

PVAc Glue

Application: HF/RF applications; KA edgebanding; assembly of windows and furniture for moist conditions (bathroom, kitchen, etc.) as well as for dowel driving units with a high pressure pump.

Characteristics/Directions for use: Self-crosslinking PVAc glue highly water resistant (fulfills EN 204 D3 and Type II ANSI/HPVA HP-1-1994). Excellent bond strength and durability. CAUTION: May cause discoloration of veneer in flat press applications.

Min. temp. for materials, glue and room air:	15°C (58°F)
Appearance:	white - opaque with UV indicator
Glue Application:	one sided
Application amount :	4-6 mil wet=10-16 g/sqft
Open time [min]:	approx. 6-8 minutes
Pressure [N/mm²]:	30 psi minimum=2 kp/sqcm=.2 N/sqmm
Density [g/cm³]:	approx. 1.1 (9.1 lbs./gal.)
Solids content [%]:	approx. 50
pH value:	approx. 3-4
Min. press. time at room temp. [min]:	approx. 20-30 minutes (depending on the substrates to be glued)

Tested according to Jowat test methods. Customer trials are required.

General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity [mPa.s]: approx. 6,000
(Brookfield, 20°C, spindle 5, 20RPM)

Cleaning: Machines and equipment may be cleaned after use with warm or cold water. Dried glue must be removed mechanically.

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

PVAc Glue

Remarks:

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JOWAT Corporation Information

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PVAc Glue

Application: General assembly glue for all wood applications where a fast setting speed is essential.

Characteristics/Directions for use: Medium viscosity, extremely fast setting PVAc glue, which forms a hard, tough glue line with good durability and bond strength.

Customer trials are required.

Min. temp. for materials, glue and room air [°C]:	15 (58°F)
Glue Application:	One-sided
Application amount:	4-6 mil wet = 10-16 g/ft ²
Open assembly time at RT [min]:*	approx. 4 ± 2
Pressure [N/mm ²]:*	> 0.2 (30 psi)

* According to Jowat test method.

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Technical Data:	Viscosity at 20 °C [mPas]:	11,500 ± 3,000
	(Brookfield, RV, spindle 5, 20rpm)	
	Solids content, 2 h at 90 °C [%]:*	55 ± 2
	Density at 20 °C [g/cm ³]:*	1.0 ± 0.5 (8.4 lbs./gal.)
	pH value at 20 °C:*	4.5 ± 0.5
	Appearance:	60—opaque; 62—brown; 64—blue under UV light

* According to Jowat test method

Cleaning: Machines and equipment may be cleaned after use with warm or cold water. Dried glue must be removed mechanically.

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

PVAc Glue

110.60/62/64**Remarks:**

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PVAc Glue

110.60/62/64

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PVAc doweling Glue

Application: For automatic dowel insertion adhesive. For usage with soft or hard-textured wood and particleboard on dowelling machines.

Characteristics/Directions for use: Low viscosity, joint-filling, tough elastic glue film. Contains UV indicator. Special formulation avoids crust formation at the nozzle and facilitate start-up after down times.

Min. processing temperature for materials, glue and room air [°C]:	15 (58 °F) (not identical to MFFT)
Appearance of the glue film:	Colorless transparent with UV indicator
Classification according to EN 204:	Not applicable
Density at 20°C [g/ cm³]:*	1.05 ± 0.1 (Jowat test method)
Open time at RT [min]:	Not applicable
* According to Jowat test method.	

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Specification:	Viscosity at 20°C (68 °F) [mPas]:	125 ± 15
	(Brookfield RV, Spindle 2, 20 RPM)	
	Solids content, 2 h at 90 °C (194 °F) [%]:	40 ± 2
	(Jowat test method)	
	pH value at 20 °C (68 °F):	5.0 ± 0.5

Cleaning: Machines and equipment may be cleaned after use with warm or cold water. Dried glue must be removed mechanically.

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

04/22

Page 1 of 3

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Jowat
Adhesives



PVAc doweling Glue

114.60**Remarks:**

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Page 2 of 3

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PVAc Glue

Application: Especially designed for laminating vinyl films (reverse printed and regular) and lightweight paper foils (non-impregnated) to wood substrates. Also suitable for foam and fabric bonding applications.

Characteristics/Directions for use: Low to medium viscosity copolymer emulsion with excellent adhesion to coated surfaces. Glue film is elastic and flexible when dry.

Min. temp. (materials, glue and room air): 15°C (58°F)

Application amount : 1.5-2.0 mil wet=3-5 g/sqft

This glue may be applied with brush or roll. When diluted with 2-4% water, it may be also be sprayed.

Tested according to Jowat test methods. Customer trials are recommended.

Technical Data:

Viscosity [mPas]:	approx. 2,500 (Brookfield)
Density [g/cm³]:	approx. 1.05 (8.8 lbs./gal.)
Solids [%]:	approx. 55
pH value:	approx. 4-5
Appearance:	clear - translucent

Cleaning: Machines and equipment may be cleaned after use with warm or cold water. Dried glue must be removed mechanically.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic containers of 45 lbs. net or in 55 gallon metal drums with PE lining. Special packaging upon request.

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Copolymer

Application: Especially designed for priming HPL edgebanding to be bonded with Jowatherm EVA based edgebanding hot melt.

Characteristics/Directions for use: Low to medium viscosity copolymer emulsion with excellent adhesion to coated surfaces.
Mix 1:1 with water. Brush on an even coating and let dry thoroughly prior to edgebanding.

_primer

During storage, the viscosity of the product may increase. High storage temperatures promote higher increase in viscosity. We recommend the use of a suitable tool to stir the product before use.

Min. temperature for materials, glue and room air [°C]:	15 (58°F) (not identical with minimum film-forming temperature)
Application amount :	1.5-2.0 mil wet-3-5 g/sqft
Appearance of the glue film:	Transparent
Density at 20 °C (68 °F) [g/cm³]:	approx. 1.05 ± 0.05 (8.7 lbs/gal)

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Specification: Viscosity at 25 °C (77 °F) [mPas]: approx. 2,000 ± 1,000
(Brookfield, RV, spindle 5, 20 RPM)
Solids cont., 2h at 90 °C (194 °F) [%]: approx. 70 ± 2
(Jowat test method)
pH value: 4.5 ± 1
(Jowat test method)

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Cleaning: Machines and equipment may be cleaned after use with warm or cold water. Dried glue must be removed mechanically.

