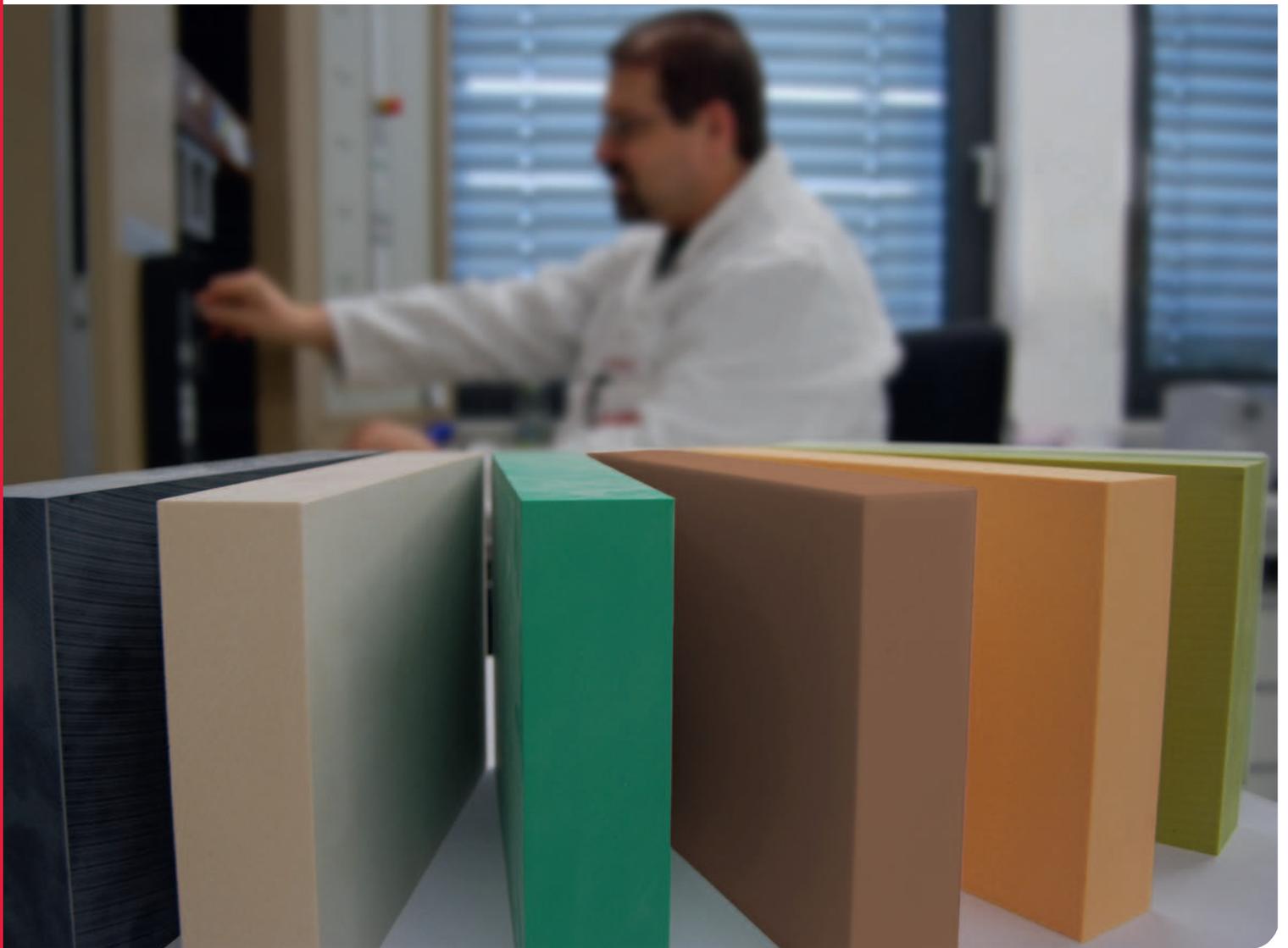


RAKU-TOOL® Boards

There is a solution for every challenge: RAKU-TOOL.



