

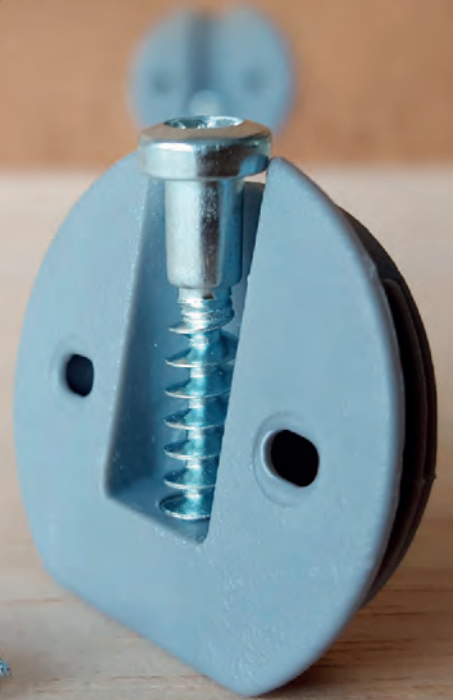


877.424.9860
BanovaUSA.com

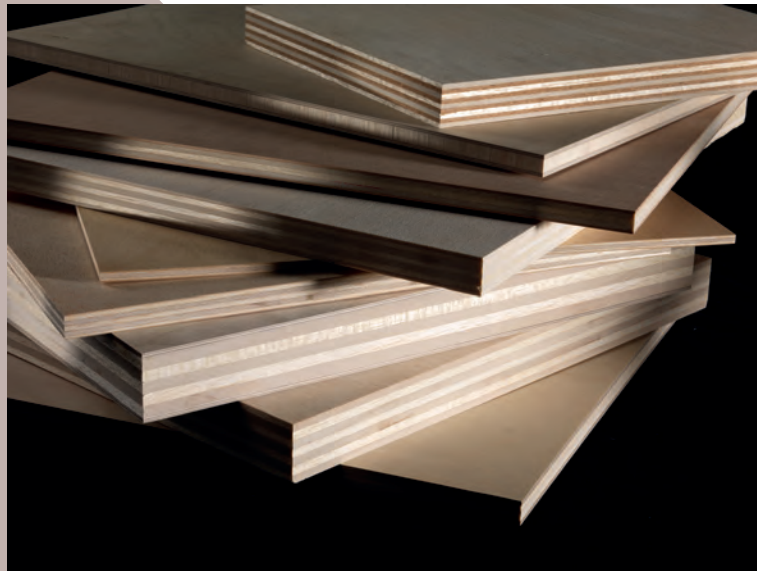


BANOVA[®]
GROWN LIGHT • MADE STRONG

PROCESSING and TECHNICAL GUIDE



THE WORLD'S *LIGHTEST* PLYWOOD



General product and application information for Banova® is covered in this brochure. Standard solutions were collected from various market segments and applications, where they were tested and approved in daily use. For additional information and the most current product availability, visit us online at:

www.BanovaUSA.com

To contact your 3A Composites USA sales representative:

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LIGHTEN UP

We are proud to offer the following technical information for your review and to assist in any product processing support.

Page 3.....**Corner Connection**

Connections of the panel edge to a surface between Banova® and other materials.

Page 10.....**Face Connection**

Face to face connections to components with Banova® inside.

Page 16.....**Hinges**

Application of movable hardware.

Page 20.....**Processing**

Techniques and parameters for Banova® processing.

Page 33.....**Planning**

Tables and formulas for planning with Banova®.

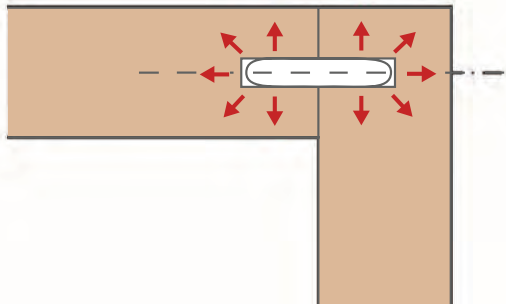
3A Composites cultivates several thousand hectares of FSC certified balsa wood farms in Ecuador (FSC-C019065) and Papua New Guinea (FSC-C125018).

Please do not hesitate to reach out with any questions or concerns you may have or if we can be of any further assistance. CUSTOMER SERVICE 877-424-9860.

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BONDED JOINT WITH WOOD DOWEL

Fast drilled and inserted in an industrial process. The standard connection with wood dowels is efficient due to a high drilling performance and a perfect bond in the panel core.



Easily and quickly positioned and assembled. The glue penetrates deep into the porous wood structure during the assembly of the edge joint. Therefore the bonding performance with liquid glue is notably better in Banova® than in common wood based panels.

ADVANTAGES WITH BANOVA®

- » Invisible, durable joint.
- » Fast and simple standard joint made with manual drilling tools or on fully automated drilling stations.
- » Components are directly positioned at the right spot, which allows a fast assembly.
- » Highly versatile application in combination with connecting fittings for interior components and furniture.

WHERE YOU CAN FIND THIS

Your regional hardware supplier.

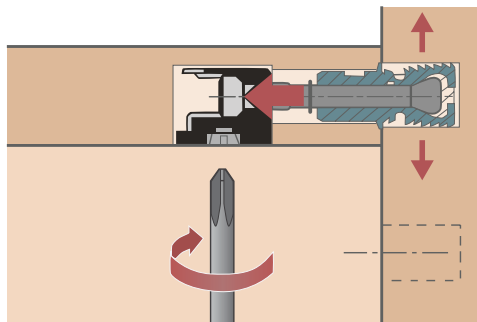
CAM FITTING FOR FURNITURE RASTEX RAPID



Drilled like a standard wood dowel with little PU mounting adhesive into the hole for a durable joint.



The plastic dowel is manually mounted and the components are positioned directly at the right spot likewise to the assembly with wood dowels.



Easy and quick assembly, with a single turn of a screwdriver the plastic dowel expands and the glue is pressed deep into the wood structure of the porous panel core. The deep anchorage of the glue in the wood structure is the relevant advantage compared to common wood based panels.

ADVANTAGES WITH BANOVA®

- » Full prefabrication on automated drilling machines or with CNC machinery.
- » Easy mounting of components with a screwdriver.
- » Economic shipment of furniture components as flat pack. Connectors are mounted just before assembly.
- » Durable connection due to perfect bond into the wood pores.

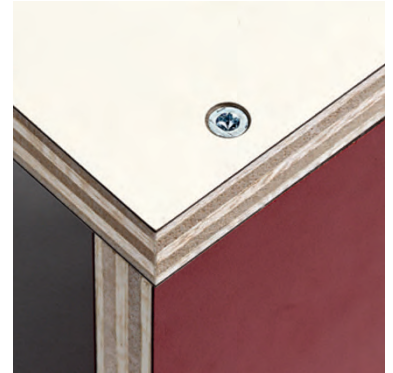
WHERE YOU CAN FIND THIS

Dowels: Rapid S DU 324 / DU325
Cams: Rastex 15
www.hettich.com

CORNER CONNECTION

DIRECT SCREW

The perfect corner connection without pre-drilling. Thanks to the solid panel core, long and strong screws are directly applied without the risk of panel splitting. The screw is also used in combination with dowels for positioning and liquid glue or double-sided tape for enhanced resistance and vibration constraint.



We suggest standard screws with a deep screw thread that anchors profoundly into the wood structure of the panel core. The strength of the connection is optimized by increasing screw length and head diameter.