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Copolymer

Application: Especially designed for laminating vinyl and paper film (reverse printed or regular) substrates for Woodworking and Furniture industry.

Characteristics/Directions for use: Low to medium viscosity copolymer emulsion with excellent adhesion to coated surfaces. Glue film is elastic and flexible when dry.

The material is applied one-sided to the base boards (lamination material) or to the wrapping material.

During storage, the viscosity of the product may increase. High storage temperatures promote higher increase in viscosity. We recommend the use of a suitable tool to stir the product before use.

Min. temperature for materials, glue and room air [°C]:	15 (58°F) (not identical with minimum film-forming temperature)
Application amount :	1.5-2.0 mil wet-3-5 g/sqft
Appearance of the glue film:	Transparent
Density at 20 °C (68 °F) [g/cm³]:	approx. 1.05 ± 0.05 (8.7 lbs/gal)

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Specification:	Viscosity at 25 °C (77 °F) [mPas]:	approx. 2,000 ± 1,000
	(Brookfield, RV, spindle 5, 20 RPM)	
	Solids cont., 2h at 90 °C (194 °F) [%]:	approx. 70 ± 2
	(Jowat test method)	
	pH value:	4.5 ± 1
	(Jowat test method)	

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Copolymer

148.50

LIABLE FOR ANY LOSS, DAMAGE OR INJURY OF ANY NATURE, EITHER DIRECT, INDIRECT OR CONSEQUENTIAL, IN CONNECTION WITH OR RESULTING FROM THE PURCHASE, USE OR SALE OF THE PRODUCTS. SELLER'S OBLIGATION UNDER THIS WARRANTY SHALL BE LIMITED TO CREDITING BUYER WITH THE INVOICE VALUE OF ANY NONCONFORMING PRODUCTS UPON THEIR RETURN TO SELLER OR REPAIRING OR REPLACING ANY NONCONFORMING PRODUCTS, IN SELLER'S SOLE DISCRETION. If an additional copy of the General Terms and Conditions is needed, please contact JOWAT.

PU Dispersion

150.90/91/95

Application: Especially designed for bonding vinyl films to particle board or MDF. This adhesive can be processed in one-component form (without adding crosslinking agent).

Characteristics/Directions for use: PU dispersion with built-in crosslinking mechanism, excellent film formation, high initial strength and good water and heat resistance after crosslinking. Heat resistance values are higher if the lamination is carried out within 8 hours after adhesive application.

Min. temp. (materials, glue and room air): 15°C (58°F)
Glue Application: one sided
Application amount : 2-5 mil wet=5-12 g/sqft (depending on board quality)
Min. activation temp. in the bondline: 55°C (131°F)

Applied by spraying (cup or pressure pot). Pot and gun components must be stainless steel or plastic. Diameter of spray nozzle should be 1.0-1.5 mm (.040-.060 inches). The edges should be sprayed a second time after the first coat has dried. Glue film must be completely dry before pressing. Complete curing at room temperature takes about 7 days.

Depending on the adhesive, type of foil, foil thickness, design and shape of the MDF part and test method used, it is possible to achieve heat resistance values between 80 and 100°C (176 to 212°F).

Tested according to Jowat test methods. Customer trials are recommended.

Technical Data: Viscosity [mPas]: approx. 3,000 (Brookfield)
Density [g/cm³]: approx. 1.05 (8.7 lbs./gal.)
Solids [%]: approx. 41
pH value: approx. 8
Appearance: 90 - opaque with UV indicator; 91 - white; 95 - blue

Cleaning: Fresh glue may be removed with cold water. Dried glue must be removed mechanically.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic containers of 44 lbs. net or in 55 gallon metal drums with PE lining. Special packaging upon request.

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PU Dispersion

150.90/91/95

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PU dispersion

Application: Especially designed for bonding vinyl films to particle board or MDF.

Characteristics/ Cross linkable Polyurethane emulsion. High heat and water resistance when cured.

Directions for

use:

Applied by spraying (cup or pressure pot). Pot and gun components must be stainless steel or plastic. Diameter of the spray nozzle should be 1.0-1.5 mm (0.040-0.060 inches). The edges should be sprayed a second time after the first coat has dried. Glue film must be completely dry before pressing. To increase water and heat resistance. 3-5% (by weight) Jowat Hardener 195.00 or 195.10 must be added under moderate agitation. Complete curing at room temperature takes about 7 days.

Before the use in spraying equipment it is recommended to strain the adhesive with a wide meshed filter (400 - 1000 micron) to remove dried adhesive skin that might have formed.

Tested according to Jowat test methods.
Customer trials are required.

Min. Temperature for materials, glue and ambient air [°C]: Approx. 15 (59 °F)

Glue Application One sided

Glue thickness 2-5 mil wet = 5-12 g/ft² (depending on board quality)

Appearance: White / blue under UV light

Reactivation Temperature [°C] Min 55 (131 °F)

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

General bonding requirements:

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Specification:

Viscosity at 20 °C (68 °F) [mPa·s]: (Brookfield, Spindle 3, 20 RPM)	3,000 ± 500
Density at 20°C [g/cm ³]:*	1.05 ± 0.05 (8.76 ± 0.42 lb./gal)
Solids content [%]:*	41 ± 3
pH Value at 20 °C (68 °F):*	8.0 ± 1

* According to Jowat test method.

PU dispersion

Cleaning: Fresh glue may be removed with cold water. Dried glue must be removed mechanically.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). During transport, the temperatures may be lower, between 6 to 14°C (43 – 58°F). The material may be exposed to these temperatures a maximum duration of 14 days. If in doubt, the temperature need to be checked in goods entry. Cold material may not be processed, but must be previously warmed up slowly at 15-25 °C (59-77°F) (exposure over 2-3 days depending on volume of the packaging unit).
For best before date, please refer to label on the packaging unit.
After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

Remarks: **For further information concerning handling, transport and disposal, please refer to the Safety Data Sheet.**

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PU dispersion

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Crosslinking Agent

Application: Emulsifiable, modified polyisocyanate to increase water resistance and adhesion when mixed with various dispersion adhesives.

Characteristics/Directions for use: Increases the resistance of a dispersion adhesive to moisture; also increases the adhesive properties.

Please refer to the individual data sheets for the various emulsion glues. Containers which are used to pre-mix Jowat® crosslinking agent Jowat® 195.10 may not be tightly closed (they may burst due to formation of carbon dioxide).

Processing time: 4-8 hours (depending on the type of dispersion)

Customer trials are required.