www.rampf-gruppe.de

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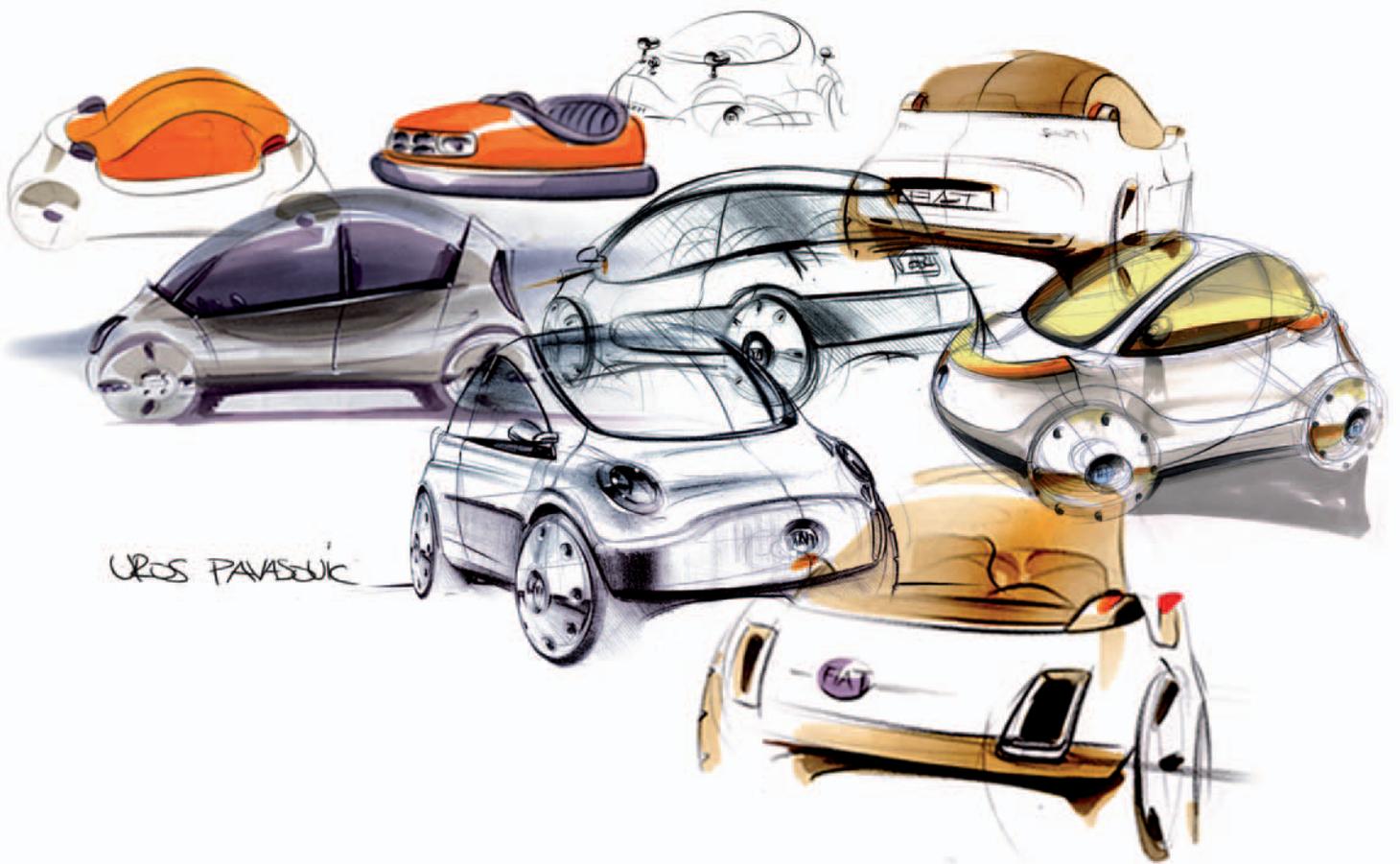
ainplastics.com



RAMPF®

discover the future

We find solutions for your applications –
Performance proven solutions with RAKU-TOOL®.



RAKU-TOOL[®] Application Examples



The customer chose CP-6100 because the RAMPF paste could produce 5 high quality models which were ideally suited for this process.

Production of models for wind turbines in the Wind Energy Industry.

