# MULTI ZONE HOT BONDER (MZHB)

**Salient Features**

- **7” Colour touch screen (PLC-HMI) controller**
- **2 simultaneous repairs with independent 12-zone temperature control**
- **Menu driven program to create, run & view Cure Cycles (CC)**
- **Online and offline reporting / printing**
- **Hold, modify & continue or extend CC**
- **Power interruption management**
- **Customization requirements are welcome**

**Safeties**

- **Detection of heater-sensor mismatch**
- **Sensor failure management**
- **Protection against sensor faults such as Open, Short or improper contact**
- **Auto-hold if Temp. Gradient or deviation exceeds limit**
- **Over temperature cut-off**
- **Alarm on vacuum failure and other faults**

## Multi Zone Hot Bonder

Repair techniques for aerospace and other advanced composite structures enhances their useful life and saves time and money. Among the various repair techniques, hot bonding is widely acclaimed for its ability to restore the strength close to the original values. It is used for the repair of metal or composites structures. Hot bonding performed using flexible heater blanket and vacuum bag is the most suitable method for in situ repair.

Hot bonding is performed through elevated temperature cured adhesive system, which increases the glass transition temperature and hence the service temperature of the final product. These adhesive systems are sensitive to temperature gradient. The hot bonding equipment currently being imported (none manufactured within India) does not ensure temperature uniformity. To overcome these problems CSIR-NAL has designed and developed a multi zone, portable hot bonding equipment that uses multiple numbers of appropriately placed heater blankets, sensors and a data acquisition device coupled with a novel control algorithm and software. This product can maintain the given temperature profile simultaneously at 12 locations. An image of the NAL’s ‘Multi Zone Hot Bonder’ and its salient features and specifications are given below.

# Specifications

| | |
|---|---|
| Number of temperature zones | 12 independently controlled zones |
| Maximum temperature | 230°C (for silicon heater blankets) |
| Number of Controlled vacuum levels | Two |
| Maximum heater area | 0.9Square Meter (1380sq.inch) per zone |
| Maximum heater power | 6900W (30A/230V) per heater / per zone |
| Total heater power rating | 13.8KW (60A/230V) for 2 zones |
| Number of Temperature sensors | 24 Numbers (J type) |
| Temperature control accuracy | ± 1°C of set value |
| Temperature uniformity | ± 2°C among the 12 zone controlled value |
| Heater – sensor mapping | Any heater to any one or more sensors |
| Temperature control basis | Online selection as the leading, lagging or average of any set of sensors |
| Weight and Size of the MZHB | 20 Kg: 660 x 430 x 330 mm (LxWxH) |


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