06 -1Z-2	1 Blanket for segment 6 - Right Front Side

20 BLANKET SPECIFIC FOR CFM56 ABRADABLE LINER BONDING

Item P/N Description

The blanket is in two electrical zones to be controlled by the ANITA Console.
Two blankets identical are necessary to cover the complete circular ring of this engine



20001	GMIHBCFM56-A-2Z-V*	Set for CFM56-5A	Airbus A320 family
20002	GMIHBCFM56-B-2Z-V*	Set for CFM56-5B	Airbus A320 family
20003	GMIHBCFM56-C-2Z-V*	Set for CFM56-5C	Airbus A340
20004	GMIHBCFM56-3-2Z-V*	Set for CFM56-3	Boeing 737

*V =1 for 120 V;= 2 for 230 V

To control these blankets GMI proposes several solutions with our 1 zone , 2 zone Bonding Consoles or with 1 Bonding Console 4 zones .

Anita 1 zone GMIQS01Z



Anita 2 zones GMIEZ0901



Anita 4 zones GMIEZ4Z01



20.1 OTHER HEATING PROCESS ON ENGINE CASES

Blankets and Anita consoles above can be also used for controlling several heating processes on metallic structures like for example accelerate the curing cycle of anti-erosion paint or productive products. Consult us for engineering advices.

21 AIR INLET BLANKETS

We can supply the set of blankets to replace wiremesh areas of the Air Inlet. Our set covers the complete ring in 3 blankets .

21.1 FOR V2500

Item	P / N	Description
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The system is designed in 3 blankets. one covers the upper segment; two to cover respectively the lower left and lower right sides. Each blanket is manufactured in 2 zones parallel in the length.

Approximative dimensions:

- Blanket upper: 1530 x 760 x 760 mm
- Blanket lower left: 1730 x 630 x 760 mm
- Blanket lower right: 1850 x 760 x 630 mm



21101 GMIHBAI-V25-2

A Set of **3** blankets, each on **monophase 230 Volts** to connect to our 6 zone Bonder and Power system New in 2014 ANITA 6Z40.

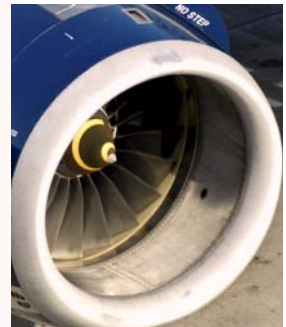
21.2 FOR A3300 -P4168

Item	P / N	Description
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The system is designed in 3 blankets. one covers the upper segment; two to cover respectively the lower left and lower right sides. Each blanket is manufactured in 2 zones parallel in the length.

Approximative dimensions:

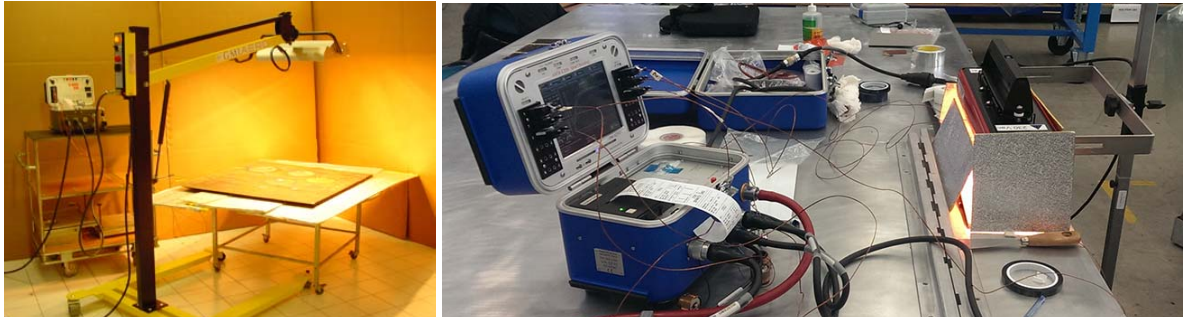
- Blanket upper: 1530 x 760 x 760 mm
- Blanket lower left: 1730 x 630 x 760 mm
- Blanket lower right: 1850 x 760 x 630 mm



21201 GMIHBAI-4168-2

A Set of **3** blankets, each on **monophase 230 Volts** to connect to our 6 zone Bonder and Power system New in 2014 ANITA 6Z40.

22 INFRA RED LAMPS AND SYSTEMS



22.1 PANEL WITH AN ARTICULATED ARM - LARGE AREA

Item	P/N	Description
22101	GMIWIR-MA-2	230 Volts- 3KW) Large Curing area: 1 x 0,9 m (40 x 35 inches) With interface to Anita for automatic control 230 Volts- 3KW - Typically for heat up to 120 °C see also below an option to control the system with an independent attached controller-scanner
22102	GMIWIR-MR-2	Option to be attached to above system to control it independently of the Anita Bonding Console by a controller only , mounted on the vertical strut
22103	GMIWIR-MRS-2	The same as above but with a 4 thermocouple scanner Type J or K to be specified (see picture above) <i>Picture of control box may be different</i>
22104	GMIWIRL2	Spare Lamp 230 Volts
22105	GMIWIRF	Spare Filter



22.2 INFRA RED SYSTEMS- SPOTBOND 1 AND 2

Articulated For Small And Larger Areas

Item P/N Description

An articulated head mounted on a vertical bar on a rolling base. With interface for direct control by an Anita EZ Bonding Console or optionally through a controller-scanner



22201	GMIWIR-SB2-A-2	SpotBond 2, 2000 Watts - 2 lamps controllable by console Anita - 230 Volts (120 volts on request)
22202	GMIWIR-SB1-A-2	SpotBond 1, 1000 Watts - 1 lamp controllable by console Anita - 230 Volts (120 volts on request)
22203	GMIWIR-SB2-RS-T* *T Thermocouples type J or K	SpotBond 2, 2000 Watts - 2 lamps controllable by a controller + scanner 4 TC - 230 Volts (120 volts on request)
22204	GMIWIR-SB1-RS-T* *T Thermocouples type J or K	SpotBond 1, 1000 Watts - 1 lamp controllable controllable by a controller + scanner 4 TC - 230 Volts (120 volts on request)
22205	GMIWIR-SBL-1	Spare Lamp 120 Volts
22206	GMIWIR-SBL-2	Spare Lamp 220 Volts
22207	GMIWIR-SBC01	Transportation case



HEATERS

22.3 RADIANT PANELS TO BE POSITIONED ABOVE A PART

Item	P/N	Description
22301	GMIWRP040040-V*-1Z	Panel with ceramic radiant circuits Up to 120 /180°C With adaptable height legs To be controlled by Anita Console or by option below



22302	GMIWRS4-T*	Option to be attached to above system to control it independently of the Anita Bonding Console . - Controller scanner with 4 thermocouple circuits type J or K to be specified - mounted on the vertical strut
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* T = J or K according to type of thermocouple



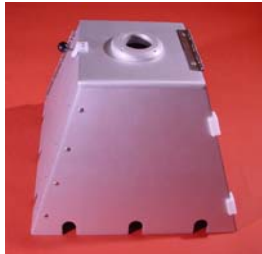
23 FOLDABLE OVEN WITH HOT AIR FOR ANITA CONSOLES

Item	P/N	Description
23001	GMIET010	<p>A foldable oven for drying the sandwich area after core removal and before core installation of potting.</p> <p>The oven is useful to accelerate the potting curing; in some cases it can be used to heat the adhesive up to 120°C.</p> <p>Base of the oven 40x 40 cm</p> <p>The oven temperature cycle is controlled :</p> <ul style="list-style-type: none"> - either by the ANITA Console. The oven is equipped with a specific heat gun. and an internal diffusion grid for gun air break. - or by a controller scanner as proposed below <p>The system in separated parts as listed below</p>



HEATERS

GMIET010	The foldable oven with its diffusion grid (2 parts)
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23002	GMIETE011-1 (120Volts) US plug	Heat Gun adapted to the oven above. This heat gun can be used for several other jobs in a workshop when it is necessary to melt or soften some materials like pre-pregs
	GMIOTE011-2 (220Volts) CE plug	



23003	GMIETE012-1 (120 Volts) with a US plug	Connector for Anita bonding console cable (adaptors)
	GMIETE012-2 (230 Volts) with a CE plug	



23004	GMIWRS4-T*	<p>Option to control the heat gun</p> <ul style="list-style-type: none"> - Controller scanner with 4 thermocouple circuits type J or K to be specified - mounted on the vertical strut
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* T = J or K according to type of thermocouple



24 AUTONOMOUS HEATING BLANKETS AND CONTROLLERS

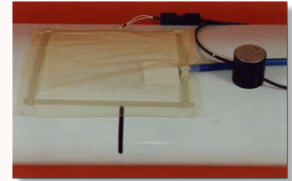
This specific family of blankets is conceived and manufactured for use at low temperature (80°C or around according to specs and exceptionally 100°C) . They are driven in power by specific simple low cost instruments that we call **Autonomous Bonders**.

Autonomous blankets

They are used as classical blankets but are limited to low temperature of max 80 °C.

They need the autonomous controller as below

Various sizes of blankets; see below



Controller for autonomous blankets

Preset at **60 or 80°C**



or specific to be advised



24.1 AUTONOMOUS BLANKETS FLEXIBLE

Item	P/N	Dimensions (cm)
24101	GMIHBA02020-V*	20 X 20
24102	GMIHBA025025-V*	25 X 25
24103	GMIHBA030030-V*	30 x 30
24104	GMIHBA040040-V*	40 x 40
24105	GMIHBA030050-V*	30 x 50
24106	GMIHBA060060-V*	60 x 60

where *V =1 for 120 V;= 2 for 230 V

24.2 AUTONOMOUS BLANKETS STRETCHABLE

Item	P/N	Dimensions (cm)
24201	GMIHBAC020020-V*	20 X 20
24202	GMIHBAC025025V*	25 X 25
24203	GMIHBAC030030V*	30 x 30
24204	GMIHBAC040040V*	40 x 40
24205	GMIHBAC030050V*	30 x 50

where *V =1 for 120 V;= 2 for 230 V

24.3 AUTONOMOUS CONTROLLERS

Item	P/N	Description
Model Type 11 or 2 output in parallel Power max: Voltage X 7 Amp		



24301	GMITH1-V*-60	Preset at 60 °C/140°F	1 single output
24302	GMITH1-V*-80	Preset at 80 °C/176°F	1 single output
24303	GMITH2-V*-60	Preset at 60 °C/140°F	2 single output

* V = 1 for 120 Volts ; = 2 for 230 Volts

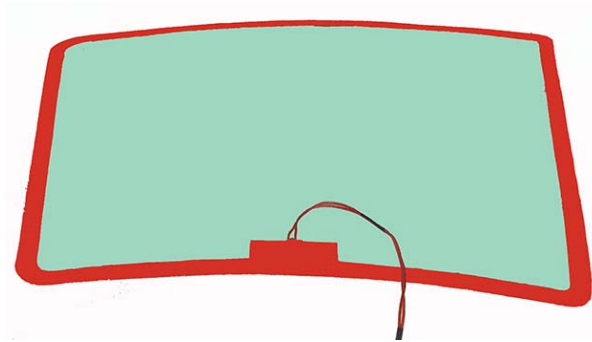
24304	GMITH2B-V*-T*	Model Type 2 higher power than model 1 2 output in parallel Power max: Volts x 16 Amp
where : V Volts = 1 for 120 or 2 for 230 Volts - and Temperature T= 60 or 80 (°C)		



24.4 APPLICATIONS OF AUTONOMOUS SYSTEMS

24.4.1 DISBONDING OF WIND SCREEN

By softening of PR - Here below blanket for Embraer Aircraft - Consult us for application details.



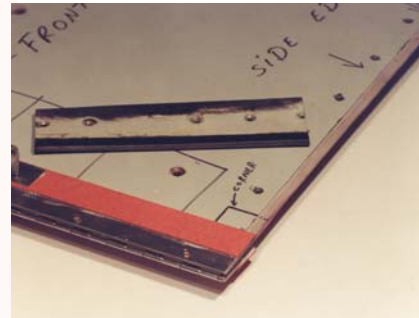
24.5 BOEING 747 - KRUEGER AND CAMBER FLAP SEAL BONDING - HEATED HINGES

These panels have bonded seals that tend to disbond with time. The panel is then dismantled and reinstallation of the seals is performed in a workshop.

Up to now, this work was done at ambient temperature. Our system cures the adhesive at 70°C / 158 °F. Thanks to our innovative autonomous controller, the operation is made easily without use of an external console.

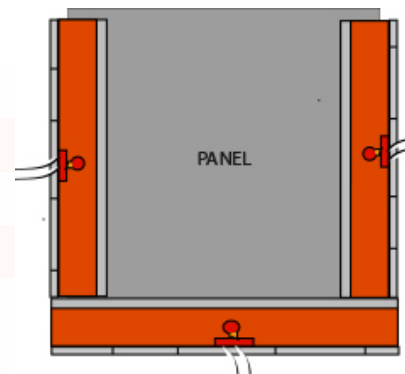
Curing at a higher temperature reduces considerably the duration of the operation and enhances the quality of adhesion.

Delivery - The 3 hinges: one for the longer side, the two others are shorter and identical for the two sides,
Heating device according to panel



Device P/N	Panel Length mm/ feet	Panel Width mm/feet
24501 GMIFLP6400-X	1850 (6.08)	570/1.87
24502 GMIFLP6390-X	2200/7.22	700/3.00
24503 GMIFLP6410-X	1930/6.33	700/3.00
24504 GMIFLP3290-X	2540/8.33	570/1.87

For control add the autonomous controller rated 70°C
P/N: GMITH3-70-V ; where V = 1 for 120 volts ; =2 for 230 volts ; **3 outputs**



25 BLANKET CONNECTING ACCESSORIES**MULTIPLE BLANKET CONNECTION SOLUTIONS**

Item	P/N	DESCRIPTION
	25001 GMINGE102	cable to connect 2 blankets in parallel Allows an Anita to drive 2 x 2 blankets simultaneously
	25002 GMIANE104	box for connection of 4 blankets in parallel Allows an Anita to drive 2 x 4 blankets simultaneously



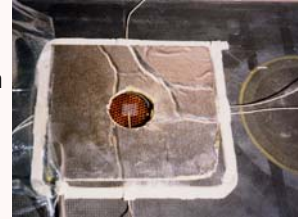
26 FLEXIBLE INSULATOR

P/N

Description

26001 GMITI010

used to protect areas from being overheated;
also excellent insulator against heat losses by
radiation and convection
typical application: repair of elevator; bonding an
adhesive in bottom of hole in honeycomb.
delivered in sheet of **45 x 75 cm**
can be easily cut with a cutter



(3)OTHER USEFUL COMPLEMENTARY TOOLS FOR BONDING

27 THERMOCOUPLE CABLES

27.1 THERMOCOUPLE CABLE ROLLS

Item	P/N	Description
------	-----	-------------

Our thermocouple cable is of high quality and particularly suitable for the fabrication of individual cables for the sensing of temperature in composite vacuum bags. It is available in rolls and is sleeved with Kapton for easy manipulation and rolling. Its specifications are compatible with composite repair classes of measurement.



