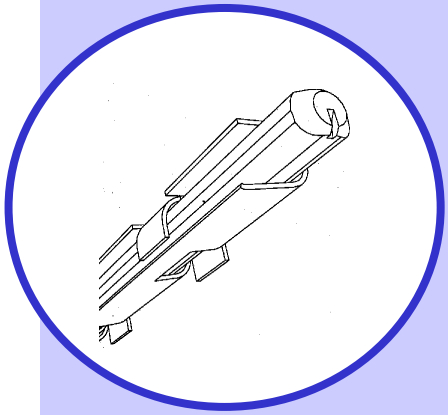
Lightened Thermal Clamps
Amphenol Series LTC



MAIN CHARACTERISTICS

MAXIMUM RELIABILITY

• QUICK LOCKING AND UNLOCKING : Unlike others on the market, Series LTC thermal clamps feature a quick, quarter-turn locking mechanism that provides a positive and fast assembly.

• MAXIMUM RESISTANCE TO SHOCK AND VIBRATION : Very low wear and resistant to extreme shock and vibration, even when used in harsh environments.

• NO MOVING PARTS : The precision assembly permits the two components (spring and rod/cam) of the thermal clamp to stay together, even when in the unlocked position.

• SENSITIVE AND VISUAL INDICATION : The top end of the rod/cam provides a visual indication that shows the “open” or “closed” position for ease of inspection.

MAXIMUM THERMAL TRANSFER

• UNIFORM HEAT TRANSFER : Its unique design produces a uniform pressure distribution along the PCB edge for absolute best heat transfer, which avoids damaging the heat sink and provides a better thermal conduction.

• The uniform clamping pressure eliminates hot spots along the PCB interface producing an even distribution of heat along the entire edge.

• Thermal couple between the cold wall and the heat sink is created by a direct metal to metal contact providing more heat transfer capability than conventional wedge style retainers due to the constant pressure and the flexibility of the spring.

• ZERO INSERTION AND EXTRACTION FORCES : The insertion and guiding process of the PCB in its location requires no additional force.

• Board lengths between 40 mm (*1.57 in*) and 300 mm (*11.81 in*) can be accommodated once the cold wall and heat sink are specified - in increment of 20 mm (*0.787 in*).

• Series LTC thermal clamps are compatible with different heat sinks thicknesses.

• MAINTAINABILITY : the unique design makes field repairs quick and easy. Repairs can be accomplished without use of any special tool. Although the LTC thermal clamps have been tested for over one thousand lock-unlock cycles, they have been derated and specified for 500 fully loaded cycles. This, in most cases, will exceed the overall system life, virtually eliminating service and maintenance.

• Various mounting options are available.

• Other custom styles are available upon request.

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GENERAL DESCRIPTION

Amphenol offers a new advanced design. Series LTC thermal clamps are designed to ensure the thermal coupling (heat dissipation) between the heat sink of a printed circuit board and the cold wall of a box (for Daughter Board), or of a backplane (for the Mother Board).

At the same time they ensure the guiding of the boards in its locations, as well as the locking of the Daughter Boards into the right position relative to the Mother Board by a 1/4 turn.

Ease of use, safety in vibration, low weight and space saving are benefits of this design.

Series LTC thermal clamps are available in the following designs :
- a left type and a right type,
- variety of lengths,
- different locking devices (standard and custom tools).

APPLICATIONS

• Avionic GSM systems
• Counter measure systems
• High speed calculators
• Industrial controls

• Superior retainer for high density electronic devices running in very high vibration environments.
• Space saving design and low weight for demanding applications.
• Designed to comply with MIL-STD-810E.

