

Thermoforming KYDEX® Thermoplastic Sheet

For information applicable to KYDEX® FST please refer to 300 series technical briefs.

TB - 140-B

Introduction

KYDEX® sheet has excellent forming properties, which results in uniform wall thicknesses and crisp detail. KYDEX® sheet forms to deep draws with low forces when heated to the upper end of the forming temperature range. Unlike many other thermoforming sheets, KYDEX® sheet has unusually high resistance to hot tearing.

General Guidelines

- KYDEX® sheet will form differently than other thermoplastic materials.
- KYDEX® sheet is more consistent than other thermoplastics, resulting in fewer rejects.
- KYDEX® sheet will give better detail than other thermoplastics.
- KYDEX® sheet can be vacuum, drape, and pressure formed. These methods result in increased levels of detail.

Forming Guidelines

- Oven temperatures should be set differently than the settings used for ABS or FR-ABS.
- Typical heater settings (percentage timers) are 30% – 50% top heaters and 50% - 70% bottom heaters.
- The most frequent problem is trying to heat the sheet too quickly, particularly on the primary surface.
- Cycle times will vary depending on the oven conditions and grade of KYDEX® sheet being formed.
- When forming KYDEX® sheet, it is better to rely on the sheet appearance during heating than on fixed cycle times.
- Forming temperatures – Guidelines: (Sheet should not exceed 204°C (400°F).

165 - 177°C (330 - 350°F) for < 1.50mm (0.060")
 182 - 196°C (360 - 385°F) for 1.50mm to 3.20mm (0.060" to 0.125")
 196 - 204°C (385 - 400°F) for > 3.20mm (0.125")

- Ideally the core sheet temperature should be within 10°F of the surface temperature.

Additional Guidelines

Drying is generally not required except in high humidity conditions. If the material needs to be dried, it should be dried at 68°C (155°F) or about 15° below the products HDT for 10 hours for 2.00mm (0.080"), 16 hours for 3.20mm (0.125") or 24 hours for 6.40mm (0.250") thickness

Two sided (sandwich) heaters are recommended above 2.00mm (0.080") nominal thickness.

Sheet Appearance During Heating

As KYDEX® sheet is heated, the inherent stresses in the sheet will relax.

- **Stage I:** The heating is marked by wide undulations and softening
- **Stage II:** The material will start to form small ripples (known as oil canning).
- **Stage III:** The material will start to smooth out and sag (KYDEX® sheet will generally sag less than other thermoplastic due to its high melt strength).
- **Stage IV:** The ripples will have smoothed out indicating that most stresses have been removed. 10 to 30 seconds afterwards the sheet is ready to form.

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Thermoforming Machine Manufacturers

If you can NOT achieve Stage IV before the sheet blisters and /or smokes excessively, IT IS BEING HEATED TOO QUICKLY. Cut back on the heat and increase the dwell (cycle) time.

Thermolabels or Infrared (IR) pyrometer is ideal for determining sheet surface temperature. You should achieve (but not exceed) proper forming temperature at Stage IV.

In summary, the main thing to look for when thermoforming KYDEX® sheet, is the uniform sag and lack of rippling. At this point, the KYDEX sheet is ready to form.

Design Criteria:

- Minimum radius (vacuum forming) is generally equal to the nominal thickness (i.e. 0.71mm (0.028")) thickness.
- Mold Shrinkage for male molds is 0.4 - 0.6%; female molds, 0.5 - 0.7%; female pressure-forming molds 0.40 - 0.50%.

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