THERMOCOUP

27101	GMIANT150-J	A roll of 150 m of thermocouple cable Type J with limits of error +/-1.1 °C
27102	GMIANT150-K	A roll of 150 m of thermocouple cable Type K with limits of error +/-1.1 °C
27103	GMIANT300-J	A roll of 300 m of thermocouple cable Type J with limits of error +/-1.1 °C
27104	GMIANT300-K	A roll of 300 m of thermocouple cable Type K with limits of error +/-1.1 °C

27.2 THERMOCOUPLE CABLE MOUNTED

Item	P/N	Description
------	-----	-------------

27201	GMIEZT010-J-3	1 Thermocouple cable checked and tested 3 meters long 6 Type J To be used for Anita with plugs J for calibration certificate see below
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27202	GMIEZT010-K-3	1 Thermocouple cable checked and tested 3 meters long 6 Type K To be used for Anita with plugs K for calibration certificate see below
-------	---------------	---



Calibration Certificate

The cables are delivered with a conformance certificate . if you want also an individual certificate of calibration , we can supply at additional cost a certificate for each cable duly serialised. The cable is tested to be within tolerances of +/- 1,4°C at 4 points : 40, 80, 120 , 200 °C - see also below how to calibrate yourselves the thermocouple cables

27.3 INSTRUMENTS FOR CHECKING OF THERMOCOUPLES

In order to qualify thermocouples, see our set of instruments in our **Chapter Workshop.Section (8) on page 75.**

27.4 THERMOCOUPLE PLUGS & PANELS

Item	P/N	Description
27401	GMIEZT010-1-J	Thermocouple plug set type J to be mounted for ambience below 220 °C (for higher temperature see below)



27402	GMIEZT010-1-K	Thermocouple plug set type K to be mounted for ambience below 220 °C (for higher temperature see below)
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For Fabrication Processes or Repair inside Oven / Autoclaves

27403	GMIEZT110-1-T*	Thermocouple plug set of type J or K to specify for ambience up to 260°C
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27404	GMIFBTP-H-6-T*	Thermocouple socket panel for interior of oven - up to 260 °C - 6 sockets
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27405	GMIFBTP-H-8-T*	Thermocouple socket panel for interior of oven - up to 260 °C - 8 sockets
-------	----------------	---



27406	GMIFBTP-H-12-T*	Thermocouple socket panel for interior of oven - up to 260 °C - 12 sockets
-------	-----------------	--

* where T = J or K according of thermocouple type

Extension thermocouple pair cables

27407i	GMIFBTEX-8-T*	Cable with pairs individually twisted ; a mylar internal for shield ; a copper wire for use s ground connection for 8 pairs ; select thermocouple type J or K
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27408	GMIFBTEX-12-T*	same for 12 pairs ; select thermocouple type J or K
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28 WELDER FOR THERMOCOUPLES

Item	P/N	Description
28001	GMIAT100-V where V = 1 for 120 volts V= 2 for 230 volts	Portable instrument for welding thermocouple cables (type J or K) of Anita console
28002	GMIATAC020	High quality stripper to prepare the tip end of the cable before welding



THERMOCOUP

28.1 INFRA RED THERMOCOUPLE SENSOR

Item	P/N	Description
<p>To connect to the Anita Console directly The sensor is delivered ready to connect with a cable and plug compatible with ANITA thermocouple circuit. A mounting ring is delivered to assure the correct distance to the targeted surface and to present the sensor perpendicularly for repetitive measurements Four sensors are presented according to the temperature range for optimum precision. Precision is 2% in the nominal range, 5% outside. -- Dimensions: L. 45 mm - Dam. 13 mm.</p>		
28101	GMIANT300-T*	For Temperature range. 70 à 105 °C (160 to 204 °F).
28102	GMIANT320-T*	For Temperature range. 95 à 130 °C. (200 to 270 °F).
28103	GMIANT350-T*	For Temperature range. 125 à 155 °C.(260 to 310°F)
28104	GMIANT380-T*	For Temperature range. 145 à 175 °C.(290 to 350°F)



where T = J or K according of type of thermocouple

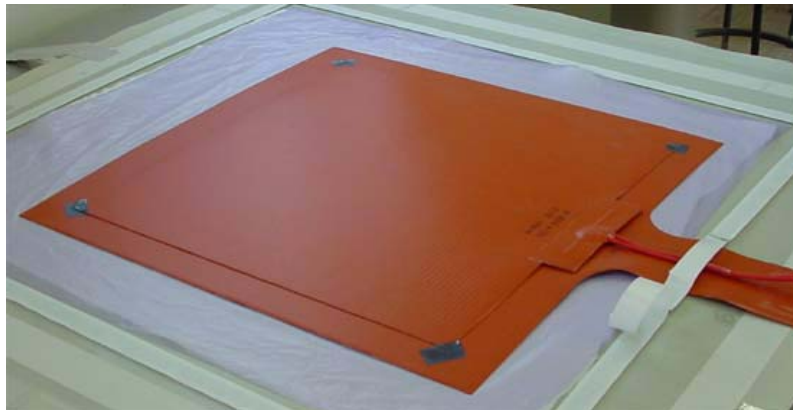
28.2 ANISCAN - SMALL PORTABLE THERMOCOUPLE SCANNER

P/N	Description
28201 GMISC04-J or -K	<p>Aniscan Scanner for 4 thermocouple channels Type J or Type K at the order With USB key to collect the cycle data. Can be used when heat is developed by autonomous bonders, radiant panels...</p>



29 STSM - SMART TEMPERATURE SENSING MATS WITH THERMOCOUPLES

Our Sensing Mat (STSM) is an innovative tool that will answer to the operator question as to where to position thermocouples for temperature control when performing hot bonding. The STSM is a layer of silicone embedded with very thin thermocouples according to a pre-set lattice . When laid between the patch and the blanket, the sensors will be in intimate contact with the optimised areas of the repair patch and will measure adequately the temperature of the patch to be bonded in place. According to the size and shape of the patch, the operator has the latitude to select the sensors that will participate to the control and to the monitoring of the cure cycle.



According to the size the mat contains 6 or 12 couples of type J or K to be selected at the order. The mat connects through a quick connector to a prolongator cable that is then connected to the Anita Bonding Console.

29.1 STANDARDS SENSING MATS

Item	P/N	Description	Thermocouple Number
29101	GMISM-03030-6-J*	Smart Mat 30 x 30 cm	6
29102	GMISM-04040-6-J*	Smart Mat 40 x 40 cm	6
29103	GMISM-05050-6-J*	Smart Mat 50 x 50 cm	6
29104	GMISM-06060-6-J*	Smart Mat 60 x 60 cm	6
29105	GMISM-06060-12-J*	Smart Mat 60 x 60 cm	12 - 2 output of 6
29106	GMISM-07070-12-J*	Smart Mat 70 x 70 cm	12 - 2 output of 6
29107	GMISM-09090-12-J*	Smart Mat 90 x 90 cm	12 - 2 output of 6

*J or K according to choice .

Note that the large mats of 12 couples need two thermocouple prolongator cables of 6 couples to connect to the Anita console

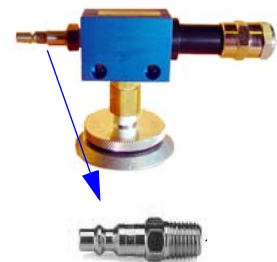
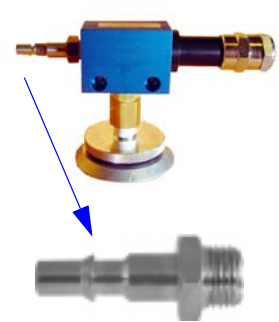
29.2 PROLONGATOR CABLES

Item	P/N	Description	Nombre de T/C
29201	GMIHBSM-6-J-3	Prolongaor cable of 6 couples of type J - 3 m long	6 type J
29202	GMIHBSM-6-K-3	Prolongaor cable of 6 couples of type K - 3 m long	6 type K

(4) VACUUM GENERATION

30 COMPRESSED AIR PUMP - VENTURI

Item	P/N	Description
30001	GMIOTPVV010	Vacuum bag valve with a venturi pump mounted. This set can be easily mounted on the vacuum bag. Excellent flow. Delivered with its silencer. with standard male connector brand Staubli Model with french connection for compressed air Staubli
30002	GMIOTPVV110	The same venturi pump but with possibility of tuning the vacuum level ; Model with french connection for compressed air Staubli
30003	GMIOTPVV011	Venturi as GMIOTPVV010 but with brand male connector US - Atlas Copco for compressed air input
30004	GMIOTPVV111	Venturi from above with tuning valve ; compressed air input being Atlas copco brand



VACUUM

31 ELECTRICAL VACUUM PUMPS

31.1 LIGHT PORTABLE PUMPS

P/N	Description
31101 GMIWVP011-V* Where V= 1 for 120 volts and 2 for 230 Volts	For repair bags. Small and light (9 Kg) No oil. This pump for one or two vacuum bags; for more power see other model below Comes complete with a manometer and vacuum silicone hose A transport case can be proposed as below



31102 GMIWVP021	Same as above but bi-voltage 120 or 230 Volts by change of a power cable
-----------------	--



31103 GMIWVPC011	Transport case for the vacuum pump above Note: the case is presently of colour blue;
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31.2 MOBILE VACUUM CENTERS FOR WORKSHOP

Item	P/N	Description
31201	System with oil vacuum pump and tank	Mounted on rolls. Ready for simultaneous connection of 5 vacuum bags Proposed in 2 tank capacities: 16 & 25 M3/H ; in version 220 monophase or 380 Volts three phases
31202	GMIWVR011	Capacity 16M3/h - monophase 230 Volts
31203	GMIWVR012	Capacity 16 M3/h - three phase 380 Volts
31204	GMIWVR013	Capacity 25 M3/h - monophase 230 Volts
31205	GMIWVR014	Capacity 25 M3/h - three phase 380 Volts



32 VACUUM HOSE - VALVES - CONNECTIONS

All parts described in this chapter are for use with our bonding systems for composite repair. Thermocouple cables, vacuum hoses, valves to be used inside autoclaves and ovens are listed in the Workshop Chapter - see Chapter 8, page 71 .

32.1 VACUUM HOSE

Item	P/N	Description
32101	GMIOTP030	Silicone Vacuum hose to connect pumps to vacuum bag A roll of 30 meters Other dimensions on request Temperature max 230 °C . Int diameter 8 mm.



32.1.1 VACUUM VALVES

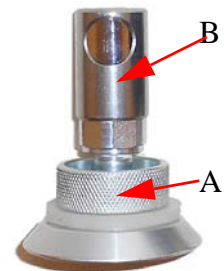
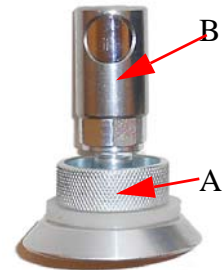
we can propose several types of valves according to standard of connection. please review your favourite model

Item	P/N	Description
32111	GMIWVB010	Base of vacuum valve auto closing with its nipple to receive the mobile part below
32112	GMIWVB011	Mating connector for valve above; with connector for insertion in vacuum hose of internal diam of 8 mm
32113	GMIWVB010-01	Base alone of vacuum valve A Diam 65 mm
32114	GMIWVB010-02	Base alone of vacuum valve A Diam 50 mm
32115	GMIWVB010-02	Auto closing part alone mounted on part A of above picture



VACUUM

Item	P/N	Description
32116	GMIWVB010-04	Connection for insertion in flexible hose of diam 8 mm Thread 1/4 gas
32117	GMIWVB012	Set A + B of picture, Mounted The part B is of brand Staubli for connector 6 mm The part A is as above GMIWVB010-01 (diam 65 mm) The set is autoclosed when the connector of the hose is removed Needs the connector GMIEZP060-1as above for mounting by insertion the flexible hose- see also below
32118	GMIWVB013	Set A + B of picture, Mounted The part B is of brand Staubli for connector 6 mm The part A is as above GMIWVB010-02 (diam 50 mm) The set is autoclosed when the connector of the hose is removed Needs the connector GMIEZP060-1as above for mounting by insertion the flexible hose- see also below
32119	GMIOTP060-02	Simple vacuum sniffer to be inserted tangentially to the repair bag wherever this is useful if not necessary Compatible with Anita vacuum hoses of internal diam. of 8 mm



32.2 VACUUM SENSING VALVES

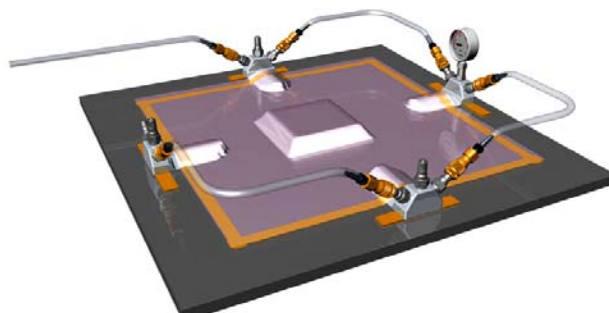
Item	P/N	Description
32201	GMIOTPVS010	Vacuum meter mounted on connector to mate the valve base GMIWVB010 (see above for identification)
32202	GMIOTPVS012	Vacuum meter mounted on connection to mate the valve base GMIWVB012- (see above for identification)



VACUUM

32.3 MULTI -PORT VALVES

Item	P/N	Description
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32301 GMIWVB3F

Valve 3 ports - for **flat** surface



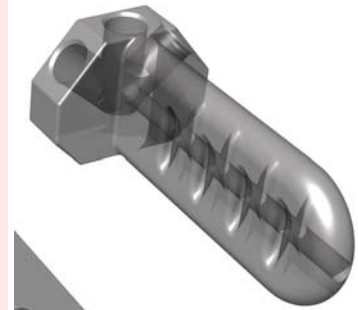
32302 GMIWVB3C

Valve 3 ports - for **curved** surface



32303 GMIWVB3V

Valve 3 ports for positioning
orthogonally to the surface







Each Valve has 3 ports and is delivered as illustrated above without any connection accessory ; thread 1/4 BSP ; you may connect any accessory : Vacuum connector, Gauge,...see illustrations below





32.4 CONNECTIONS

Item	P/N	Description	
32401	GMIOE013	Y connection to connect two bags to a vacuum pump Under this reference, input connector of brand Staubli (see below) - diam. 6 connections to bags: Staubli brand	
32402	GMIOE113	as above but with input connector of brand Atlas Copco - see picture.	
32403	GMIEZP060-1	Connector Staubli - for insertion in hose of interior diam of 8 mm Compatible with Anita connections or to the Y above and our hose. See our special vacuum hose	
32404	GMIEZP060-2	Connector Staubli - for insertion in hose of interior diam of 6 mm Compatible with Anita Console connections or to the Y above.	
32405	GMIEZP021	Staubli brand connector female and for insertion in hose 6 mm internal diameter	
32406	GMIEZP160-1	Atlas Copco Connector male and other side to be inserted in hose of 8 mm internal diameter	
32407	GMIEZP160-2	Atlas Copco Connector male and other side to be inserted in hose of 6 mm internal diameter	
32408	GMIEZP121	Staubli brand female with other side female thread 1/4 NPT	

VACUUM

Item	P/N	Description	
32409	GMIEZP020-02	Staubli brand male with other side male thread 1/4 Gaz	
324010	GMIEZP020-04	Male Staubli brand connector with other side female 1/4 Gaz	
324011	GMIEZP020-05	Atlas Copco male connector with other side female thread 1/4 NPT	
324012	GMIEZP020-03	Atlas Copco male connector with other side male thread 1/4 NPT	

32.4.1 VACUUM LEAK TEST

Item	P/N	Description	
32411	GMIWLD010	To help locating the source of the leak in a vacuum bag.	 