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Technical Characteristics

• Heat sink thickness capability :
  - Standard version : 1.6 mm$^{+/-0.15\ mm}$ (*0.063 in* $^{+/-0.0059\ in}$)
  - Other versions : by addition of wedges

• Distance between 2 Daughter Boards :
  - From 8 mm min. (*0.315 in min.*), depending on the connector that it used

• Mechanical endurance :
  - 500 locking / unlocking cycles

• Locking of the board (PCB retention) :
  - For the minimum heat sink thickness (1.45 mm or *0.57 in*) : > 50 N for a thermal clamp of 80 mm (> *11.25 lbs for a thermal clamp of 3.15 in*)

• Maximum locking / unlocking coupling torque : 5 Nm for a thermal clamp of 80 mm (*44.3 lbs.in for a thermal clamp of 3.15 in*)

Environmental Characteristics

• Temperature range : 1000 hours from 55°C to 125°C

• Temperature shock : 500 cycles (-50°C / +125°C under NFC20605 method A1) and MIL-STD-810E - Method 503.3

• Humidity : 56 days (under NFC20603) and MIL-STD-810E - Method 507.3

• Salt spray : 96 hours (under NFC20611) and MIL-STD-810E - Method 509.3 (Salt Fog 96 hours continuous exposure)

• Sinusoidal vibration : severity 10 Hz to 2000 Hz - 20 gn (under NFC20616) and MIL-STD-810E - Method 514.4

• Random vibration : severity 50 Hz to 2000 Hz - 1.2 gn²/Hz (under MIL-STD-1344 A - Method 2005.1)

• Shock : severity 100 g / 6ms half sine pulse (under NFC20608) and MIL-STD-810E - Method 516.4

• For most applications, the LTC thermal clamps meet all performance objectives set by military and commercial users for high-reliability, high-density circuit board packaging of electronic equipment.

Material

• Body (spring system) : Beryllium Copper (BeCu) per QQ-C-533

• Axis (Rod/Cam) : Stainless Steel per QQ-S-763, ASTM A 582

Finish

• Body (spring system) : Nickel plate per QQ-N-290, Class 1, Grade G

• Axis (Rod/Cam) : Nickel Passivation per MIL-S-5002

Weight

• Roughly 1,7 g for every 10 mm or 0.152 oz for every inch

Tolerances … Unless otherwize specified : .xxx = +/- .25 (.010), .xx = +/- .5 (.02)

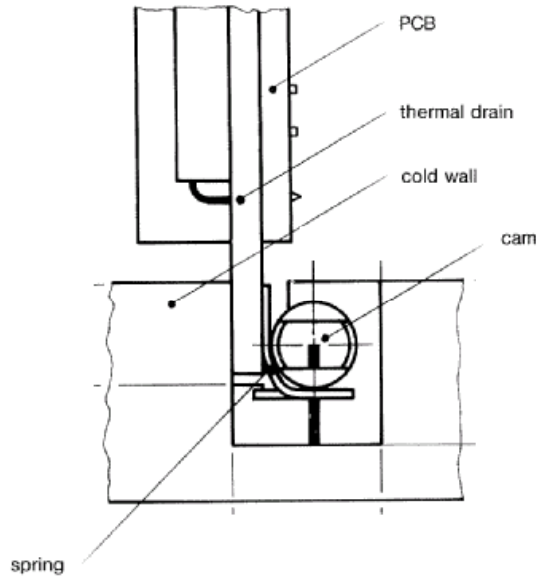
Note on dimensions … Metric listed first followed by english in parenthesis

Specifications subject to change without notice.

Thermal Performance

This varies mainly due to the thermal resistance between the heat sink and the cold wall.

