

GMI

INNOVATION IN TECHNOLOGY FOR AIRCRAFT MAINTENANCE

Composite & Metallic Structures, Solution Engineering, Training

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HEATING TECHNOLOGY BLANKETS, RADIANT PANELS, RADOME SHAPPED BLANKETS



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HEATING BLANKETS FOR ANITA CONSOLES



GMI supplies and engineers very flexible heating blankets suitable to heat a composite part. The challenge is to get flexibility and homogeneity performances to achieve appropriate curing of the whole patch. Our blankets meet these specifications together with long life duration.

A variety of items according to dimensions are on stock. All dimensions can be ordered specifically. Shaped items can also be designed and manufactured.

All our blankets are engineered to meet the temperature control specifications of ANITA Consoles.

HEATING BLANKETS FOR ANITA CONSOLES

We offer 3 classes of Standard Models:

• Model 1 Standard Blankets:

These blankets connect to ANITA Models NG or OT.

• Model 2 Hazardous Environment Blankets:

These blankets are specially designed to connect to our special ANITA version NGHE or OTHE for hazardous environment.

• Model 3 Three-Phase Blankets

These blankets of generally very large dimensions are designed in 3 phases and connect to ANITA through a power amplifier three phases (380 or 480 VAC). Non standard models are also manufactured.

independently and according to their own reaction.

GMI proposes items with this feature and advises the customer upon request. Each zone gets own lead output to connect to the heating control console.

Note that THE GMI ANITA Console is compatible with 2-zone control.

VOLTAGE AND POWER

The blankets can be ordered for 220 volts or 120 volts monophase. Blankets are also designed under three phases for high power requirements. The power can be advised by GMI upon request.

Model 3 Three Phase Blankets are designed in 3 phases for 220 Volts, 380 Volts, 415 and 480 Volts .

Some models are designed up to 16 kW and more

GENERAL SPECIFICATIONS

- Silicone rubber heaters,
- Maximum raising temperature : 260°C (500 F),
- High temperature up to 350 °C (600 °F) are also available,
- Thickness: 1.4 mm (0.55 inch.),
- Lead output in a tab to guarantee no dead area in the total heating area
- Lead length: 500 mm (20 in)
- Leads with connectors mounted to be compatible with ANITA Bonder cables.

To change these standard specifications , please consult us.

BOEING SPECIFICATIONS

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 with a maximum of density and regularity.

GMI manufactures its blankets to meet this specification recommendation.

ELECTRICAL ZONING

Zoning may be advised when using a large blanket. To get better homogeneity performances it can be interesting to divide the surface in two or more zones that will be controlled in temperature

TO ORDER A HEATING BLANKET

First consult the following list of on stock products. If the size you need is not on stock you can order in specifying:

- The voltage,
- The wattage,
- The dimensions in inch or cm,
- The number of independent zones eventually.
- The position of the lead output (Tab)
- The nature of the console (hazardous or not)

For very large blankets it is advised to use a power amplifier and to design the blanket in 3 phases.

For connection to GMI ANITA Polymerisation Console you must order an electrical circular connector to be mounted per zone per blanket. Unless specified differently we quote andd equip all our blankets with the connector dedicated to the bonding console.