(5) TOOLINGS

**33 SURFACE PREPARATION GENERAL WORKS
STEPPING - SCARFING**

33.1 LESLIE CONSOLES WITH GMI INNOVATIVE TOOLS

Unique equipment developed by GMI since twenty years ago and sold regularly worldwide to all customers who want to machine the composite structures according to the state of the art rules. Include innovative tools unequaled for performances in stepping, scarfing, milling, routing, edging... laminate or sandwich structures with flat, curved or multi curved surface skins.



TOOLINGS

Two models are proposed:

Item P/N	Description
33101 GMIAT87B02-320	<p>Leslie, Mobile Workshop with innovative tools and attachments and useful accessories to prepare the structure before repair Contains all parts to conduct a repair from paint removal to patch installation see specifications details in annexes.</p> <p>the foldable oven and its heat gun are proposed in option</p>



Item P/N

Description

33102 GMICRT9201

Leslie, Model CRT, restricted kit from above with innovative tools and attachments
For manufacturers, repair centres, universities
see specifications details in annexes
the foldable oven and its heat gun are proposed in option



§ GMIET010
+ gun
+ connector for Anita control

A foldable oven for drying the sandwich area after core removal and before core installation or potting.
The oven is useful to accelerate the potting curing; in some cases it can be used to heat the adhesive up to 120°C.
Base of the oven 40x 40 cm
The oven temperature cycle is controlled by the ANITA Console. The oven is equipped with a specific heat gun. and an internal diffusion grid for gun air break.
special connector for the Anita Console is included



34 DRILLING

34.1 DRILLING MACHINE

Item	P/N	Description
34101	GMIWTD010	DRILLING MACHINE STRAIGHT FOR CARBON SKINS to be used with our drill reamers below.
34102	GMIWTD011	DRILLING MACHINE IN ANGLE FOR CARBON SKINS to be used with our drill reamers below



34.2 DRILL REAMER HIGH QUALITY FOR CARBON SKINS

Item	P/N	Description

These drill perform 2 operations in the same time : drilling and reaming. They are conceived for a high quality operation on carbon skins

	Diameter mm		Diameter mm		
34201	GMICDR0396	3,96	34202	GMICDR0520	5,20
34203	GMICDR0410	4,10	34204	GMICDR0627	6,27
34205	GMICDR0475	4,75	34206	GMICDR0635	6,35
34207	GMICDR0480	4,80	34208	GMICDR0650	6,50
34209	GMICDR0490	4,90	342010	GMICDR0667	6,67
342011	GMICDR0508	5,08			
For definition in inch		diam in inches			
342012	GMICDR0180	1/8 in	342013	GMICDR0532	5/32 in
342014	GMICDR0316	3/16 in			

34.3 DRILL STOPS

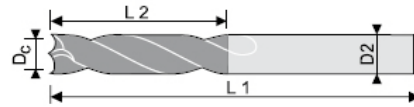
Item	P/N	Description
34301	GMIIRS02	Drill Stops #40
34302	GMIIRS03	Drill Stops #30
34303	GMIIRS04	Drill Stops #21
34304	GMIIRS05	Drill Stops #11
34305	GMIIRS06	Drill Stops #14



TOOLINGS

34.4 DRILLS FOR KEVLAR SKINS

Item



P/N	Diam mm (in)	L1 mm	L2 mm
34401 GMIKDR0300	3,00	40	12
34402 GMIKDR0317	3,17 (1/8")	40	12
34403 GMIKDR0400	4,00	55	18
34404 GMIKDR0476	4,76	58	24
34405 GMIKDR0500	5,00	62	26
34406 GMIKDR0555	5,55 (7/32")	66	28
34407 GMIKDR0600	6,00	66	28
34408 GMIKDR0635	6,35(1/4")	70	31
34409 GMIKDR0650	6,50	70	31
344010 GMIKDR0700	7,00	74	34
344011 GMIKDR0793	7,93 (5/19")	79	37
344012 GMIKDR0800	8,00	78	37

34.5 TEETH COUNTERSINKS WITH REMOVABLE PILOT

34.5.1 FOR CARBONE

Item	P/N	Description
		Countersink with removable pilot (2 or 3 lips) at 100° for Carbone; Thread M6 x 100
		according to diameters
	34511 GMICSK0400	4,00
	34512 GMICSK0476	4,76
	34513 GMISCK0635	6,35



For other products please consult us

34.5.2 FOR KEVLAR

Item	P/N	Description
		Countersink with removable pilot (2 or 3 lips) at 100° for Kevlar
		according to diameters
	34521 GMIKSK0400	4,00
	34522 GMIKSK0477	4,77
	34523 GMIKCK0635	6,35



For other products please consult us

34.6 MICROSTOP DRILL CAGES

Item	P/N	Description
To perform chamfer in metal or in carbon with great precision		
34601	GMIMDC06	Diameter 6 mm - M6x100
34602	GMIMDC08	Diameter 8 mm - M8 x 100

For other products please consult us



34.7 CORE DRILLS

Item	P/N	Description
Core Drills Diamond Coated GRID D40 (thin for carbon skins) according to diameters		
34701	GMIT4003	Diam 3/8 inch
34702	GMIT4005	Diam 1/2 inch
34703	GMIT4007	Diam 3/4 inch
34704	GMIT4009	Diam 1 inch
34705	GMIT4011	Diam 1 1/4 inch
34706	GMIT4013	Diam 1 1/2 inch
34707	GMIT4015	Diam 2 inches
For pilot guide consult us		



34.8 ROUTER BITS

Item	P/N	Description
34801	GMIOE030	Router Carbide for Carbon 6 mm diam To rout carbon skins neatly with no risk of delamination
34802	GMIOE031	Router Carbide for Kevlar 6.35 mm diam Multi lips to avoid delamination on glass and kevlar skins



34.9 DIAMOND CONES

Item	P/N	Description	Thin grain for fine sanding
34901	GMIOEDC060	60° - axis 6 mm	
34902	GMIOEDC100	100° - axis 6 mm	
34903	GMIOEDC120	120° - axis 6 mm	
34904	GMIOEDC130	130° - axis 6 mm	

34.10 DIAMOND FILES

Item	P/N	Description	Diamond Grit
341001	GMILID060	File length 150 mm - abrasive length 100 mm	Diamond Grit: medium
341002	GMILID100	File length 150 mm - abrasive length 100 mm	Diamond Grit: fine
341003	GMILID160	File length 250 mm - abrasive length 150 mm	Diamond Grit: medium
341004	GMILID200	File length 250 mm - abrasive length 150 mm	Diamond Grit: fine

SANDING

35 SANDING

35.1 SANDING DISCS



Item	P/N (a box of 100 pieces)	Grit	Item	P/N (a box of 100 pieces)	Grit
Diameter 1 in / 25 mm			Diameter 2 in / 50 mm		
	35101 GMIAC041-080	80		35102 GMIAC042-080	80
	35103 GMIAC041-120	120		35104 GMIAC042-120	120
	35105 GMIAC041-180	180		35106 GMIAC042-180	180
	35107 GMIAC041-240	240		35108 GMIAC042-240	240
	35109 GMIAC041-320	320		351010 GMIAC042-320	320
Diameter 3 in / 75 mm					
	351011 GMIAC043-080	80			
	351012 GMIAC043-120	120			
	351013 GMIAC043-180	180			
	351014 GMIAC043-240	240			
	351015 GMIAC043-320	320			

TOOLINGS

35.2 MANDRELS

Item	P/N	Diamètre
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Mandrels for sanding discs above - medium hardness - see picture for principle of mounting

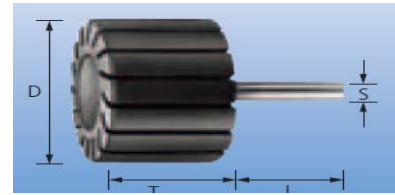
35201 GMIAC041	1 in / 25mm
35202 GMIAC042	2 in / 50 mm
35203 GMIAC043	3 in / 75 mm



35.3 ABRASIVE CYLINDERS AND SUPPORTS

we present here some possibilities ; for others please consult us

Mandrels	in mm	in mm
P/N	Dim mm	Dim mm
35301 GMIMA01510	15 x 10	6 x 35
35302 GMIMA01530	15 x 30	6 x 35
35303 GMIMA01925	19 x 25	6 x 35
35304 GMIMA02220	22 x 20	6 x 35
35305 GMIMA02525	25 x 25	6 x 35
35306 GMIMA03020	30 x 20	6 x 35
35307 GMIMA03030	30 x 30	6 x 35



Cylinders in box of 100 pieces

D x T mm	Grain 80	Grain 150	Grain 240
35308 15 x 10	GMICA1510-080	GMICA1510-150	
35309 15 x 30	GMICA1530-080	GMICA1530-150	GMICA1530-240
353010 19 x 25	GMICA1925-080	GMICA1925-150	GMICA1925-240
353011 22 x 20	GMICA2220-080	GMICA2220-150	
353012 25 x 25	GMICA2525-080	GMICA2525-150	
353013 30 x 20	GMICA3020-080	GMICA3020-150	
353014 30 x 30	GMICA3030-080	GMICA3030-150	



36 SCISSORS

Item	P/N	Description
36001	GMIAC017	Scissors Length 24 cm standard use for papers or others



36002	GMIAC018	High quality scissor with microteeth for cutting Kevlar dry fabric Works also for Carbon
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36003	GMIAC019	Electrical scissors for cutting glass fiber/carbpn or kevlar (max 175g/m2) Delivered in a box with accessories Not for prepregs
-------	----------	--



37 TOOLINGS FOR SEALANTS AND PR TREATMENT

37.1 VIBRATING CHISEL AND SPECIAL BLADES FOR SEALANT REMOVAL

For this activity, GMI has developed:

- a) Tools designed specifically to remove sealants, PRC, Silicones, glues, RTV, seals, gaskets and all general mastic.(see below)
- b) Instrument to accelerate the hardening of the PR with temperature control - see page 67

Item	P/N	Description
37101	GMIVG01	<p>One System Chisel + Case as a Complete Kit containing:</p> <ul style="list-style-type: none"> 1- Padded leather case for onboard operation 2- Medium CHISEL see below for high power chisel 3- VIBRO-BLADE dustless Sharpener of blades with aggregate disc for sharpener and vacuum bags - 4 –A number of sample blades
37102	GMIVG01-01	The vibrating chisel
37103	GMIBS010	Chisel Blade sharpening Wheel in a portable case Delivered without the chisel



Consumable for sharpening machine

37104 GMIVGBG10 package of 10 Dustless Vacuum Bags for sharpening case

TOOLINGS

Item	P/N	Description
37105	GMIVGR10	package of 10 aggregate rings for sharpening case

Other Presentations possible for the Chisel

37106	GMIVG01-11	A Kit containing the Medium Chisel with: - anti static hose 5 m - a set of 20 blades for soft metal See also below the kit with High power Chisel
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37107	GMIVG02	The same as above but with the High Power Chisel
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37108	GMIVG02-02	High power chisel for thick coat of sealants
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Kits of Blades

37109	GMIVGH06	Hand KIT for mastic removal. A box of 6 mixed blades for T3 aluminium and hard metal with handle for easy manipulation
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371010	GMIVGH06-T3	Hand KIT for mastic removal on soft T3 aluminium A box of 6 blades
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371011	GMIVGH06-H	Hand KIT for mastic removal on Hard metal A box of 6 blades
--------	------------	---



Other useful items

371012	GMIVGSH15	ANTI STATIC HOSE (Very useful) Recommended when working inside the aircraft; to compressed air power the vibrating chisel One roll of 050 feet (15 m approx.) anti static hose with conductive connectors
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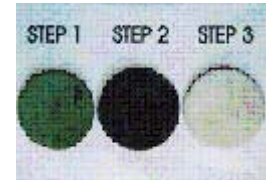


TOOLINGS FOR SEALANTS AND PR TREATMENT

Item	P/N	Description
371013	GMIAP03	Angle Polisher For T3 Aluminium



371014	GMIAP03-F03	Compound impregnated discs for polisher machine above. Specific for T3 aluminium In a bag 3 discs
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(6)INSTRUMENTS FOR NON DESTRUCTIVE TESTS - NDT

38 TAP-TAP

Item	P/N	Description
38001	GMIUC226	Tap tap aluminium for sandwich and thin skin
38002	GMIUC227	Tap tap steel for laminate panels with thick skins
38003	GMIUC228	Other model in aluminium



NDT

39 ELISA ULTRASONIC CONSOLE KIT FOR COMPOSITE REPAIR

Description

39001 GMIUCS87B02-VLT - Elisa 2015 Version LT (see below) version with tablet

Ultrasonic instrument set developed for composite repair context .
With easy operation to be used by technicians in charge of composite repair

- Delivered with
- dialogue and display Laptop
 - an A-Scan simple interface small box
 - two probes for carbon test
 - a set of accessories
 - in a nice transportable case
 - A manual for use and composite damage assessment procedure



3901 GMIUCS87B02-VFT

Version VFT of above

Complete set of ultrasonic instrument kit with **Portable Tablet PC** with integrating ultrasonic circuits

Version updated 2015



40 SPECIMENS FOR THICKNESS CALIBRATION

Description

40001 GMIUCTS2010 Set of carbon thickness specimens; fabric and tape various thicknesses
 The kit composed of:
 a) Specimens of Carbon Tape:
 11 specimens of thickness in terms of plies:
 4, 6, 8, 12, 16, 24, 32, 48, 64, 72, 96.
 b) Specimens of Carbon Fabric:
 7 specimens of thickness in terms of plies:
 2, 3, 4, 6, 8, 12, 16 plies



Each sample with 4 presentations of carbon, carbon + bronze mesh, + primer + paint

4001 GMIUCT72-5 Set of 5 specimens for laminated
 Thicknesses **96, 64, 32, 16 et 8 Plies**
 Application to ATR72 wing panel inspection
 composed of
 Part Respective P/N :
 GMIUCT096
 GMIUCT064
 GMIUCT032
 GMIUCT016

41 HUMIDITY PRESENCE METER FOR RADOME

Item P/N Description

41001 GMIRMD012 Direct Reading Colored Comparator Scale - for instantaneous indication of moisture; spring loaded electrode-buttons to adapt to curved surfaces.
 Rechargeable Ni-Cad Battery - eliminates costly battery replacement.
 220V MODEL
 Carrying Case, Charging Cord, Manual Included



NDT

42 THERMOGRAPHY KITS FOR AIRBUS ELEVATORS,

Item P/N Description

Each Kit is delivered in a case for easy storage and safe transportation (see brochure)
 Each kit conform to the specifications and methodology as developed in agreement with Airbus NDT.