Appearance: Colorless / yellowish clear

NCO content [%] Approx. 22.5 ± 1.5 (Jowat test method)

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

Specification: Viscosity at 20 °C (68 °F) [mPa·s]: $1,250 \pm 650$
(Brookfield, Spindle 2, 20 RPM)
* According to Jowat test method.

Cleaning: Machines and equipment may be cleaned after use with warm or cold water, using Jowat Cleaner Concentrate 192.40. Parts only soiled with the crosslinking agent may be cleaned with Jowat Thinner 401.40/402.30. Cured adhesive compound can only be cleaned mechanically.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). For best before date, please refer to label on the packaging unit. After the elapse of the best before date, it is essential that you again verify that the product is fit for the intended application.
Protect from frost.

Packaging: Information about packaging types and units is available upon request.

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04/21

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Jowat
Adhesives



Crosslinking Agent

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PO hot melt adhesive**221.00**

Application: For wrapping of decor paper foils to solid wood, particleboard or MDF. Good adhesion to aluminum or laminates of polyester or melamine resin. Also can be used for edge banding of primed ABS, PP, PVC < 2mm and fleece backed veneer HPL, CPL, and resinated paper edges.
May be used for straight edgebanding applications, softforming, processing center (BAZ) and pre-coating.

Characteristics/Directions for use: Transparent, elastic hot melt adhesive with good adhesion and hot tack. High heat resistance, long open time and good thermal stability in the melt.

Customer trials are required.

Processing temperature [°C]:	180-200 (356-392°F)
Appearance:	Transparent
Density at 20°C (68 °F) [g/cm³]:*	approx..0.95 ± 0.02 (7.9 ± 0.17 lb/gal)
Softening range [°C]:*	approx. 140 ± 5 (284 ± 9° F)
Open time at 190°C [s]:*	28 ± 2

*Test according to Jowat method

Our Application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 200°C [mPas] 22,500 ± 7,500
(Brookfield, Thermosel, Spindle 28, 5 RPM)

Cleaning: Preliminary cleaning while hot by scraping with a spatula. Remove any residues when cold with Jowat® Cleaner 402.40.

Storage: May be stored in properly closed original containers, cool and dry. Best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Types of packaging and units upon request.

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PO hot melt adhesive**221.00**

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PO hot melt adhesive

237.10

Application: For edgebanding CPL, HPL, polyester, resinated paper and veneer. Suited for PVC, ABS and PP edgebands, however, the special properties of the thermoplastic edgebands and the reverse primer application have to be tested before use.

Characteristics/Directions for use: Long open time, high hot tack, good adhesion and high heat resistance, excellent resistance to oxidation and color stability in the melt. Very good mechanical processing characteristics with accurate string-free hot melt application. Can be processed on automatic units with roller.

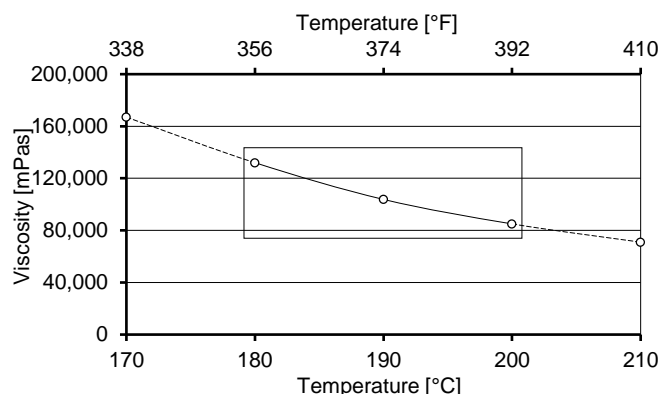
Application Temp.: 180-200°C (374-410°F)

The properties of the substrates and the processing conditions will influence the processes of joining and bonding.

The materials to be used must be free of grease and dust and be dry, they also have to match perfectly. Wood moisture content should be at 8 - 10%. Minimum temperature of substrates and ambient air should not be below 18°C. Avoid draft.

Tested according to Jowat test methods. Customer trials are recommended.

Technical Data: Density [g/cm³]: approx. 1.1 (9.1 lbs./gal.)
Softening point: approx. 160°C (320°F) Ring & Ball
Appearance: beige



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: Granulate. Types of packaging and units upon request.

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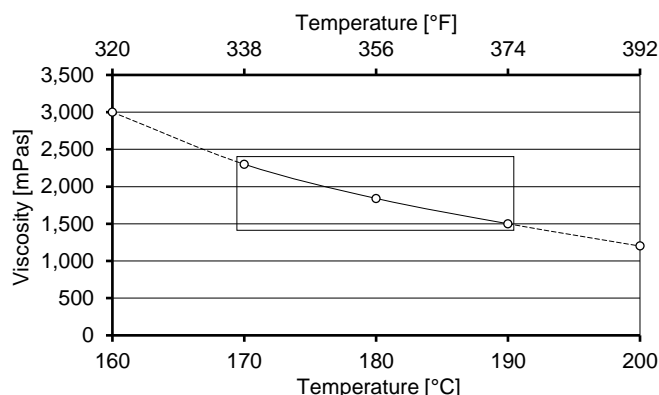
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EVA hot melt adhesive

Application:	For assembly purposes in the furniture industry (e.g. corpus gluing and mitre joints) in the electrical and metal industries. Good adhesion to coated and lacquered surfaces..
Characteristics/Directions for use:	Low viscosity hot melt with elastic glue line, high hot tack and fast setting with good color and heat stability in the melt.
Processing Temp.:	170-190°C (340-375°F)
Open Time:	14-15 seconds
Setting Time:	1-2 seconds

Tested according to Jowat test methods. Customer trials are recommended.

Technical Data:	Density [g/cm³]:	approx. 0.95 (7.9 lbs./gal.)
	Softening point:	approx. 100°C (212°F) Ring & Ball
	Appearance:	Yellow - translucent



Cleaning:	Preliminary cleaning while hot by scraping with a spatula.
Storage:	May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.
Packaging:	In plastic bags of 33 lbs. net.
Remarks:	For further information concerning handling, transport and disposal, please refer to the Safety Data Sheet. Our information on this data sheet is based on test results from our laboratories as well as on experience gained in the field by our customers. It can, however, not cover all parameters for each specific application and is therefore not binding for us. The information given in this leaflet represents neither a performance guarantee nor a guarantee of properties, nature, condition, state or quality. No liability may be derived from these indications nor from the recommendations made by our free technical advisory service.