The customer built a metal reinforcement structure with cross ribs according to instructions from RAMPF Tooling. In parallel an expanded polystyrene block was bonded onto 2 inch thick wood plates. The entire structure was covered with epoxy laminated glass fabrics, including the underside. The polystyrene-wood block was screwed into slotted holes on the metal reinforcement structure. 5 models total were created. Due to the size of the CNC equipment each model of 46 meters in length had to be divided into two sections of 12 meters in length. An additional model of approximately 7 meters was also created. RAMPF technicians applied the Close Contour Paste CP-6100 onto the supporting structures within one week, leaving gaps every 2 meters vertically and horizontally. After 24 hours gaps were filled and the model parts cured in an oven at 25° C. After the initial cure, parts were post-cured in steps up to 70° and cooled down afterwards. After cooling the model was polished and painted with vinyl ester high gloss topcoat.

A resin infusion process, using a high temperature epoxy infusion system in combination with glass fabrics was used to produce the tools. Using a meter mix machine the infusion took approx. 2 hours per 100 m² surface. Each tool was cured 24 hours at 25° C on the model, then post-cured in steps up to 50°C for 14 hours. The pre post-cure was necessary to strengthen the chemical cross linking of the epoxy resin and make demolding easier.

To finalize the tools a supporting structure was applied to the back of the tool which was then demolded and a final post-cure of the tool in steps up to 160°C took place.

RAKU-TOOL® Application Examples



Production of interior cubing parts for a passenger car cabin with RAKU-TOOL® MB-0720 board material.

Cubing models allow designers to create a detailed reproduction of their product idea. Exterior as well as interior cubing allows for a comprehensive assessment of visual appearance, feel and accuracy of fit of individual parts or even an entire cabin. Likewise the cubing process helps to recognize and eliminate potential problems or design faults at an early stage in the design process. The further into the design process the more costly any adjustments or revisions can be.

This into the process integrated modeling technique helps to:

- » Shorten development times
- » Reduce costs for modifications
- » Simplify specification work
- » Improve quality

Criteria for material choice:

- » Dimensionally accurate and stable material
- » Easy to process
- » Fine surface structure
- » The board material is bonded with color and density matched adhesive and then machined according to the CAD data. Afterwards, the individual parts are screwed onto an aluminum profile base frame.
- » Good dimensional accuracy of models due to good shape stability and low coefficient of thermal expansion of the board material.
- » Time savings through fast and easy processing. The material is easy and quick to machine. It can also be worked on by hand. Good chip formation.
- » Little finishing required due to fine surface structure.

RAKU-TOOL® Close Contour Pastes

Economic Modeling for the automotive, marine, wind and aerospace industries.



Your Advantages

- Excellent surface structure, smooth and seamless, suitable for direct tooling
- Good dimensional stability
- Easy to process
- Quick application
- Layer thickness 40 mm for Epoxy (EP) without slump on vertical surface
- Quick cure schedule, can be machined after 24 hours at room temperature
- Low density supporting structure (PU or EPS)
- Little wastage when compared to boards
- Easy and quick machining with low dust
- Easy to repair