42001 GMIDS32HK010-02 **For A320;** 3 blankets in a kit

42002 GMIDS00HK010-02 **For A300-600;** 6 blankets in a kit

42003 GMIDS34HK010-02 **For A340;** 6 blankets in a kit

42004 GMIDS34CK010-02 The **controller** with all its accessories delivered in a case for easy storage and safe transportation (see brochure)
 Each kit conform to the specifications and methodology as developed in agreement with Airbus NDT.



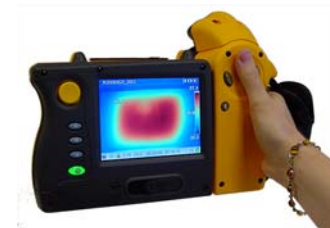
42005 GMIDS34TK010-02 The **transformer** with all its accessories delivered in a case for easy storage and safe transportation (see brochure)

The transformer **ONLY** for countries or hangars where 120 Volts is available and not 230 Volts



GMIDS34IC010 The **infra red camera** high performances for water ingress detection in elevators.

Picture depending of model at the time.
 |



(7)SPECIFIC REPAIR APPLICATIONS

We present here solutions developed for specific maintenance issues or particular repair processes.

43 - REPAIR OF DRILLED HOLES.....	74
44 - PR HARDENING OR SOFTENING	77
45 - REPAIR OF INFLATING SYSTEMS	78
46 - TEST OF DE-ICER BOOTS FOR REGIONAL COMMUTERS	80

43 REPAIR OF DRILLED HOLES

During drilling operations on composite laminate parts, damages can occur either at the entrance of the drill, at the exit or internally. The Heating Bolt Solution has been developed to provide heat for curing the resin applied to repair these damages; compaction can be also mechanically generated. Inserted in the hole, the tool provides heat to raise the temperature at the periphery of the hole and in a localized area on the two in /out skins at a temperature of 80°C approximative or at another programmed value.

To control the process, specific electric and electronic interfaces with advanced programmable software have been developed.

This tooling solution has been developed in order to provide a localised heating for curing the applied resin inside hole to repair damages possibly associated with the drilling and reaming operations in a carbon laminate.

43.1 HEATING TOOL RANGE : PINS AND BOLTS

A set of specifically designed tools have been conceived to deal with the variety of cases possibly met in this activity according to the diameter of the holes and of the thickness of parts.

We have treated a large extent of cases described in the tables of the following paragraphs.

We offer solutions for small holes below 6 mm and above .

- a) Below a hole diameter of 6 mm, we offer **PIN** solutions.
- b) Above 6 mm , we offer **BOLT** Solutions.

All tools include possibility of temperature control by 3 thermocouples type J or K by our console ANITA EZ.

Our offer also include an integrated controller for up to 6 devices, specially designed for aircraft assembly line.

REPAIR OF DRILLED HOLES

43.2 PINS FOR SMALL HOLES (< 6 MM) - PIN FAMILY

Item	P/N	Hole (mm)
------	-----	-----------

43201	GMICT032 -T*	3,2
43202	GMICT048 -T	4,8
43203	GMICT056 -T	5,6
43204	GMICT060 -T	6,0
43205	GMICT064 -T	6,35



* where T is the type of thermocouples J or K

Note : these parts are under 24 Volts and are either for use under 120 or 230 Volts through the use of the interface as described below

43.3 BOLT HEATING DEVICES FOR HOLES OF DIAMETER ABOVE 6 MM

Item	P/N	Hole diameter (mm)
------	-----	--------------------

43301	GMICB079-V*	7,9
43302	GMICB095-V*	9,5
43303	GMICB102-V*	10,2
43304	GMICB111-V*	11,1
43305	GMICB127-V*	12,7
43306	GMICB159-V*	15,9
43307	GMICB191-V*	19,1



-V*: 1 for 120 Volts; = 2 for 230 Volts operation

43.4 HEATING WASHERS

Item	P/N	Diamètres (mm)
------	-----	----------------

For the same type of work, heating washers are also of interest.
 Typical : 55 mm external diameter; central hole diam. 6mm; with 3 thermocouples type J or K



4341	GMIHW5506- T*	Ext.: 55- Int.: 6
------	---------------	-------------------

* T t = J or K according to the the type of thermocouples

Other dimensions on request

These washers are under 24 volts ; controllable as explained below

43.5 HEATING PLATES

Item	P/N	Dimensions (mm)
------	-----	-----------------

4351	GMIHP050070-T*	Length : 50mm - Width: 70mm
4352	GMIHP070100- T*	Length: 100mm - Width : 70mm

Other dimensions under request

These plates are under 24 volts ; controllable as explained below

43.6 TEMPERATURE CONTROL

Two possibilities

- a) Either by a console Anita EZ ; one or two heating tools in parallel
- b) For up to 6 heating tools in parallel

43.6.1 TEMPERATURE CONTROL FOR ANITA EZ

Item	P/N	Description
------	-----	-------------

To control a **pin** , a **waher** or a **heating plate** with an **Anita EZ** bonding Console an **interface** is needed.

43611	GMICTE-1Z	Interface for an Anita Console 1 PIN only can be connected
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43612	GMICTE-2Z	Interface for an Anita Console 2 PINS can be connected
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For Bolts , no interface is needed ; connect it to the Anita directly

43.7 INTEGRATED CONTROLLER FOR 6 BOLTS OR PINS, WASHERS, PLATES

Specially conceived for assembly line production t

item	P/N	Description
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43701	GMIAB6Z01	Console for 6 bolt or pin control simultaneously in parallel Delivered complete with its cables
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44 PR HARDENING OR SOFTENING

44.1 APRIL CONSOLE FOR SEALANT HARDENING PROCESS

item P/N Description

44101 GMIPRA-3Z-X Code Name: **APRIL - 3 Zone control**

This console has been conceived specially for providing heat generation **at a very low rate specially appropriate for PR**
More , it can also control heat distribution on small or very large areas (several square meters) with temperature control with very fine tuning

The heating blanket connected can be designed specifically in shape and dimensions.
The console can drive a blanket with **3 differentiated areas.**



44.2 APRIL CONSOLE FOR FABRICATION HEATING PROCESSES
APPROPRIATE FOR STRINGER FABRICATION RELATED HEATING CYCLES

item P/N Description

44201 Code Name: **APRIL 3Z**

This console answers to a frequent need in Composite Fabrication Workshop where several heating cycles have to be controlled in parallel with simplicity of administration and offering full traceability .

3 Cycles in parallel.



OTHERS

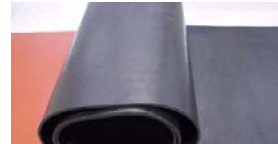
44.3 SOFTENING OF PR FOR DISBONDING

44.3.1 APPLICATION TO THE HALF WING OF ATR72

Item P/N

44311 GMIKD010-V* Complete kit containing
 - a specific blanket and its neoprene protection
 - the specific power driver and temperature limiter

*V = 1 version
 120 Volts and
 X= 2 version
 230 volts

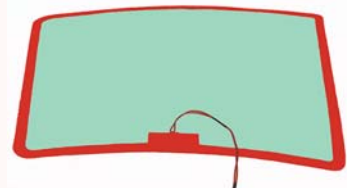


44.3.2 DISBONDING OF WIND SCREEN

Item P/N

GMIKWS01-E-2 The kit contains:
 - the specific heating blanket having the profile of the screen contour
 - A pre-set controller i

The P/N here is for Embraer aircraft



45 REPAIR OF INFLATING SYSTEMS

Item P/N

Description

45001 GMIST0704-V

V= 2 for 230 Volts
 V= 1 for 120 Volts

The console “Samantha“(N: GMIST0704) has been developed to handle the bonding process of repair patches on flexible structures of inflating systems (safety slides).

The console offers following features: - cycle programming, - temperature control,- power control appropriate for this specific material, safeties, PC interface.

The console can control up to 4 patches simultaneously



REPAIR OF INFLATING SYSTEMS

Item	P/N	Description
45002		Heating systems appropriately designed for this application are available according to dimensions; consult the specific brochure.



46 TEST OF DE-ICER BOOTS FOR REGIONAL COMMUTERS

46.1 PNEUMATIC DE-ICER BOOT TESTER.

Item P/N Description

46101 GMISA9501

Application to ATR Aircraft
SACHA 9501 handles all the pneumatic operation sequences specified for this operation. SACHA SA501 has been conceived as a self consistent console which integrates high quality pressure control instruments with a design that allows easy operations with the accuracy it was not possible to achieve previously with traditional assembly of pipes, hoses and manometers.

Because of its small size and compact design, the console allows operations in the workshop and is fully transportable to be ready for an outside work.

- Simultaneous test of 2 circuits
- Digital pressure sensing
- Highly accurate control



46102 GMISAP060

Pressure digital gauge



46103 GMISAP120

De-icer inflating Hose ; with connectors compatible with, on one side Sacha , the de-icer on the other side



(8) EQUIPMENT FOR WORKSHOP CLEAN AND SANDING ROOMS

47 - BASIC SERVICES: VACUUM AND COMPRESSED AIR	82
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53 - CALIBRATION SETS FOR OUR INSTRUMENTS	92

47 BASIC SERVICES: VACUUM AND COMPRESSED AIR

47.1 MOBILE VACUUM CENTERS FOR WORKSHOP

Item	P/N	Description
47101		System with oil vacuum pump and tank Mounted on rolls. Ready for simultaneous connection of 5 vacuum bags Proposed in 2 tank capacities: 16 & 25 M3/H ; in version 220 monophase or 380 Volts three phases
47102	GMIWVR011	Capacity 16M3/h - monophase 230 Volts
47103	GMIWVR012	Capacity 16 M3/h - three phase 380 Volts
47104	GMIWVR013	Capacity 25 M3/h - monophase 230 Volts
47105	GMIWVR014	Capacity 25 M3/h - three phase 380 Volts



47.2 MOBILE COMPRESSOR

Item	P/N	Description
47201	GMIWCM010	Compressor mobile to drive one machine as sander or router of the mobile workshop at a time. Coming complete with its connector and hose 10 meters to connect to machine



48 DUST SANDING PROTECTION EQUIPMENT**48.1 SANDING BOOTH**

Item	P/N	Description
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This booth allows to proceed to the sanding of carbon and glass parts in a safe self contained working environment. The booth is delivered ready to be installed with built in dust collection, lighting, and sound proof
An electrical cabinet under 3 phases is for the control. We offer **several models according to your specific requests**
We propose here below two models according to internal width

48101	GMIWSB180-3-415	Model 1 Internal width: 1800 mm External dimensions W x H x D mm: 1860 x 1960 x 1800 mm Other informations when engineering the offer
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48102	GMIWSB270-3-415	Model 2 Internal width: 2700 mm External dimensions W x H x D mm: 2760 x 1960 x 1800 mm Other informations when engineering the offer
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48.2 DOWN DRAFT TABLES

Item	P/N	Description
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We offer **two** models according to working table length

Model 1: Length 1500 mm

Model 2: Length 2000 mm

General features:

- Working table width 1000 mm
- Working table height: 900 mm
- Working table made in steel grid of node 30 x 30 mm (protection in option)
- Fan: Flow: 5000 m3/h; Motor: 3 Kw; Volts: 230 & 380 Volts
- Filters: 1st level in efficiency F7; 2nd level: Efficiency H14
- Collect bin: 1; dim: 1380 or 1880 x 140 x 70 mm
- Filter check: detection of filter fill up before change; lights to indicate which of the two is to be changed.
- Rejection of air: adaptation hole: 45 cm diam.
- Electrical control cabinet for power on/off.