EVA hot melt adhesive**JOWAT Corporation Information**

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EVA hot melt adhesive

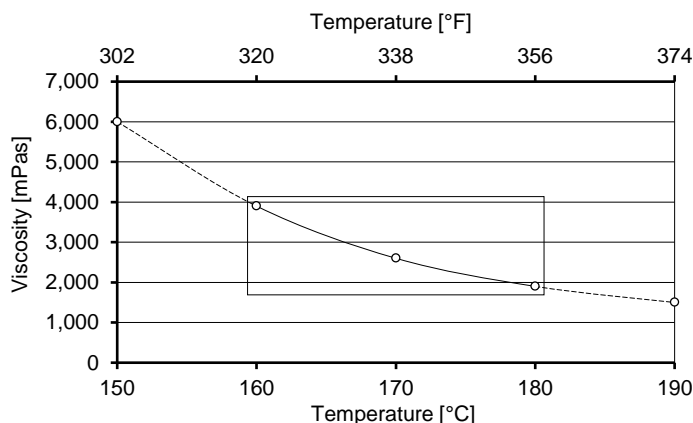
Application: For assembly purposes in the furniture, electrical and metal industries. Good adhesion to a variety of substrates, including coated and lacquered surfaces. Suitable for cove stick application. Suitable for fast machines.

Characteristics/Directions for use: Low viscosity hot melt with elastic glue line, high hot tack, long open time, excellent color and heat stability in the melt.

Tested according to Jowat test methods. Customer trials are recommended.

Processing Temp.: 340-375°F (171-191°C)
Open Time at 350°F: approx. 10-12 seconds
Set Time at 350°F: approx. 1-2 seconds

Technical Data: Density [g/cm³]: approx. 0.95 (7.9 lbs./gal.)
Softening point: approx. 230°F (110°C) Ring & Ball
Appearance: yellow - translucent



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic bags of 33 lbs. net.

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EVA hot melt adhesive

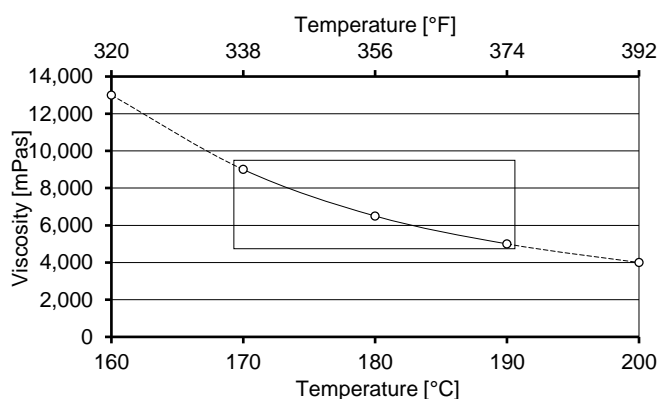
Application: For assembly applications in the furniture, electrical and metal industries. Good adhesion to difficult to adhere to surfaces (lacquered, polyester, PVC and finished paper foils).

Characteristics/Directions for use: Medium viscosity elastic hot melt with long open time, high hot tack, good color and heat stability in the melt.

Tested according to Jowat test methods. Customer trials are recommended.

Processing Temp.:	177-205°C (350-400°F)
Open Time:	53-54 seconds @ 350°F
Setting Time:	13-15 seconds @ 350°F
Open Time:	80-82 seconds @ 375°F
Setting Time:	23-24 seconds @ 375°F

Technical Data: Density [g/cm³]: approx. 0.95
Softening point: approx. 75°C (167°F) Ring & Ball
Appearance: yellow - translucent



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: Granules in plastic bags, 25 kg net.

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EVA hot melt adhesive - unfilled

280.10

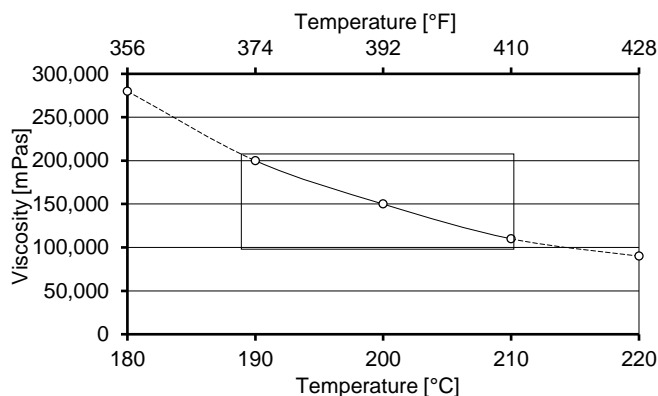
Application: Hot melt for automatic edgebanding suitable for solid wood, veneer, primed thermoplastic (PVC, ABS, PP), and resinated paper edgebands. Also used for softforming application (especially on BAZ and Combiformer machines).

Characteristics/Directions for use: High viscosity hot melt with high heat resistance and good cold flexibility. Excellent color and heat stability in the melt.

Tested according to Jowat test methods. Customer trials are recommended.

Application Temp.: 190-210°C (374-410°F)
Feed Speed: roller application: 18-60 m/min (50-180 ft/min)
nozzle application: 10-40 m/min (30-120 ft/min)

Technical Data: Density [g/cm³]: 1.05 (8.7 lbs./gal.)
Softening point: 120°C (248°F) Ring & Ball
Appearance: natural



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic bags of 44 lbs. net.

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EVA hot melt adhesive - unfilled**280.10**

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EVA hot melt - unfilled**280.30**

Application: For bonding thermoplastic edgebands (e.g. ABS, PP, PVC, PMMA), edgebands made of resinated décor paper, CPL, HPL, veneer (with or without fleece backing) or solid wood. Also used in softforming applications (especially designed for BAZ machines).

Characteristics/Directions for Use: Medium viscosity hot melt with high heat resistance and good cold flexibility. Excellent color and heat stability in the melt.
* Compared to other Jowat products for this application.

Customer trials are required.

Processing temperature [°C]:	180 – 200 (356 – 392 °F)	
Feed speed [m/min]:	10 – 40 (32 – 130 ft/min)	
Appearance:	yellow opaque	
Density at 20 °C (68 °F) [g/cm³]:	approx. 1.03 ± 0.05	(Jowat test method)
Softening range [°C]:	approx. 90 ± 5	(Kofler bench)
Open time at 190 °C [s]**:	approx. 6 ± 2	(Jowat test method)
Setting time [s]**:	not applicable	(Jowat test method)

** Measured on a 140 µm hot melt film.

Our Application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate product for your requirements. Please observe the information in the section "Remarks".

