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1. Introduction

1.1. Purpose of the manual

This manual presents the properties of the Strumber material and the recommended methods for its processing, bonding, finishing, and storage. Its purpose is to facilitate correct and safe use in the production of furniture, flooring, and decorative elements.

Strumber® is a wood-like material that serves as an alternative to sawn timber. As with various species of traditional wood, it requires appropriate selection of tools, techniques, and finishing products to optimize material handling.

1.2. About Strumber

Strumber is an innovative material made from pressed hemp or flax straw combined with a plant-based adhesive. It constitutes an ecological alternative to solid wood and wood-based materials, offering high stability, attractive aesthetics, and consistent physical-mechanical parameters. Thanks to a unique production technology, whole stems of annual plants can be processed, making Strumber a fully renewable and low-emission material.

1.3. Intended use and scope of application

Strumber is designed for broad use in the wood industry and related manufacturing sectors. Its structure and properties make it suitable for producing structural and finishing elements used indoors, such as:

- furniture production,
- solid and engineered flooring,
- stair treads and balustrades,
- countertops (furniture/table, kitchen),
- wall and ceiling decorative elements,
- wooden accessories,
- wooden toys.

Strumber is particularly recommended where an ecological alternative to solid wood is required and where the aesthetic of a natural raw material must be preserved while maintaining consistent mechanical parameters. The material works well with conventional woodworking techniques, enabling integration with existing production processes.

1.4. Limitations of use

Strumber is not intended for applications requiring resistance to outdoor weather exposure (e.g., exterior construction elements, wood façades exposed to rain and humidity).

It should not be used in areas lacking proper ventilation, especially under long-term exposure to dust, nor in chemically aggressive environments that may affect the plant-based adhesive used in the production process.

Strumber is not suited for dynamic loads exceeding those typical for solid wood and must not be used in load-bearing structures requiring full building certification.

The material is not suitable for brushing. This process excessively tears fibers and significantly degrades the surface.

2. Features and properties of the material

2.1 Available material densities

Strumber is produced in two standard density variants: approx. 750 kg/m³ and approx. 900 kg/m³. Density 750 kg/m³ corresponds to properties typical of woods like beech or oak, while the 900 kg/m³ variant resembles the hardness of exotic wood. Density selection should reflect the intended end use.

2.2. Product range

Strumber is available in several formats for use across different technological processes.

Beams:

- 170 ×170×2550 mm — base format for further cutting into furniture elements, strips, and components.

Planks:

- cut from beams to a thickness of 40 mm,
- suitable for steps, slats, structural and decorative elements.

Blanks:

- cut from beams according to specification; suitable for steps, slats, structural and decorative elements.

3-layer boards:

- size: 2500x1250 mm,
- thickness: 18 mm, 22 mm, 36 mm dimensional stability suitable for countertops, fronts, and larger elements.

Veneers:

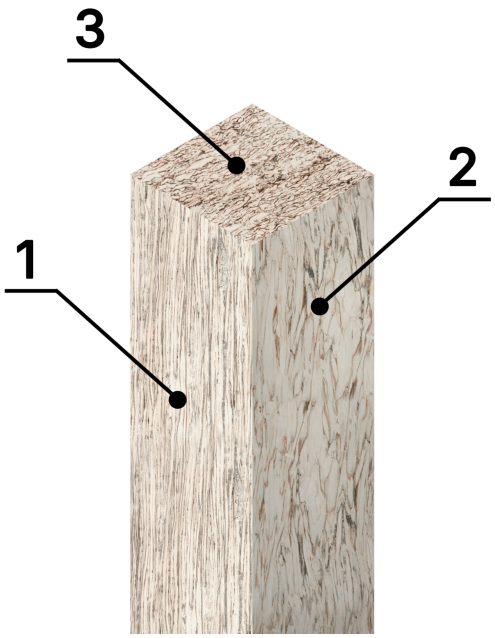
- ≥6 mm thick — for surface layering, lightweight decorative components.