ADVANTAGES WITH BANOVA®

- » Quick and efficient assembly.
- » Immediate fixation and no waiting time for further processing.
- » High flexibility in design and construction of individual furniture.
- » Broadly approved fastener.

WHERE YOU CAN FIND THIS

Your regional hardware supplier.

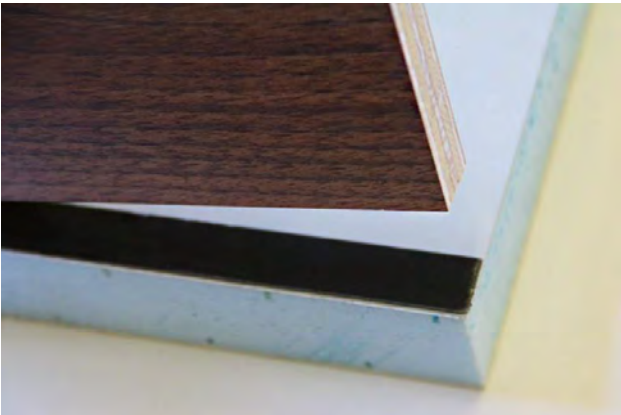
Würth FBS or screws for particleboard: www.wuerth.com

Spax screws for particleboard: www.spax.com

Ferronorm screws for particleboard: www.sfs.biz

Screws for particleboard: www.bossard.com

DOUBLE SIDED ADHESIVE TAPE EASY BONDING



Double sided adhesive tapes are perfect for all connections between laminated or coated surfaces. Due to the large bonding area this connection method is significantly more efficient than punctual fasteners. It's easy and quick to apply, and contamination is easy to avoid compared to the use of liquid adhesive.

The durable elastic bond with double sided adhesive tape is preferred for mounting of parts and components with high stress or vibration impact. A typical application is the fixation of furniture elements to a floor or a wall where the cabinets contribute to the stiffness of the vehicle structure.

ADVANTAGES WITH BANOVA®

- » Invisible and durable connection.
- » Clean application without risk of contamination.
- » More efficient work flow due to immediate bond after joining of the parts (no curing time).
- » Easy to combine with positioning aides such as wood dowels, cam fittings, or standard screws.

WHERE YOU CAN FIND THIS

Silver Tapes: www.aftc.eu
3M™ VHB™: www.3m.com

ADHESIVE BONDING WITH LAMELLO BISQUITS

Wood biscuits are highly effective as connection for individual furniture of small lot sizes. Manufacturing is simple, from milling with power tools to mounting with an adequate glue dispenser. The biscuit shaped notches are milled from the craftsmen in a very flexible, but highly accurate way.



The shape creates the strength of this connector. Since it requires only partial notches of an organic biscuit shape, the panel structure is not weakened as it would be by a thorough notch. Nevertheless, the surface of the lamello provides a great bonding area that anchors in the panel core. At the stage of assembly, the lengthwise orientation of the connector allows a slight shift and quick alignment of the components.

ADVANTAGES WITH BANOVA®

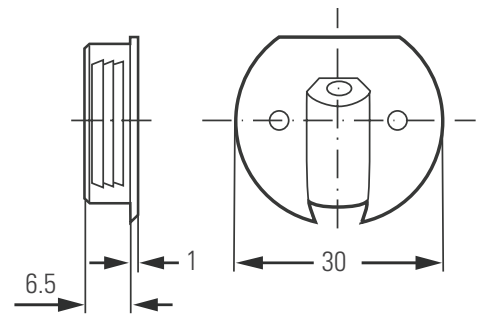
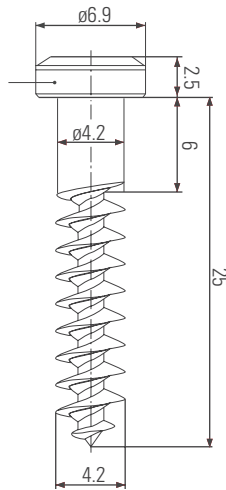
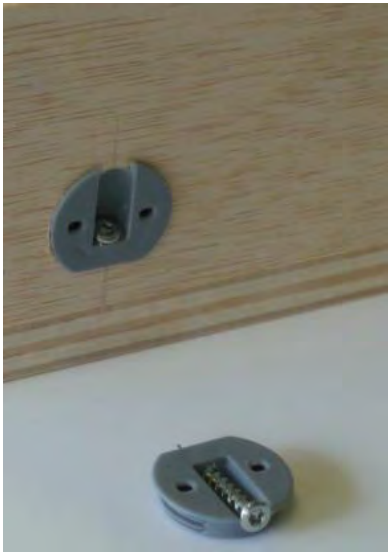
- » Invisible and durable connection.
- » Fast and easy standard connection made with the help of power tools or CNC equipment.
- » Simple aids for glue application make it easy to avoid contamination of adhesive.
- » Highly flexible and versatile use in combination with various furniture connectors.

WHERE YOU CAN FIND THIS

Your regional hardware supplier.

www.lamello.com

FURNITURE CONNECTOR FOR RV WITH ECOSYN® PXL



Free mounting or defined positioning with dowels. Specific screw design of ecosyn® PXL screws ensure maximal vibration resistance and avoid overwinding. No pre-drilling in panels needed.

Easy insert of standard furniture connectors to press fit.

ADVANTAGES WITH BANOVA®

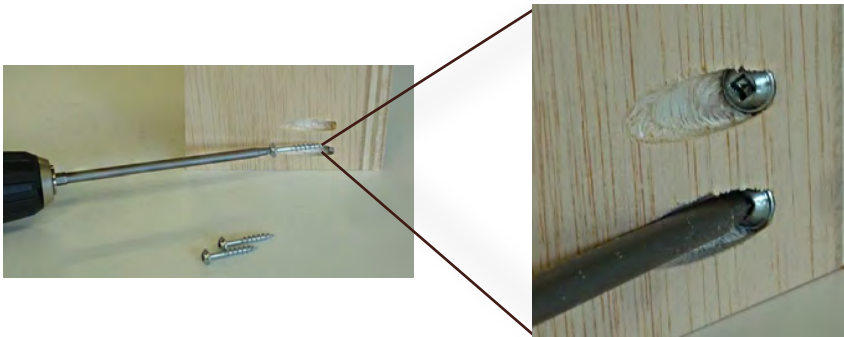
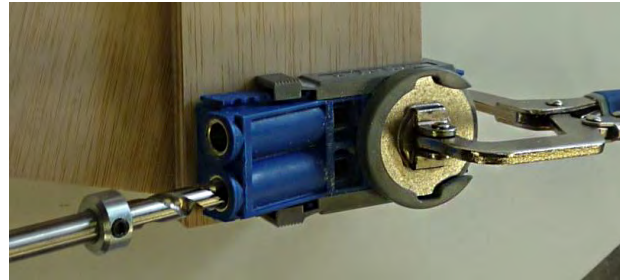
- » Resolvable joint for free positioning.
- » Outstanding pull-out and vibration resistance of ecosyn® PXL screw (>40kg per 10mm of screw thread).
- » Convenient joint which provides high cost efficiency and maximal flexibility in furniture assembly.
- » Highly versatile; can also be used in combination with dowels, adhesive or double-sided tapes for positioning and assembly.

WHERE YOU CAN FIND THIS

ecosyn® PXL screw: www.kvt-fastening.de/
Press fit furniture connectors: www.haefele.com

POCKET HOLE SCREW JOINT

Fast and flexible; drilled by hand with simple drilling jig or automated on a CNC router.