General bonding requirements: The properties (e.g. surface tension, plasticizer content...) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperature, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil, and grease, and be dry. Ideally, the minimum temperature should be at 18 °C. Avoid draught.

Specification: Viscosity at 200 °C (392 °F) [mPa·s]: 50,500 ± 12,500
(Brookfield, Thermosel, spindle 29, 10 RPM)

The values are always determined on the date of production.

continued on page 2

08/21 All data indicated are characteristics represented as average values. Our technical data sheets are constantly revised to represent the latest state of technology. This edition is replacing and superseding all previous ones, and is valid on the date of compilation.

Jowat
Adhesives



Cleaning: Preliminary mechanical cleaning while hot (e.g. with a spatula). Remove any residues in the application environment when cold using Jowat® Cleaner 402.40.

Storage: The product should remain stored in closed original containers, dry and cool.
For best-before date, please see container label.
After the elapse of the best-before date, it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

Remarks: **For further information concerning safety, handling, transport and disposal, please refer to the Safety Data Sheet.**

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EVA hot melt adhesive

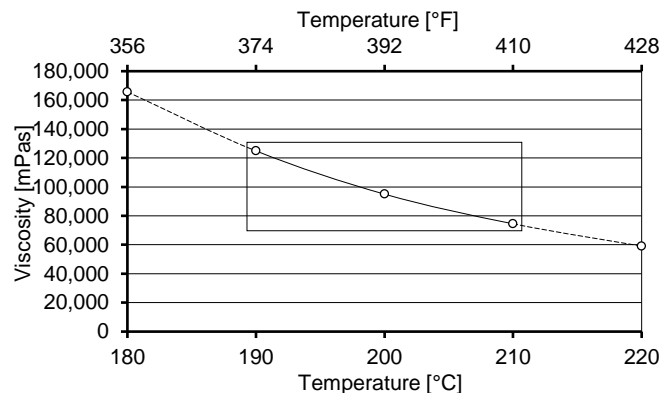
Application: Hot melt for automatic edgebanding suitable for solid wood, veneer, and primed thermoplastic (PVC, ABS, PP). Also used for soft forming applications.

Characteristics/Directions for use: High viscosity hot melt high heat resistance and good cold flexibility. Excellent color and heat stability in the melt.

Tested according to Jowat test methods. Customer trials are recommended.

Application Temp.: 190-210°C (374-410°F)
Feed Speed: roller application: 18-60 m/min (50-180 ft/min)
nozzle application: 10-40 m/min (30-120 ft/min)

Technical Data: Density [g/cm³]: approx. 1.1 (9.1 lbs./gal.)
Softening point: approx. 105°C (221°F) Ring & Ball
Appearance: clear



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: Packaging and unit size upon request.

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EVA hot melt adhesive

Application: For bonding thermoplastic edgebands (like e.g. ABS, PP, PVC, PMMA), edgebands made of resinated paper, CPL/HPL, veneer (with or without fleece backing) and solid wood. Can be used for straight edgebanding, softforming and BAZ.

Characteristics/Directions for use: Long open time, high hot tack, good adhesion and high heat resistance. Very good resistance to oxidation and color stability in the melt. Very good mechanical processing characteristics with accurate string-free hot melt application. Can be processed on automatic units with roller and slot nozzle. Customer trials are required.

Processing temperature [°C]:	180 - 200 (356-392 °F)
Feed speed [m/min]:	10-75 (32-250 ft/min)
Appearance:	Light beige
Softening point [°C]:*	approx. 95 ± 5 (Kofler Heat Bench)
Open time at 190 °C (374 °F) [s]:*	approx. 12 ± 2 (Jowat test method)
Setting time:	not applicable

* According to Jowat test method.

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 200°C [mPa-s] 85,000 ± 13,000
(Brookfield, Thermosel, Spindle 29, 5 RPM)
Density at 20 °C (68 °F) [g/cm³]:* approx. 1.14 ± 0.02 (Jowat test method)

Cleaning: Mechanical preliminary cleaning while hot (e.g. by scraping with a spatula). Remove any residues in the application environment when cold with Jowat® Cleaner 402.40.

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

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EVA hot melt adhesive

JOWAT Corporation Information

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EVA hot melt adhesive

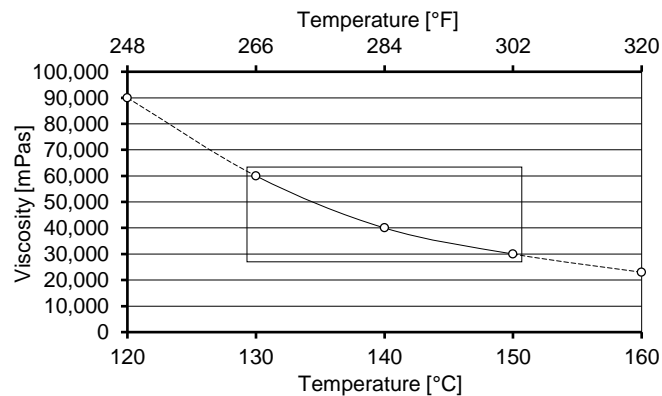
Application: Designed for contour edgebanding of PVC, paper, and polyester at low application temperatures and at very slow feed speeds.

Characteristics/Directions for use: Low viscosity hot melt with fast melting properties, long open time and good color and heat stability in the melt.

Application Temp.: 130-150°C (266-302°F)
Feed Speed: roller application: 5-20 m/min (15-60 ft/min)

The structure of the edge material and working conditions may influence the bond.
Tested according to Jowat test methods. Customer trials are recommended.

Technical Data: Density [g/cm³]: approx. 1.3 (10.8 lbs./gal)
Softening point: approx. 90°C (194°F) Ring & Ball
Appearance: 20 - natural; 21 white



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic bags of 44 lbs. net.