RAKU-TOOL®

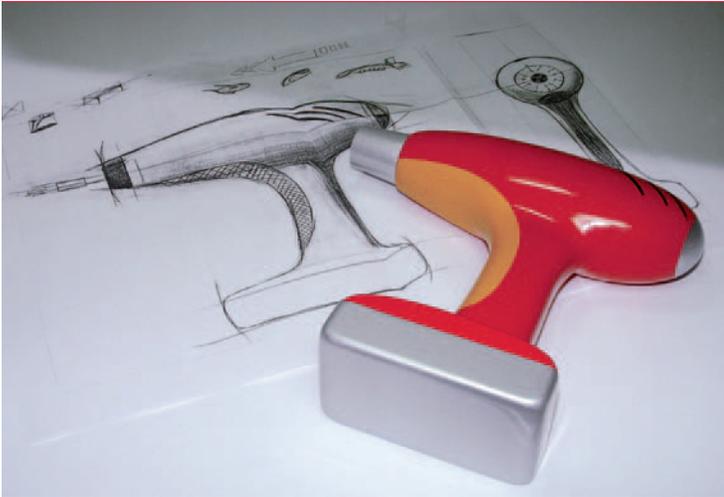
Close Contour Paste

			CP-6100 R CP-6100 H Epoxy based	CP-6070 R CP-6070 H Epoxy based	CP-6050 R CP-6050 H Epoxy based
Color	Visual		Light blue	Brown	Light brown
Density	ISO 1183	g/cm ³	1.30 (81 pcf)	0.75 (47 pcf)	0.50 (31 pcf)
Shore D Hardness	ISO 868		85-90	55-60	45-50
Coefficient of thermal expansion	ISO 11359	10 ⁻⁶ K -1	35-40 (19-22 in/in/°F)	70-75 (33-42 in/in/°F)	75-80 (42-44 in/in/°F)
Deflection temperature, HDT	ISO 75	°C	70-75 (158-167 °F)	60-65 (140-149 °F)	60-65 (140-149 °F)
Transition temperature, Tg	DSC	°C	70-75 (158-167 °F)	70-75 (158-167 °F)	70-75 (158-167 °F)
Compressive Strength	ISO 604	MPa	110-120 (1600-17400 psi)	18-20 (2610-2900 psi)	10-15 (1450-2175 psi)
Compressive modulus	ISO 604	MPa	6500-7500 (943000-1090000 psi)	900-1000 (130500-145000 psi)	450-500 (65300-72500 psi)
Flexural strength	ISO 178	MPa	60-70 (8700-10200 psi)	16-18 (2320-2610 psi)	10-15 (1450-2175 psi)
Layer thickness		mm	40 (1.6 in)	40 (1.6 in)	40 (1.6 in)
Machinable after (at 25° C)		h	24	24	24

All properties after cure: 7 days at RT or 14h at 40°C

Our recommendations on the use of the material are based upon many years of experience and current scientific and practical knowledge. They are, however, provided without any obligation on our part and do not relieve the buyer of the need for suitability tests. They do not constitute a legal relationship, nor are any protected third party rights whatsoever affected thereby. No liability accepted for misprints. Version 2008/09

Modeling and Working Boards. RAKU-TOOL styling (SB), modeling (MB) and working boards (WB) stand for high mechanical properties and continuous quality. The materials are shaped manually or machined easily using the correct tools.

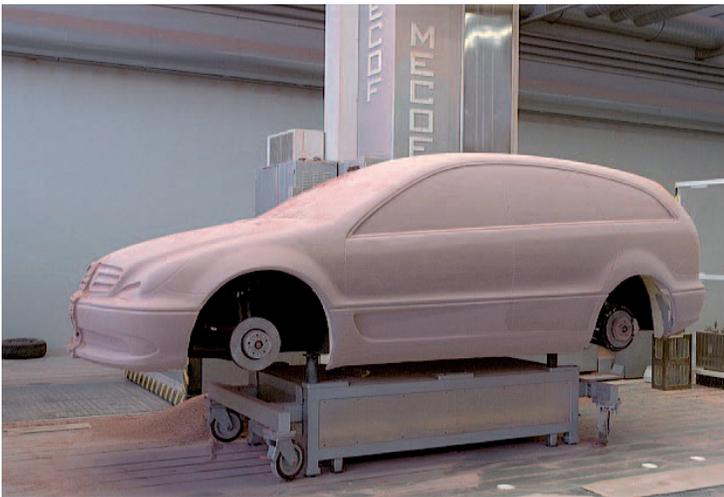


Styling (SB)

- » Styling & Design Models
- » Program proving

Key Properties:

- » Fine surface structure
- » Easily shaped and machined



Modeling (MB)

- » Master Models
- » Cubing Models
- » Patterns

Key Properties:

- » Very fine surface structure
- » Good dimensional stability



Tools (WB)

- » Metalforming Tools
- » Foundry Patterns
- » Core Boxes
- » Jigs and Fixtures
- » Prepreg Lay Up Tools

Key Properties:

- » Excellent mechanical properties

RAKU-TOOL®

Styling & Modeling Boards



www.rampf-gruppe.de

» RAKU-TOOL
SB-0160

» RAKU-TOOL
SB-0240

» RAKU-TOOL
SB-0320

» RAKU-TOOL
SB-0470

Design & Styling with RAKU-TOOL

	» RAKU-TOOL SB-0160	» RAKU-TOOL SB-0240	» RAKU-TOOL SB-0320	» RAKU-TOOL SB-0470
Color	Light gray	Light green	Apricot	Apricot
Density (ISO 1183) g/cm ³ lb/ft ³	0.16 10.0	0.24 15.0	0.32 20.0	0.47 29.0
Applications	Styling & design models Data control models Supporting structures for Close Contour Paste	Styling & design models Data control models	Styling & design models Data control models	Styling & master models
Key properties	» Light weight and smooth surface » Easily shaped, low dust » Resistant to organic solvents	» Good surface structure » Easily shaped and machined » Resistant to organic solvents	» Very good surface structure » Easily shaped and machined	» Very good surface structure » Easily machined
Hardness (ISO 868) Shore D	–	–	–	–
Coefficient of thermal expansion (ISO 11359) 10 ⁻⁶ K ⁻¹ in/in/°F x 10 ⁻⁶	25 – 35 14 – 19	60 – 70 33 – 39	60 – 65 33 – 36	60 – 65 33 – 36
Deflection temperature (ISO 75) °C °F	–	55 – 65 130 – 150	60 – 70 140 – 158	60 – 70 140 – 158
Compressive strength (ISO 604) MPa psi	2 – 3 280 – 430	2 – 4 290 – 570	5 – 7 720 – 1,000	10 – 15 1,400 – 2,100
Flexural strength (ISO 178) MPa psi	2 – 3 280 – 430	5 – 6 720 – 850	6 – 8 850 – 1,100	10 – 15 1,400 – 2,100
Dimensions mm in	4 x 24 x 96 6 x 24 x 96 8 x 24 x 96 2 x 48 x 96 6 x 48 x 96	4 x 24 x 96 8 x 24 x 96 2 x 48 x 96 4 x 48 x 96 6 x 48 x 96	4 x 24 x 96 6 x 24 x 96 8 x 24 x 96 2 x 48 x 96 4 x 48 x 96 6 x 48 x 96	50x500x1500 2.0x19.7x59.1 100x500x1500 3.9x19.7x59.1 150x500x1500 5.9x19.7x59.1 200x500x1500 7.9x19.7x59.1

» EP-2305/EH-2904-1

» EP-2305/EH-2904-1

» EP-2305/EH-2904-1

Bonding with RAKU-TOOL

	» EP-2305/EH-2904-1	» EP-2305/EH-2904-1	» EP-2305/EH-2904-1
Mixing ratio (pbw)		100 : 30	100 : 30
Color		Apricot	Apricot
Pot life (min.)		25	25
Minimum curing time (h)		16	16

» UP-4301/UH-4901

» UP-4301/UH-4901

» UP-4301/UH-4901

Repair with RAKU-TOOL

	» UP-4301/UH-4901	» UP-4301/UH-4901	» UP-4301/UH-4901
Mixing ratio (pbw)		100 : 1 – 3	100 : 1 – 3
Color		Apricot	Apricot
Pot life (min.)		4 – 6	4 – 6
Minimum curing time (h)		25 – 30	25 – 30

Modeling boards are used for master models, cubing models, presentation models, design and shape studies.



» RAKU-TOOL
MB-0540

» RAKU-TOOL
MB-0600

» RAKU-TOOL
MB-0670

Modeling with RAKU-TOOL

Eco-board
Made from Recycled
Material!