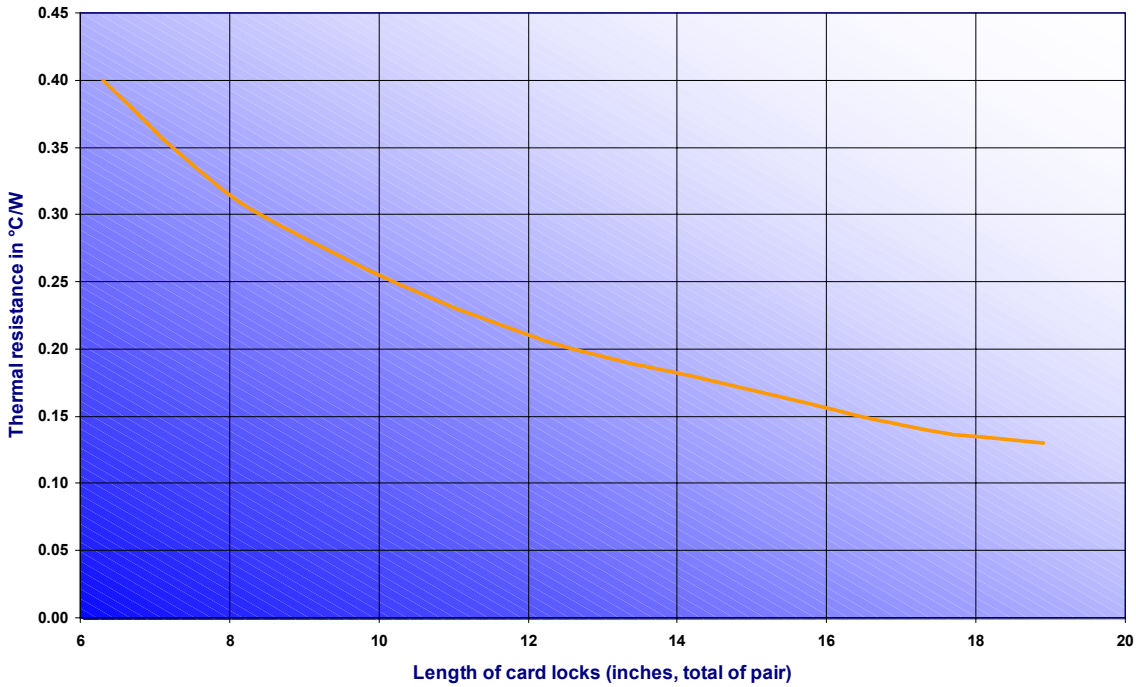
The measure of this resistance depends on 3 main factors :
- the heat sink
- the thermal clamp
- the cold wall which must pull the heat from the heatsink through conduction



This measure which must not take into account the convection and the radiation phenomena, allows to define exactly the thermal resistance of the clamp coupling, for which the values are dependant of the length of the thermal clamp.

The thermal resistance of coupling per surface is less or equal to 1,6 $K.W^{-1}.cm^2$ or 2.5°C.inch/Watt.

Amphenol Thermal Clamps - Thermal Resistance Data



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Mechanical Performance

Clamping force applied onto the heat sink for a thermal clamp of 80 mm (*3.15 in*) :

Thickness of the board in mm	1,45	1,55	1,60	1,65	1,75
Thickness of the board in inches	*(0.057)*	*(0.061)*	*(0.063)*	*(0.065)*	*(0.069)*
Average value in N	250	380	460	520	630
Average value in lbs	*(56.25)*	*(85.50)*	*(103.50)*	*(117.00)*	*(141.75)*