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EVA hot melt adhesive

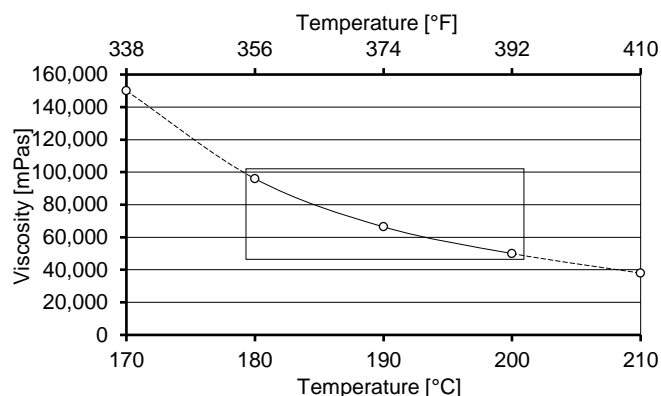
Application: Hot melt for automatic edgebanding suitable for solid wood, veneer, primed HPL, PVC and resinated paper edgebands.

Characteristics/Directions for use: Medium viscosity hot melt with high heat resistance and good cold flexibility. Excellent color and heat stability in the melt.

Tested according to Jowat test methods. Customer trials are recommended.

Application Temp.: 180-200°C (356-392°F)
Feed Speed: roller application: 18-60 m/min (50-180 ft/min)
nozzle application: 10-40 m/min (30-120 ft/min)

Technical Data: Density [g/cm³]: approx. 1.05 (8.7 lbs./gal.)
Softening point: approx. 105°C (221°F) Ring & Ball
Appearance: natural



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In cartons of 26.88 lbs. net; 48 cartridges per carton.

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EVA hot melt adhesive HOLZ-HER Cartridge

Application: Hot melt for HOLZ-HER cartridge edgebanders. Suitable for primed HPL, solid wood, veneer, PVC and resinated paper edgebands.

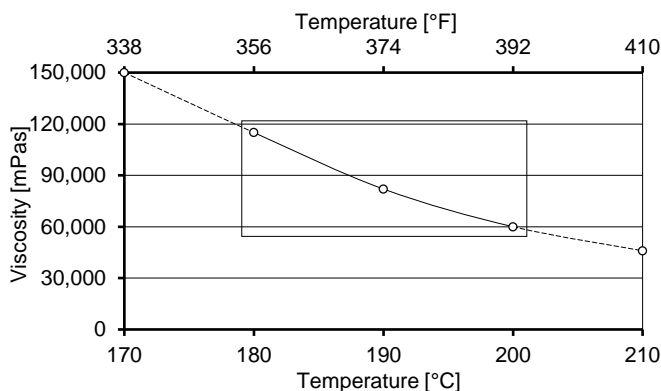
Characteristics/Directions for use: Medium viscosity hot melt. Good adhesion properties; especially to primed HPL. Good color and heat stability in the melt. Tested according to Jowat test methods. Customer trials are recommended.

Application Temp.: 180-200°C (356-392°F)

The structure of the edge material and working conditions may influence the bond.

PRIMER MUST CONSIST OF JOWACOLL 148.60 DILUTED WITH WATER 50:50. DUE TO THE DIFFERENCES IN HPL, WE STRONGLY RECOMMEND TO CARRY OUT SUITABILITY TESTS PRIOR TO PRODUCTION.

Technical Data: Density [g/cm³]: approx. 1.3 (10.8 lbs./gal.)
Softening point: approx. 100°C (212°F) Ring & Ball
Appearance: 80-natural; 81-white; 82-brown; 83 black



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In cartons of 35 lbs. net.

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HOLZ-HER Cartridge****JOWAT Corporation Information**

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EVA hot melt adhesive

Application: For edgebanding veneer, solid wood, resin impregnated paper edgebands, PVC, ABS, and primed HPL. Good wetting and adhesion properties. This hot melt can also be used for precoating and softforming applications.

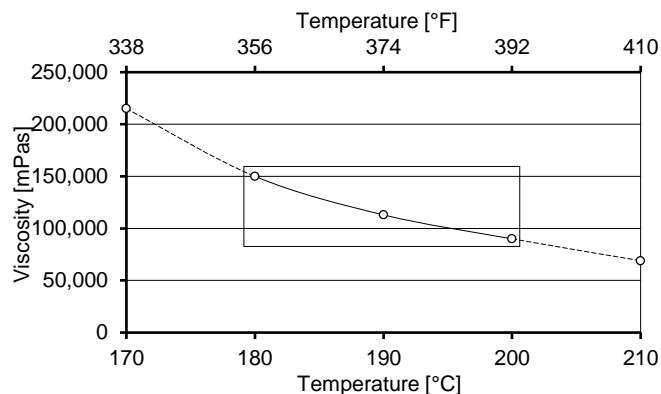
Characteristics/Directions for use: Medium-high viscosity hot melt. Very economical with good color and heat stability in the melt.

WHEN BONDING HPL, THE PRIMER MUST CONSIST OF JOWACOLL 148.50 DILUTED WITH WATER 50:50. DUE TO THE DIFFERENCES IN HPL WE STRONGLY RECOMMEND TO CARRY OUT SUITABILITY TESTS PRIOR TO PRODUCTION.

Tested according to Jowat test methods. Customer trials are recommended.

Application Temp.: 190-210°C (374-410°F) in the melt
Feed Speed: 12-60 m/min (30-120 ft/min)

Technical Data: Density [g/cm³]: approx. 1.33 (10.8 lbs./gal.)
Softening point: approx. 110°C (230°F) Ring & Ball
Appearance: 60-natural; 61-white; 62-brown; 63 black



Cleaning: Preliminary cleaning while hot by scraping with a spatula.

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please refer to label on the packaging unit.

Packaging: In plastic bags of 44 lbs. net.

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EVA hot melt adhesive

Application: For bonding thermoplastic edgebands (e.g. ABS, PP, PVC) with suitable primer. The special properties of the edgebands and primer application have to be tested before use (especially if thermoplastic edgebands are to be bonded).

Characteristics/Directions for use: Excellent melt performance after initial melting, good heat resistance, good adhesion and bond stability at low temperatures. High oxidation and color stability in the melt. The surface structure of the edging material as well as the processing conditions will influence the result.
Customer trials are required.

Processing temperature [°C]:	180-200°C (356-392 °F)
Feed speed [m/min]:	12-40
Appearance:	Beige granules
Softening point [°C]:	approx. 100 ± 5 (212 ± 18 °F) Ring & Ball
Open time at 190°C* [s]:	approx. 4 ± 2
Setting time [s]:	not applicable

* According to Jowat test method

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 200 °C (392 °F) [mPa·s]: 53,000 ± 10,000
(Brookfield, Thermosel, Spindle 29, 5 RPM)
Density at 20 °C (68 °F) [g/cm³]: approx. 1.45 ± 0.5 (12.1 ± 0.83 lbs./gal.)

