**Recommended Press Condition for Multilayer Board Lamination**

**GH-100**

Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 2.5~3.5℃/min. within the melting temperature range of the prepreg resin (80~150℃). Keep the product temperature at 195~205℃ for more than 80 min.

2. The setting temperature of heating plates differs depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. The degree of vacuum shall be below 4.0kPa(30torr). Please start vacuuming before adding heat and pressure for lamination.

4. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.5~3.5 MPa.)

5. We recommend that pressure on material is low pressure of 0.5MPa for resin of prepreg at the initial stage and set the full-pressure, before product temperature become 100℃.

6. Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.

7. By outgas from an inner substrate, the curing property of prepregs may be affected. Please use MCL-HS100 as an inner substrate.

8. When you will use FR-4 laminates as dummy products, it is possible that FR-4 laminates decompose because of high lamination temp. Please use MCL-HS100 or GH-100 for dummy laminates, too.

Recommended Press Conditions

- Vacuum Condition: Under 4.0kPa (30torr)

- Setting temp: 205~215℃ (401~419℉)
  - Hold more than 80min. at 195~205℃ (383~401℉) at product temp.

- Heating rate: 2.5~3.5℃/min (4.5~6.3℉)
  - (80~150℃ (176~302℉))

- Pressure: 2.5~3.5MPa (363~508psi)
  - 0.5~1.0MPa (72.5~145psi)

- Full pressure timing: under 100℃ (212℉)

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
### Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 3.0~4.0°C/min. within the melting temperature range of the prepreg resin (80~150°C). Hold the product temperature above 230°C for more than 100 min.

2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. The degree of vacuum shall be below 4.0kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.

4. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.5~3.5 MPa.)

5. In order to reduce the pressure shock to each part of the laminate, low pressure shall be applied to the material at the initial stage and increase it at the material temperature 100°C, when the resin becomes soft.

6. Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.

7. By cut gas from an inner substrate, the curing property of prepregs may be affected. Please use MCL-E-705G, MCL-E-770G as an inner substrate.

8. When you will use FR-4 laminates as dummy products, it is possible that FR-4 laminates will decompose because of high lamination temp. Please use MCL-E-705G, GEA-705G, MCL-E-770G, GEA-770G for dummy laminates, too.

### Recommended Press Conditions

<table>
<thead>
<tr>
<th>Time (min.)</th>
<th>Temperature (℃)</th>
<th>Pressure (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0~20</td>
<td>100°C</td>
<td>0.5~1.0MPa</td>
</tr>
<tr>
<td>20~60</td>
<td>150°C</td>
<td>0.5~1.0MPa</td>
</tr>
<tr>
<td>60~120</td>
<td>200°C</td>
<td>0.5~1.0MPa</td>
</tr>
<tr>
<td>120~140</td>
<td>250°C</td>
<td>2.5~3.5MPa</td>
</tr>
<tr>
<td>140~160</td>
<td>Setting temp.</td>
<td>2.5~3.5MPa</td>
</tr>
<tr>
<td>160~180</td>
<td>More than 100min over 230°C at product temp.</td>
<td>2.5~3.5MPa</td>
</tr>
<tr>
<td>180~200</td>
<td>Vacuum below 4.0kPa (30torr)</td>
<td>2.5~3.5MPa</td>
</tr>
</tbody>
</table>

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

① Heating rate of the product should be about 3.0～4.0℃/min. within the melting temperature range of the prepreg resin (80～150℃). Hold the product temperature above 230℃ for more than 100 min.

② The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

③ The degree of vacuum shall be below 4.0kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.

④ The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.0～3.0 MPa.)

⑤ In order to reduce the pressure shock to each part of the laminate, low pressure shall be applied to the material at the initial stage and increase it at the material temperature 110～130℃, when the resin becomes soft.

⑥ Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.

⑦ By out gas from an inner substrate, the curing property of prepregs may be affected. Please use MCL-E-770G as an inner substrate.

⑧ When you will use FR-4 laminates as dummy products, it is possible that FR-4 laminates will decompose because of high lamination temp. Please use MCL-E-770G or GEA-770G for dummy laminates, too.