Easily and quickly assembled and connected. You can combine it with dowels, wood biscuits, adhesive or double-sided adhesive tape.

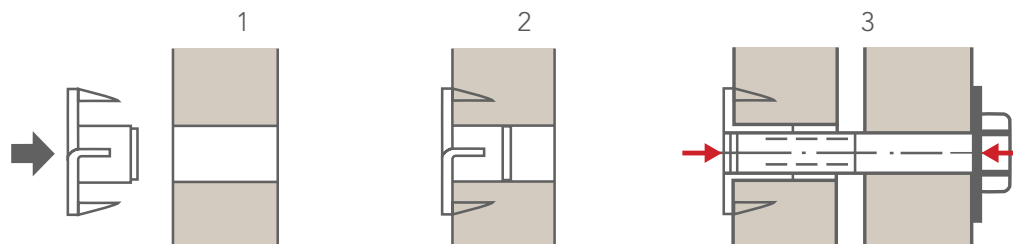
ADVANTAGES WITH BANOVA®

- » Fast and flexible application in various connecting positions.
- » Great performance due to transverse screwing (>25kg per 15mm of screw thread).
- » Screw positioning is possible directly at the panel edge. Several screws can be combined on a small area.

WHERE YOU CAN FIND THIS

Tools, screws and jigs from your local hardware supplier.
www.kregtool.com

BOLT FASTENING INTO TEE NUT



The tee nut is driven into a pre-drilled hole from the back of the panel, and some versions are also bonded to the back face for fixation and twist locking. Bolts are set from the face to obtain an end-to-end connection between two components. The load distribution on the surface and in the panel core allows punctual fixations for high loads with durable resistance.



There is a large range of different shapes and models of tee nuts available on the market. However once mounted, they all look the same from the front; only a bolt or a hole is visible as mounting point.

ADVANTAGES WITH BANOVA®

- » Fastening into metal thread enables for countless mounting and replacement.
- » Distribution of high point loads by form closure.
- » Exact positioning of inserts by automated drilling and fastener mounting.
- » Especially recommended for dynamic loading.

WHERE YOU CAN FIND THIS

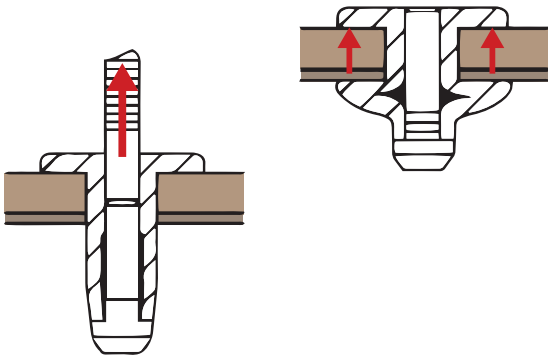
Your regional hardware supplier.

www.rampa.com

www.kvt-fastening.com

www.jetpress.com

MOUNTING BY RIVET



Mounting of panels to metal frames with rivets is simple and provides high process stability. The accurate and reliable mounting procedure is secured by using a big headed rivet in combination with the adequate rivet setting tool. The rivet head is evenly set with minimal tolerance and without tapering into the panel surface as often seen when mounting with screws.

The form-locking connection with rivets is unobtrusive but nevertheless efficient since the load is firmly supported by the surface of the flat rivet head. Single suspensions are made by positioning a perforated metal sheet or a large washer behind the panel and set the rivet through the panel into the back support.



16mm rivet with appropriate setting tool

ADVANTAGES WITH BANOVA®

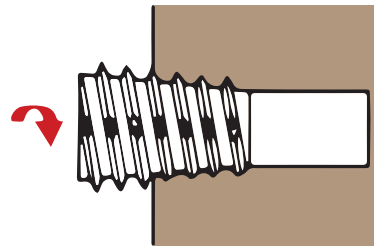
- » Visible but unobtrusive fastener.
- » Form-locking connection.
- » Predrilled panels can be used as mounting jig for predrilling into the sub-structure.
- » Only removable with drilling tools.
- » Flexibility of later positioning of single suspensions.

WHERE YOU CAN FIND THIS

www.gesipa.com

SCREW NUT INSERT

Screw nut inserts are positioned into the surface or the edge as defined support points for metric bolts. Highest performance is obtained with a small amount of additional mounting adhesive that penetrates into the wood and adheres to the nut thread.



Various sizes and designs are available for specific uses. For the adequate performance in the lightweight Banova® panel we suggest the choice of nuts with deep thread and maximal possible diameter for optimal load distribution. It's crucial that the thread cuts into the wood and builds up compression in the pre-drilled hole by its own shape. Therefore the holes must be drilled with a smaller diameter than used in dense hardwoods.

ADVANTAGES WITH BANOVA®

- » Fast drilling and insert from the visible panel side.
- » Countless mountings and replacements provided by metric metal bolts.
- » Equal distribution of high point loads into the panel.
- » Exact positioning of fasteners by automated drilling and mounting.

WHERE YOU CAN FIND THIS

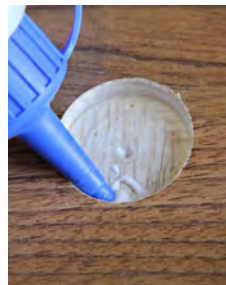
Your regional hardware supplier.

www.rampa.com

www.jetpress.com

WOOD INSERT FOR DIRECT SCREWING

The wood insert is bonded with a common wood glue or specific mounting glue into the pre-drilled hole and positioned evenly into the panel surface. The insert is used as a local anchorage for fasteners and supports high loads over the large bonding surface. Most efficient are inserts out of hardwood plywood.



Wood inserts are recommended to mount high point loads with common screws. For maximal efficiency the wood inserts are applied from the back side of the panel and screws are inserted from the front side which provides a highly reliable form closure.



ADVANTAGES WITH BANOVA®

- » Fastening in well-known wood material.
- » Reinforcement only at the required positions.
- » Manufacturing in manual or automated application processes.

WHERE YOU CAN FIND THIS

Your local hardware supplier.

CLIP CONNECTOR FASTMOUNT

The distinctly deep plastic thread cuts deep into the solid panel core, and thus provides permanent mechanical anchorage.



The big sized connectors resist dynamic loads in form of several mounting and dismounting as well as vibration impacts. Thanks to Banova's lightweight and form stability you will need fewer fasteners for panel mounting.

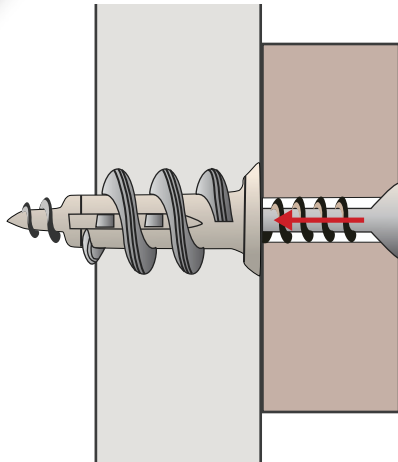
ADVANTAGES WITH BANOVA®

- » Invisible mounting.
- » Quick mounting and replacement with a simple click; no tools needed.
- » Reduces mechanical stress and vibrations between different components.
- » Allows high degree of pre-fabrication for interior modules (walls & furniture).

WHERE YOU CAN FIND THIS

www.fastmount.com

LIGHTWEIGHT CONSTRUCTION ANCHOR



The plastic or metal anchors are screwed into the panel surface or into the edge without pre-drilling. The deep thread of the anchor cuts well into the core, and provides a thorough hold in the lightweight Banova®.

