# Multilayer Bonding System

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An innovative multilayer bonding system offers many advantages compared to the existing method currently used in the printed circuit board industry. This new technology, developed by Cedal Equipment, is designed to improve planarity around the bonding area and, at the same time, aims to improve the overall capabilities of the bonding system. In fact, by pin lamination, the layers and the prepreg are positioned in the hot press without being melted first. Consequently, there is a chance of shifting between the layers during the hot press cycle. Using the new bonding system, the book of layers is first registered and the prepreg is already polimerised, avoiding any chance of such shifting.


*Figure 1 – The InduBond 130 multilayer bonding system from Cedal Equipment*

The ideal bonding point of a multilayer book should have the following features:

- allow thermal expansion of the layers when they are heated by the press;
- have no over-thickness compared to the layers (such as rivet heads, resin rings, etc) which disturbs a good pressure distribution;
- have high mechanical strength;
- be made as fast as possible; and
- it should not create limits to the height of layer book.

## The key concept of the new equipment

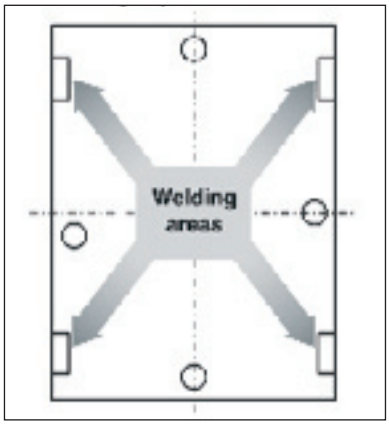
Cedal's world-wide patented inductive-bonding system, InduBond 130 (Figure 1), is based on a new heating concept which does not apply external heating to the multilayers, in order to avoid having to apply high pressure to transfer this heat to the book during the bonding process. In this way, damage to the core sandwich is prevented. In fact a magnetic flow is used to heat the Copper foil throughout the multilayers, melting the prepreg in a very short time. The pressure applied in this case is very light and assures a very flat surface.

The bonding areas of the core are located along the longer sides and they must have the suggested Copper pattern (typically 4 locations to optimise the bonding process of the sandwich - Figure 2) on which the bonding head works (Figure 3). The system can bond any kind of core without any thickness variation around the bonding area itself. Thus better quality of the surface and thickness control during the lamination can be achieved.

## Additional advantages

The productivity of the system can be drastically improved by bonding several books of multilayers simultaneously, with a possible reduction of the overall bonding time to about 50%. Each book is positioned on the template, one on top of the other (with no prepreg in between), and they are held in position by adjustable registration pins. The height available for this

*Figure 2 – Indications for the inner-layer welding area settings*



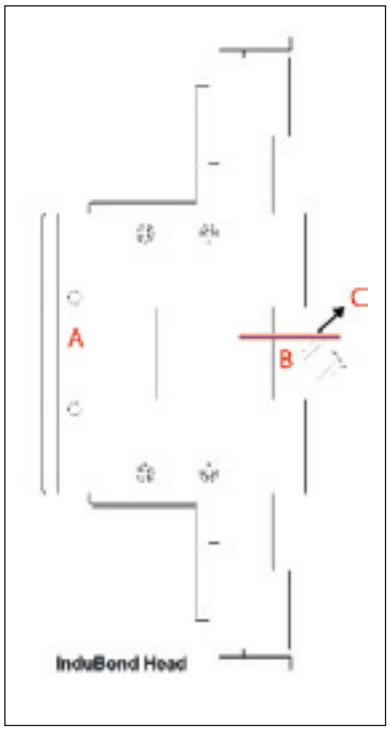



*Figure 3 - Diagram of the InduBond bonding head (a) template (b) and layer (c)*

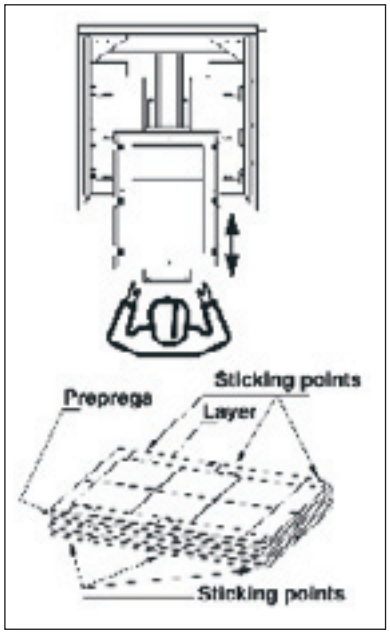



*Figure 4 –Schematic overview of the machine-operator-book set up*

build up is about 12 mm and any type of multilayer can be bonded in this way, provided the total thickness is within the maximum range. Furthermore, there is no limitation to the number of layers.

A reduction in energy consumption is another significant advantage offered by the new machine. In fact,

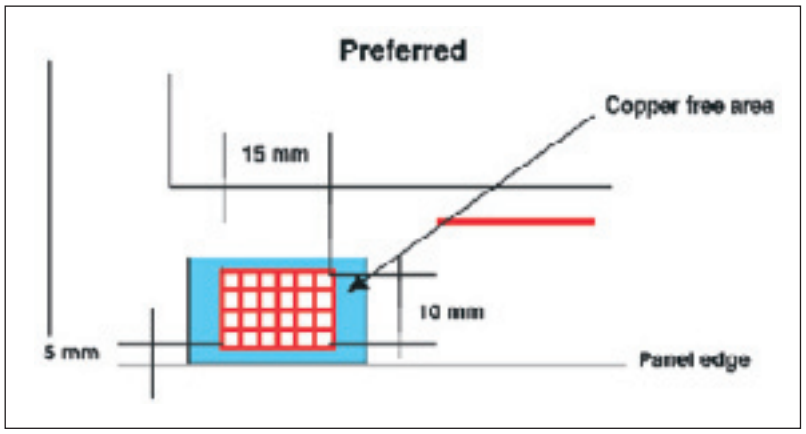



*Figure 5 –Preferred Copper pattern for welding using the inductive bonding machine*

the power requirements of the system are concentrated to the area where the bonding heads are and are strictly limited to the magnetic flow time, thus saving about 70% of current costs of operation.

**The bonding process**

A schematic overview of the machine-book structure and of the operator's position is shown in Figure 4. Book preparation and the sticking action are basic operations of the bonding process. The inner layers require the registration-tooling holes/slots, which are typically made either by a punching or a drilling machine. The Copper pattern must be provided for each welding position on both sides of all inner layers (Figure 5), while the prepreg requires holes allowing for the registration pins to pass through. Of course, parameters such as bonding time, bonding cycle and gripping force have to be set. The temperature rising test is done with a digital thermometer.

In this way, it is possible to manufacture multilayer printed circuit boards with highly controlled thicknesses and other characteristics, also when high-quality or exotic base materials such as those recently introduced into the printed circuit board industry have to be bonded. The system also allows to minimise rejects, energy consumption and overall manufacturing times and costs.

Cedal Equipment has developed the InduBond 130 Multilayer Bonding System to meet both the requirements for ideal bonding points of a multilayer book as well as the need of the advanced multilayer PCB industry to compete on the global market.