PROCESSING GUIDELINE

UDMAX® PA6

Continuous Fiber Reinforced Thermoplastic Laminate

> **Purpose** Recommended starting conditions for heating, transfer, press forming and cooling of UDMAX® PA6 continuous-fiber laminates. Final settings should be validated for the specific laminate construction, part geometry and production equipment.

QUICK PROCESS WINDOW

HEATING	TRANSFER	FORMING PRESSURE	COOLING	DEMOLDING
240-280 °C	Within seconds	≥ 5 bar / 70 psi	20-60 s	~100 °C or below

1. General Information

UDMAX® PA6 laminates are continuous fiber reinforced thermoplastic composite materials developed for applications requiring a high stiffness-to-weight and strength-to-weight ratio together with efficient thermoforming capability.

The PA6 thermoplastic matrix can be reheated and formed within relatively short cycle times. Processing conditions are influenced by laminate thickness, reinforcement architecture, part geometry, tooling concept and required surface quality.

2. Storage and Handling

PA6 is hygroscopic and can absorb moisture from the surrounding environment. Controlled storage and handling help maintain stable processing behavior and consistent part quality.

- Store laminates in their original sealed packaging in a clean, dry environment.
- Protect the material from water, condensation and prolonged exposure to high humidity.
- Before opening the package, allow cold material to reach the temperature of the processing area.
- Reseal unused material after opening and minimize unnecessary exposure to ambient humidity.
- Use suitable dust extraction and personal protective equipment during cutting, milling or drilling.

3. Heating

Uniform through-thickness heating is essential for good formability and consolidation. The objective is to bring the PA6 matrix into an appropriate molten processing window while limiting unnecessary thermal exposure.

- Typical laminate temperature: 240-280 °C.
- As an initial guideline, heat approximately 20-60 °C above the matrix melting temperature.
- Medium-wave infrared heating is generally suitable for fast and controlled heating.
- For laminates around 1 mm thickness or greater, two-sided heating is recommended to improve temperature uniformity.
- Avoid excessive heating time, local hot spots and unnecessarily high temperature. Brownish discoloration or visible surface degradation may indicate excessive thermal exposure.

4. Transfer to the Forming Tool

The heated laminate begins to cool as soon as it leaves the heating system. Transfer should therefore be fast, repeatable and protected from uncontrolled air flow.

- Keep the distance between the heater and press as short as practical.
- Transfer the laminate within a few seconds whenever possible.
- Minimize drafts and cold-air circulation along the transfer path.
- Accurate positioning in the tool is important for repeatable material flow and part geometry.
- Automated handling is recommended for high-volume production or whenever process repeatability is critical.

5. Press Forming

After transfer, the tool should close in a controlled and repeatable sequence. Sufficient pressure is required to form the laminate, restore consolidation and reproduce the intended component geometry.

FORMING PRESSURE	≥ 5 bar (approximately 70 psi)

Actual forming pressure depends on part geometry, laminate thickness, reinforcement configuration, draw depth, tooling design, consolidation requirement and surface-quality target.

Press closing speed should be optimized for the component. A relatively fast approach can reduce heat loss, while the final closing phase may be slowed to support controlled material flow and reduce wrinkling.

Local clamping or tailored pressure control can be useful for deep draws, ribs and geometrically complex regions. Clamping position and force should be established through part-specific trials.

Multi-layer laminates may temporarily increase in thickness during heating. Correct tool design and sufficient forming pressure allow the stack to be reconsolidated during molding.

6. Cooling and Demolding

Cooling should preferably take place while the component remains under controlled pressure in the closed tool. Homogeneous pressure and temperature distribution support dimensional stability, surface quality and consistent consolidation.

- Recommended demolding temperature: approximately 100 °C or below.
- Typical cooling time: approximately 20-60 seconds.

- Actual cooling time depends on part thickness, tool temperature, mold material, cooling-channel design, component geometry and laminate construction.
- Uniform mold cooling helps minimize warpage and dimensional variation.
- The component should have sufficient stiffness and dimensional stability before the mold is opened.
- For demanding aesthetic surfaces, rapid heat/cool tooling may be considered to improve surface replication and process control.

7. Recommended Initial Processing Window

PROCESS PARAMETER	RECOMMENDED STARTING POINT
Material	UDMAX® PA6 continuous fiber reinforced laminate
Heating temperature	240-280 °C
Temperature above matrix melting point	Approx. 20-60 °C
Heating method	Medium-wave infrared recommended
Heating direction	Two-sided heating recommended for laminates around ≥1 mm
Transfer time	As short as possible; typically within a few seconds
Forming pressure	≥5 bar / approximately 70 psi
Cooling under pressure	Recommended
Typical cooling time	20-60 seconds
Demolding temperature	Approximately 100 °C or below

8. Process Optimization

The values in this guideline are intended as initial processing recommendations. Final serial-production parameters should be validated with the selected UDMAX® laminate grade, actual tool, heating system and press.

Stable production is typically achieved by controlling six key variables: uniform laminate temperature, minimal transfer time, controlled tool closing, adequate consolidation pressure, uniform cooling and appropriate demolding temperature.

IMPORTANT TECHNICAL NOTE
The information in this document is provided as a practical processing guide. Optimum settings may vary with laminate architecture, fiber orientation, thickness, equipment, tooling and component design. Processing trials and part-specific validation are recommended before final production parameters are released.

UDMAX® TAPES

Continuous Fiber Reinforced Thermoplastic Composites