Lightweight construction anchors are offered from various suppliers in diverse forms and configurations. Mounting directly into the anchor is done with a defined standard screw, a metric bolt or with a nut onto an anchor with a bolt head.



ADVANTAGES WITH BANOVA®

- » Fast and flexible mounting from the visible side.
- » Anchoring of high loads in the full thickness.
- » Simple definition of fastening points on a panel surface or edge.
- » High flexibility of anchor positioning - still possible at the last manufacturing stage: Interior Mounting.

WHERE YOU CAN FIND THIS

Your regional hardware supplier.
Plastboard Fixing W-GS: www.wuerth.com
Plasterboard Fixing GK: www.fischer.com

HARDWARE MOUNTING

STANDARD SCREWS

Standard screws are not only used for easy assembly of furniture, but also to mount hinges and other fittings. A rule of thumb is to use 4-6mm strong screws with a length of 3-4 times the thickness of the panel that has to be joined.

Average screw extraction forces were tested with standard ferronorm screws into the surface of a 15mm panel. The panels should not be pre-drilled.

Screw Diameter	Banova PLY	Banova PLUS	Banova HDF
6.0mm	28kg	46kg	35kg
5.0mm	28kg	37kg	35kg
4.5mm	24kg	34kg	30kg
4.0mm	24kg	34kg	30kg

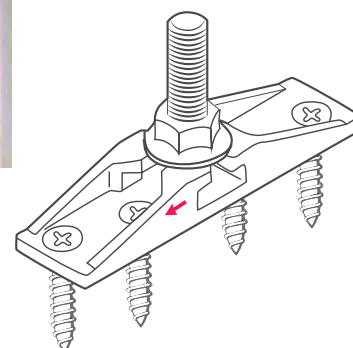


Example for use:

With a standard screw 5 x 90 and a screwing depth of 60mm, a maximal extraction force of 112kg is obtained per screw. A sliding door of 3000 x 1200 x 40mm consisting of a Banova® PLUS core and HPL decorative faces has a total weight of 38kg (10.4kg/m²). This low weight is easily supported by standard hardware and can be mounted with two standard screws. Concealed edge bands or other special inserts aren't required. The hardware is less loaded, and the door is easier to move but still solid.

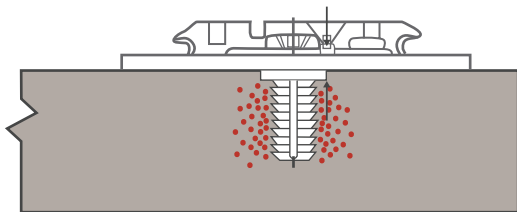
ADVANTAGES WITH BANOVA®

- » Mounting hardware for sliding doors and hinges for swinging doors works well with standard screws.
- » Pre-drilling isn't required since there isn't a risk of splitting even when screwing close to the edge.
- » Easy to fabricate a durable joint without edge bands or special inserts.



FLAP HINGE FOR PRESS INJECT

Hinges are injected into pre-drilled holes on the door edge. A durable, firm hold of the plastic dowels against vibrations and dynamic movements is ensured by a small drop of mounting adhesive into the pre-drilled hole prior to hinge mounting.



The strength of the described connection is shown after curing as a rigid and durable joint between the door and its hinge, which results in high resistance against dynamic loads. The adhesive penetrates deep into the porous panel core and provides firm and durable anchorage - better than in dense wood-based panels like MDF.

ADVANTAGES WITH BANOVA®

- » Popular standard hinge with high acceptance level.
- » Lower stress to hinges thanks to lighter and more form-stable door.
- » The process step of adhesive application is easy to be implemented in the standard procedure.
- » No risk of contamination due to clearly defined adhesive application into the pre-drilled hole.

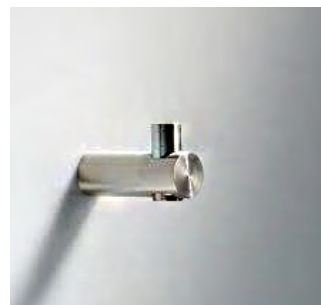
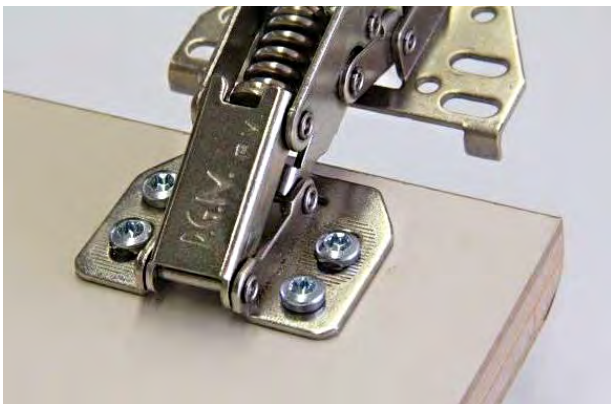
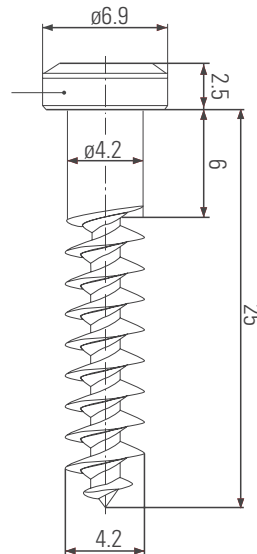
WHERE YOU CAN FIND THIS

www.dgnhinges.com

MOUNTING HARDWARE

ECOSYN® PXL SCREWS

The ecosyn® PXL screw is very practical for screwing heavy loaded hardware like hinges to a door or a furniture side. This screw was specifically developed so that the screw thread cuts well into the wood and provides durable anchoring in the panel. The special thread design provides maximal pull-out force from a very limited area.



ADVANTAGES WITH BANOVA®

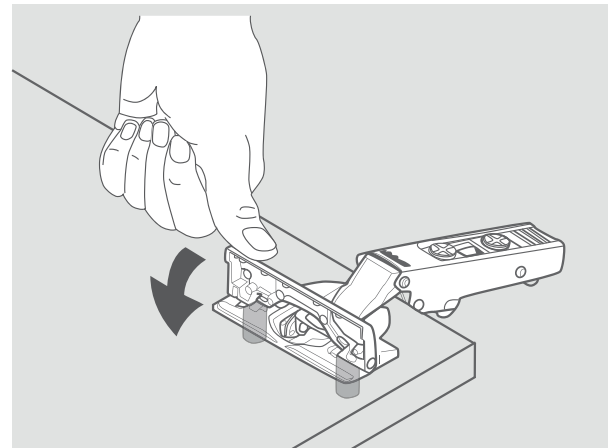
- » Cost efficient mounting without dowels, inserts or adhesive application.
- » Free positioning of hardware on the panel surface.
- » High process reliability due to adjustable tightening torque.

WHERE YOU CAN FIND THIS

www.kvt-fastening.de

CONCEALED HINGE BLUM INSERTA

This hinge is not just quickly mounted; it also anchors tightly into the panel core by the expansion of the plastic dowels in the pre-drilled holes. Lighter components also reduce stress to the hinges caused by vibration and dynamic impact. As a result it reduces the number of hinges needed and allows for the design of bigger doors.



The mounting plate is also fastened by the expansion mechanism of a plastic dowel in the panel core. The accurate fit of the hardware in the standard holes ensures a durable hold against vibrations.