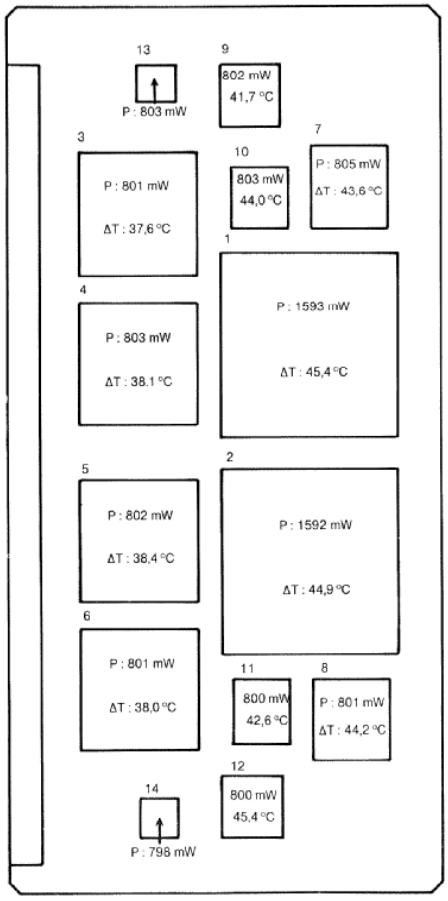
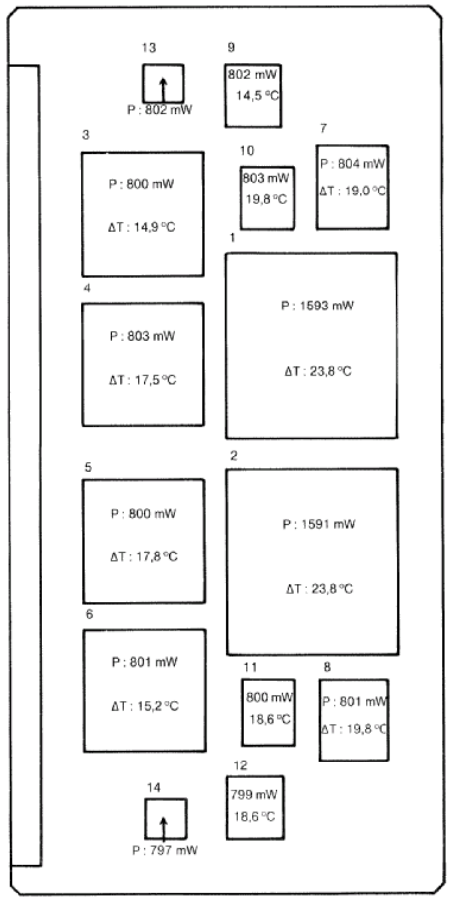
Clamping efficiency

The efficiency of Amphenol Thermal Clamps has been shown during tests performed on different types of PCB fitted with thermal drains.

The test results are given as an example in the table below. They cover the following PCB's :
- 200 µm epoxy glass PCB
- thermal drain in CIC (Cu/Invar/Cu)

These comparative tests have been done with a 1/2 ATR PCB equipped with SMT chips. Results show that with identical power, heating is 50 % lower for Amphenol Thermal Clamps inserted in a water cooled rack.

Test Results	Without thermal clamp	With thermal clamp
water flow	-	0.5 l/mm
total dissipated power	12.8 W	12.8 W
room temperature	20.4 ° C	24.2 ° C
water temperature	-	24.2 ° C
average heating	42 ° C	18.6 ° C
maximum heating	45.4 ° C	23.8 ° C
minimum heating	37.6 ° C	14.5 ° C

Test **without** thermal clamps	Test **with** thermal clamps
PCB technology : Cu - Inv. - Cu	PCB technology : Cu - Inv. - Cu
total dissipated power : 12.8 W average heating : 42° C	total dissipated power : 12.8 W average heating : 18.6° C
	

Performance data is for information use only. Manufacturing variability, test conditions, and environmental conditions may affect results.

Test reports

Comprehensive test data has been accumulated during the development of the LTC thermal clamps to support the performance claims. Thermal and retention performance characteristics are fully documented. The following Amphenol laboratory test procedures, reports and results are available upon request :

1 - thermal performance testing
2 - shock testing
3 - vibration testing
4 - life cycling

Engineers who specify the LTC thermal clamps can have complete confidence in the performance characteristics described.

