



Technologies for Surfaces of Leather / Artificial Leather

Plastics
Technologies
in Motion.

High-quality vehicle interiors are characterized by a sophisticated design and the use of first-class materials that have to be perfectly processed and adapted. Leather surfaces are no longer exclusively used for the premium segment, but increasingly applied in vehicle interiors of the high-volume and medium-priced segment. As a natural material, leather presents tough processing challenges. The range of variants, the quality requirements and numerous project-specific parameters demand ingenious manufacturing solutions that can only be implemented with extensive experience and solid technical and process know-how. FRIMO's tooling and equipment technology in leather processing is leading on the market.

Perfect seam positioning as well as the joining of the leather/artificial leather with the soft pad are the main objectives. FRIMO's tooling and equipment range from manual laminating – leather directly onto the substrate – to direct back-foaming processes. They lead to an economically efficient production ensuring reproducible and durable quality of components. FRIMO offers concepts that enable the customer to process different materials, e.g. artificial and genuine leather, in one tool.

Leather and soft touch

Besides the possibility to laminate leather directly onto a substrate, there are four main ways to create soft touch under the leather:

- Rigid laminating
- Partly soft or soft-mount laminating
- "Indirectly" back-foamed
- Directly back-foamed

These variants are supplemented by a number of sub-variants and possible combinations.



Leather, PU directly back-foamed



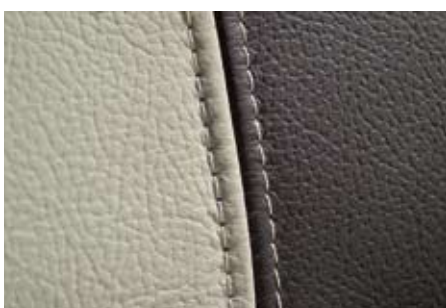
Example door panel



Leather, PU directly back-foamed



Example instrument panel



Sewn covering, artificial leather



Sewn covering, back-foamed



Skin-type softlayer for softtouch

Know-how leather laminating and back-foaming

Layer compositions of leather-laminated interior components

Variant	Rigid laminating
Surface	Leather / Artificial leather
Intermediate Layer / Sandwich	None



Variant	Semi-rigid or soft / soft-mount laminating
Surface	Leather / Artificial leather
Intermediate Layer / Sandwich	Variants: 1) Intermediate layer partly glued on / foamblock inlay 2) Substrate front-foamed 3) Foam insert on substrate 4) Leather back-foamed 5) Substrate partly or completely laminated with skin-type softlayer 6) Substrate pre-laminated with foil



Variant	"Indirectly" back-foamed and laminated
Surface	Leather / Artificial leather
Intermediate Layer / Sandwich	<ul style="list-style-type: none"> - Thermoformed spray or slush skin, back-foamed - Skins with partially reduced thickness