Recommended Press Conditions

The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 3.0~4.0℃/min. within the melting temperature range of the prepreg resin (80~130℃). Hold the product temperature above 230℃ for more than 100 min.

2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. The degree of vacuum shall be below 4.0kPa(30torr). Please start the vacuuming before adding heat and pressure for lamination.

4. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.5~3.5 MPa.)

5. In order to reduce the pressure shock to each part of the laminate, low pressure shall be applied to the material at the initial stage and increase it at the material temperature 110~130℃, when the resin becomes soft.

6. Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.

7. By out gas from an inner substrate, the curing property of prepregs may be affected. Please use MCL-E-705G as an inner substrate.

8. When you will use FR-4 laminates as dummy products, it is possible that FR-4 laminates will decompose because of high lamination temp. Please use MCL-E-705G or GEA-705G for dummy laminates, too.

Recommended Press Conditions

Vacuum below 4.0kPa (30torr)

- Setting temp.
- more than 100min over 230℃ at product temp.
- 120min
- temp. in laminate
- heating rate 3.0~4.0℃/min (80~130℃)
- Pressure:2.5~3.5MPa
- up to holding pressure at product Temp. (110~130℃) in laminate
- 0.5~1.0MPa

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 2.0～3.0℃/min. within the melting temperature range of the prepreg resin (80～150℃). Hold the product temperature above 220℃ for more than 80 min.

2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. The degree of vacuum shall be below 4.0kPa(30torr). Please start the vacuuming before adding heat and pressure for lamination.

4. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.0～3.0 MPa.)

5. In order to reduce the pressure shock to each part of the laminate, low pressure shall be applied to the material at the initial stage and increase it at the material temperature 110～130℃, when the resin becomes soft.

6. Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.

7. By out gas from an inner substrate, the curing property of prepregs may be affected. Please use MCL-E-700G Type(R) as an inner substrate.

8. When you will use FR-4 laminates as dummy products, it is possible that FR-4 laminates will decompose because of high lamination temp. Please use MCL-E-700G Type(R) or GEA-700G for dummy laminates, too.

Recommended Press Conditions

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be 1.0~2.5℃/min. within the melting temperature range of the prepreg resin (80~130℃). Hold the product temperature above 170℃ for more than 40 min.
2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.
3. The degree of vacuum shall be below 4.0 kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.
4. The time for vacuuming shall not be longer than the end of molding process (When resin flow stops). If the vacuuming is continued until the end of the lamination process, flowed resin becomes fragile due to bubble remain. Fragments of it may become a cause of dent. Also small bubbles (blur) may occur in the edge of the product.
5. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.0~3.0 MPa.)
6. Inner pattern filling capability of prepreg may change according to inner pattern and thickness design.
7. In order to reduce the pressure shock to the product, it is recommended to set initial pressure low, 0.5 MPa with 90~110℃ product temperature at the initial stage.

Recommended Press Conditions

- ※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

1. Heating rate of the product measured from 80~130°C should be between 2.5 and 4.0°C/minutes. The heating time when the product temperature is 185°C or higher should be 60 minutes or longer.

2. Setting temperature of heating plates differs depending on the heating rate of the product and the type of cushions used, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. Vacuuming should be started before heating and pressing the product and degree of vacuum should be below 4.0kPa (30 torr).

4. Vacuuming should not be continued until the end of molding process. If the vacuuming is continued until the end of the lamination process, bubbles might remain in the flowed prepreg resin. As a result, the flowed resin might become fragile and break into fragments. The fragments of resin scattered on the product might cause dents or defaults on the surface of the product. Also fine bubbles and blur might occur at the edge of the product, if the vacuuming is continued till the end.

5. Lamination pressure should be thoroughly examined, because it might influence the thickness of the product and the rate of dimensional change of the product.

(Standard pressure for vacuum pressing is 3.0~4.0MPa.)

6. To lessen the pressure shock of the product, two-stage press is recommended. The lamination pressure at the first stage recommended is 0.5 MPa.