HEATING BLANKETS

DESIGN OF 1 ZONE BLANKETS 2 TYPES OF MODELS LS & SS

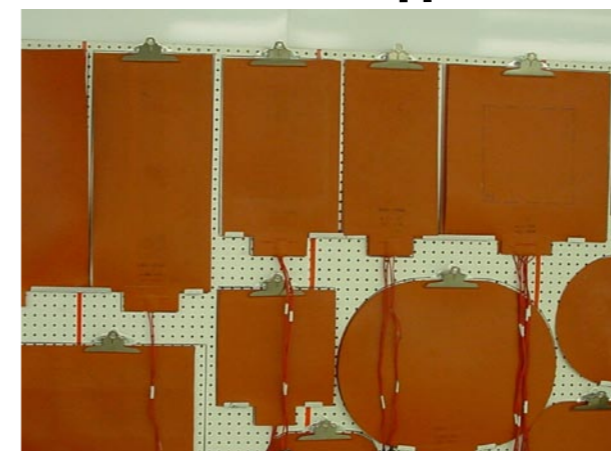
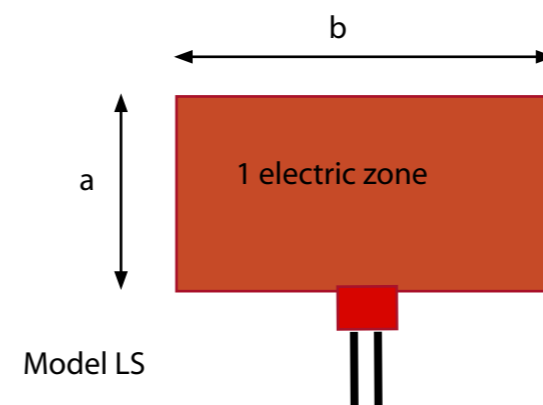
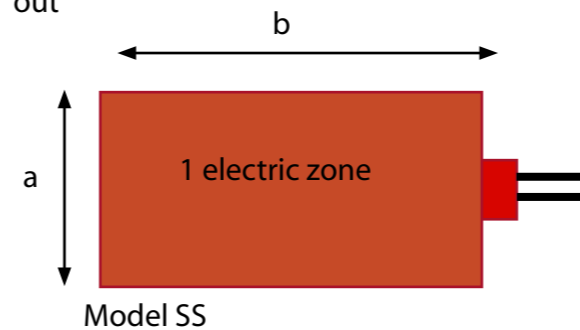
In the case of 1 Electrical zone, the sketch of the blanket shape is as sketched below.

Two models are possible according to the position of the Tab .The tab is always in the middle of the side . It can be in the middle of the small side or the larger side.

The standard model is the one with Tab in the middle of the small side.

If you do not specify differently , your blanket as ordered will be with tab in the middle of the small side .

Standard electrical sketch is as follows for the 2 models according to the position of the tab -lead out



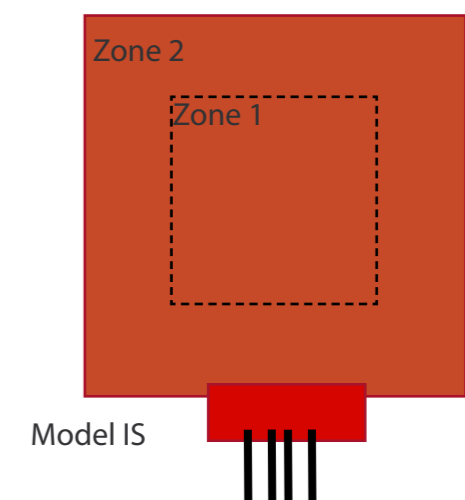
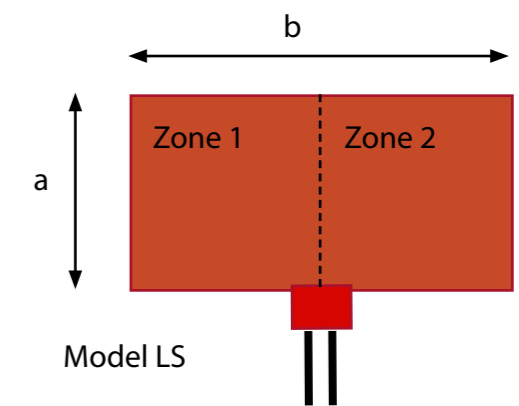
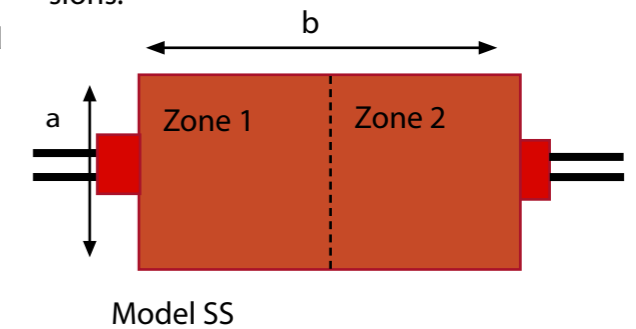
DESIGN OF 2 ZONE BLANKETS

There are 2 usual design models of 2 zone heating blankets.