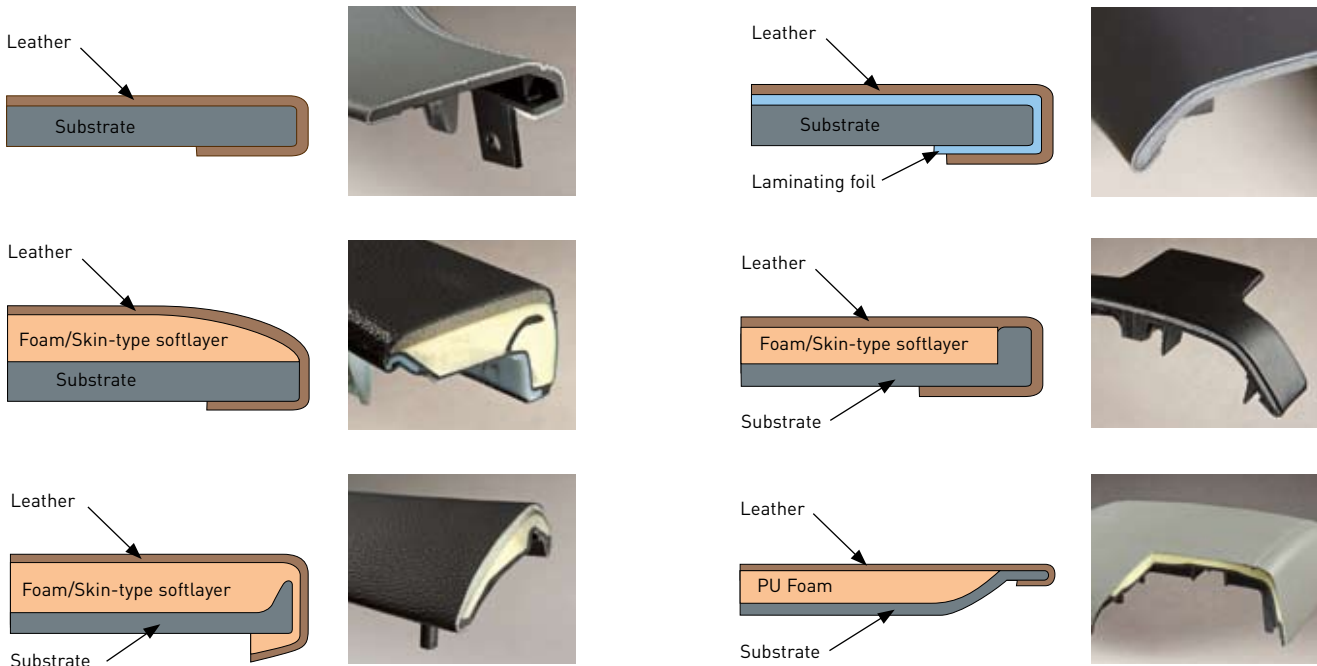
Variant	"Directly" back-foamed
Surface	Leather / Artificial leather
Intermediate Layer / Sandwich	<ul style="list-style-type: none"> - Leather patchwork with sealed seams - Directly put into foam mold - PU back-foamed



All substrates injection molded, press formed or PU foamed

Transitions soft-hard

The perfect compliancy of the surface geometry as well as the component interface geometry according to the CAD data base require detailed expertise in the design of soft-hard transition areas. These have to be designed in close conjunction with the respective type of softness and the required component interface geometry. The following overview shows typical concepts for soft-hard transitions.



Leather and adhesive systems

There are four main types of adhesive systems, as well as numerous sub-variants, which are directly linked to laminating techniques. This creates many combination options that can be well adapted to customer demands. FRIMO offers support with information and decision-making tools.

	Contact adhesive water-based / solvent-based	Double-sided tape on component	Two-component PU, water-based (reactive system, dispersion)	Hot melt (PU reactive)
Glued material / Side	Both sides	Leather	Both sides	On substrate
Type of adhesive application	Spray or brush application	Manual	Spray or brush application	Bead application (e.g. by robots)
Activation and adhesive reaction	By pressure, heat activation beneficial	By pressure	By pressure and heat, activation temperature 55° - 65°C	By pressure and cooling, activation temperature 60° - 80°C
Typical cycle times	Approx. 1 - 4 min.	Approx. 1 - 4 min.	- Membrane laminating approx. 3-5 min. - Press laminating without intermediate layer approx. 1 min., with intermediate layer up to 2 min.	Approx. 1 min.
Applications	- Simple geometries - Short cycle time	- Small quantities - Simple geometries - No adhesive equipment	Complex geometry	Generally only in edgefolding areas