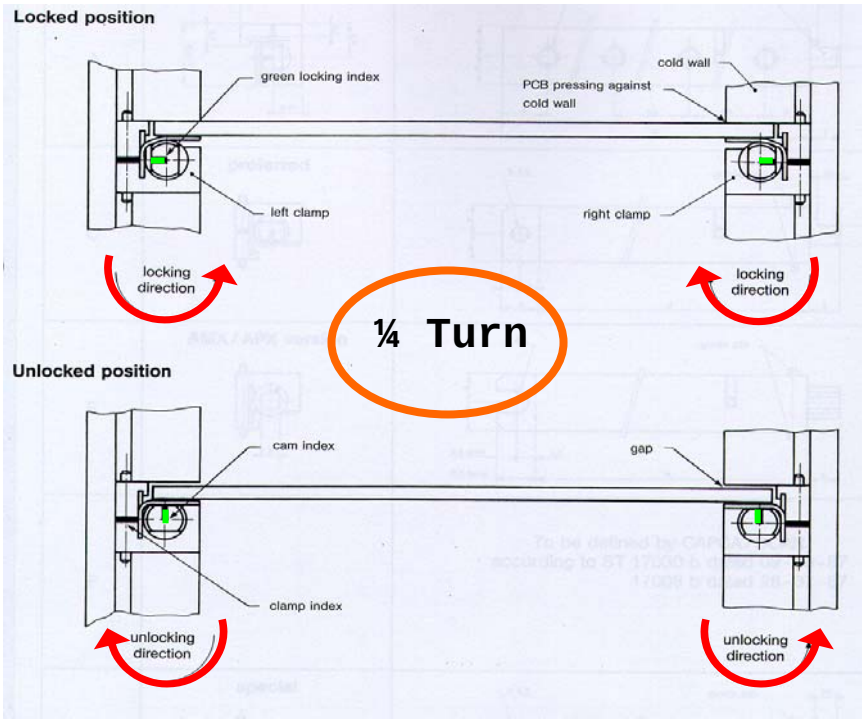
Quarter turn mechanism

Locking and unlocking directions must be carefully followed - no torque wrench required.

The locking and unlocking direction is different for a left and a right LTC thermal clamp as shown :

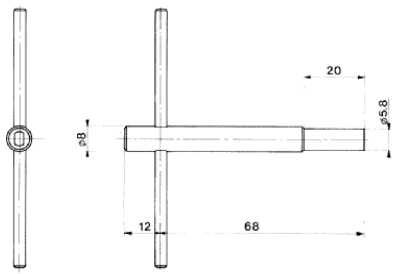
- Locking of a left thermal clamp : counter clockwise
- Locking of a right thermal clamp : clockwise

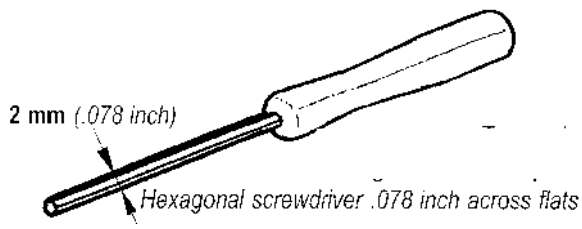
With the help of the color band (at the ultimate extremity of the axis), the user can identify if the boards are locked or not in to place.



Locking / Unlocking Tools

Wrench for axis termination with two flats : **SIHDGTCLE**
Allen wrench (2 mm- *5/64*) : **SIHDGTCRE**





Benefits of this design for a box mount version

- The pieces are kept together (only 2 components) avoiding any disassembly of the thermal clamps during shocks, bumps and vibrations.
- Very easy to use : locking or unlocking through a quarter turn.
- Torque wrench not required.
- Space saving design allowing to maximize the volume of the cold wall.
- 500 cycles without wear of the axis (stainless steel rod/cam).
- Visual checking if it is locked or unlocked (color band on rod/cam).

Installation information

Some dimensions to be used for the machining of the cold wall are available - Figure 3. Please consult Amphenol for details.

The design of the cold wall integrates a groove to keep the thermal clamp in position for the X and Y axis.

The retention of the thermal clamp is ensured in the axis Z through a particular form (see detail A) at its extremity.

The thermal clamp is locked or unlocked in a quarter turn and the end of the cycle is both visual (color band on the rod/cam) and sensitive.

An additional stoppage device of the locking or unlocking cycle can be easily realised through the specific design of the cold wall. In this case, the locking/unlocking tool blocks itself on the cold wall. This system is only used for particular applications (See Figure 1, 2 and detail A).