Cleaning: Mechanical preliminary cleaning while hot (e.g. by scraping with a spatula). Remove any residues in the application environment when cold with Jowat® Cleaner 402.40

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit.
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Packaging: Information about packaging types and units is available upon request.

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EVA hot melt adhesive

Application: For edgebanding veneer, resin impregnated paper edgebands, PVC and similar. Good wetting and adhesion properties.

Characteristics/Directions for use: Medium viscosity hot melt. Very economical with good color and good heat stability in the melt. The surface structure of the substrate to be bonded as well as the processing conditions will influence on the result. Customer trials are required.

Processing temperature [°C]: 190-210°C (374-410°F) in the melt
Appearance: Final digit 0 = light beige

Final digit 1 = white

Final digit 2 = brown

Softening point [°C]:* approx. 105 ± 5 (221 ± 9 °F)

* According to Jowat test method.

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Specification: Viscosity at 200°C [mPa-s] 90,000 ± 15
(Brookfield, Thermosel, Spindle 29, 5 RPM)
Density at 20 °C (68 °F) [g/cm³]:* approx. 1.40 (11.5 lbs./gal.)

Cleaning: Mechanical preliminary cleaning while hot (e.g. by scraping with a spatula). Remove any residues in the application environment when cold with Jowat® Cleaner 402.40.

Storage: The product should remain stored in properly closed original containers, cool and dry. For best before date, please refer to label on the packaging unit. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

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PUR hot melt adhesive

607.40/41

Application: For bonding thermoplastics edgebands (e.g. ABS, PP, PVC) with suitable primer application to the reverse side, as well as edgebands made from resinated décor paper, veneer or solid wood.

Characteristics/Directions for use: Fast setting and high initial strength.*
*Compared with other Jowat products for this application.
Processing with special equipment from moisture-proof sealed containers.
Customer trials are required.

Processing temperature [°C]:	130 – 150 (266 – 302 °F)
Appearance:	Final digit 0 = beige Final digit 1 = white
Softening range [°C]:*	approx. 70 ± 5 (158 ± 9 °F) (Kofler Bench)
Open time at 140 °C (284 °F) [s]:*	approx. 8 ± 2
Reaction time [d]:	approx. 4-7 (depending on ambient conditions)

* According to Jowat test method.

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 140 °C (284 °F) [mPa·s]: 75,000 ± 25,000
(Brookfield, Thermosel, Spindle 28, 5 RPM)
Density at 20 °C (68 °F) [g/cm³]: 1.36 ± 0.06 (11.35 ± 0.50 lbs./gal)
(Jowat test method)

10/21

Page 1 of 3

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Jowat
Adhesives



PUR hot melt adhesive

607.40/41

- Cleaning:** If necessary, flush out hot melt remnants from the melt and applicator units with Jowat Flushing Agent 930.94.
For more information refer to the "PUR hot melt Manual" under the heading "Maintenance and Cleaning" (available upon request).
- Storage:** May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)).
Best before date, please see container label.
After the elapse of the best-before-date, it is essential that you again verify that the product is fit for your intended application.
Protect from moisture.
- Packaging:** Information about packaging types and units is available upon request.

Remarks: **For further information concerning handling, transport and disposal, please refer to the Safety Data Sheet.**

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10/21

Page 2 of 3

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PUR hot melt adhesive

607.40/41

JOWAT Corporation Information

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10/21

Page 3 of 3

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PUR hot melt adhesive

608.00/01

Application: For bonding thermoplastics edgebands (e.g. ABS, PP, PVC) with suitable primer application to the reverse side, as well as edgebands made from resinated décor paper, aluminum with an appropriate pretreatment, HPL or veneer.

Characteristics/Directions for use: Fast setting, high initial strength.*
* Compared to other Jowat products for this application

Processing with special equipment from moisture-proof sealed containers.

Customer trials are required.

Processing temperature [°C]:	100 – 120 (212 – 248 °F)
Appearance:	Final digit 0 = yellowish opaque Final digit 1 = white
Density at 20 °C (68 °F) [g/cm³]:*	approx. 1.10 ± 0.10 (9.18 ± 0.83 lb./gal)
Softening point [°C]:*	approx. 65 ± 5 (149 ± 9 °F) (Kofler Bench)
Open time at 120 °C (248 °F) [s]:*	approx. 7 ± 3
Reaction time [d]:	approx. 4 - 7 (depending on ambient conditions)

* According to Jowat test method.

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General bonding requirements: The properties (e.g. surface tension, plasticiser content.....) and the conditioning of the substrates, as well as the processing conditions (e.g. ambient temperatures, humidity...) will influence the processes of joining and bonding. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 120 °C (248 °F) [mPa·s]: 90,000 ± 20,000
(Brookfield, Thermosel, Spindle 28, 4 RPM)

Cleaning: If necessary, flush out hot melt remnants from the melt and applicator units with Jowat Flushing Agent 930.94.
For more information refer to the "PUR hot melt Manual" under the heading "Maintenance and Cleaning" (available upon request)

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please see container label.
After the elapse of the best-before-date, it is essential that you again verify that the product is fit for your intended application.
Protect from moisture

06/21

Page 1 of 3

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Jowat
Adhesives



PUR hot melt adhesive

608.00/01

Packaging: Information about packaging types and units is available upon request.

Remarks: **For further information concerning handling, transport and disposal, please refer to the Safety Data Sheet.**

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Page 2 of 3

06/21

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PUR hot melt adhesive

608.00/01

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Page 3 of 3

06/21

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PUR hot melt adhesive

609.30

Application: For flat lamination and for the manufacture of sandwich elements, also for assembly purposes..

Characteristics/ Adhesive with medium open time and high initial tack.*

Directions
for Use:

* Compared to other Jowat products for this application.

Contains UV marker for identification.

Processing with special equipment from moisture-proof sealed containers.

Customer trials are required.

Processing temperature [°C]: 110 – 130 (230 – 266 °F)

Appearance: opaque

Density at 20 °C (68 °F) [g/cm³]: approx. 1.1 ± 0.1 (9.18 – 0.83 lb./gal)

(Jowat test method)

Softening range [°C]: approx. 60 ± 5 (140 ± 9 °F) (Kofler bench)

Open time at 120 °C (248 °F) [min]**: approx. 3 ± 1 (Jowat test method)

** Measured on a 140 µm hot melt film.

Reaction time [d] approx. 1-3 days (depending on ambient conditions)

Our Application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate product for your requirements. Please observe the information in the section "Remarks".