ADVANTAGES WITH BANOVA®

- » Quickly mounted; tool-free boss fixing.
- » Reduced load impact to the hinges due to light and stable doors.
- » Standard hinge with wide distribution and high varieties for special solutions.
- » Simple packaging and logistics as flatpack furniture (hinges separate to components).

WHERE YOU CAN FIND THIS

www.blum.com

GENERAL INFORMATION

PROCESSING GUIDE VALUES

- » Banova® is a solid wood material and can be processed as such.
- » Reduced processing forces also allow clamping and pressing of panels in the production process (2.5kg/cm^2). At higher processing pressures and clamping forces there is a risk of surface damage.
- » Best processing results were experienced with:
 - High cutting speed
 - Positive tooth geometry
 - Positive angle of cutting edge
- » The low cutting resistance and homogeneous panel density allow higher feed rates and an increased processing performance overall.
- » An efficient dust extraction is fundamental for best processing results and long service life of the tools. In practice, the light chips and dust from processing are easily extracted by suction.
- » Dirt and foreign particles as stones, sand, or metal parts are fully avoided in production and the glue used is unfilled. This provides a long service life of any tungsten carbide and polycrystalline diamond tipped tools.

CONTOUR MILLING & NESTING SHANK-TYPE CUTTERS VHW

APPLICATION

- » CNC Routers
- » Smoothing and finishing of cutouts and contours
- » Milling into surface with simultaneous feed z-axis and x- or y-axis.

TOOL DETAILS

- » Shaft angle to both sides
- » $n_{\max} = 30,000\text{min}^{-1}$
- » Diameter = 8, 10, 12, 16, 18mm



RECOMMENDED PARAMETERS

- » Shank type cutter VHW - spiral positive / negative with shaft angle $Z = 2+2$
- » Revolution speed $n = 24,000\text{min}^{-1}$

Diameter - 12mm (Ident. Nr. 180972)

- » Feed speed $v_f = 3\text{m/min}$ in parallel feed
- » Tooth feed $f_z = 0.063\text{mm}$

ADVANTAGES WITH BANOVA®

- » Easy milling into the surface with little cutting resistance.
- » High feed speed due to low cutting pressure.
- » Long service life of tools thanks to the tool friendly bond and homogeneous density distribution.

CONTOUR MILLING

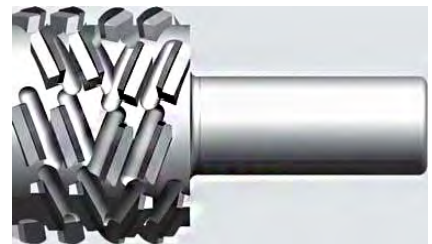
LEUCO P-SYSTEM SHANK-TYPE CUTTERS

APPLICATION

- » CNC Routers
- » Smoothing and finishing of contours along and across the grain without fraying.
- » Processing of components with high end surface without graying, especially in materials with fiber content.

TOOL DETAILS

- » Symmetric or asymmetric possible
- » Extremely oblique shearing
- » Long service life of PKD-cutters with extremely high cutting quality
- » Diameter = 12, 48, 60mm



RECOMMENDED PARAMETERS

- » P-system high-performance jointing shank-type cutters CM, DP
- » $Z = 4+4$
- » Revolution speed $n = 24,000\text{min}^{-1}$

Diameter - 12mm (Ident. Nr. 180872)

- » Feed speed $v_f = 3\text{m/min}$ in parallel feed
- » Tooth feed $f_z = 0.125\text{mm}$

ADVANTAGES WITH BANOVA®

- » Perfect cutting edges.
- » High feed speed due to low cutting pressure and oblique shearing.
- » Long service life of tools thanks to the tool friendly bond and homogeneous density distribution.

DOWEL & PATTERN DRILLING DOWEL DRILL BIT HW - TOPLINE



TOOL DETAILS

- » Secure guidance by centering point
- » Long service life of tungsten carbide cutters (HW)
- » Right and left spiral available
- » Diameter = 4, 5, 6, 8, 10mm
(Identification no. 178695 bis 178704)

APPLICATION

- » Portable boring machines
- » Automatic boring machines
- » CNC machining center
- » Drilling of holes without fraying

RECOMMENDED PARAMETERS

- » Revolution speed $n = 4,500 \text{ min}^{-1}$
- » Feed speed $v_f = 1.5 \text{ m/min}$

ADVANTAGES WITH BANOVA®

- » Chip-free hole edges.
- » Efficient chip conveying.
- » High feed rates possible due to homogeneity and low density of panel.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

DOWEL & PATTERN DRILLING

DOWEL DRILL BIT HW - WITH BACK-GUIDE

TOOL DETAILS

- » Secure guidance by centering point
- » Right and left spiral available
- » Long service life of tungsten carbide cutters (HW)
- » Protection of hole edges during return stroke provided by the back-guide
- » Diameter = 4, 5, 6, 8, 10, 12, 13, 14, 15, 16mm (Identification no. 166107 bis 167199)



APPLICATION

- » Portable boring machines
- » Automatic boring machines
- » CNC machining center
- » Drilling of holes without fraying

RECOMMENDED PARAMETERS

- » Revolution speed $n = 4,500\text{min}^{-1}$
- » Feed speed $v_f = 1.5\text{m/min}$

ADVANTAGES WITH BANOVA®

- » Chip-free hole edges.
- » Efficient chip conveying.
- » High feed rates possible due to homogeneity and low density of panel.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

CYLINDER BORING CYLINDER BORING BITS HW - Z=2+2



TOOL DETAILS

- » 2 rakers, 2 spurs and centering point
- » Long service life of tungsten carbide cutters
- » Right and left spiral available
- » Diameter = 15, 16, 18, 20, 22, 25, 26, 30, 35, 40mm
(Identification no. 003303 bis 182260)

APPLICATION

- » Automatic boring machine
- » CNC machining center
- » Drilling holes for hardware insert without fraying

RECOMMENDED PARAMETERS

- » Revolution speed $n = 4,500 \text{ min}^{-1}$
- » Feed speed $v_f = 1.5 \text{ m/min}$

ADVANTAGES WITH BANOVA®

- » Chip-free hole edges.
- » Efficient drilling and chip conveying.
- » High feed rates possible due to homogeneity and low density of panel.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

SIZING WITH CIRCULAR SAW

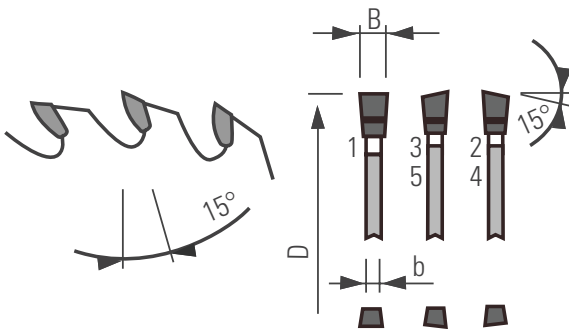
SIZING SAW BLADE HW "G5"

TOOL DETAILS

- » Tooth form: G5
- » Long service life of tungsten carbide cutters (HW)
- » Diameter = 200-550mm
(Identification no. 192076 bis 192090)
- » Noise reduction thanks to laser ornaments

APPLICATION

- » Table saw
- » Chop and miter saws
- » Panel sizing saws
- » For chip free sizing cuts as well as clipping and miter cuts