All formats maintain the characteristic properties of Strumber, ensuring consistent appearance and compatibility within a single project.

2.3. Visible structural types

Strumber has longitudinal fiber alignment within the beam, which influences its behavior during machining and defines its unique aesthetic. Three types of visible structures can be obtained from a single beam:

1. Linear Structure (LS) — longitudinal cutting
2. Irregular Structure (IS) — longitudinal cutting
3. Cross-Section Structure — transverse cutting



2.4. Mechanical and functional properties

Strumber behaves similarly to solid wood while offering dimensional stability due to fiber pressing. Because of its fibrous structure, slight raising of fibers may occur after applying the first coat of finish - intermediate sanding is required. Transverse machining requires carefully selected tools to minimize tear-out.

2.5. Material moisture

Moisture control is crucial for stability and for achieving high-quality bonding and finishing.

Standard resistance and dielectric meters do not provide accurate readings on Strumber because the material lacks stable electrical-moisture correlation. Its fibrous structure and plant-based adhesive cause readings to be inconsistent.

Near Infrared (NIR) technology is the only reliable and repeatable moisture measurement method for Strumber. The company uses NIR devices for ongoing production control.

3. Safety when working with Strumber

3.1. General information

Strumber is not classified as a chemically hazardous product. In solid form it is safe during normal use.

3.2. Ventilation requirements

Cutting, milling, and sanding produce fibrous dust similar to wood dust, which may cause:

- mechanical irritation of eyes or skin,
- coughing and temporary respiratory discomfort.

Adequate dust extraction and ventilation must be provided.

During processing, it is necessary to use:

- general ventilation and local dust extraction,
- exhaust systems installed on machines (CNC, saws, sanders).

3.3. Personal protective equipment requirements

During processing, it is recommended to use:

- protective goggles – to protect against dust and small particles,
- work gloves – to protect the skin from irritation,
- a dust mask when ventilation is insufficient (dust filter),
- work clothing that protects the skin from contact with dust.

All protective equipment must comply with current EN standards for eye, respiratory and hand protection.

3.4. Fire behavior

Strumber is combustible. Fire may produce CO and smoke typical of lignocellulosic materials.

Recommended extinguishing agents:

- water mist
- powder and foam extinguishers
- dispersed water stream
- sand

Respiratory protection should be used during firefighting.

4. Storage and transport

4.1. Storage conditions

Strumber should be stored in:

- dry, well-ventilated rooms,
- temperatures between 10–25°C,
- conditions that protect it from moisture, precipitation, and direct sunlight.

It is recommended to store the material on stable, level surfaces, using spacers or pallets that allow air circulation.

Elements that have undergone preliminary processing (cutting, sanding, or milling) should be stored under the same conditions as raw beams. Short-term loose storage is permitted; however, the surfaces should be protected against dust, dirt, and moisture.

4.2. Protection against deformation

To prevent material deformation:

- place beams and elements in a horizontal position,
- protect them from point pressure,
- provide uniform support along their entire length,
- avoid storing them near sources of heat and moisture.

The material should remain in its factory packaging until processing begins.

4.3. Transport and storage

During transport:

- use covered means of transport,
- secure elements against shifting (straps, spacing wedges),
- protect them from rain and excessive moisture,
- avoid overloads that may cause cracking or deformation.

The material should not be exposed to prolonged contact with moisture.

It is recommended to:

- maintain stable storage conditions before introducing the material into production,
- acclimatize the material in the processing environment for at least 24–48 hours,
- monitor any dimensional changes prior to further processing.

5. Mechanical processing of Strumber

Regular maintenance of cutting tools is essential for maintaining high processing quality and extending the service life of equipment. It is recommended to follow cleaning and protection procedures in accordance with the guidelines provided by manufacturers of saw blades, milling cutters, planing knives, and drill bits.

5.1. Cutting

The diameter of the saw blade should be matched to the type of element being processed.