Color	Light brown	Brown	Brown
Density (ISO 1183) g/cm ³ lb/ft ³	0.54 33.7	0.60 37.5	0.67 41.8
Applications	Master & cubing models Patterns	Master & cubing models Patterns	Master & cubing models Patterns
Key properties	<ul style="list-style-type: none"> » Fine surface structure » Easily shaped and machined » Good dimensional stability » Low coefficient of thermal expansion 	<ul style="list-style-type: none"> » Fine surface structure » Easily shaped and machined » Low coefficient of thermal expansion » Good dimensional stability 	<ul style="list-style-type: none"> » Fine surface structure » Easily shaped and machined » Low coefficient of thermal expansion » Good dimensional stability
Hardness (ISO 868) Shore D	45 – 50	50 – 55	60 – 65
Coefficient of thermal expansion (ISO 11359) 10 ⁻⁶ K ⁻¹ in/in/°F x 10 ⁻⁶	45 – 50 25 – 28	50 – 55 28 – 31	50 – 55 28 – 31
Deflection temperature (ISO 75) °C °F	60 – 65 140 – 149	70 – 75 158 – 167	75 – 80 167 – 176
Compressive strength (ISO 604) MPa psi	10 – 15 1,500 – 2,200	15 – 20 2,100 – 2,800	20 2,900
Flexural strength (ISO 178) MPa psi	13 – 18 1,900 – 2,600	15 – 20 2,100 – 2,800	20 – 25 2,900 – 3,600
Dimensions mm in	50x500x1500 2.0x 19.7x 59.1 100x500x1500 3.9x 19.7x 59.1	25x500x1500 1.0x 19.7x 59.1 50x500x1500 2.0x 19.7x 59.1 75x500x1500 3.0x 19.7x 59.1 100x500x1500 3.9x 19.7x 59.1 150x500x1500 5.9x 19.7x 59.1 200x500x1500 7.9x 19.7x 59.1	25x500x1500 1.0x 19.7x 59.1 50x500x1500 2.0x 19.7x 59.1 75x500x1500 3.0x 19.7x 59.1 100x500x1500 3.9x 19.7x 59.1

» EP-2306/EH-2904-1

» EP-2306/EH-2904-1

» EP-2306/EH-2904-1

Bonding with RAKU-TOOL

Mixing ratio (pbw)	100 : 30	100 : 30	100 : 30
Color	Brown	Brown	Brown
Pot life (min.)	35	35	35
Minimum curing time (h)	16	16	16

» UP-4310/UH-4900

» UP-4310/UH-4900

» UP-4310/UH-4900

Repair with RAKU-TOOL

Mixing ratio (pbw)	100 : 1 – 3	100 : 1 – 3	100 : 1 – 3
Color	Brown	Brown	Brown
Pot life (min.)	4 – 6	4 – 6	4 – 6
Minimum curing time (h)	25 – 30	25 – 30	25 – 30



RAKU-TOOL®

Modeling and Working Boards

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» RAKU-TOOL
MB-0720

» RAKU-TOOL
WB-0700

» RAKU-TOOL
WB-0801

Tool making with RAKU-TOOL

Color	Brown	Light green	Gray
Density (ISO 1183) g/cm ³ lb/ft³	0.72 45.0	0.70 43.8	0.80 50
Applications	Master & cubing models Patterns	Lay up tools for pre-preg High temperature applications Vacuum forming molds	Master models Cubing models Tooling jigs and fixtures Vacuum forming tools
Key properties	<ul style="list-style-type: none"> » Excellent surface structure » Low coefficient of thermal exp. » Good dimensional stability » Good compressive and flexural strength 	<ul style="list-style-type: none"> » Very fine surface structure » Very easily machined » Good dimensional stability » Temperature resistance up to 135° C 	<ul style="list-style-type: none"> » Fine surface structure » High HDT and very low CTE » Good dimensional stability » Good compressive and flexural strength
Hardness (ISO 868) Shore D	60 – 65	70 – 80	65 - 70
Coefficient of thermal expansion (ISO 11359) 10 ⁻⁶ K ⁻¹ in/in/°F x 10⁻⁶	50 – 55 28 – 31	35 – 45 19 – 25	45 – 50 25-28
Deflection temperature (ISO 75) °C °F	75 – 80 167 – 176	130 – 140 266 – 284	85 – 90 185 – 194
Compressive strength (ISO 604) MPa psi	20 – 25 2,800 – 3,500	50 – 55 7,100 – 7,800	40 – 45 5,800 – 6,500
Flexural strength (ISO 178) MPa psi	25 – 30 3,500 – 4,200	30 – 40 4,200 – 5,700	35 – 40 5,100 – 5,800
Dimensions mm in	25x500x1500 1.0x19.7x59.1 50x500x1500 2.0x19.7x59.1 75x500x1500 3.0x19.7x59.1 100x500x1500 3.9x19.7x59.1 150x500x1500 5.9x19.7x59.1 200x500x1500 7.9x19.7x59.1	50x500x1500 2.0x19.7x59.1 75x500x1500 3.0x19.7x59.1 100x500x1500 3.9x19.7x59.1 150x500x1500 5.9x19.7x59.1 200x500x1500 7.9x19.7x59.1	25x500x1500 1.0x19.7x59.1 50x500x1500 2.0x19.7x59.1 75x500x1500 3.0x19.7x59.1 100x500x1500 3.9x19.7x59.1 150x500x1500 5.9x19.7x59.1