RECOMMENDED PARAMETERS

- » G5 300 x 3.0 x 2.2mm
- » Tooth quantity = 100, G5
- » Revolution speed $n = 4,500\text{min}^{-1}$
- » Feed speed v_f with scoring device = 10-30m/min
- » Feed speed v_f without scoring device = 8m/min with nearly chip free edges

ADVANTAGES WITH BANOVA®

- » Chip-free cutting edges without holes in the panel core.
- » High extraction performance of light chips and dust.
- » High feed rates possible due to homogeneity and low density of panel.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

PANEL TRIMMING AND SIZING

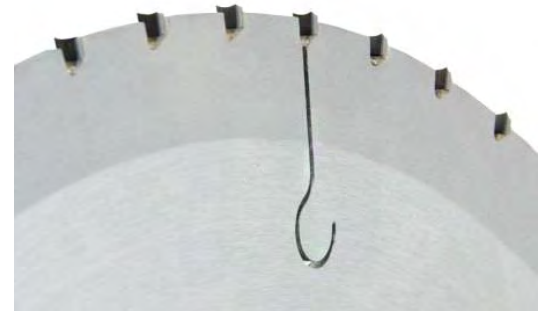
CIRCULAR SAW FOR PANEL SIZING DP-nn-SYSTEM

APPLICATION

- » Panel sizing saw for trimming and sizing of finished and raw panels

TOOL DETAILS

- » Polycrystalline diamond cutters - polished for long service life
- » Various tooth geometries depending on use
- » Small evacuation gap geometry for noise reduction
- » Diameter = 260 - 450mm



RECOMMENDED PARAMETERS

- » NN DIA 303 x 2.5mm 60 (Identification no. 459439)
- » Tooth number = 60, Hohlrücken (HR)
- » Revolution speed $n = 4,500 \text{ min}^{-1}$
- » Feed speed v_f with scoring device = 10-30m/min
- » Feed speed v_f without scoring device = 8m/min with nearly chip free edges

ADVANTAGES WITH BANOVA®

- » Chip-free cutting edges without holes in the core.
- » High feed rates possible due to homogeneity and low density of panel.
- » Noise reduction thanks to special tooth geometry and low panel density.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

PANEL SIZING

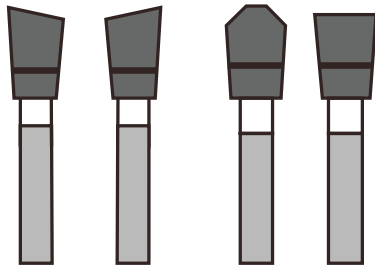
ALTERNATE TOP BEVEL (WS)

ALTERNATE TOP BEVEL + FLAT (WS-F)

INVERTEDV + HOLLOW GROUND DA-D)

APPLICATION

- » Panel sizing is possible with standard tool and various tooth geometries



TOOL DETAILS

- » Tungsten carbide tipped tools
- » Positive cutting angle

RECOMMENDED PARAMETERS

- » Cutting speed $v_c = 80 - 100\text{m/s}$
- » Feed rate per tooth $f_z = 0.05 - 0.2\text{mm}$
- » Parallel feed
- » High feed rates with scoring device

ADVANTAGES WITH BANOVA®

- » Chip-free cutting edges without holes in the panel core.
- » High feed rates possible due to homogeneity and low density of panel.
- » Long service life of tools thanks to the tool friendly bond, the homogeneous density distribution and no foreign particles in the panel.

SURFACE FINISHING SANDING ON WIDE BELT SANDING MACHINE

APPLICATION

- » Thickness equalisation as preparation for industrial face lamination (continuous or cycle press)
- » Thickness equalisation in crafts enterprises
- » Surface finishing / surface preparation for liquid coating (colors & laquers) or glue application

TOOL DETAILS

- » Fabric or paper sanding belt
- » Preferred sanding grain material silicon carbide (SiC)
- » Sanding grit P100 - P120 for thickness equalisation
- » Sanding grit P120 - P150 for surface finishing



RECOMMENDED PARAMETERS

Processing example: Thickness equalisation on a wide belt sanding machine in a workshop:

- » Sanding across the grain (1220 x 2440mm)
- » Belt speed $v_s = 20 - 30\text{m/s}$
- » Feed speed $v_f = 8 - 10\text{m/min}$
- » Sanding thickness 0.2 - 0.4mm per passage
- » Machine equipped with sanding roll in metal or hard rubber

*Sanding tests must be run if higher requirements on surface quality apply

MACHINE REQUIREMENTS

- » Efficient dust extraction.
- » Steady running sanding belts without relevant vibrations.
- » Processing accuracy depending on individual requirements.

SURFACE LAMINATION

SUITABILITY OF ADHESIVE TYPES ON BANOVA® SUBSTRATE

Surface	Face Thickness	Urea Formaldehyde	White Glue	Emulsion-Polymer-Isocyanate	PU-Hotmelt	1-Comp. Polyurethane	2-Comp. Polyurethane
		UF	PVAc	EPI	PUR	1K-PUR	2K-PUR
Wood Veneer	0.6 - 2.0mm	☆☆☆	☆☆☆	☆☆☆	☆☆☆		
Laminate HPL	0.6 - 1.0mm		☆☆	☆☆	☆☆☆		☆
CPL/MDO	0.2 - 0.8mm		☆☆	☆☆	☆☆☆		
MDF/HDF	0.8 - 1.8mm		☆☆	☆☆	☆☆☆	☆☆☆	☆☆☆
Aluminum	0.4 - 1.0mm			☆	☆☆☆		☆☆☆
GFRP	0.8 - 2.0mm			☆	☆☆☆		☆☆☆

☆☆☆ Preferred

☆☆ Suitable

☆ Possible

PARAMETERS TO LAMINATE SURFACE

- » The Banova® substrate is being laminated with common adhesive from the wood industry (see table above).
- » The panels are delivered with evenly sanded surfaces, flat and ready to laminate.
- » The untreated wood surface is porous and allows the adhesive to penetrate deeper into the surface compared to panels with a higher surface density. This provides an excellent bond, but does require a higher glue spread as applied on heavy panels with dense surfaces.
- » The documented adhesives and processing parameters are collected from experience and provide a good overview about current state of the art processes.
- » Documented production parameters must be checked and aligned with the current product data sheets of the adhesive suppliers, and the bonding quality must be monitored by the manufacturer. We do not provide recommendations for specific products or adhesive suppliers.

COMMON WOOD ADHESIVES PROCESSING PARAMETERS

UREA FORMALDEHYDE UF

» Adhesive:	Sempadur P8
» Surface:	Veneers
» Bonding Quality:	C3 according to EN12765
» Emission Class:	E1
» Area of Application:	Interior application with short exposure to water & humidity
» Glue Spread:	120 - 160 g/m ²
» Open Working Time:	Maximum 15 minutes bei 20°C
» Pressure:	2.5 kg/cm ²
» Press Panel Temperature:	100°C
» Cycle Time:	4 minutes pressing time
» Conditioning:	Minimum 6 hours in bulk with cover panel on bottom & top

WHITE GLUE PVAc

» Adhesive:	Collano DW 2018
» Surface:	Veneer, HPL, wood-based panels
» Bonding Quality:	D3 according to EN204
» Emission Class:	NAF - no added formaldehyde
» Area of Application:	Interior application with short exposure to water & humidity
» Glue Spread:	100 - 200 g/m ²
» Open Working Time:	8 - 10 minutes
» Pressure:	2.5 kg/cm ²
» Press Panel Temperature:	60°C
» Cycle Time:	5 minutes pressing time
» Conditioning:	Minimum 24 hours in bulk with cover panel on bottom & top