- Beams 170 ×170 mm — Ø 450 mm blade
- Planks, blanks, panels, veneers — Ø 300 mm blade

Cutting raw material

Strumber can be cut using standard circular saws and band saws. Proper tool selection is essential, as it directly affects the quality of the cut and process efficiency. When processing finishing surfaces, the use of a scoring blade is recommended to achieve a clean and precise bottom edge of the cut.

Circular saws for longitudinal cutting — beam breakdown

Longitudinal cutting involves cutting the beam along the direction of the fiber alignment. This applies to longitudinal cutting of both the linear and irregular surface structures.

Recommended parameters for longitudinal cutting with a Ø300 mm circular saw:

Saw type	Cutting blades with carbide teeth
Number of teeth	≥18
Tooth geometry	Straight tooth
Feed limiter	No
Carbide width	Carbide wider than the saw body
Blade with heat and vibration dissipation	Yes
Internal chip evacuation	x2
External chip evacuation	x2
Blade material	Reinforced steel
Blade coating	Gas-based coating that minimizes material adhesion and reduces friction
Rake angle	18 degrees
Hook angle	15 degrees

Recommended blade rotation speed	approx. 5000 rpm

Example of a saw blade verified in internal tests as effective for longitudinal cutting
FABA circular saw blade from the PI-503 EVO2 series

Circular saw blades for cross-cutting and longitudinal cutting (universal saw blades)

Cross-cutting refers to cutting across the linear surface and along the cross-sectional surface of the beam. The use of blades with alternating straight and trapezoidal teeth has a positive effect on cross-cut quality.
Improper selection of blade teeth during cross-cutting may cause material scorching and fiber tear-out.

Recommended parameters for cross-cutting with a Ø300 mm circular saw:

Saw type	Cutting blades with carbide teeth
Number of teeth	≥28
Tooth geometry	Alternating beveled tooth
Feed limiter	Yes
Carbide width	Carbide wider than the saw body
Blade with heat and vibration dissipation	Yes
Internal chip evacuation	x2

External chip evacuation	x2
Blade material	Reinforced steel
Blade coating	Gas-based coating or technical anti-adhesive, anti-corrosion, heat-reducing coating
Rake angle	15/18 degrees
Hook angle	15 degrees
Recommended blade rotation speed	approx. 5000 rpm

Example of a saw blade verified in internal tests as effective for both longitudinal and cross-cutting (universal saw blade)
FABA circular saw blade from the PI-508V EVO2 series

or
FREUD circular saw blade from the LG2A series

Practical notes

The FREUD circular saw blade from the LG2A series provides high-quality finishing cuts. It delivers smoother cutting results and is recommended for panels and finishing elements, particularly for edging and trimming operations.

Scoring Blade

When cutting finishing surfaces, the use of a scoring blade on a panel saw is recommended. It ensures a clean bottom edge of the cut and reduces the need for additional finishing in later production stages. When working with a scoring blade, blades with less dense toothing should be used, or the scoring depth should be reduced to avoid scorching the edges of the material.

Example of a saw blade verified in internal tests as effective for scoring cuts
ITA TOOLS circular saw blade from the P36.125020024.000 series

Band Saws

Strumber is a material of increased hardness; therefore, when performing straight cuts with band saws - both along and across the fiber direction - it is recommended to use blades with a width of 25–40 mm, a thickness of 0,6–0,8 mm, 3–4 TPI teeth, and correct blade tension in accordance with the manufacturer's specifications (typically 15–25 kN for steel bands). The machine’s motor should provide sufficient power, at least 3–4 kW, to maintain a stable feed rate in this high-density material.

General-purpose band saws designed for cutting solid and laminated wood perform well when working with Strumber. An example of equipment with parameters suitable for effective processing of Strumber is the Centauro Supercut 80 band saw.