» EP-2306/EH-2904-1

» EP-2304/EH-2934

» EL-2210/EH-2910*

Bonding with RAKU-TOOL

Mixing ratio (pbw)	100 : 30	100 : 20	100 : 60
Color	Brown	Green	Transparent
Pot life (min.)	35	90	60
Minimum curing time (h)	16	16	16

» UP-4310/UH-4900

» UP-4320/UH-4920

Repair with RAKU-TOOL

Mixing ratio (pbw)	100 : 1 – 3	100 : 3 – 5	
Color	Brown	Green	Repair with adhesive bonded inserts
Pot life (min.)	4 – 6	4 – 6	
Minimum curing time (h)	25 – 30	25 – 30	

Working boards are used for metal forming, hammer forms, foundry patterns, molds, jigs and lay up tools.



» RAKU-TOOL WB-1405	» RAKU-TOOL WB-1450	» RAKU-TOOL WB-1700
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Tool making with RAKU-TOOL

Color	Red	Brown	Dark gray
Density (ISO 1183) g/cm ³ lb/ft³	1.40 87.5	1.45 90.5	1.70 106
Applications	Pattern plates and core boxes Machined negatives and positives Models, molds and tools Hammer forms	Foundry patterns and core boxes	Metal forming tools Vacuum forming molds, jigs Foam molds, rapid prototyping molds
Key properties	» Dense surface structure » Very easily machined » Good dimensional stability » Good abrasion resistance and impact strength	» Very dense surface » Easily machined » High mechanical properties	» Very dense surface structure, can be polished » Easily machined » Good temperature resistance » Excellent compressive strength » High abrasion resistance
Hardness (ISO 868) Shore D	85 – 90	80 – 85	85 – 90
Coefficient of thermal expansion (ISO 11359) 10 ⁻⁶ K ⁻¹ in/in/°F x 10⁻⁶	50 – 55 28 – 31a	65 – 75 36 – 42	45 – 50 25 – 28
Deflection temperature (ISO 75) °C °F	75 – 80 167 – 176	75 – 80 167 – 176	120 – 125 248 – 257
Compressive strength (ISO 604) MPa psi	85 – 95 12,300 – 13,800	70 – 75 10,200 – 10,900	125 – 130 17,800 – 18,600
Flexural strength (ISO 178) MPa psi	80 – 90 11,600 – 13,100	70 – 75 10,200 – 10,900	80 – 85 11,000 – 12,000
Dimensions mm in	30x500x1000 1.2x 19.7x 39.4 50x500x1000 2.0x 19.7x 39.4 75x500x1000 3.0x 19.7x 39.4 100x500x1000 3.9x 19.7x 39.4 150x500x1000 5.9x 19.7x 39.4	50 x 500 x 1000 2.0 x 19.7 x 39.4 100 x 500 x 1000 3.9 x 19.7 x 39.4	50x 500 x 750 2.0 x 19.7 x 29.5 100x 500 x 750 3.9 x 19.7 x 29.5

Eco-board
Made from Recycled
Material!

» EL-2210/EH-2910*	» EL-2210/EH-2910*	» EL-2210/EH-2910*
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Bonding with RAKU-TOOL

Mixing ratio (pbw)	100 : 60	100 : 60	100 : 60
Color	Transparent	Transparent	Transparent
Pot life (min.)	60	60	60
Minimum curing time (h)	16	16	16

Repair with RAKU-TOOL

Mixing ratio (pbw)			
Color	Repair with adhesive bonded inserts	Repair with adhesive bonded inserts	Repair with adhesive bonded inserts
Pot life (min.)			
Minimum curing time (h)			

See more online...



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RAMPF Tooling in the NAFTA region.



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