The first case where the two heating zones are parallel, side by side. We find here the same case as previously : models LS and SS - see sketch below.

The second case where one zone is internal to the other .

The first design is appropriate for long rectangular blankets. The two zones may be equal in surfaces or according to specific request from customer may correspond to particular different dimensions.



HEATING BLANKETS

LIST OF TRADITIONALLY ORDERED ITEMS

We provide here a list of standard rectangular and circular blankets for ANITA models NG or OT

For hazardous versions see following chapter

Specify at the order 120 or 220 Volts monophas

STANDARD RECTANGULAR / SQUARE BLANKETS

Dimensions in mm (inches)	P/N	Remarks
200 x 200 (8 x 8)	GMIHB020020	1 zone
250 x 250 (10 x 10)	GMIHB025025	1 zone
300 x 300 (12 x 12)	GMIHB030030	1 zone
300 x 500 (12 x 20)	GMIHB030050	1 zone
300 x 700 (12 x 27)	GMIHB030070	1 zone
400 x 400 (16 x 16)	GMIHB040040	1 zone
500 x 500 (20 x 20)	GMIHB050050	1 zone
600 x 600 (24 x 24)	GMIHB060060	2 zones
150 x 500 (6 x 20)	GMIHB015050	1 zone
610 x 810 (24 x 32)	GMIHB061081	2 zones
810 x 810 (32 x 32)	GMIHB081081	2 zones

Specify at the order 120 or 220 Volts monophas

HEATING BLANKETS

LIST OF TRADITIONALLY ORDERED ITEMS

We provide here a list of standard rectangular and circular blankets for ANITA models NG or OT

For hazardous versions see following chapter

STANDARD CIRCULAR BLANKETS

Diameter in mm (inches)	P/N	Remarks
200 (8)	GMIHB020	1 zone
250 (10)	GMIHB025	1 zone
300 (12)	GMIHB030	1 zone
400 (16)	GMIHB040	1 zone
450 (18)	GMIHB045	1 zone
500 (20)	GMIHB050	1 zone
550 (22)	GMIHB055	1 zone
600 (24)	GMIHB060	2 zones
700 (28)	GMIHB070	2 zones
750 (30)	GMIHB075	2 zones
800 (32)	GMIHB080	2 zones
900 (35)	GMIHB090	2 zones

Specify at the order 120 or 220 Volts monophas
Special dimensions under request

BLANKET CONNECTION ACCESSORIES

Electrical connector for blanket standard : P/N : GMINGE060-1

MULTIPLE BLANKET CONNECTION SOLUTIONS

For standard Blankets - Volts : monophas - 120 or 220 Volts

Cable to connect 2 blankets in parallel : P/N : GMINGE102

Connection box with 4 blanket output / P/N : GMIANE100

3 PHASE VOLTAGE BLANKETS FOR LARGE REPAIRS

These blankets connect to the GMI Power Boosters and are controlled by the ANITA console.

They are designed according a **3 phase triangle** scheme

Standard Rectangular Blankets 2 ZONE Design

Example of traditionally ordered items

P/N below are given for 380 Volts ; for 480 and 220 volts, please specify at the request.