7. In case of Hot start press, the full pressure timing should be shifted earlier (like the broken line) than Cold start press. Recommended full pressure timing range is 70~90°C of actual laminate temperature.

Recommended Press Conditions

*The standard heating profile is for general reference only. Conditions may change according to metal plate thickness, number of cushion layers, number of MLB lay-ups, etc.
Precautions for Lamination of Multilayer Board

① Heating rate of the product measured from 80~130℃ should be between 2.0~3.0℃/minutes. The heating time when the product temperature is 175℃ or higher should be 60 minutes or longer.

② Setting temperature of heating plates differs depending on the heating rate of the product and the type of cushions used, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

③ Vacuuming should be started before heating and pressing the product and degree of vacuum should be below 4.0kPa(30torr).

④ Vacuuming should not be continued until the end of molding process. If the vacuuming is continued until the end of the lamination process, bubbles might remain in the flowed prepreg resin. As a result, the flowed resin might become fragile and break into fragments. The fragments of resin scattered on the product might cause dents or defaults on the surface of the product. Also fine bubbles and blur might occur at the edge of the product, if the vacuuming is continued till the end.

⑤ Lamination pressure should be thoroughly examined, because it might influence the thickness of the product and the rate of dimensional change of the product. (Standard pressure for vacuum pressing is 2.5~3.0MPa.)

⑥ To lessen the pressure shock of the product, two-stage press is recommended. The lamination pressure at the first stage recommended is 0.5MPa.

⑦ In case hot press starts, the full pressure timing should be shifted earlier (like the broken line) than cold start press. Recommended full pressure timing range is under 50~90℃ of actual laminate temperature.

Recommended Press Conditions

*The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.*
Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 1.5~3.0°C/min. within the melting temperature range of the prepreg resin (80~130°C).
2. Hold the product temperature above 170°C for more than 40 min.
3. For high layer MLBs requiring the high Tg and higher through hole reliability, please set the product temperature higher than the standard temperature (above 185°C for more than 40 min).
4. Vacuuming should be started before heating and pressing the product and degree of vacuum shall be below 30torr (0.58 psi). The time for vacuuming is continued until the end of molding process (when resin flow stops).
5. The initial pressure is 0.5 MPa, and step up pressure to 2.5~3.0 MPa before minimum melt viscosity (100~120°C).
6. In case of Hot start press, the full pressure timing should be shifted earlier (like the broken line) than Cold start press. Recommended full pressure timing range is 100~120°C of actual laminate temperature.

Recommended Press Conditions

- Heating Rate: 1.5~3.0°C/min (80~130°C)
- Pressure: 2.5~3.0 MPa (362~435 psi)

Vacuum: below 4.0 kPa (30 torr)

Maximum Setting Temp: 190°C (374°F)

Start pressure: 120~130°C (248~266°F)

Heating Rate: 1.5~3.0°C/min (80~130°C)

Pressure: 2.5~3.0 MPa (362~435 psi)

In case hot press starts, the full pressure timing should be shifted earlier (like the broken line) than Cold start press. Recommended full pressure timing range is 100~120°C of actual laminate temperature.

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
GWA-900G/GWA-910G

- **Precautions for Outer-layer Copper Foil**
  There is the case that Outer-layer peel strength lowers by a kind of the copper foil. Copperfoil should be examined enough.

- **Precautions for Lamination of Multilayer Board**
  ① Heating rate of the product should be about 3.0~4.0℃/min. within the melting temperature range of the prepreg resin (80℃~).
  ② The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.
  ③ The degree of vacuum shall be below 4.0 kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.
  ④ The time for vacuuming shall not be longer than the end of molding process. If the vacuuming is continued until the end of the lamination process, flowed resin becomes fragile due to bubble remain. Fragments of it may become a cause of dent. Also small bubbles (blur) may occur in the edge of the product.
  ⑤ The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.5 ~4.0 MPa at vacuum pressing.)
  ⑥ We recommend that pressure on material is the low pressure of 0.5 MPa for resin of prepreg at the initial stage and material temperature pressurizes it before 80℃. The starting pressure is 0.5MPa, and set the full-pressure, before product temperature become 100℃.