COMMON WOOD ADHESIVES PROCESSING PARAMETERS

EMULSION-POLYMER-ISOCYANATE EPI

» Adhesive:	Akzo Nobel EPI 1911
» Catalyst:	Akso Nobel 1993 Härter
» Surface:	Veneer, HPL, wood-based panels
» Bonding Quality:	D4 according to EN 204
» Emission Class:	NAF - no added formaldehyde
» Area of Application:	Interior application with long exposure to water and humidity
» Glue Spread:	140 - 220 g/m ²
» Open Working Time:	10 minutes
» Pressure:	2.5 kg/cm ²
» Press Panel Temperature:	65 - 70°C
» Cycle Time:	4 minutes pressing time
» Conditioning:	Minimum 6 hours in bulk with cover panel on bottom & top

2K POLYURETHAN 2K-PUR

» Adhesive:	Collano A 2125 (Comp. A & Comp. B)
» Surface:	Metal, GFRP, plastics, rubber, etc.
» Emission Class:	NAF - no added formaldehyde
» Area of Application:	Structural bond of sandwich panels
» Glue Spread:	200 - 400 g/m ²
» Potlife:	20 - 35 minutes of 100g at 20°C
» Pressure:	2.5 kg/cm ²
» Press Panel Temperature:	20 - 50°C
» Cycle Time:	90 minutes pressing time at 20°C

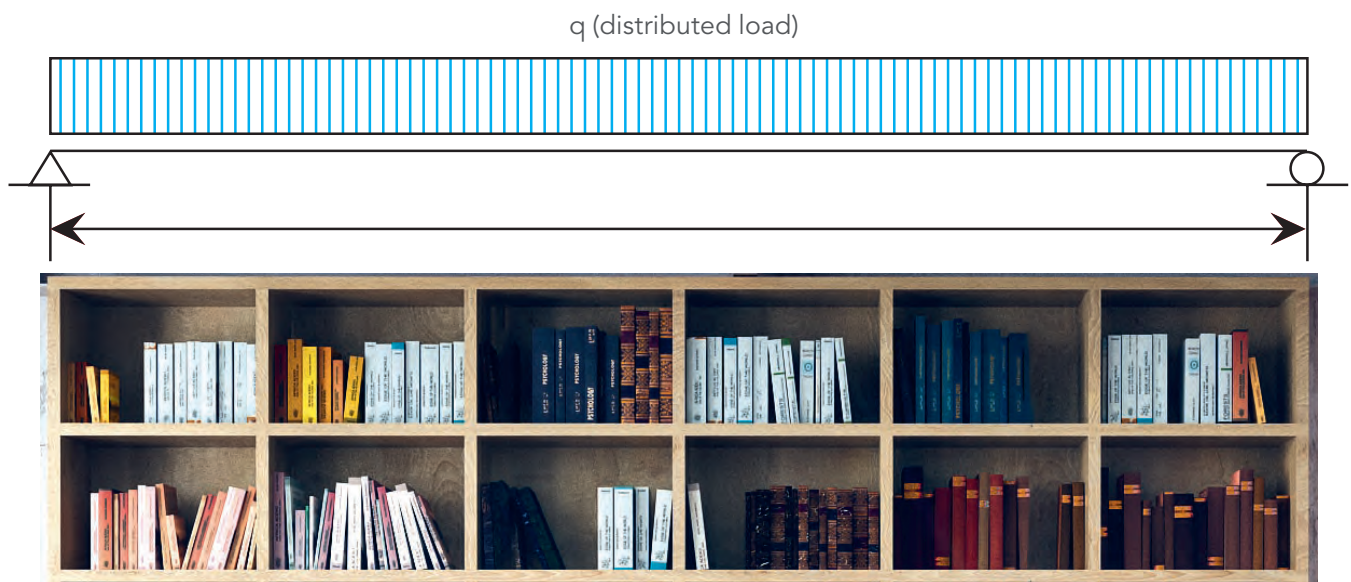
DEFINITION OF PANEL THICKNESS

Banova® is mainly used in interior applications where stability and stiffness is important. From static perspective, the panels are commonly loaded with bending forces found for example in the application of shelf boards.

GENERAL CONDITIONS AND DEFINITIONS

- » Static System: Single-span beam as for shelf boards.
- » Loads: Distributed load as applied with books and folders.
- » Limiting Criterias: At the defined load cases, deflection of the shelf boards becomes the limiting criteria. Shear and bending resistance are not limiting at the defined loads.

- » System Limitations: This documentation is a guideline to define the needed panel thickness depending on applied loads. The results in the following tables were calculated with known section values and characteristic material values. The tables are used as a guideline, but do not conform to a full static proof. Design details and external influences such as moisture content or creeping are not considered in the calculations. The correct design and application is part of the designer's and manufacturer's responsibility.



EXAMPLE USING TABLES

TABLE USAGE INSTRUCTIONS

1. Choose a table depending on defined load 50, 100, 150, or 200 kg/m².
2. Choose span of 400 - 1200 mm in the first column of the table.
3. Green highlighted fields show combinations of panel thickness and span that result in a deflection below span/300. This is a widely accepted value of acceptance.

0.5	Average deflection in mm within defined limit.
2.2	Deflection just out of limit, but may be accepted depending on need.
	Deflection off limits, not appropriate.

Distributed Load 50 kg/m²

BANOVA® PLUS - lengthwise

Span (mm)	Panel Thickness (mm)							l/300
	12	15	18	25	30	40	50	
400	0.5	0.2	0.1	0.1	0.0	0.0	0.0	1.3
500	1.1	0.5	0.3	0.2	0.1	0.0	0.0	1.7
600	2.3	1.1	0.6	0.3	0.2	0.1	0.0	2.0
800		3.6	1.8	1.1	0.6	0.2	0.1	2.7
1000			4.4	2.6	1.6	0.6	0.3	3.3
1200				5.4	3.3	1.2	0.6	4.0

Distributed Load 100 kg/m²

BANOVA® PLUS - lengthwise

Span (mm)	Panel Thickness (mm)							l/300
	12	15	18	25	30	40	50	
400	0.9	0.4	0.2	0.1	0.1	0.0	0.0	1.3
500	2.2	1.1	0.5	0.3	0.2	0.1	0.0	1.7
600		2.3	1.1	0.7	0.4	0.2	0.1	2.0
800			3.6	2.1	1.3	0.5	0.3	2.7
1000				5.2	3.2	1.2	0.6	3.3
1200					6.5	2.5	1.3	4.0

EXAMPLE USING TABLES CONTINUED

TABLE USAGE INSTRUCTIONS

1. Choose a table depending on defined load 50, 100, 150, or 200 kg/m².
2. Choose span of 400 - 1200 mm in the first column of the table.
3. Green highlighted fields show combinations of panel thickness and span that result in a deflection below span/300. This is a widely accepted value of acceptance.

0.5	Average deflection in mm within defined limit.
2.2	Deflection just out of limit, but may be accepted depending on need.
	Deflection off limits, not appropriate.