48201	GMIWDT015-2	Model 1 - Dimensions overall: - Working Table dimensions: 1500 x 1000 mm
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48202	GMIWDT020-2	Model 2 - Dimensions overall: - Working Table dimensions: 2000 x 1000 mm
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OPTIONS

48203	GMIWDT015-3J	Panels for 3 sides (for model 1)
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48204	GMIWDT020-3J	Panels for 3 sides (for model 2)
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48205	GMIWDT015-L	Lights for Model 1
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48206	GMIWDT020-L	Lights for Model 2
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48207	GMIWDTF-F7	Filter spare - front type F7
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48208	GMIWDTF-H14	Filter spare - rear one
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48209	GMIWDTA-NC-100-150	Neopren Grid 1000 x 1500 mm
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482010	GMIWDT015-CP	Polyester Grid for model 1
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482011	GMIWDT020-CP	Polyester Grid for model 2
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48.3 MOBILE UNIT FOR DUST ASPIRATION

Item	P/N	Description
<p>This cleaner unit is designed to protect the operator from fumes and dust ensuring an easy movement for the operator into the work space, without having to install fixed extraction plants. The mechanical filters are easy to be replaced . high quality according to EN1822[H12] 99 % 230 Volts monophased</p>		
4831	GMIWDM015-2	complete mobile unit
4832	GMIWDM015-F12	set of filters for exchange



FREEZERS

49 FREEZERS

49.1 CHEST FREEZERS

Item	P/N	Description
49101	GMIWPF010 (230 Volts)	Chest Freezer for prepreg storage a) -18 à -25°C b) Internal Volume : 590 litres c) External dimensions : Lx Dx H, cm : 165 x 81 x 92 d) Internal max length : 150 cm enough for long pre-preg tubes To be delivered with a graphic recorder - see below Consult the brochure for details



49.2 FREEZER ATEX

Item	P/N	Description
49201	GMIWPFX010-360 230 Volts (360 Liters)	FREEZER ATEX in agreement with ATEX certification 94/9 CE. To store inflammable products and resins Model 360 litres Internal Dimensions: 440 x 435 x 1635 mm External Dimensions: 600 x 615 x 1840 Temperature display external digital Automatic defrost with water container. Safety thermostat for anti freeze. Construction: structure with white epoxy anti corrosion. For options and complementary info see detailed brochure Other models available Consult us for confirmation of details



FREEZERS

49.2.1 WALK IN FREEZER

Item	P/N	Description
49211	GMIWCC010 (230 Volts)	<p>Cold room for pre-preg storage</p> <p>Very practical for storage and good access. Volume and storage means allow easy partition of 120 and 180 °C products. basic model proposed 6,15 M3 - Other models possible.</p> <p>See brochure for details See also recorder below</p>



49.3 GRAPHIC RECORDER

Item	P/N	Description
49301	GMIWFR010 (230 Volts)	Graphic recorder with its probe for Freezer, Cold Room
49302	GMIWFR010-1	Spares 60 pages of recording ; on 31 days
49303	GMIWFR010-2	Pens - Set of spares of 6 pens



50 GENERAL SHOP EQUIPMENT

50.1 WEIGHING SYSTEMS

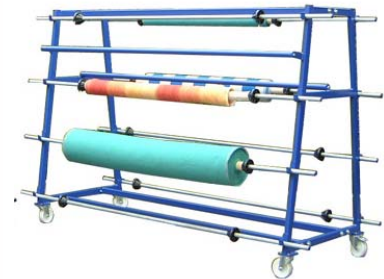
Item	P/N	Description
50101	GMIWEB010-600	High precision weight device to weigh resins and mixing. To be put on a table. Weighting range max: 600g max; precision 0,1g If you need a wider weighting range, see model below



50102	GMIWEB010-2000	High precision weight device but with range of 2 Kg
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50.2 ROLL STOCKER

Item	P/N	Description
50201	GMIWSR102-180	Roll stocker for 10 rolls Support for <u>10 rolls</u> mounted on both sides. width of rolls 180 mm mounted on wheels Standard paint : white



50202	GMIWSR071-180	Roll stocker for 07 rolls Support for <u>07 rolls</u> mounted on one side width of rolls 180 mm mounted on wheels Standard paint : white
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GENERAL SHOP EQUIPMENT

50.3 VAPOR ASPIRATION HOOD

Item P/N Description

General :

- 15/10th steel construction.
- White epoxy painting RAL 9010 with high resistance against chemicals.
- Polycarbonate glazed walls
- With extractor fan
- 230 Volts nominal

50301 GMIWAH010-2 Model 1
Dimensions overall mm: 980 x 600 x 620

50302 GMIWAH011-2 Model 2
Dimensions overall mm : 980 x 800 x 620

50303: GMIWAHT010 Support table for both models
Dimensions mm: 1200 x 750 x 750



50.4 MIXING POTS

Item P/N Description

50401 GMIAC160-400
Mixing pot ; for non wax product
graduated
conic Diameter 80 mm - Vol : 400 ml



50.5 CUTTING LAMINATE

Item P/N Description

50501 GMIWDO-6-100-200 **Cutting laminate (green on table in picture)**
Colour blue
Thickness 6,mm
dimensions: 120 x 200 cm

dimensions may change - consult us



WORKSHOP

51 EQUIPMENT FOR REPAIR - FABRICATION

51.1 OVENS

Ovens Fully equipped for Repair

Model standard of internal dimensions 2,5 x 2,5 x 4 m;
fully equipped.

With vacuum system

With **GMI ANIFIB Computer control**



51.2 AUTOCLAVES

According to dimensions and specifications
Fully controlled by our computers ANIFIB

Simplified Model also available for easy doubler
fabrication (ANICLAVE©)

Consult our brochure



52 PARTS FOR CURING IN AUTOCLAVE

52.1 VACUUM HOSE

Item	P/N	Description
Vacuum hose high temperature Threaded 1/4" NPT		
52101	GMIAUVH010-010	Length 1 m
52102	GMIAUVH010-015	Length 1,5 m
52103	GMIAUVH010-020	Length 2,0 m
52104	GMIAUVH010-025	Length 2,5 m
52105	GMIAUVH010-030	Length 3,0 m
52106	GMIAUVH010-040	Length 4,0 m
52107	GMIAUVH010-050	Length 5,0 m
52108	GMIAUVH010-060	Length 6,0 m
52109	GMIAUVH010-070	Length 7,0 m
521010	GMIAUVH010-080	Length 8,0 m
521011	GMIAUVH010-090	Length 9,0 m
521012	GMIAUVH010-100	Length 10,0 m
521013	GMIAUVH010-110	Length 11,0 m
521014	GMIAUVH010-120	Length 12,0 m



52.2 VACUUM VALVES

Item	P/N	Description
Valves High Quality for autoclaves - Stainless Steel - Viton seal		
52201	GMIAUVB010	Vacuum valve, base size: 2 inch, connection size: 1/4 inch
52202	GMIAUVP010	Vacuum Plug - QRC plug with female thread, female thread size: 1/4 inch
52203	GMIAUVS010	Vacuum socket - QRC Socket Connector with female thread, female thread size: 1/4 inch



WORKSHOP

53 CALIBRATION SETS FOR OUR INSTRUMENTS

53.1 CALIBRATOR OF TEMPERATURE FOR ANITA CONSOLES

Item	P/N	Description
53101	GMIINGT250	Portable temperature calibrator for temperature circuits of Anita by simulation of thermocouples J or K. This instrument is also a thermometer for thermocouples J or K.



53.2 CALIBRATOR SET FOR VACUUM CALIBRATION

Item	P/N	Description
53201	GMIOTV251-01	Hand vacuum pump to achieve a vacuum level in the sensor circuit of the Anita console; to be associated with the vacuum measuring instrument below.



53202	GMIOTV251-02	Reference vacuum manometer high precision to compare to the value of the Anita. Comes fully equipped for connection to pump above.
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53203	GMIOTV251	Kit containing the two elements above: hand pump and vacuum reference
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53204	GMIOTV252	Complete kit as above : - with manual pump and a digital precision manometer
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CALIBRATION SETS FOR OUR INSTRUMENTS

53.3 CALIBRATION UNIT FOR THERMOCOUPLE CABLES

Item	P/N	Description
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In order to qualify thermocouples with a precision of +/- 1.0°C.
This is composed of a set of 3 separate units necessary

53301	GMIFC1000	Dry oven as a calibrated heat source with a precision of +/- 1.5°C. Portable instrument. All coming with a methodological manual
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53302	GMINGT550	A thermometer of reference of high precision +/- 0,5°C
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53303	GMINGT550-010	A reference probe to measure the error of the heat source
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see above picture

53.4 CHECKING UNIT FOR HEATING BLANKETS

P/N	Description
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53401	GMITHB010	A precise instrument to register with fidelity the ohmic value of the blanket resistance with appropriate cables to connect to Anita Blankets Note : the model may not be exactly as on picture
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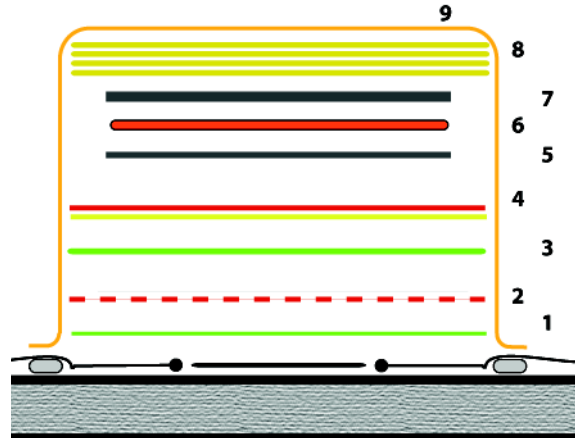


(9)REPAIR MATERIALS

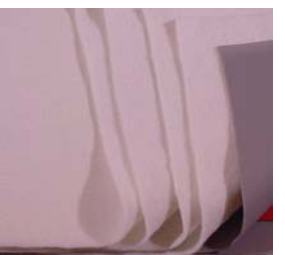
54 REPAIR PRODUCTS

54.1 VACUUM BAG MATERIALS

According to identification numbers in the following sketch of a typical vacuum bag montage:



Item	P/N	Description
54101	GMIPEV1010	# 1 -Release fabric
54102	GMIPEV1019	#2 - Perforated nylon
54103	GMIPEV1022	#3 - Bleeder fabric
54104	GMIPEV1011	#4 - Non perforated nylon
54105	GMIPEV1014	# 5 - Flexible caul plate Sheet 1,4 m width
54106	GMIPEV1024	# 7 - Insulator Sheet flexible 1,4 m width
54107	GMIPEV1013	# 8 - Airweave - Breather



see above blanket (red)

PRODUCTS

Item	P/N	Description
54108	GMIPEV1018	# 9 - Vacuum bag nylon
54109	GMIPEV1015	Vacuum bag tape (GS213)
541010	GMIPEV1016	High temperature tape

Specific products can be delivered under specific request like adhesives, Prepreg, honeycomb.

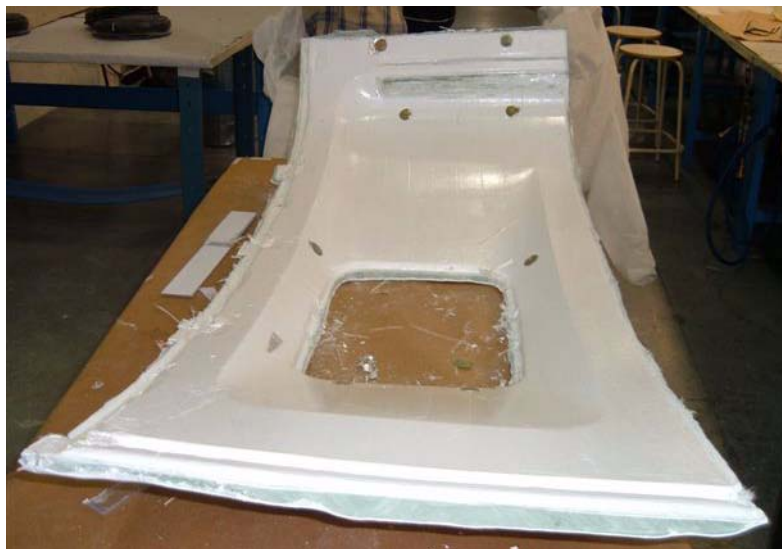
54.2 DRY FABRICS

GMI Aero can deliver products in Kits according to minimum quantities of:

- a) glass fibre
- b) carbon fibre
- c) metallisation fabrics

54.3 OTHER PRODUCTS

- a) adhesive films
- b) foaming adhesives
- c) honeycomb panels
- d) moulding products



(10) TRAINING SERVICES

We propose various level of training. Consult our extensive catalogue.

Courses aim at transferring to the users a practical knowledge of the theory and of the principles of advanced composite repair and hands on practice of the specific equipment. A program is established in each case.

We offer courses that may be classified into 3 groups:

1 Transfer of Technology in the field of Repair Processes

These courses cover all the fundamental basic and advances themes of aircraft composite part repairs. Moreover some programs are proposed here that deal with basic physics of processes like “drying”, heat transfer,...

2 One Day Clinic:

Mastering the operating procedures of our maintenance equipment.

These courses have for objective to review the operating procedures of our equipment and the instructions for calibration and servicing. Voluntarily these courses are concentrated in one or two days maximum

3 Specific part repair or On Job Training

These courses are conducted to demonstrate the actual procedures for repairing specific parts. The operators are guided to follow exactly the SRM, CMM procedures and to perform the repair operations.



55 MAIN TRAINING SESSIONS OF TECHNOLOGY TRANSFER

Theme	Code
GENERAL THEMES	
Composite Materials Mastering the vocabulary, Understand the technology	CMU
Advanced Composite Repair A Review of all Phases in 5 days - Level I	RCR
Advanced Composite Repair An In depth Practical Course in 10 days - Level II	ACR
Composite Repair Advanced Techniques in Perspective An overview for Engineers	OCR
Metal to Metal Bonding	MMB
Principles and Practice of Hot Bonding in Repair	PHB
Machining of Advanced Composite Structures Learn the typical preparation work of the repair with machining practice: routing, stepping, sanding,	MCS
Moisture Detection and Part Drying Techniques	MDD
Ultrasonic Damage Evaluation Hands on practice for damage	UDE
SKILL AND FUNDAMENTALS IMPROVEMENT	
Heating process, Energy transfer in Bonding, Solutions to Thermal issues	HST
How to Control Bonding Heating Process? Thermocouple Sensors and Control Models	TSM
SPECIALISED SKILLS	
Radome Specific Repair Techniques	RRT
Floor Repair Techniques	FRT
Reverser Repair with Application to Corecowl & Transcowl of CF6 and PW4000	RRT
Engine Air Inlet repair; panel alumesh replacement	AIR
CFM56 abrasable liner replacement and bonding	ALR

Consult our specialised catalogue for full description or consult us .

(11)ENGINEERING FOR COMPOSITE PART FABRICATION

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56 AUTOCLAVES

|



We design and deliver autoclaves for the aerospace industry, for workshop and repair workshop and training schools

Our ANICLAVE family equipment are dimensioned, specified and equipped to be fully operational with state of the art instrumentation. They reflect our thirty years of experience of collaboration with major aircraft and OEM manufacturers.

We engineer the autoclave to your requirements in terms of pressure max, temperature max, diameter, length ,...

Consult us for engineering your own solution .

57 OVENS - ANICURE®

Our **Anicure © Ovens** are designed for composite part fabrication with specific design appropriate to your needs. We are able to configure ovens according to nature of production : classical composite manufacturing under vacuum but also with local pressure control or through infusion . Our controlling system allows to:

- Control several zones
- Coordinate the oven temperature control with parallel infusion process (one or several machines)
- Produce automated reports



Figure 1. 20 m long Infusion Oven



Figure 2. OVEN with Infusion machine ; our coordinated control software **ANICURE**

58 AUTOCLAVE AND OVEN CONTROLLING SYSTEM ANIFIB

Our autoclaves are controlled by our system ANIFIB™ that offers several unique solutions :
The ANIFIB™ system is composed of two sub-systems:

- a) An **Industrial Computer** called itself ANIFIB and which is mounted near the oven/ autoclave.
- b) A **PC** linked to the ANIFIB computer as a supervisory station with cycle programming and supervisory software.

The temperature control protocols can be set by the operator according to the two classical modes:

1. Air temperature control
2. Part temperature control

The PC screen displays:

- the equipment animated **mimics** (position of the valves, status of door,.....)
- a **graphic evolution** of all the important data: the temperature curves of the air in the oven, the part temperatures, the vacuum in the bags, the pressures ...
- **all the measures** numerically displayed in arrays (corresponding to the filed data).the current **alarms** and explanation messages



MULTI SUPERVISION A unique feature of our solution is also the capability of our Central PC Station to supervise several autoclaves . Thus a central data base of programs , cycles, reports is constructed that allows to produce a comprehensive overview of production statistics.