Blankets are delivered ready to use with connectors mounted to match the cables of the GMI ANITA Power Booster Standard 16 Kw (see the specific catalogue and Booster Specifications)

Dimensions in mm	Part Number	Remarks	Total Power Watts
800 x 1500	GMIHB080150-3-380 *	2 zones 800 x 750 mm	9 400
1000 x 1000	GMIHB100100-3-380 *	2 zones 1000 x 750 mm	7 800
1000 x 1500	GMIHB100150-3-380 *	2 zone 1000 X 750 mm	11 700
1000 x 2000	GMIHB100200-3-380 *	2 zones 1000 x 1000 mm	15 600
750 x 1500	GMIHB075150-3-380 *	2 zones 750 x 750 mm	8 775
750 x 2000	GMIHB075200-3-380 *	2 zones 750 x 1000 mm	11 700
Other dimensions on request	* for 380 Volts 3 Phases Specify if 480 Volts	Consult GMI for more details and advises according to application	

BLANKETS FOR ANTI EXPLOSION ATMOSPHERE

Blankets have the same specifications in terms of general built in principles and quality as the standard models. They have an additive feature design. They are covered with a ground grid moulded in.

This grid is used to ground the heating circuit and to provide a path for ground continuity to the console.

All dimensions as described in the previous chapters are available.
Traditional ordered items are :

BLANKETS FOR ANTI EXPLOSION ANITA MODELS

Dimensions in inches	P/N	Remarks
15 x 36	GMIHB015036 -X-G	2 zones
24 x 24	GMIHB024024 -X-G	2 zones
12 x 24	GMIHB012024 -X-G	1 zone
10 x 18	GMIHB010018 -X-G	1 zone
18 x 18	GMIHB018018 -X-G	2 zones
10 x 12	GMIHB010012 -X-G	1 zone
10 x 10	GMIHB010010 -X-G	1 zone
08 x 10	GMIHB008010 -X-G	1 zone
08 x 08	GMIHB008008 -X-G	1 zone
06 x 08	GMIHB006008 -X-G	1 zone
06 x 06	GMIHB006006 -X-G	1 zone

X = 1 for 120 Volts ; X = 2 for 220 Volts.

All these blankets are equipped with anti arcing connector .

Individual connector P/N is : GMINGHE060-3



RADOME SHAPPED BLANKETS FOR AIRBUS & BOEING AIRCRAFTS



MOLDED HEATING BLANKETS FOR RADOME REPAIRS

GMI offers ready to use moulded blankets to the shape of aircraft radomes .Our catalogue includes most frequently requested models. These blankets have been designed to cover the tip of Radomes of Boeing 767, 747, 737,...., and AIRBUS Wide and Narrow Bodies,...

We offer a STANDARD LIST of products in terms of dimensions and electrical zoning. These blankets are shaped to fit either the External skin or the Internal skin of the radome.

We also answer to specific questions in terms of design principles and dimensions.

3° ZONE STYLE SECTORS OR CONCENTRIC ZONING



Two styles of electrical zoning design are offered : by sector or by concentric zones.*

Some radome blankets are offered only under sector zoning.

The figure above illustrates the notion of sectors .

DESIGN PRINCIPLES

The blankets are built according to certain design principles as stated below. The user must understand that the criteria that funded the design are adapted to sound repair techniques for radomes.

1°- DIMENSIONS OF THE BLANKETS

The dimensions of our blankets have been decided by consideration of the three following case considerations:

The blankets cover the tip of the radome and in particular the transparency area. This area is non developpable and repairs will require this type of shaped blankets.

Out of this area, local repairs could be implemented by using flat circular blankets (consult our catalogue for selection).

When repairs cover a larger surface than the transparency area, it is mostly recommended to proceed in another way, like refitting a complete cap to the radome base. The bonding of the belt of the new cap can be done either with specific blankets or in an oven.