General bonding
requirements:

The properties (e.g. surface tension, plasticizer content...) and the conditioning of the substrates, as well as the processing conditions will influence the processes of joining and bonding. Among other factors, the crosslinking of the adhesive depends on the application amount, the temperature and humidity of the ambient air, as well as on the temperature, moisture content, and permeability of the substrates. Customer tests under consideration of everyday production conditions are therefore absolutely necessary to define stable process parameters and to ensure that the product is fit for purpose. For best bonding results, the materials to be bonded should be free of dust, oil, and grease, and be dry. Ideally, the minimum temperature should be at 18 °C (64 °F). Avoid draught.

Specification: Viscosity at 120 °C (248 °F) [mPa·s]: 14,000 ± 4,000
(Brookfield, Thermosel, spindle 28, 20 RPM)

The values are always determined on the date of production.

continued on page 2

04/22

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Jowat
Adhesives



Cleaning: Flush out PUR melt remnants from roller applicator units with Jowat® Flushing Agent 930.22 (if necessary, repeat procedure several times). For other applicator systems and melt units, we recommend to use Jowat® Flushing Agent 930.34 (red). For more information, please refer to the “PUR hot melt Manual” under the heading “Maintenance and Cleaning” (available upon request).

Storage: The product should remain stored in properly closed original containers, dry and cool (15 – 25 °C (59-77 °F)).
For best-before date, please see container label.
After the elapse of the best-before date, it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

Remarks: **For further information concerning safety, handling, transport and disposal, please refer to the Safety Data Sheet.**

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JOWAT Corporation Information

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Flushing agent

Application: For flushing out applicator units for PUR hot melts after extended down times or during complete standstill.

Characteristics/Directions for use: Due to a special additive, the chemical reaction of the PUR hot melt adhesive is prevented during the flushing procedure. Allow all adhesive to be extruded completely. Then fill the unit with Jowat® flushing agent and melt. The entire amount of flushing agent has to be run through the hose and nozzle; then repeat the procedure to ensure that all hot melt residues have been removed from the equipment. If this is not done, it may be possible that the desired crosslinking reaction will not take place when the reactive PUR hot melt adhesives are processed

Customer trials are required.

Processing temperature [°C]:	130 – 140 (266 – 284 °F)
Appearance:	Red
Density at 20 °C (68 °F) [g/cm³]:*	approx. 0.95 ± 0.05 (8.76 ± 0.42 lb/gal)
Softening point [°C]:*	approx. 80 ± 5 (176 ± 9 °F) (Kofler Bench)

* According to Jowat test method.

Our application Technology Department and our Application Specialists will provide technical data to assist you in your choice of an appropriate adhesive for your requirements. Please observe the information in the section "Remarks".

Specification: Viscosity at 140 °C (284 °F) [mPa·s]: 50,000 ± 5,000
(Brookfield, Thermosel, Spindle 28, 10 RPM)

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please see container label.
After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

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Flushing agent

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Flushing agent

Application: For flushing out applicator units for PO or EVA hot melt adhesives. Not to be used for flushing out applicator units for PUR hot melt adhesives.

Characteristics/Directions for use: Allow all adhesive to be extruded completely. Then fill the unit with Jowat® flushing agent 931.20 and melt. The entire amount of flushing agent has to run through the hose and nozzle; then repeat the procedure to ensure that all hot melt residues have been removed. Before taking up work again, the flushing agent has to be completely removed from the equipment.

All raw materials used in the manufacturing of 931.20 are approved according to FDA guideline 175.105 for food packaging

Customer trials are required.

Application Temperature [°C]:	160 – 180 (320 - 356 °F)
Density at 23 °C (73 °F) [g/cm³]:*	approx. 0.95 ± 0.05 (7.93 ± 0.42 lb/gal)
Softening range [°C]:*	approx. 110 ± 2 (230 ± 4 °F) (ring and ball)

* According to Jowat test method.

Specification: Viscosity at 160 °C (320 °F) [mPa·s]: 1,700 ± 400
(Brookfield Cone and plate, Spindle 7, 100 RPM)

Storage: May be stored in properly closed original containers, cool and dry (15-25°C (59-77°F)). Best before date, please see container label. After the elapse of the best-before date it is essential that you again verify that the product is fit for your intended application.

Packaging: Information about packaging types and units is available upon request.

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06/21

Page 1 of 2

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Jowat 
Adhesives

Flushing agent

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Gluing, as one of the most efficient methods of bonding, is constantly expanding into new areas of application. At the same time, the number of substrates to be bonded is also growing at an unprecedented rate. New methods and equipment to process adhesives are constantly being improved and developed.

The in-house R&D department of JOWAT Corporation ("JOWAT") is responding with intensive efforts to keep pace with these constant changes. A highly trained and qualified team of chemists and engineers are using the latest techniques and the brightest ideas to provide adhesives that meet the needs of our customers for new and innovative applications.

We have assimilated information based on test results from our laboratories as well as on experience gained in the field by working with our customers. This information is available by contacting our technical service department. Customers who have obtained information and thereafter undertake modifications during a running production are invited to provide this information to us to assist us in maintaining our field information and obtain any updated information we may have. However, any technical information we provide is provided without any representation or warranty and for informational and assistance purposes only, and must not be relied upon or used to replace field testing by the user of the adhesive in the actual application for which the adhesive is to be used. Our laboratory testing and field information obtained cannot simulate all eventualities that may occur in each specific application, and for that reason we cannot and do not insure performance or results in specific applications.

Any user of adhesives manufactured by JOWAT must test the adhesive(s) for suitability in each individual application, performing such tests in connection with the first use of a sample as well as all subsequent modifications during any ongoing production.

In addition to such other tests the users of our adhesives deem appropriate to insure suitable bonding, all users of adhesives manufactured by JOWAT should test the adhesives for suitability on original parts equal to normal processing conditions. The adhesive bond should then also be tested and assessed by subjecting it to the actual stress and conditions it will undergo in all of its intended and reasonably foreseeable uses. ALL OF THESE TESTS ARE ABSOLUTELY NECESSARY AND MUST BE PERFORMED.

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Page 2 of 2

06/21

All data indicated are characteristics represented as average values. Our technical data sheets are periodically revised to represent the latest state of technology. This edition is replacing and superseding all previous ones, and is valid on the date of compilation.

Please refer to the last page of this technical data sheet for additional information.