- **Recommended Press Conditions**

<table>
<thead>
<tr>
<th>Temperature (℃)</th>
<th>Pressure (MPa)</th>
<th>Time (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>0.5</td>
<td>30</td>
</tr>
<tr>
<td>100</td>
<td>2.5</td>
<td>60</td>
</tr>
<tr>
<td>150</td>
<td>3.0</td>
<td>90</td>
</tr>
<tr>
<td>200</td>
<td>3.5</td>
<td>120</td>
</tr>
<tr>
<td>250</td>
<td>4.0</td>
<td>150</td>
</tr>
<tr>
<td>300</td>
<td>4.5</td>
<td>180</td>
</tr>
<tr>
<td>350</td>
<td>5.0</td>
<td>210</td>
</tr>
<tr>
<td>400</td>
<td>5.5</td>
<td>240</td>
</tr>
</tbody>
</table>

Vacuum: below 4.0kPa (30torr)

Setting Temperature 200-220℃ (392~428ºF)
Hold more than 80 min. at 195~205℃ (383~401ºF) at product temp.
Pressure : 3.0MPa (427psi)

Full Pressure timing : under 100℃ (212ºF)

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
GHA-679G Type(S)

Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 3.5~4.5℃/min. within the melting temperature range of the prepreg resin. Hold the product temperature above 210℃ for more than 60 min.

2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. The degree of vacuum shall be below 4.0 kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.

4. The time for vacuuming shall not be longer than the end of molding process. If the vacuuming is continued until the end of the lamination process, flowed resin becomes fragile due to bubble remain. Fragments of it may become a cause of dent. Also small bubbles (blur) may occur in the edge of the product.

5. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (Standard pressure is 2.5~3.5 MPa at vacuum pressing.)

6. In order to reduce pressure shock to the product, it is recommended to set initial pressure low, 0.5 MPa, although one-step pressure is basically no problem.

7. In case of Hot start press, the full pressure timing should be shifted earlier (like the broken line) than Cold start press. Recommended full pressure timing range is 70~90℃ of actual laminate temperate.

Recommended Press Conditions

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.
Precautions for Lamination of Multilayer Board

1. Heating rate of the product should be about 1.5~2.5℃/min. within the melting temperature range of the prepreg resin (80~130℃). Hold the product temperature above 170℃ for more than 40 min.

2. The setting temperature of the heating plates differs, depending on the heating rate or cushions, so it is necessary to adjust the temperature in order to satisfy the above condition ①.

3. For high Tg (over 200℃) MLB, please set the temperature of the heating plates higher than the standard temperature.

4. The degree of vacuum shall be below 4.0 kPa (30torr). Please start the vacuuming before adding heat and pressure for lamination.

5. The time for vacuuming shall not be longer than the end of molding process. If the vacuuming is continued until the end of the lamination process, flowed resin becomes fragile due to bubble remain. Fragments of it may become a cause of dent. Also small bubbles (blur) may occur in the edge of the product.

6. The pressure of the product may influence molding property, thickness between layers or dimensional change, so it is necessary to examine sufficiently to decide the condition. (standard pressure is 2.5~3.0 MPa.)

7. In order to reduce pressure shock to the product, it is recommended to set initial pressure low, 0.5 MPa for 20~30 min., although one-step pressure is basically no problem.

Recommended Press Conditions

For Standard Multilayer Application

- Vacuum: below 4.0 kPa (30torr)
- Setting Temperature: 175~180℃
- Product Temperature
- Temperature of Heating Plate
- Heating Rate: 1.5~2.5℃/min.
- Pressure: 2.5~3.0 MPa

For Multilayer Application Requiring Tg of More than 200℃

- Vacuum: below 4.0 kPa (30torr)
- Setting Temperature: 200~215℃
- Product Temperature
- Temperature of Heating Plate
- Heating Rate: 1.5~2.5℃/min.
- Pressure: 2.5~3.0 MPa

※The standard heating profile is for general reference only. Conditions may change depending on metal plate thickness, number of cushion layers, number of MLB lay-up, etc.