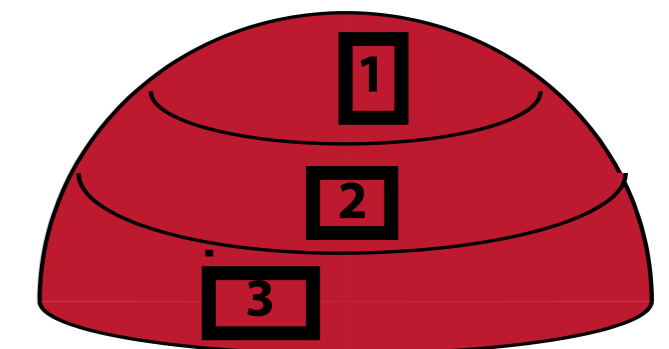
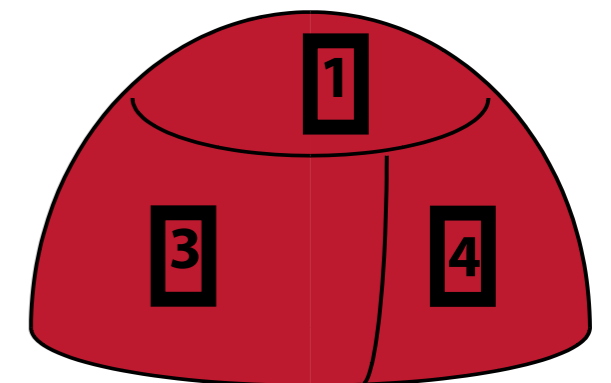
Dimensions are given in following tables for each model.

2° ELECTRICAL ZONING

Due to the large heating area of each blanket, it is logical to split the surface into independent heating areas.

The user has thus the possibility to activate for heating only the zones covering the repair . A unique zone blanket would heat non damaged areas with risk of delamination.

Sector Design



Concentric Design

MOLDED HEATING BLANKETS FOR RADOME REPAIRS

4° INTERNAL / EXTERNAL SKIN SHAPES

Due to the difference of profiles between the two skins, two blankets must be considered:

- Internal Skin Shapped ,
- External Skin Shapped .

The external skin shapped blanket must be used to repair damages on external skin.

Internal skin blankets must be used to repair damages on internal skins .

When a damage is through the two skins, use of the two blankets is necessary.

The external one must be used to reconstitute first the external skin and for the curing of the adhesive to bond the honeycomb. The internal skin blanket is used to bond the internal skin.

In no case the internal blanket must be used to bond from inside the adhesive on the external skin.

5°- MOULDS AND USE

Moulds must be manufactured for the use of the blankets.

The mould must be inserted between the blanket and the skin of the radome. In that respect, they must be manufactured with glass or carbon mould prepreg. The thickness being of 2 to 3 mm.

It will be used to guarantee the profile of the radome.

Also the mould is necessary to support the thermocouples for temperature control. The sensors must be positioned on the mould, between the mould and the blanket.

6°- LENGTH DEFINITION

The way the length is defined in specification tables is explained by the following figure. Length is the one of a line starting from the base to the other base in the Total



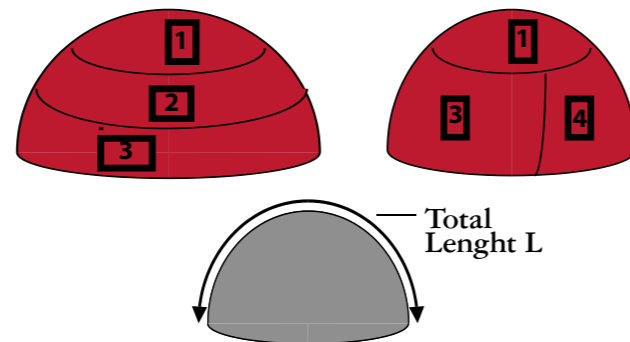
7° TEMPERATURE CONTROL BY ANITA

BONDING CONSOLES

The GMI Anita Bonding Consoles are recommended to be used for the control of the temperature of the process.

The independant control of each zone as implemented by ANITA (NG or OT models) will perform appropriate control of each electrical zone of the blankets.

Note one Bonding Anita will be able to control 2 zones simultaneously.



AIRBUS AIRCRAFTS STANDARD RADOME BLANKETS

SECTOR ZONE DESIGN

(All blankets are on 220 Volts only)

Aircraft	SKIN	Length in mm	Design Sector	P/N
A320*	External	1400	4 zones	GMIHBR320-ES-140-2
A320	Internal	1400	4 zones	GMIHBR320-IS-140-2
A340**	External	1200	4 zones	GMIHBR340-ES-120-2
A340	Internal	1200	4 zones	GMIHBR340-IS-120-2

* for narrow body family : A320, A319, A321...