Figure 1

Cold wall equiped with an additional stoppage device

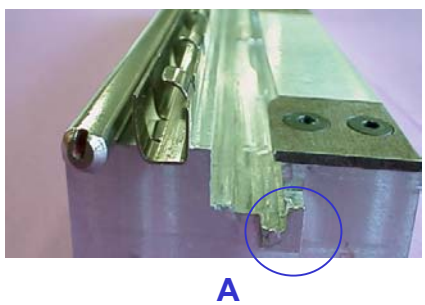
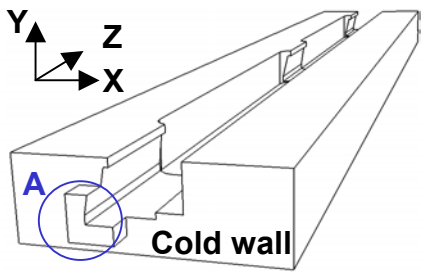
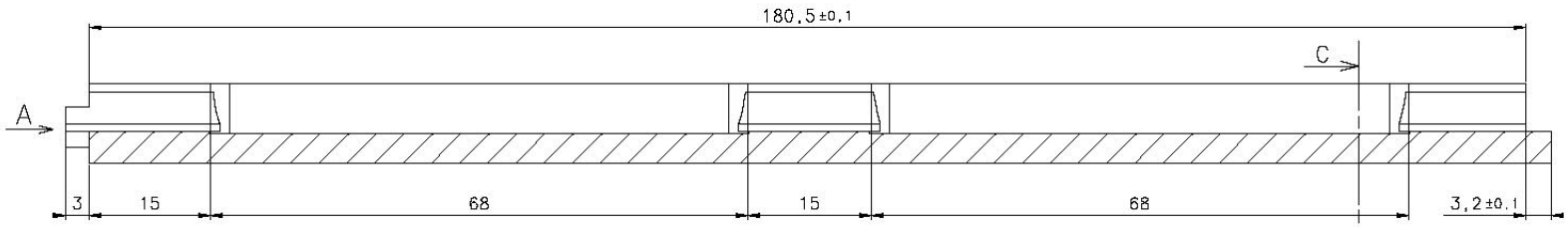
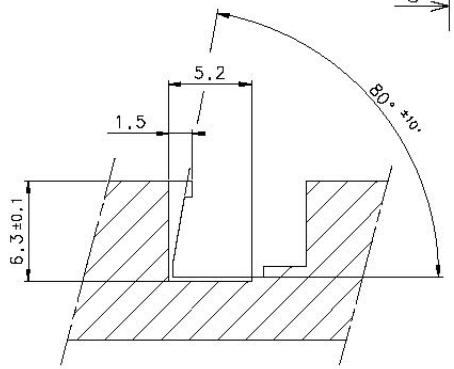


Figure 2

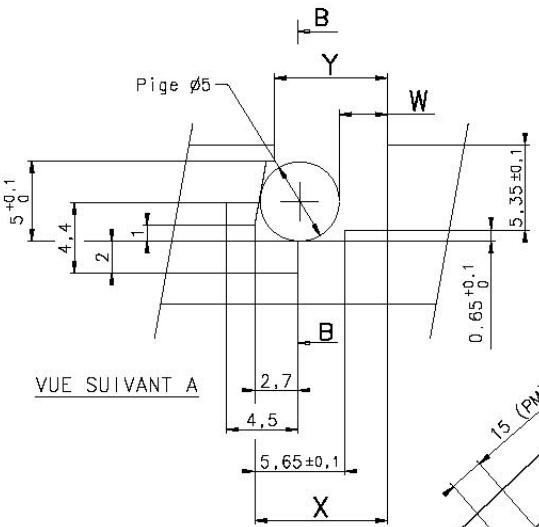




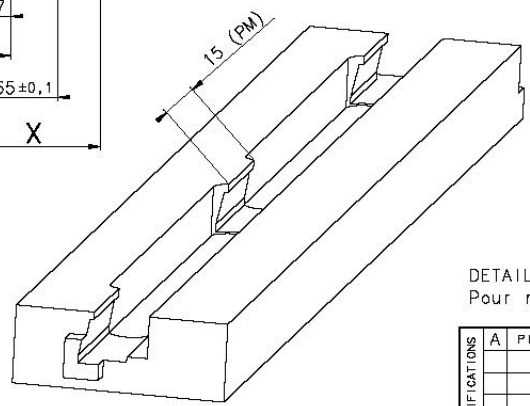
COUPE BB



COUPE CC



VUE SUIVANT A



Epaisseur du drain	W ±0.05	X ±0.03	Y ±0.1
2.5	3	8.3	7.1
1.6	2.1	7.4	6.2
1.2	1.7	7	5.8
0.8	1.3	6.6	5.4