Processes and equipment technology

Process steps in leather laminating

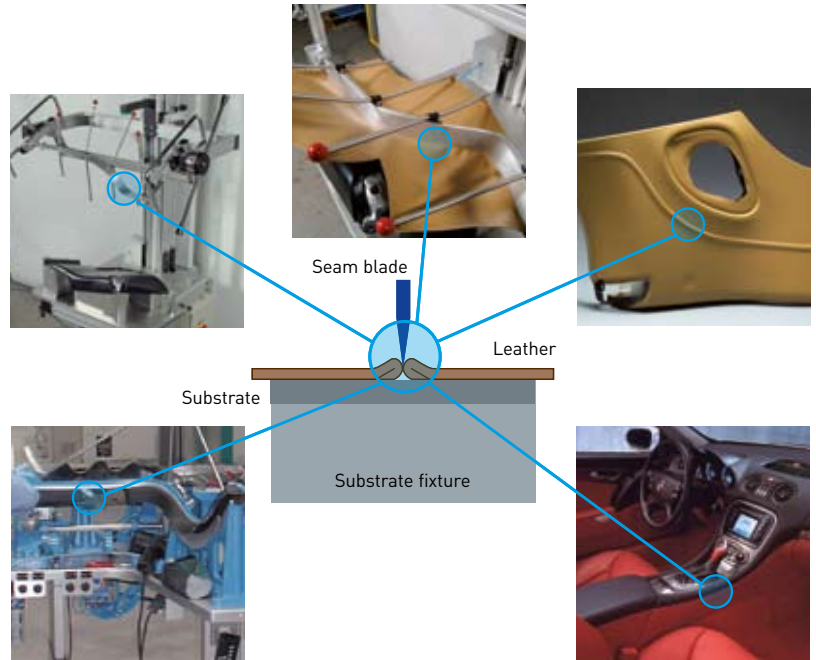
Leather laminating generally requires the following process steps:

- 1 Planning/fabrication of the sewn covering
- 2 Adhesive application
- 3 Pre-fixing of the soft layer (foam layer, layer fabrics)
- 4 Reapplication of adhesive
- 5 Positioning, incl. pre-fixing of the seams
- 6 Laminating
 - Membrane laminating
 - Press laminating, often with integrated edgelifting process

Steps 3 and 4 are not necessary when the soft layer is already applied to the decor, as well as in the case of rigid laminating.

Leather and seam positioning systems

The positioning and orientation of the functional and decorative seams are decisive factors that ultimately affect the quality of sewn 3D covered components. FRIMO equipment achieves this with high process reliability and reproducible precision.



Processes and equipment

1) Manual laminating

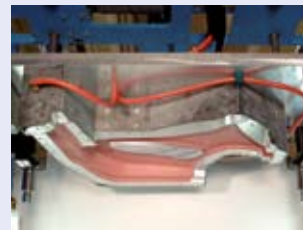


Component on positioning fixtures

2) Semi-automatic press laminating



Membrane laminating (2D membrane)



Membrane laminating (3D membrane), upper tool



Press laminating, stiff molds



Membrane laminating (3D membrane), lower tool



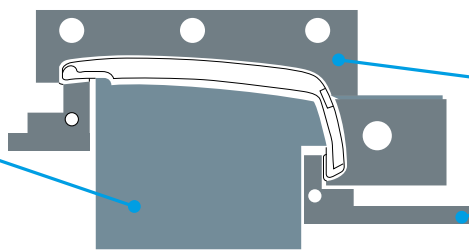
Press laminating with edgelifting, combi tool

Cost-saving tooling and equipment technology for leather laminating

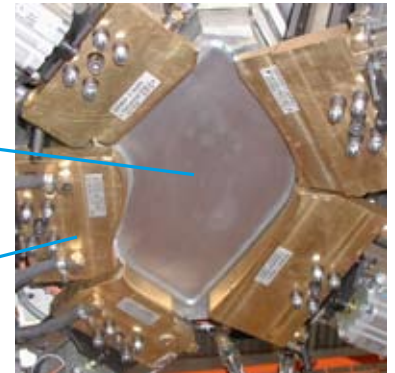
Manufacturing systems with high process reliability enable our customers to achieve the highest level of component quality. Ranging from the most simple membrane laminating unit with tooling right through to the complex combination tools by means of which an instrument panel, for example, can be laminated and edgfolded simultaneously. Here FRIMO can offer all variants of tailor-made customer solutions. A small selection of these is shown in the photos below:



Lower tool



Press laminating tool



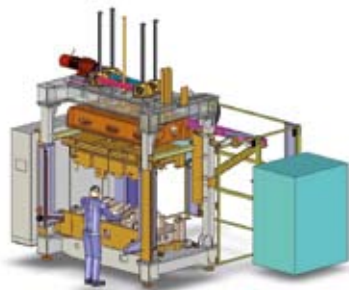
Upper tool



Double press laminating unit (electric motor driven)



Sliding table double press laminating unit (pneumatic) with fast tool change



Single station press laminating unit



Double press laminating unit

Invisible airbag scoring for leather components

With FRIMO leather scoring, the skin is weakened by the use of a rotating circular knife. This patented process guarantees a highly accurate and odorless result with the shortest possible cycle times.