59 AUTOCLAVE PRODUCTION STATISTICS

GMI Aero has developed a unique system that allows to produce statistics of production. With our software you get a complete vision of your production per autoclave, number of part produced per reference, mean of production, revealing all associated features ... You may trace all events relative to the fabrication phase of a part per reference,...

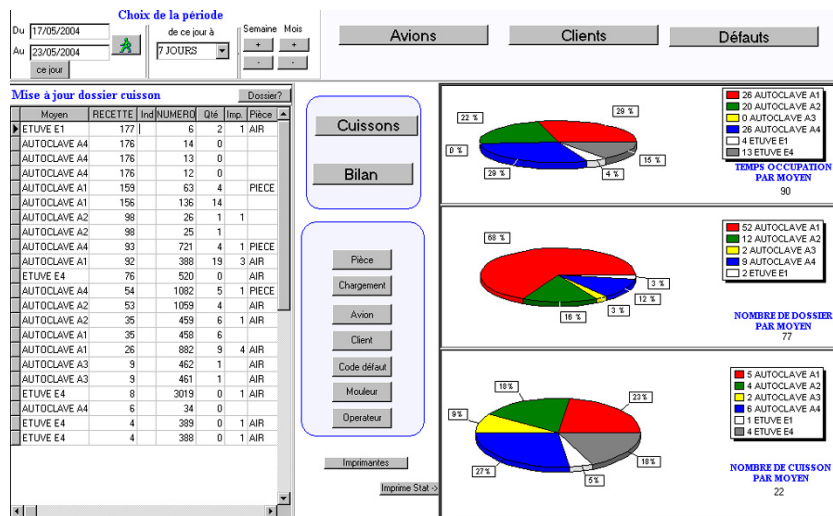
You can also produce and schedule **PRODUCTION MANAGEMENT DATA & STATISTICS**

Management Of Part Follow Up Documents

Possibilities to produce all the documents to follow a part during its life in the factory, before the curing and after; its description, how it is instrumented, its curing cycle description, its quality report...

Statistics of production

Management of the production data bank; possibility to establish queries and reports on: production of a given mean, by part, by type of aircraft, on defects, number of defects per load,...



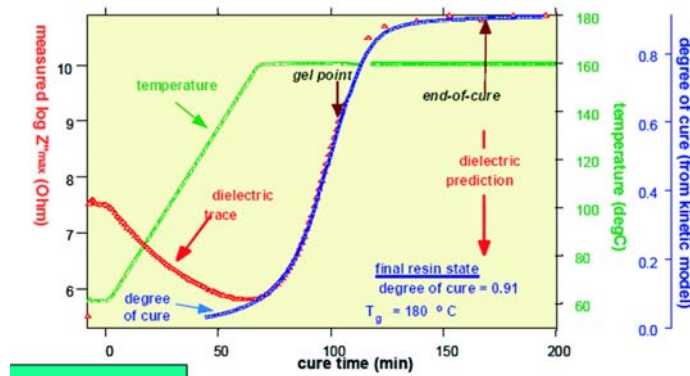
60 INNOVATIVE SENSORS & MATERIAL MODELS

The following table lists the optional possible developments. These complements have for objectives the measurement and derivative calculus on material produced. .

Material Quality	Possibilities to deliver a report on material quality
Real time Viscosity measurement	Viscosity measurement, Tg, extent of cure. .
Optimum Control	Feed back control on the temperature control taking account of the viscosity evolution of the resin (for example optimum start of the pressure control cycle) Optimisation of polymerisation plateau duration and value taking account of the extent of cure.
Dielectric sensor	The characteristics of the resin are measured through sensor using the modification of the dielectric properties of the resin. These sensors in ceramic have been developed to be inserted in moulds; our system allows to connect up to 4 sensors. Viscosity sensor flush at the mould surface.



Figure 1: Viscosity curve derived from the dielectric property sensor



61 OUT OF AUTOCLAVE FABRICATION SOLUTIONS

Our company expertise in several technologies and processes like

- a) Design of heating systems
- b) Thermal Transfer Analysis
- c) Design of Multi Zone Controlling Systems

allows us to propose very innovative solutions to take in charge heating and bonding processes for production **Out of Autoclave** .

We illustrate here some of our recent realisations

61.1 HEATING AND BONDING DISTRIBUTED PATCHES OR AREAS

Here our **PALOMA**® **SYSTEM** has been applied to the post autoclave cure of a sandwich part to bond locally several tenths of areas distributed on the part and several others contributing to productivity gains.

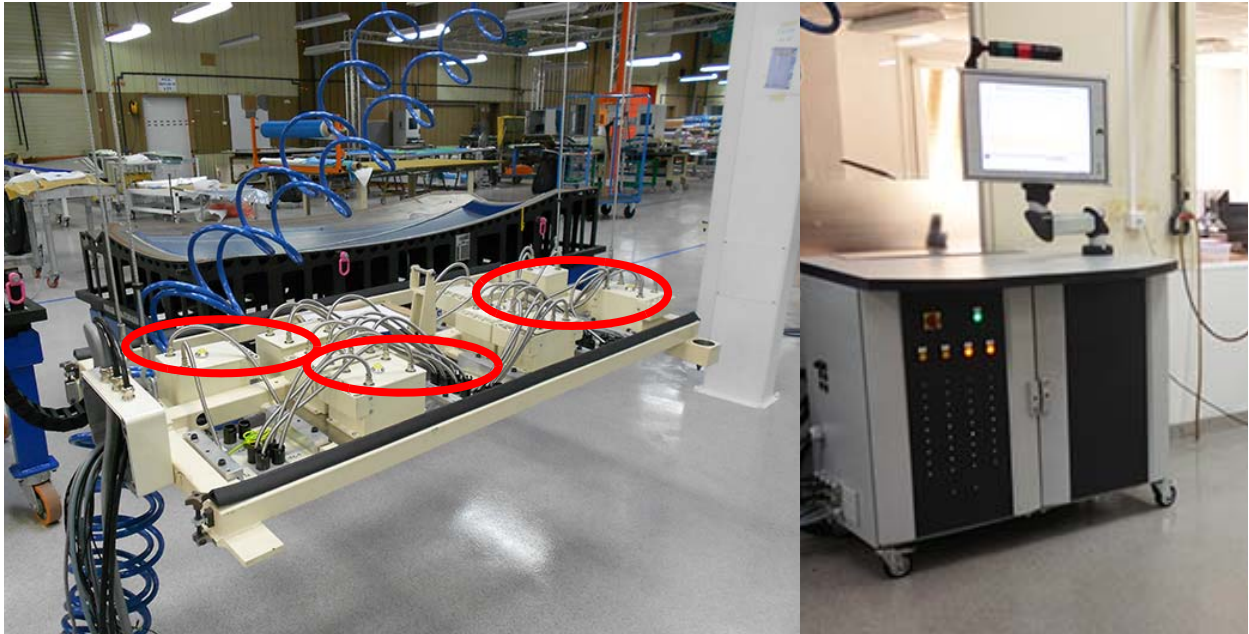


Figure 3. left heating system areas ; right our Paloma for controlling up to 18 independent areas and up to 80 heating systems

61.2 STRINGER NETWORK INSTALLATION

The rear cone of a regional aircraft is made of 2 carbon skins cured in autoclave. The skin receives a system of stringers that have to be installed **all together** and maintained by sealants **hardened by heating**. The skin is maintained in a frame while a second frame supports the network of stringers . GMI designed for this project :

- a) a thermal analysis of heat transfer through the carbon skin
- b) a design of heating system that develops heat only at the right of the stringer contact surface
- c) a **Paloma** system control of **44 independent zones**

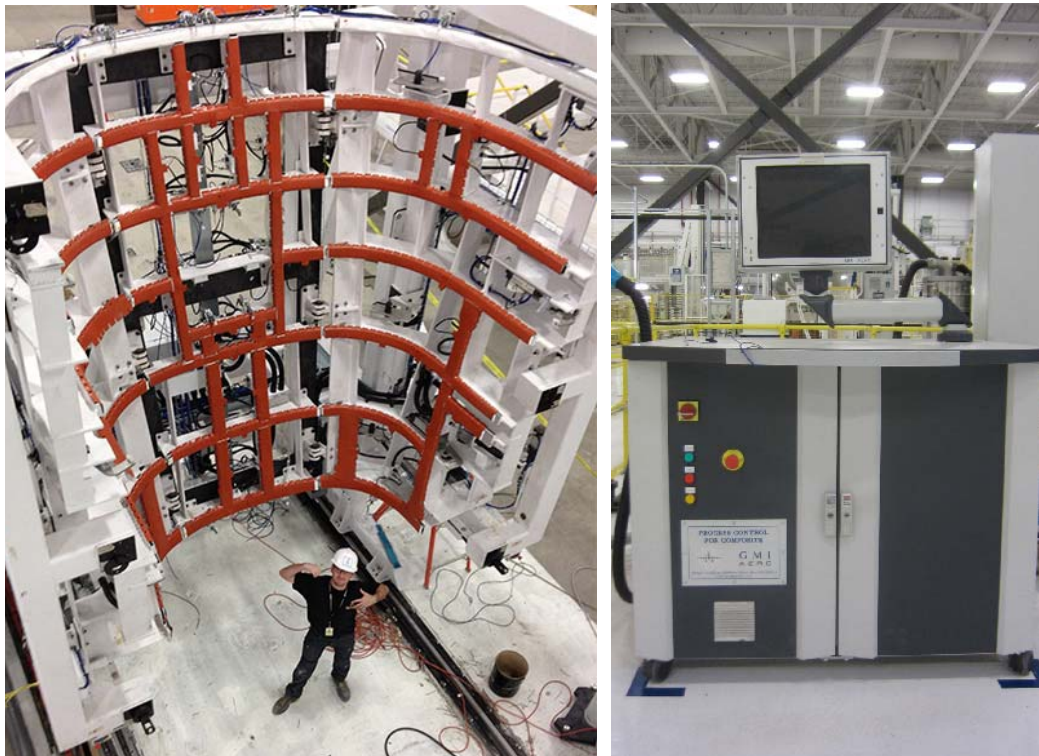


Figure 4. Left : Network of heating systems ; Right : Paloma Controlling and Powering System

62 TACKING IRON FOR STRINGER INSTALLATION

The **Tacking Iron** is designed to offer a heating area of 10 x 20 cm as a heating area (standard dimensions to be adapted if required) . The design is such , so that temperature distribution is guaranteed on the whole surface at : set-point +/- 2°C . Its manipulation is made easy for the operator because of the light weight and because of the ergonomomy of the handle.

The temperature of the iron heating surface is controlled by a specific controller of the series « Anita Rapid». The software and its alarm strategy is adapted for the specific iron process
The controller is pushed button, it starts controlling temperature as soon as the operator presses a switch.

Item	P/N	Description
62001	GMISI01020-T*-2	Tacking Iron Version 230 Volts
62002	GMISI01020-T*-1	Tacking Iron Version 120 Volts
		T * : for thermocouple type = J or K
62003	GMICI010-T*-S**	Rapid Controller *Select for T type of thermocouples J or K ** Add S for the option data collect and USB interface



**62.1 APRIL CONSOLE FOR FABRICATION HEATING PROCESSES
APPROPRIATE FOR STRINGER FABRICATION RELATED HEATING CYCLES**

item	P/N	Description
62101		Code Name: APRIL 3Z This console answers to a frequent need in Composite Fabrication Workshop where several heating cycles have to be controlled in parallel with simplicity of administration and offering full traceability . 3 Cycles in parallel.



63 PARTS FOR CURING IN AUTOCLAVE

63.1 VACUUM HOSE

Item	P/N	Description
Vacuum hose high temperature Threaded 1/4" NPT		
63101	GMIAUVH010-010	Length 1 m
63102	GMIAUVH010-015	Length 1,5 m
63103	GMIAUVH010-020	Length 2,0 m
63104	GMIAUVH010-025	Length 2,5 m
63105	GMIAUVH010-030	Length 3,0 m
63106	GMIAUVH010-040	Length 4,0 m
63107	GMIAUVH010-050	Length 5,0 m
63108	GMIAUVH010-060	Length 6,0 m
63109	GMIAUVH010-070	Length 7,0 m
631010	GMIAUVH010-080	Length 8,0 m
631011	GMIAUVH010-090	Length 9,0 m
631012	GMIAUVH010-100	Length 10,0 m
631013	GMIAUVH010-110	Length 11,0 m
631014	GMIAUVH010-120	Length 12,0 m



63.2 VACUUM VALVES

Item	P/N	Description
Valves High Quality for autoclaves - Stainless Steel - Viton seal		
63201	GMIAUVB010	Vacuum valve, base size: 2 inch, connection size: 1/4 inch
63202	GMIAUVP010	Vacuum Plug - QRC plug with female thread, female thread size: 1/4 inch
63203	GMIAUVS010	Vacuum socket - QRC Socket Connector with female thread, female thread size: 1/4 inch



64 CALIBRATION SETS FOR OUR INSTRUMENTS

64.1 CALIBRATOR OF TEMPERATURE FOR ANITA CONSOLES

Item	P/N	Description
64101	GMIINGT250	Portable temperature calibrator for temperature circuits of Anita by simulation of thermocouples J or K. This instrument is also a thermometer for thermocouples J or K.



64.2 CALIBRATOR SET FOR VACUUM CALIBRATION

Item	P/N	Description
64201	GMIOTV251-01	Hand vacuum pump to achieve a vacuum level in the sensor circuit of the Anita console; to be associated with the vacuum measuring instrument below.
64202	GMIOTV251-02	Reference vacuum manometer high precision to compare to the value of the Anita. Comes fully equipped for connection to pump above.
64203	GMIOTV251	Kit containing the two elements above: hand pump and vacuum reference



64204	GMIOTV252	Complete kit as above : - with manual pump and a digital precision manometer
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FABRICATION

64.3 CALIBRATION UNIT FOR THERMOCOUPLE CABLES

Item	P/N	Description
-------------	------------	--------------------

In order to qualify thermocouples with a precision of +/- 1.0°C.
This is composed of a set of 3 separate units necessary

64301	GMIFC1000	Dry oven as a calibrated heat source with a precision of +/- 1.5°C. Portable instrument. All coming with a methodological manual
-------	-----------	--



64302	GMINGT550	A thermometer of reference of high precision +/- 0,5°C
-------	-----------	--



64303	GMINGT550-010	A reference probe to measure the error of the heat source
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see above picture



Figure 5. Thermocouples of autoclave

(12) ANNEXES - TECHNICAL SPECS OF SOME EQUIPMENT

ANITA BONDING CONSOLES

Anita EZ09

Anita EZH14

Anita QS1Z

LESLIE ADVANCED TOOLINGS AND ATTACHMENTS FOR SURFACE PREPARATION





The ANITA EZ09- A New Concept for Smart Patch Repair Bonding

THE ANITA BONDING CONSOLES

The Anitas are recognised worldwide by MROs and aircraft constructors as the most appropriate equipment for the repair by bonding of high performances aircraft structures. Their design and process handling benefit of twenty years of GMI AERO commitment in composite fabrication and repair.