5.2. Planing and thicknessing

Planing Strumber should always be carried out in alignment with the fiber direction in the beam. Machining across the fibers increases the risk of tear-out and irregular surface defects. It is recommended to use highly sharp blades with stable geometry to achieve a smooth and clean planed surface.

Process recommendations:

- work along the direction of the fibers,
- use sharp blades—preferably carbide or spiral knives,
- avoid excessive depth of cut in a single pass; the recommended value is 0,5–1,0 mm,
- maintain an even feed rate and stable support of the material.

For jointers and thicknessers, it is advisable to maintain the cutterhead speed recommended by the machine manufacturer and to regularly clean the area around the cutterhead, as the material tends to produce fine, fibrous particles.

Thicknessing should be carried out with stable material feed, and the feed speed should be chosen to minimize fiber raising. The recommended feed rate is 6–10 m/min, depending on the desired surface quality.

5.3. Drilling

Drilling in Strumber requires tools that ensure a clean entry and exit of the drill bit while minimizing the risk of fiber tear-out. Due to the hardness and fibrous structure of the material, it is recommended to use drill bits designed for solid wood and wood-based materials.

Recommended tools:

- Forstner/Bormax bits – provide clean hole edges and stable guidance in the material.

- Drill bits with a centering tip and peripheral cutters – minimize the risk of surface tear-out when making through-holes.
- Spiral wood drill bits – suitable for smaller-diameter holes requiring high precision.

5.4. Milling

Strumber has a longitudinal fiber structure, which makes milling along the fiber direction significantly easier and results in superior surface quality. Selecting the correct tool direction is crucial. The cutting edge should engage the material in a way that compresses the fibers, stabilizing the structure and minimizing tear-out. Milling against the fiber direction, in a lifting motion, may lead to reduced edge quality and surface damage.

In practice, when machining the edges of components - such as milling the edge of a countertop - the operator should follow the same principles used for solid wood: the correct tool feed direction, matching cutter rotation to feed direction, and leaving an appropriate machining allowance. When milling across the cross-section, the use of templates and guiding stops is recommended to maintain stable tool movement and reduce tear-out.

The fibrous nature of the material may also necessitate milling the same toolpath more than once to remove raised fibers (these may alternatively be removed through sanding).

Due to the hardness and fibrous structure of Strumber®, it is recommended to use milling tools that ensure high stability during operation.

Recommended types of milling cutters:

- Compression cutters – prevent fiber tear-out, especially when milling visible edges and finishing elements.
- Diamond (PCD) cutters – highly wear-resistant, ensuring stable machining quality in dense, hard materials.

Example of a "straight spiral diamond shank cutter" verified in internal tests as effective ITA TOOLS cutters from the DTE.16.035.16.0SR series

1. Recommended cutters

- Compression cutters 2+4 or 3+3 with chip channels.
- Diameter 6–12 mm for precision machining.
- Diameter 16 mm for pocket milling.

2. Cutting edges

- Minimum 4 cutting edges over a 25 mm cutting height.
- Spiral edges that promote fiber compression.
- Low-friction coatings (e.g., X-tremeBlue, diamond coatings).

3. Operating parameters

- Spindle speed: 18,000–20,000 rpm.
- Feed rate: 8–12 m/min for 2+4 compression cutters.
- Always mill in the direction of the fibers.

4. Avoid

- Cutters with a high number of cutting edges but insufficient chip space.
- Cutters with a low number of edges at high feed rates.

Compression cutters with a larger number of cutting edges perform better at lower spindle speeds and higher feed rates, preventing fiber scorching.

5.5. Sanding

Sanding is a key stage in the finishing process of Strumber, ensuring a smooth surface and preparing the material for oiling, lacquering, or staining. Due to the fibrous

structure of the material and its tendency to raise fibers after the first coat of finish, sanding should be carried out in multiple steps.

Recommended abrasive materials:

- sanding papers and belts with a corundum abrasive,
- cloth or paper backing.