** for wide body family : A300, A330, A340...

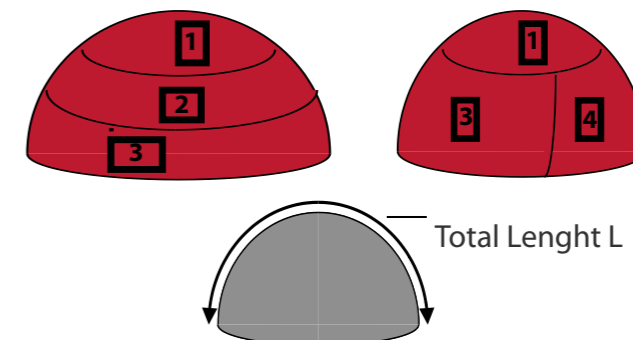
CONCENTRIC ZONE DESIGN

(All blankets are on 220 Volts only)

Aircraft	SKIN	Length in mm	Design Concentric	P/N
A320*	External	1400	3 zones	GMIHBR320-EC-140-2
A320	Internal	1400	3 zones	GMIHBR320-IC-140-2
A340**	External	1200	3 zones	GMIHBR340-EC-120-2
A340	Internal	1200	3 zones	GMIHBR340-IC-120-2

* for narrow body family : A320, A319, A321...

** for wide body family : A300, A330, A340...



BOEING AIRCRAFTS STANDARD RADOME BLANKETS

EXTERNAL SKIN BLANKETS - SECTOR ZONE DESIGN

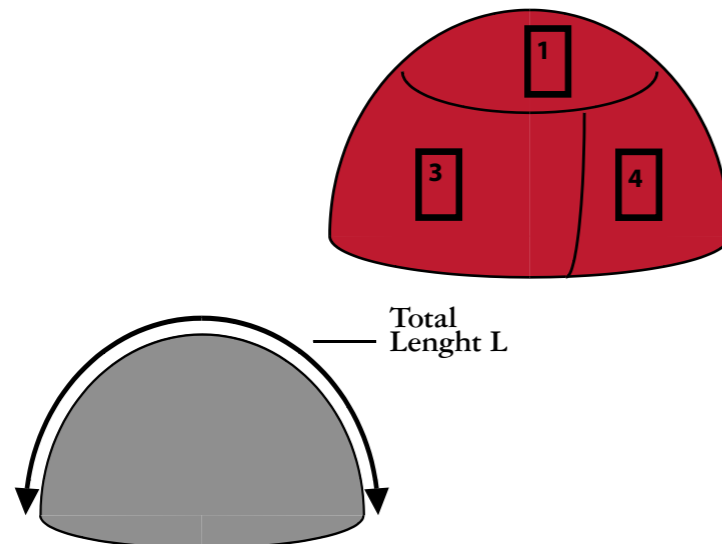
ALL BLANKETS ARE ON 220 VOLTS ONLY

Aircraft	SKIN	Total length in mm	Design in...	P/N
737	External	1100	4 Sectors	GMIHBR737-ES-110-2
737	Internal	1100	4 Sectors	GMIHBR737-IS-110-2
747	External	1150	4 Sectors	GMIHBR747-ES-115-2
747	Internal	1150	4 Sectors	GMIHBR747-IS-115-2
767	External	900	4 Sectors	GMIHBR767-ES-90-2
767	Internal			
777	External	900	4 Sectors	GMIHBR777-ES-90-2
777	Internal			