FRIMO technologies – The leader in leather surfaces

Reference projects

- BMW 3-series – Center door insert: PU Back-foaming, Trimming, Edgefolding
- BMW 7-series – Headliner: Laminating
- BMW 7-series – Instrument panel: PU Direct Back-foaming, Trimming, Edgefolding
- BMW 5-series – Center door insert: Laminating, Edgefolding
- Rolls Royce – “Total Interior”: Laminating, Edgefolding
- DC A-class – Instrument panel / Center console: Laminating, Edgefolding
- DC SL-class – “Total Interior”: Laminating, Edgefolding
- DC E-class – Door armrest covering: Laminating, Edgefolding
- DC E-class coupe – Door panel and Instrument panel: Laminating, Edgefolding
- DC S-class – Door panel and Instrument panel: Laminating, Edgefolding
- Saab 440 – Center door insert: Laminating, Edgefolding
- Porsche 911 and Boxster – “Total Interior”: Laminating, Edgefolding
- Jaguar X150 – Door panel, Instrument panel and Center console: Laminating, Edgefolding
- Jaguar X250 – Door panel, Instrument panel and Center console: Laminating, Edgefolding
- Cadillac CTS – Instrument panel: Press Laminating, Edgefolding
- Cadillac SRX – Instrument panel and Center console: Press Laminating, Edgefolding
- Corvette – Instrument panel: Press Laminating, Edgefolding



Benefits

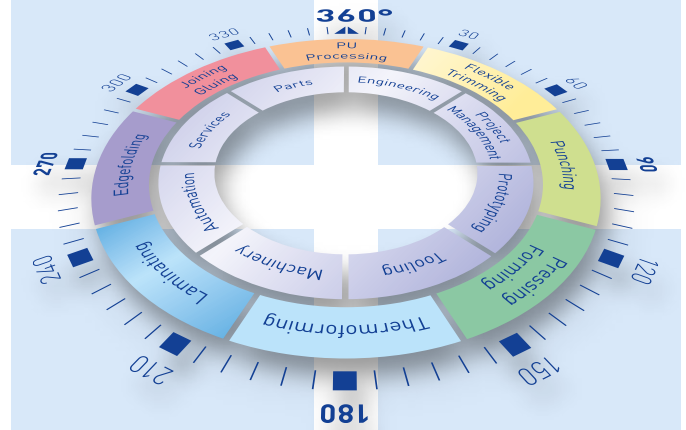
- Functional and decorative seams of sewn 3D coverings are positioned accurately and with reproducible precision
- No overstretching of the leather decor material
- Reliable prevention of pressure marks in leather covers
- Reproducible bonding with high process reliability is ensured
- The temperature-sensitive leather is handled gently
- Use of the same tools for different decors
- Cost-effective combination tools
- PU direct back-foaming of leather / artificial leather
- Invisible airbag scoring

Awards for leather applications





Plastics
Technologies
in Motion.



FRIMO Freilassing GmbH

Liegnitzer Str. 5
83395 Freilassing, Germany

Phone: +49 (0) 8654 4985 - 0
Fax: +49 (0) 8654 4985 - 80
info.freilassing@frimo.com

FRIMO Inc.

50685 Century Court
Wixom, MI 48393, USA

Phone: +1 (248) 668 - 3160
Fax: +1 (248) 668 - 3040
info.usa@frimo.com

FRIMO Automotive Trim Tooling & Equipment Co. Ltd.

Building 1, No. 568 Longpan Rd.
201801 Shanghai, China

Phone: +86 (21) 516515 - 68
Fax: +86 (21) 516515 - 69
info.china@frimo.com

www.frimo.com