Recommended grit sizes:

- 80 – initial sanding, surface calibration, removal of small irregularities,
- 120 – surface leveling before finishing and for between-coat sanding.

Process recommendations:

- Sand in the direction of the fibers to avoid visible scratches.
- Maintain even pressure and stable feed to ensure a uniform surface.
- After applying the first layer of finish (oil, oil-wax, lacquer), perform between-coat sanding, as Strumber tends to raise fibers.

For wide-belt sanders, the recommended setup is:

- 80 grit on the first drum,
- 120 grit on the second drum,

which produces a surface ready for the application of finishing products.

6. Bonding and assembly

6.1 Gluing

Strumber elements can be glued using standard technologies applied in the woodworking industry. The material works well with polyvinyl acetate adhesives. Before beginning the gluing process, it is recommended to perform tests on a small sample.

For working with Strumber, the following adhesives are recommended:

- PVAc D3 adhesives
- PVAc D4 adhesives – for applications requiring increased moisture resistance of the joint.

Adhesive application

Due to the fibrous structure of Strumber, applying adhesive with a brush or roller is not recommended. Adhesion causes fibers to stick and pull away, which makes uniform application difficult and slows down the process.

Recommended application methods:

- bottle dispensers with a slot nozzle
- pressure applicators
- gravity or pneumatic spray guns for water-based adhesives

6.2. Mechanical fastening

Strumber can be joined mechanically using standard techniques applied to solid wood and wood-based materials. The best results are achieved when using fasteners that ensure stable guidance and controlled penetration.

Technical recommendations:

- Use screws with a deep thread, which improves grip in high-density material.
- Select the fastener length to ensure joint stability without risking splitting of the element.
- Avoid placing fasteners too close to the edges; maintain a minimum distance of 20–25 mm from the edge when using screws.

7. Repairs and renovation

Defects can be filled using standard wood fillers. It is recommended to choose shades that closely match the natural color of the material.

Recommended filler: Vidaron H02 Birch

Other fillers may also be used; however, before application, tests should be conducted on a small sample of Strumber. The test should include filling the defect, allowing it to dry, sanding, and evaluating the coloration after applying the chosen finishing product.

8. Surface finishing

Strumber is compatible with woodworking finishing products in a manner similar to solid wood; therefore, the selection and application of finishing agents should follow the manufacturers' instructions. Proper application in accordance with these guidelines, as well as appropriate working conditions, are essential for achieving consistent surface quality.

The chosen finish should correspond to the product's intended use and the desired visual effect. The material accepts both water-based and oil-based products well, and its natural porosity promotes even absorption of stains. Between-coat sanding is necessary, as the fibers tend to rise after the first application of finish.

8.1. Oils

- Recommended: oils for countertops and work surfaces.
- Apply with a foam roller or a soft cloth.
- Apply 2–3 thin coats, with mandatory between-coat sanding (120 grit).
- They provide a natural appearance and basic protection against stains.

8.2. Oil-Waxes

- Apply in thin layers and spread thoroughly.
- Over-application may lead to discoloration.
- Between-coat sanding is required.

- They provide a semi-matte finish and increased surface durability.

8.3. Water-Based Stains

- These work well with the material due to its high absorbency.
- Apply evenly; remove excess before drying.
- After staining, apply an additional layer of oil or lacquer.

8.4. Lacquers

Strumber can be finished with all lacquer types used in woodworking: water-based, acrylic, polyurethane, and UV-cured systems, all of which are compatible with the material. The choice of lacquer system should match the product's intended use and available production technology.

Lacquers may be applied manually, by spraying, or by roller coater. Due to the natural porosity of the material and its tendency to raise fibers after the first coat, thorough surface preparation is essential.

9. Waste Handling

Waste generated during the processing of Strumber (offcuts, dust, trimmed elements) can be handled similarly to wood waste. The material is fully biodegradable; however, its disposal must comply with regulations applicable in the given location and the operational profile of the facility.