Distributed Load 150 kg/m²

BANOVA® PLUS - lengthwise

Span (mm)	Panel Thickness (mm)							l/300
	12	15	18	25	30	40	50	
400	0.9	0.4	0.2	0.1	0.2	0.0	0.0	1.3
500	2.2	1.1	0.5	0.3	0.2	0.1	0.0	1.7
600		2.3	1.1	0.7	0.4	0.2	0.1	2.0
800			3.6	2.1	1.3	0.5	0.3	2.7
1000				5.2	3.2	1.2	0.6	3.3
1200					6.5	2.5	1.3	4.0

Distributed Load 200 kg/m²

BANOVA® PLUS - lengthwise

Span (mm)	Panel Thickness (mm)							l/300
	12	15	18	25	30	40	50	
400	1.8	0.9	0.4	0.3	0.2	0.1	0.0	1.3
500		2.2	1.1	0.6	0.4	0.1	0.1	1.7
600			2.3	1.3	0.8	0.3	0.2	2.0
800				4.2	2.6	1.0	0.5	2.7
1000					6.3	2.4	1.2	3.3
1200						5.0	2.5	4.0

DEFINING PANEL THICKNESS USING EXISTING PANEL STIFFNESS



Banova® is commonly used to create a relevant weight reduction. Often the product is applied slightly thicker to make the component stiffer and lighter than the existing component. The approach of replacing existing components is explained below in a simple way. The calculations relate exclusively to the panel stiffness which is usually the limiting factor in interior panel applications. Full static proof may be calculated with the characteristic material data given in the technical data sheet. The correct design and application is part of the designer's and manufacturer's responsibility.

BACKGROUND AND DEFINITIONS

Modulus of Elasticity (E_m oder MOE, bending modulus) is a material characteristic required to assess or calculate panel stiffness. The bending stiffness of a panel depends on its dimensions and the configuration. Wood panel fabricators often state the Modulus of Elasticity in their technical documentations with reference to DIN EN 310. These values can be used to compare different products and materials. The following table shows some MOE values of different kinds of wood panels in different thicknesses.

Product	AVG Density	AVG MOE depending on panel thickness (N/mm ²)						
	(kg/m ³)	12	15	18	25	30	40	50
BANOVA® PLUS	230	2500	2600	3000	1900	1800	2000	0
Poplar Plywood	420	3800	3500	3200	2800	2800	2500	n.a.
Particleboard	700	1600	1600	1600	1500	1350	1200	1050
MDF	700	2200	2200	2100	2100	1900	1900	n.a.

DEFINING PANEL THICKNESS CONTINUED

USE AND CALCULATIONS

MOE values of equivalent panel thickness can be used to compare products. For example at 12mm panel thickness, Banova® PLUS is 1.13 times (=2500/2200) stiffer than MDF while being three times lighter. Apart from that, the following formula is applied to compare different products of different panel thicknesses:

$$\frac{t_1}{t_2} = \sqrt[3]{\frac{E_1}{E_2}}$$

MATERIAL 1: Poplar Plywood

Thickness:	t_1	15mm
MOE:	e_1	3500 N/mm ²
Weight: m_1		0.015 m x 420 kg/m ³ = 6.3 kg/m ²

15 mm Banova® PLUS has a bending modulus (MOE) of 2600 N/mm², which means it is less stiff than poplar plywood of the same panel thickness. There is now the option to use the next gauge thicker to obtain an elevated panel stiffness.

MATERIAL 2: Banova® PLUS

Thickness:	t_2	18mm (approved after calculation below)
MOE:	e_2	3000 N/mm ²
Weight: m_2		0.018 m x 230 kg/m ³ = 4.14 kg/m ²

Formula to calculate the required panel thickness with given bending modulus:

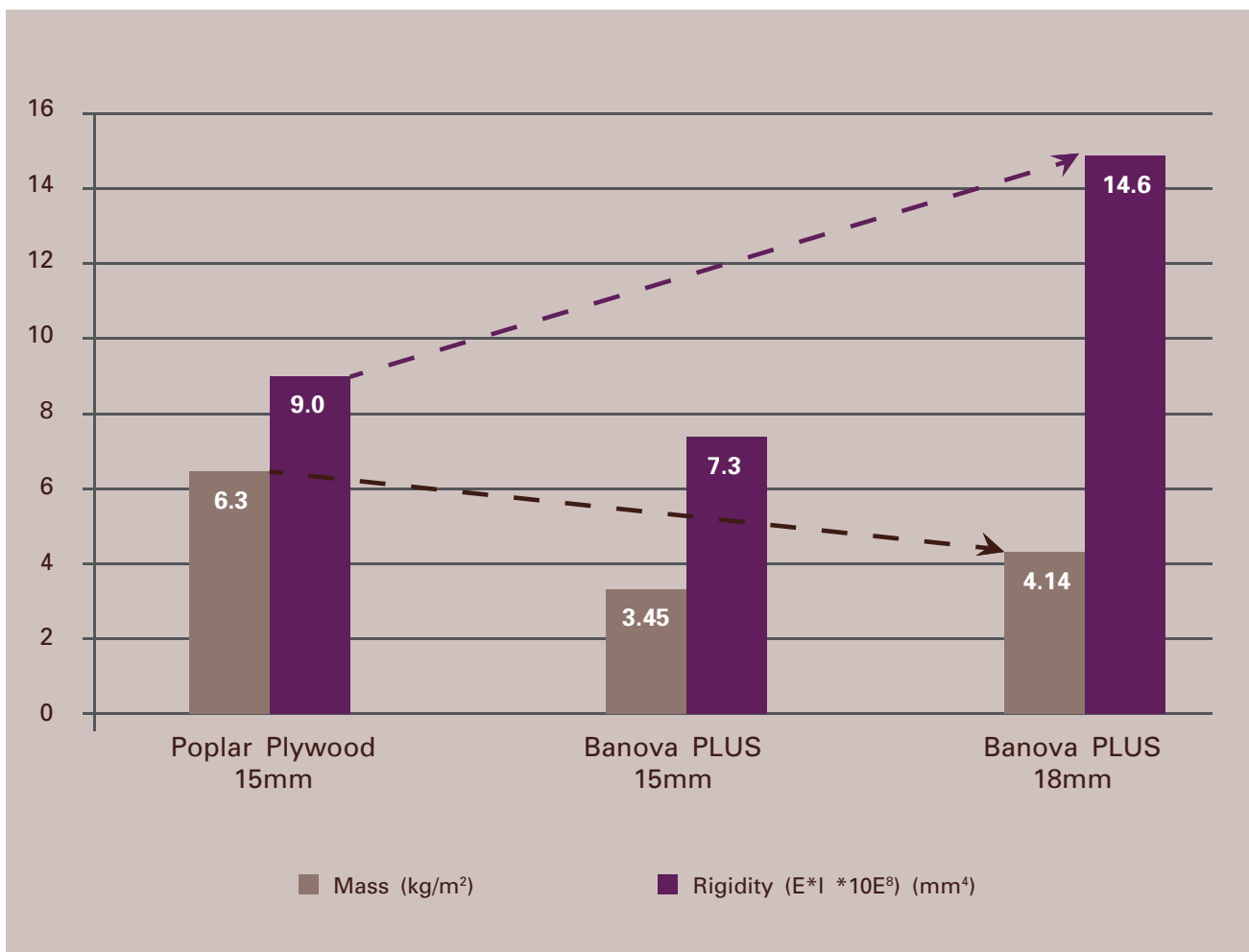
$$t_2(18\text{mm}) > \frac{t_1}{\sqrt[3]{\frac{E_2}{E_1}}} = \frac{15}{\sqrt[3]{\frac{3000}{3500}}} = 15.7\text{mm}$$

Weight Reduction: 2.16 kg/m²

GROWN LIGHT • MADE STRONG

LIGHTER AND STIFFER

18mm Banova® PLUS is 30% lighter and 62% stiffer than 15mm poplar plywood!





02-2018

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