They are conceived as portable systems, light, handy for field application and their operations have been optimised to be extremely simple to use by shop technicians.

In this family, the **Anita EZ0901**, provides a new revolutionary way to conduct advanced bonding operations. This version with a Touch Screen Panel offers easy operative procedures; several functions are made now possible for adaptive process control together with quality document elaboration and innovative training information.

TOUCH SCREEN PANEL OPERATIONS

The Anita is equipped with a large touch screen panel. A sophisticated software allows easy operations for:

- Programming easily simple and elaborated cycles
- Immediate Start of Cycles,
- Process Supervision with graphical and tabulated presentations,
- Interactive selection of temperature control modes,
- Selection of innovative functions,

ADVANCED PERFORMANCES

In a small compact box, the Anita gathers all the necessary functions to control the bonding heating process under vacuum for a repair on composites or metal structures.

It is specially conceived to reach maximum performances on small and large surfaces, on thin and thick structures and on structures with differentiated thermal reaction.

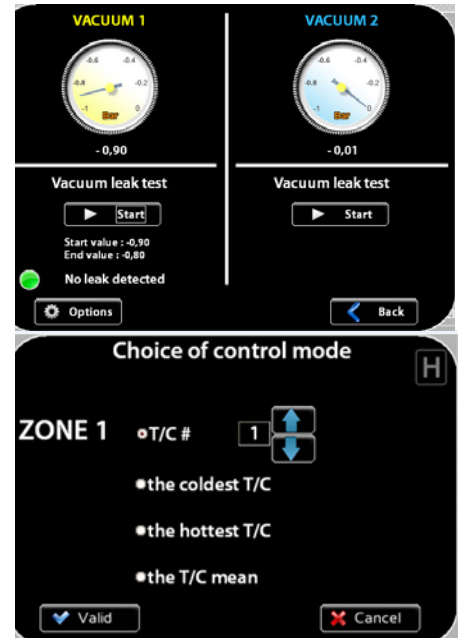
MAIN FUNCTIONS

- Heat control on **two** independent channels for 1 repair with 1 or 2 heating zones or 2 separate repairs,
- Innovative **third** channel for heat losses compensation on the bag or around the patch,
- Large heating capacity with 6000 watts/220 Volts

Large touch screen (160 x 125 mm) displays make it easy for the operator



- Bag vacuum sensing for repair qualification; 2 sensors installed,
- Panel Printer,
- Touch screen panel for
 - easy programming
 - start cycle
 - graphic supervision
 - active control mode selection
 - calibration
 - quality control report
 - heat blanket testing
- Blanket power check and detection of shorts
- Built in electronic safety circuits.
- Large memory storage capacity for cycle data
- **USB** connections: 2 ports
- Transfer of data to a USB key
- Automatic reporting under pdf
- Calibration made easy by dialogue and software tuning operations.

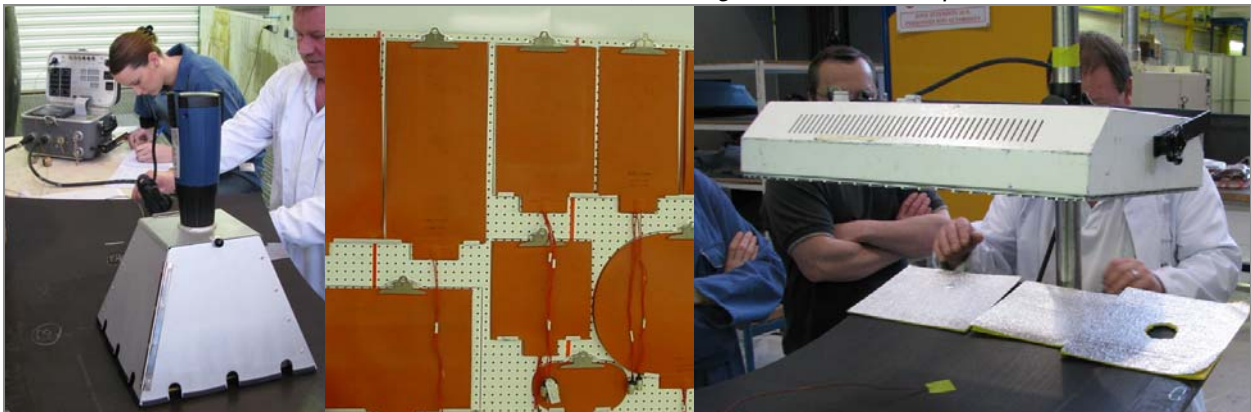


HEATING SYSTEMS

The Anita can drive, without any other circuit tuning, various heating systems like:

- heat blankets, (see our general catalogue for selection)
- radiant panels,
- hot air blowers,.....

Hot air blower, heating blankets, radiant panel



TECHNICAL SPECIFICATIONS

- Dimensions: W x D x H: 350 x 220 x 260 mm - 14 x 9 x 9 in - Weight:..., 9,6 Kg - 22 lb
- Volts: 220 or 120 VAC, **automatic switching**
- Power Capability: 30 Amps x 220 Volts = 6000 Watts or 30 x 120 Volts = 3600 Watts available on 2 independent **power output**
- High Quality **Touch Screen Panel** for Operator Dialogue and Data visualisation
Dimensions: 160 x 125 mm - 6.5 x 5 in.
- Sensing precision : temperature better than 0,4 °C /0,8°F; vacuum better than 0,050 bar/1,5 inHg

Innovative Features:...

- An **extra third output power channel** (230 Volts or 120 Volts - 3 Amp) for cold area heating
- **Test of presence of blanket**; measurement of **power of blanket** in the range 200 to 6000 watts

- Watch dog and safety associated circuits for safe operations.

Other features

- Dialogues in English, French, Spanish, German, Italian, Russian, Chinese, Japanese,.. selectable
- Units in °C and bars or °F and in of Hg selectable
- Thermocouple scanning capacity: type J or K (to be specified at the order), 12 plugs, with optional external extension up to 24 plugs
- 2 Vacuum electronic gauges on return hose from bag to qualify the actual vacuum in bag itself. This value is monitored permanently, displayed, printed, recorded,
- Printer with large standard paper,
- Audible alarm, and Mimics for alarms and heat actions; seen from far,
- Easy accessible external fuses
- All blanket cables come with special circular military connectors mounted for a high quality coupling. Our blankets come also with same quality mating connectors.
- Software and electronic safety features
- 2 USB ports, for export of data to a USB key or support

DELIVERY

The Anita comes with all its accessories necessary to implement a bonding operation under vacuum: a complete set of cables, hoses, in a nice storage and transportation console.

Console Dim: 18 x 14 x 7 in (460 x 350-x 166 mm); Weight: 27 Lb. -12 Kg

Content List:

- A Power cable: 1 unit, length 5 m (6-ft.)
- Blanket cable: 2 units, length 3 m (10 ft)
- Vacuum Silicone Hoses: 2 units for return sensing, length 3 m (10 ft.)
- 2 Vacuum Valves,
- A heat compensation blanket (230 or 120 Volts) and its cable
- Thermocouple cables:12 of 3 m long (10 ft.)
- A first set of printer consumable,
- A User and Service Manual.



The console comes with a case containing all accessories

REFERENCES TO ORDER

- **P/N:GMIEZ0901-T***
 - *T = To be specified at order for Thermocouples Type J or K , T=J or T= K

CONSUMABLES AND PERIPHERALS IN OPTION

- A box of 20 printer paper rolls P/N: GMIOTI010-01
- A box of 10 printer ink cartridges P/N: GMIOTI010-02
- A Venturi - Bag Valve Pump P/N : GMIOTPV010 or V011 (US air in connector)
- An electrical vacuum pump (bi-voltage) P/N : GMIWVP021
- A transport case containing the Anita, The accessory case, blankets and alia,..



TRAINING

GMI AERO offers a wide range of programs for training to composite repair. From level I and II programs to specialised on job repair sessions.

ADVANCED OPTIONS

- Scanner 12 TC** - Extension of thermocouple channels proposed to extend the capacity of temperature measurement by connexion of **a scanner** of Capacity 12 T/C .
Wireless linked to the Anita , the scanner can easily be positioned close to the repair and this is useful in case of difficult access , the Anita being positioned at distance..
 - Capacity 12= 2 x 6 thermocouples J or K , engineered at the order..
 - Detected automatically by the Anita.
 - With this scanner , total capacity of Thermocouples handled by Anita is : **24** for 1 large repair or **12 Thermocouples per zone for a repair with 2 zones****P/N GMIEZS012- J* or K according to your choice**
- Remote Control with a Screen Tablet :**
 We offer now the possibility to dialogue at distance with the Anita EZ through **a latest technology wifi** linking the Anita to a remote Tablet . This feature is unique to ease the work of the operator in field operations. Alarms are also transferred at distance **visually** on the remote screen and **loudly** through a speaker.
P/N : GMIEZR010



DEVELOPMENTS

GMI AERO can assist you to adapt the consoles and the peripheral equipment to suit your specific needs. Please consult us.

Several models are available to cover a large range of applications: **shop use, flight line intervention** (anti explosive proof model), with **4 heating zones**, for very large areas like: reversers or radomes



THE ANITA BONDING CONSOLE GMIEZH1401 FOR FLIGHT LINE OPERATIONS

- ***For Hazardous Environment***
- ***Applications to Fueled AIRCRAFT***
- ***Designed for 2 Simultaneous Repairs & More Advanced Features***

PRESENTATION

To comply with safety procedures imposed to use bonding electrical equipment in an area classified as hazardous the ANITA Console Family offers a version fully compliant under the P/N: **GMIEZH1401**.

According to fundamental notions on explosive area classifications, the area surrounding the aircraft unfueled is considered potentially explosive because of presence of **potential flammable gaz (airplane fuel)**. The classification of the working area for portable equipment (in our case bonding console for composite repair) is **CLASS I - DIVISION 2**



MAIN FEATURES

In a compact size, the **ANITA GMIEZH** offers all the features to bond on the aircraft **one or two repair patches** of small or very large size.

It offers:

- 12 Thermocouple scan capacity,
- Test of heating blanket, detection of connection and of blanket break,
- Two separate repairs at two different moments with different cycles,
- Intuitive programming with productive dialogue through touch screen,
- Safety system to comply for use in explosive area.

ANTI HAZARDOUS SAFETY FEATURES

The **Anita EZH** complies with the safety conditions required by the european standard CENELEC EN 50016 or by NFPA 496.

This is appropriate for Class I - Div 2 Area (ZONE 2 according to IEC)

The design of safety features are based on the principle of venting permanently the volume of the console to prevent introduction of explosive gaz (details on request)

1. Control of On/Off Power

A timer safety allows powering of the console only after a certain duration of air purge

2. Protection of fire and explosion due to arcs

All connections either to the console, between cables and with heating blankets are made through connectors with a specific design. This design allows to disconnect under power without arcing.

3. Leak current detection

Circuits are built in to check that no current leak develops. In case of detection, power is automatically cut. This covers the possible current leak of a heating blanket.

4. Heating blanket safety design

They are equipped on lower side with a ground mesh and with anti-arcing connector.

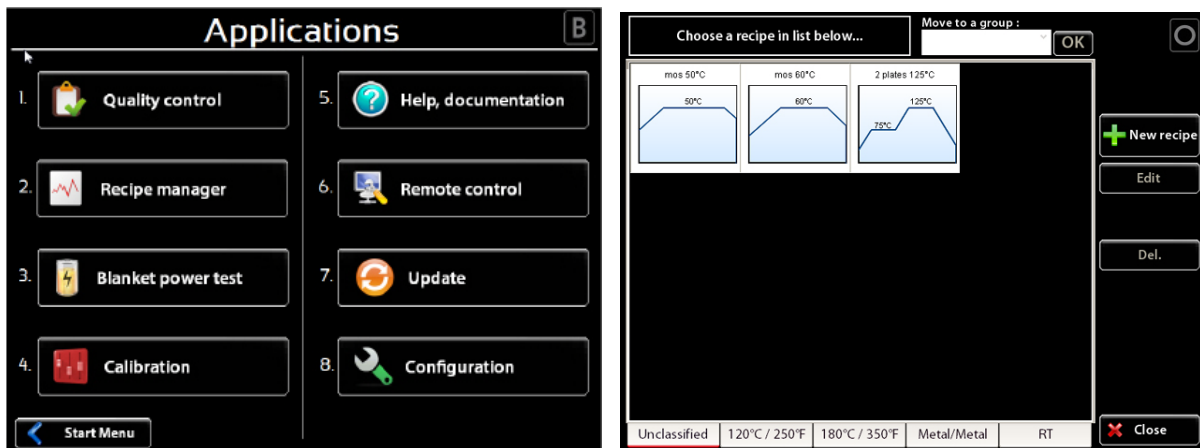
TOUCH SCREEN PANEL OPERATIONS

The Anita is equipped with a large touch screen panel. A sophisticated software allows easy operations for:

- Programming **easily** simple and elaborated cycles
- **Immediate** Start of Cycles,
- Process **Supervision** with graphical and tabulated presentations,
- Interactive selection of temperature **control modes**: hottest, mean,...
- Heat control on **two independent channels** for 1 repair with 1 or 2 heating zones or 2 separate repairs,
- Large heating capacity with **6000 watts/220 Volts**
- Bag vacuum sensing for repair qualification; **2 sensors installed**,
- Panel **Printer**,
- **Blanket power check** and detection of shorts
- **USB** connections: 2 ports
- Automatic **pdf reporting**
- **Calibration** made easy by dialogue and software tuning operations.



Left: easy coding keyboard - Right: Bag Vacuum leak test



An example of different screens

OTHER TECHNICAL DATA

- Dimensions: W x D x H: 350 x 220 x 260 mm - 14 x 9 x 9 in - Weight:..., 9,6 Kg - 22 lb
- Colour of cases: yellow
- Volts: 220 or 120 VAC, automatic switching
- Power Capability: 30 Amps x 220 Volts = 6000 Watts or 30 x 120 Volts = 3600 Watts available on 2 independent power output
- High Quality Touch Screen Panel for Operator Dialogue and Data visualisation
Dimensions: 160 x 125 mm - 6.5 x 5 in.
- Sensing precision: temperature better than 0,4 °C /0,8°F; vacuum better than 0,050 bar/1,5 inHg

DELIVERY

The ANITA Console comes with all its accessories necessary to implement a bonding operation under vacuum: a complete set of cables, hoses, in a nice storage and transportation console.