DIMENSIONS AND ELECTRICAL DETAILS

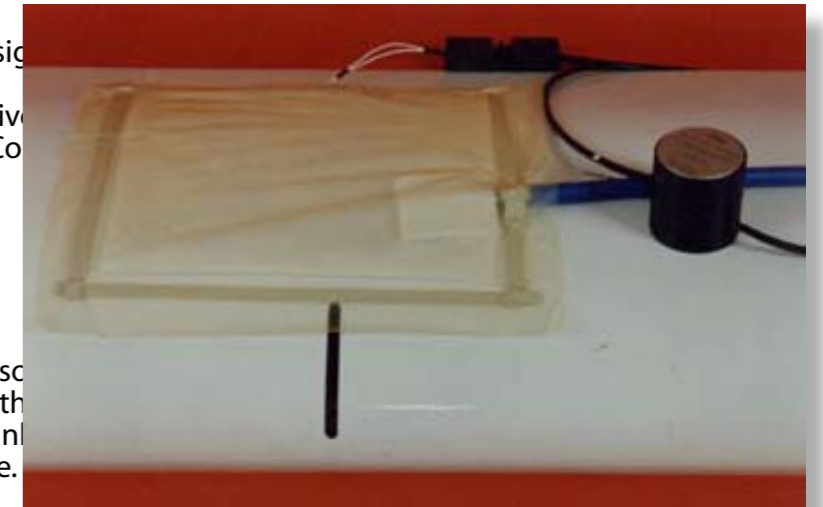
EXTERNAL OR INTERNAL SKIN BLANKETS - SECTOR DESIGN

Aircraft	Total length in mm	Power of zone 1	Power per zone 2, 3 or 4
737	1100	350	1200
747	1150	500	1400
767	900	500	900
777	900	500	900



AUTONOMOUS HEATING BLANKETS AND CONTROLLERS

We describe here the specific blankets designed to be independent of a Bonding Console. They are anyway controlled by an innovative simple device conceived as an Autonomous Controller preset at a temperature setpoint.



DESCRIPTION

The autonomous Blanket is an innovative solution for heating a composite structures with ONLY a two-part instrument: a heating blanket associated to a SPECIFIC controlling device.

The complete system does not require any programming. It is pre tuned for a temperature set point. Just plug it to 120 or 220 Volts directly ...

Many repair stations find useful to have available heating blankets that do not require a console for operations. We have designed these blankets and a simple accessory to perform the control of the process temperature .

APPLICATIONS - BENEFITS

Designed to operate from 60°C to 100°C, Autonomous Blankets find immediate applications in:

- Removing humidity from parts,
- Simple bonding,
- Disbonding of panels
- PR softening,

HOW IT WORKS ?

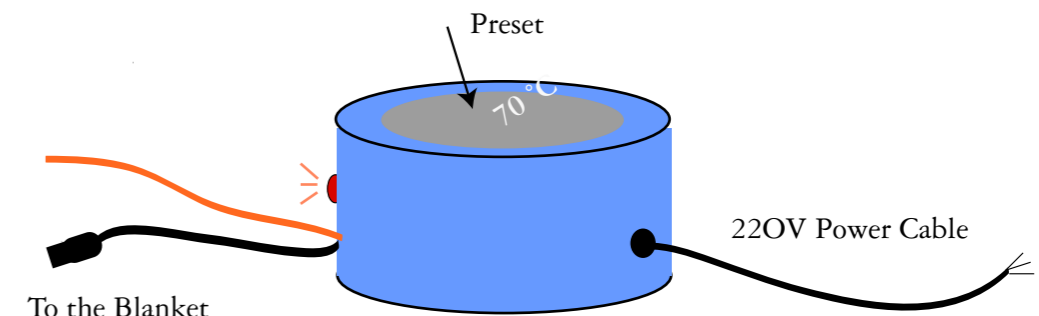
Install classically the blanket on the part make (eventually) a vacuum bag, select the temperature controlling device according to the setpoint , and plug it to the blanket and then power it directly to the Voltage.

The temperature below the blanket will gently be raised to the Nominal Setpoint with a mean slope of 2 to 3 °C per minute and will controlled at the set point .

The duration of the process is manually decided by the operator.

SAFETY TEMPERATURE LIMIT

A Thermostat for over temperature limit detection is attached. It will trigger down the power if limit is overreached.