DETAIL D'USINAGE DES PLAQUES FROIDE TAILLE 180
Pour ressort de glissière doit

MODIFICATIONS					
A	Plan originel	ECHELLE	Amphenol Socapex	DESSIN: GIMENES LE:06.12.01	
		4		TECHNIQUE:	
			BP 29 - 74311 THYEZ CEDEX	A	
				169-PLC-393-00	1/1

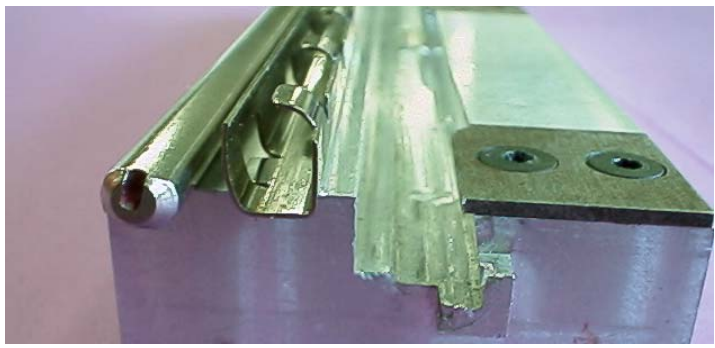
Specific installation guidelines for a box mount version

1) Choose Series LTC thermal clamp corresponding to the cold wall side to equip (left or right).
2) Series LTC thermal clamps are delivered with the axis (rod/cam) partially installed in the body/spring. Remove completely the body/spring. (Pictures 1 and 2).
3) Put the body/spring into position in the pre-machined groove of the cold wall and ensure proper direction. Push at each extremity and in the middle of the body/spring with a standard screw driver to lock it in to place. (Picture 3)
5) Insert the axis (rod/cam) into the body/spring with the color band in the direction of the board location until it locks itself into position.
6) Repeat the same steps for the second cold wall.

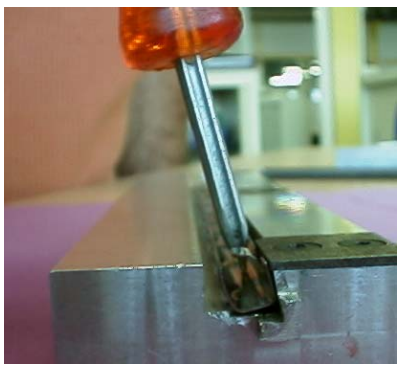
For brazed application of the thermal clamps, please consult Amphenol.

1

2



3



4

Part Number Code

Series : Lightened Thermal Clamp	**LTC**	**D**	**M**	**80**	**N**	**B**	**-**
Side of equipment : Left : G Right : D							
Type of axis termination : With tw o flats: M (Standard) For allen w rench : E (Special)							
Length : In mm, every 20 mm - xxx in incremental minimum 40 mm (xxx in) to a maximum of 300 mm (xxx in)							
Finish : Nickel : N (Standard)							
Mounting options : Box mounted : B (Generation 2) Board rivet mounted : R (Generation 3)							
Deviation : Blank for normal FXXX (to customer specifications)							

† Additional and specific designs available : please consult Amphenol.

‡ Lighter weight, lower cost and faster delivery than Generation 1.

Technical Assistance

Our engineering team has extensive experience in the packaging of thermal clamps. Modification of standard thermal clamps for special application is possible. If more information is needed concerning the products in this publication, or if you have any special application needs, please contact your nearest Amphenol Sales Office or Amphenol Corporation at the following address:

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We welcome the opportunity of providing you with the assistance needed to solve your thermal management problems.

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