Console Dim: 18 x 14 x 7 in (460 x 350-x 166 mm); Weight: 27 Lb. -12 Kg

Content List:

- A Power cable: 1 unit, length 5 m (6-ft.)
- Blanket cable: 2 units, length 3 m (10 ft)
- Vacuum Silicone Hoses: 2 units for return sensing, length 3 m (10 ft.)
- 2 Vacuum Valves,
- Thermocouple cables:12 of 3 m long (10 ft.)
- A first set of printer consumable,
- A User and Service Manual.



In option a transport case fully designed to contain the Anita, its accessories and blankets



CONSUMABLES & OPTION

- A box of 20 printer paper rolls P/N: GMINGI010-01
- A box of 10 printer ink cartridges P/N: GMINGI010-02
- A filter against oil and water recommended for the cleaning of purging air (see picture) P/N: GMIOTPF022
- A spare filter cartridge P/N: GMIOTPF022-01
- A venturi vacuum pump to be mounted on the bag itself P/N: GMIOTPV010 or 011 (US air in connector)



Left : Filter on purging air circuit; right: Venturi vacuum pump mounted on its bag valve

HEATING BLANKETS FOR FLIGHT LINE OPERATIONS

Here below we give some typical dimensions of heating blankets

Item	P/N	Dimensions in cm	
001	GMIHBH015015-1Z-V*-T*	15 X 15	1 electrical zone
002	GMIHBH020020-1Z-V*-T*	20 x 20	1 electrical zone
003	GMIHBH025025-1Z-V*-T*	25 X 25	1 electrical zone
004	GMIHBH030030-1Z-V*-T*	30 X 30	1 electrical zone
005	GMIHBH040040-1Z-V*-T*	40 X 40	1 electrical zone
006	GMIHBH050050-1Z-V*-T*	50 X 50	1 electrical zone
007	GMIHBH015050-1Z-V*-T*	15 x 50	1 electrical zone

*V= 1 for 120 Volts; V = 2 for 230 Volts

*T = additional optional Thermostat at 200°C

Other dimensions available and round blankets as well. Consult us

ANITA - GMIQS1Z QUICK START Bonding Console - 1Repair -1Zone With Fully Automatic Control

AN INNOVATIVE BONDING CONTROL UNIT

GMI Aero offers in the series of Anita Bonding Consoles an innovative version optimised in size, features and with special features to meet the special requirements of Airlines and MROs for a **quick** and **simple** implementation.

This solution benefits from our long time experience in this field and continuous R&D in repair processes.



THE ANITA QUICK START CONCEPT

For the context of quick implementation, the operator needs an equipment light and robust, integrally equipped and push-button operated.

Our Anita QS1Z complies fully with these constraints in offering in a small compact volume, all functions needed for expediting a bonding process.

The software controls in an **automatic way** the heating process in optimising the temperature distribution. The software decides which profile is the optimum to reach the set-point with a minimum of differences of temperature and with respect of alarm limits. The operator has nothing to care in terms of thermocouple selection. The operator can concentrate on the construction of the bonding bag.



ENHANCED FEATURES

In a compact size the **Anita QS** offers:

- Temperature control for one zone power output ; heating systems can be indifferently heating blankets, radiant elements, air blower,..
- 6 thermocouples
- High visibility screen for process supervision
- Programming of cycles by using the **touch-screen** panel or through a PC to constitute a built in field use library .
- USB interface for cycle data logging and analysis on a PC
- Built in vacuum venturi pump (high performances)
- Bag Vacuum sensing by a return hose

TECHNICAL SPECIFICATIONS

- Dimensions: W x D x H: 350 x 280 x 170 mm - 13,7 x 11 x 9 in - Weight: 6 kg - 13 lb
- Volts: 220 or 120 VAC, **automatic switching**
- Power Capacity (V*I) : 220 V * 30 Amps = 6600 Watts (enough for 1 square meter blanket) or 120 V * 30 Amps = 3600 Watts
- **Touch Screen Panel** display for process supervision - Panel Dimensions: 115 x 86mm - 4.5 x 3.4 in.

SENSING

- Thermocouple scanning capacity: type J or K to be specified at order, **6** channels
- 1 Vacuum electronic gauge for bag quality monitoring. This value is monitored permanently, displayed and recorded,
- Sensing precision: temperature better than 0,4 °C /0,8°F; vacuum better than 0,050 bar/1,5 in Hg

ALARMS

- Audible alarm, messages and alarm Icons on screen

VACUUM GENERATION

- Venturi pump **built in** : with protection for no contamination by water or by oil
- high performances; vacuum limit 80 mb; flow : 121NI/mn or 4,3 cfm

PROGRAMMING

- Easy field programming of temperature and duration of Ramp up and plateau cycles (up to 2 plateaus)
Up to 5 complex cycles can be installed in memory from PC

CYCLE DATA ANALYSIS & REPORTING

- Cycles data are stored in memory and can be collected through a USB Key to be analysed on a PC.

CALIBRATION

- Easy calibration through PC dialogue (software provided)

DELIVERY CONTENT LIST

The Anita comes with all its necessary accessories :

- A Power cable: 1 unit, length 5 m (16 ft.)
- Blanket cable: 1 unit, length 3 m (10 ft)
- Ground Cable : 1 unit, length 3 m (10 ft)
- Vacuum Silicone Hose: 1 unit for pumping line, length 3 m (10 ft.)
- Vacuum Silicone Hose: 1 unit for return sensing of a bag, length 3 m (10 ft.)
- 2 Vacuum valves,
- Thermocouple cables: Qty 6 ; 3 m long (10 ft.): type J in standard version (type K on request)
- PC Anitalk © software for reporting and calibration
- A User and Service Manual.

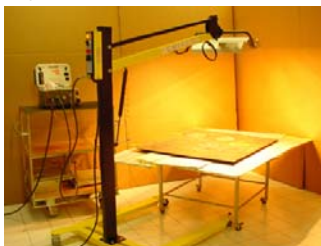


REFERENCES TO ORDER

- **Anita Bonding controller P/N:GMIQS1Z**
 - specify J or K according to type of thermocouples
- Standard colour green

HEATING BLANKETS OR RADIANT PANEL

All types possible. Consult us





INNOVATIVE TOOLINGS FOR COMPOSITE REPAIR

Composite machining toolings for fabrication and for repair have specific features.

Catalogues of standard products can be used for selection of appropriate parts.

However, no catalogue on the market will propose you the innovative tools designed by GMI AERO to perform the generic mechanical works necessary to install a repair patch on an advanced carbon structure.

These tools have been categorized in the series **Leslie** of our catalogue. They are used worldwide by major manufacturers like ATR, AIRBUS, AIR FORCES, Training Centres and by MROs. These tools result of the expertise of GMI in the repair process.

In order to offer a complete solution to the users, specific comprehensive kits have been designed. The more comprehensive version can be labelled a **Mobile Composite Repair Workshop or a Repair Technician Companion**.







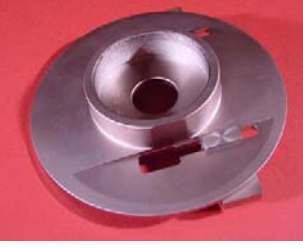
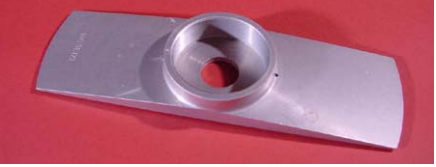



Figure 1: A view of some of our innovative surface machining tool attachments



THE INNOVATIVE TOOL ATTACHMENTS

The attachments are designed to be mounted on two pneumatic machines only and to perform routing and ply sanding. The following table illustrates the respective functions of the attachments.

Table 1: Attachment tools and attributed functions

 <p>Depth Control</p>	 <p>Sanding with Depth Control</p>	 <p>Sanding with Depth Control</p>
 <p>Routing</p>	 <p>Chamfering; edge milling</p>	 <p>Sanding with Depth Control; two models for curved and very curved surfaces</p>
 <p>Sanding with Depth Control</p>	 <p>Set of Diamond cutters for routing, milling, stepping, scarfing, chamfering...</p>	 <p>Sanding with Depth Control (non developable surfaces)</p>

STRUCTURES TO BE TREATED

The attachments will allow works on different structure types and surface shapes. These repairs will be possible of nearly all structures met on modern aircraft as described below.

Type	Material	Shapes
Sandwich	Carbon	Flat
Laminate	Glass	Curved
		Slightly non developable

Table 2: Typology of structures

A COMPREHENSIVE KIT FOR ALL SURFACE PREPARATION STEPS

The innovative tools designed by GMI to offer the technician to face all possible tasks of a composite repair on an advanced carbon structure are gathered in a case. With tools, and necessary other selected accessories the repair phase preparation can be fully conducted.



Figure 2: The mobile workshop

The Kit will allow to prepare fully the repair phases:...

- a. Remove the paint on the repair area,
- b. Prepare the installation of the core and of the patch,
- c. Dry the sandwich area after core removal with a foldable oven,
- d. Rout and Step the skin,
- e. Handle Wet Lay Up operations if any or the Prepreg cuts,
- f. Manufacture the patch pre-cured or to be co-cured,
- g. Install the patch and make the vacuum bag (heat blanket not provided).

In the next paragraph, we review systematically the main operations allowed in the logical order of a composite repair.

MACHINING WORK SCHEMES

The works are categorized to cover the typical schemes met in advanced carbon repair on aircraft structures.

- a. Cutting of a carbon laminate doubler, chamfering the edges,
- b. Routing of a sandwich skin or of a laminate box skin,
- c. Easy control to remove the skin up to the adhesive... or deeper,
- d. Stepping ply by ply a carbon skin,
- e. Scarfing with respect of a slope of 3 or 2 ° a carbon skin,

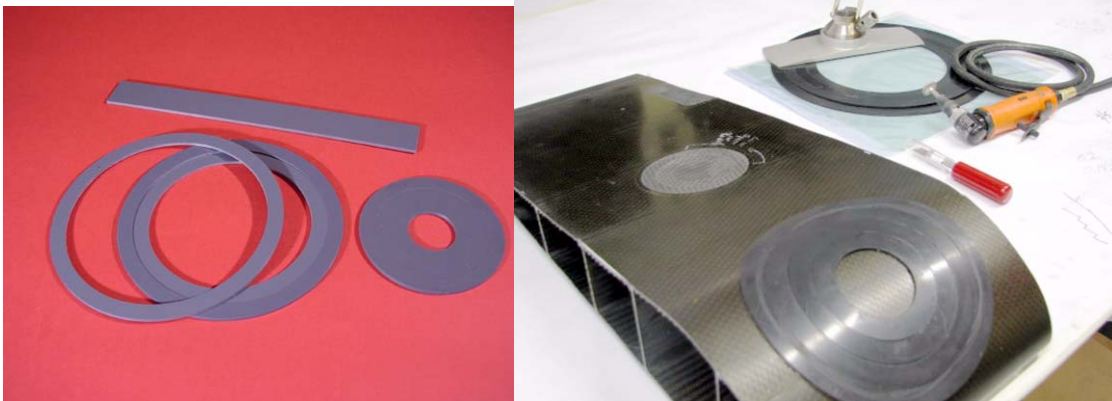
REPAIR PHASES YOU CAN HANDLE

In the Mobile Workshop you will find all the parts to prepare fully the repair phases:...

1. **Remove the paint** on the repair area,
2. Prepare the installation of the core and of the patch,
3. **Dry** the sandwich area after core removal with a foldable oven,
4. Rout and Step the skin,
5. Handle **Wet Lay Up** operations if any or the **Prepreg** cuts,
6. **Manufacture the patch** pre-cured or to be co-cured,
7. Install the patch and make the **vacuum bag** (heat blanket not provided).

USE OF TEMPLATES

The use of templates allow to work with full safety inside guides and with all the confidence which is lacking when working eye driven with other standard tools;



DUST ASPIRATION AT THE SOURCE

Each tool attachment is equipped with a port to be connected by a quick coupling connector to a flexible hose for connection to a vacuum cleaner. For convenience a venturi vacuum cleaner is provided.

A MOBILE COMPOSITE REPAIR WORKSHOP

With our Mobile Composite Repair Workshop, GMI offers to Civil and Military Repair Centres the equipment they absolutely need to conduct all the repair tasks before bonding. GMI invented a series of tools that allow to realize all the Generic Repair Works on advanced composite structures. They are the only tools on the market specific for that type of job, other standard tools from trade, being inappropriate, because they address mainly the production field. Conceived as tool attachments, they are the innovative parts of the Kit. Together with the innovative tools, the user will find under the hand the complete set of necessary accessories to conduct all the repair steps:... from the paint removal task,... to the local manufacturing of a patch.

CONSOLE COMPOSITION

To perform all the tasks of the repair, the Complete Mobile Workshop is composed of **Five groups of elements**. The details of composition are given in following tables.

1. **Group 1:** A selection of accessories to prepare the repair by paint removal, honeycomb cut, lamination of dry fabrics, cutting and assembly of patches.
2. **Group 2:** Pneumatic machines necessary for the Attachments one router and one sander.

3. **Group 3:** The innovative kit of Attachments. This kit comes with the necessary kit of diamond cutters and carbide cutters These cutters are conceived specially to achieve specific repair machining quality.
A first set of templates is added. The pneumatic adapted vacuum cleaner is included.
4. **Group 4:** First hand set of bagging products state of the art.
5. **In Option : Group 5:** A foldable oven for drying the sandwich area after core removal and before core installation or potting. The oven is useful to accelerate the potting curing; in some cases it can be used to heat the adhesive when. The oven temperature cycle is controlled by the ANITA Console. The oven is equipped with a specific heat gun.

TRANSPORTATION CONSOLE

All above in a nice console with rolls transportable in mission or near the aircraft.<



**Figure 3: left: Complete Mobile Repair Workshop
right: Set of tools and attachments in a version restricted to tools only**

Left : Mobile Workshop as a Larger Console:
 dimensions: 1230 x 535 x 285 mm; Weight: 30 Kg.

Right : Model CRT as a Restricted version:
 dimensions: 800 x 450 x 300 mm; Weight 23 Kg

TO ORDER

A- The Complete Mobile Workshop: Recommended for Airlines, MROs,

P/N: GMIAT87B02-320

Option: foldable Oven with heat gun and bonder adaptor - P/N GMIET010 + GMIETE011

B- For a **Restricted** version limited to the innovative attachment and tools without accessories.
 (groups above 2 , 3,4 ; 5 in option) Recommended for training centers and constructors

P/N: GMICRT9201-WO

Option: foldable Oven with heat gun and bonder adaptor - P/N GMIET010 + GMIETE011

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