Preset Controller to drive the Autonomous Blanket

AUTONOMOUS HEATING BLANKETS AND CONTROLLERS

SPECIFICATIONS OF BLANKETS & CONTROLLERS

BLANKETS :

- Dimensions : usual ; see the following table
- Voltage : under request 120 or 220 Volts
- Power : suitable for heating usual composite sandwich skins up to 100 °C at 2 °C per min,

CONTROLLERS

- Preset at a given temperature between 60 and 100 °C ; see following table to order
- 2Volts : 220 or 120 Voltas at request
- Dimenions : Diameter 12 cm ; height 10 cm
- Attached power cable length 3 meters
- Attached one Blanket Cable 50 cm
- Attached Safety Thermostat preset according to the Controller Internal Preset Temperature Set-point.(around setpoint + 10 °C)

TO ORDER

AUTONOMOUS BLANKETS P/N

This is a list of traditionally ordered items

P/N	Dimensions in mm
GMIHBAHD30090	900 x 300
GMIHBAHD30030	300 x 300
GMIHBAHD40150	1500 x 400
GMIHBAHD90090	900 x 900
GMIHBAHD60060	600 x 600
GMIHBAHD50050	500 x 500
GMIHBAHD40040	400 x 400

Many other dimensions possible under request
Specify at the order 120 or 220 Volts

AUTONOMOUS CONTROLLERS P/N

To control with the accuracy of some degrees, the temperature of the part it is necessary to associate the blanket to a Controlling and Connecting Device. We offer a choice of pre-calibrated devices

P/N	PRETUNED SETPOINT
GMITH2-60	For control at 60°C / 140°F
GMITH2-80	For control at 80°C / 176°F
GMITH2-100	For control at 100°C / 212°F

Specify 120 or 220 volts at the order.

One device per temperature has to be selected.

It is possible to have other pre-calibrated devices. They are delivered with a 3 meters cable to be plugged to 220 / 120 Volts and a thermostat safety device.

RADIANT PANELS FOR RESIN CURING AND REPAIR BONDING

APPLICATIONS TO ANITA BONDING CONSOLES

When a heating blanket cannot be used for bonding a composite repair, radiant panels constitute a very useful alternative.

GMI designs very high quality radiant ceramic panels perfectly appropriate to composite repair bonding.

The nature of the ceramic material produces an even temperature distribution on the part .

To allow an easy installation adjustable legs are mounted on each side ; the leg position can be adapted so that two panels can be installed side by side to constitute a continuous heating panel .

Two panels can be temperature controlled through ANITA two output channels.

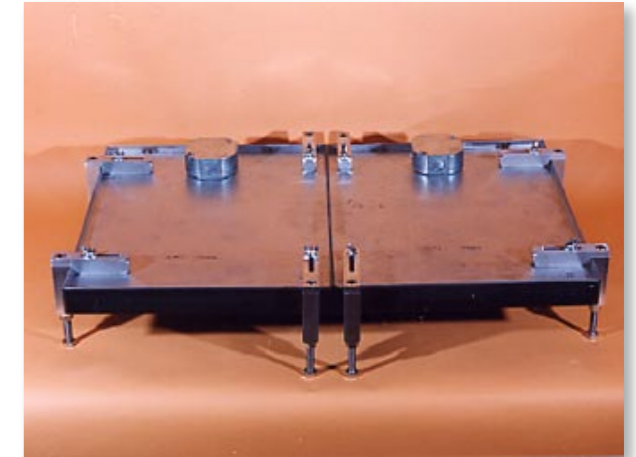
SPECIFICATIONS

We propose a set of standard dimensions panels that can be associated side by side.

Specify at the order 120 or 220 volts

Each panel is equipped with an input power stud; a cable is mounted (3 meters long) with a plug compatible to be connected to ANITA Bonding Console.

Each panel has 4adjustable legs; maximum adjustable height: 120 mm



Dimensions	P/N
300 x300 (12 x 12)	GMIRP030030
400 x 400 (16 x 16)	GMIRP040040
400 x 500 (16 x 20)	GMIRP040050
500 x 600 (20 x 24)	GMIRP050060

Specify at the order 120 or 220 volts