

BONDING

WORKING STEPS WHEN BONDING TRANSPARENT Polycasa SHEETS:

1. Tempering

Avoidance of stress cracking caused by influence of adhesive components.

2. Protection of neighbouring surfaces

Protection masking of surface against contamination using self-adhesive film, aluminium film or protective coatings.

Please consider compatibility of adhesive with film/coating!

3. Cleaning and degreasing

E.g. with isopropyl alcohol or aromatic free petrol.

Please consider resistance of plastic against cleaning agent!

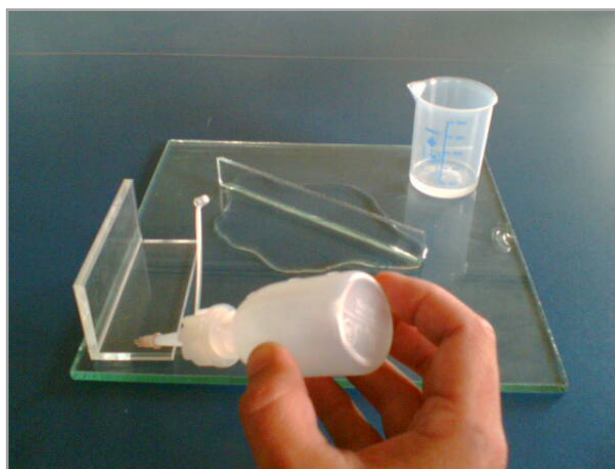
4. Bonding

Glue line design and working procedure according to processing guidelines of used adhesive.

5. Post-tempering if necessary

For a better final curing of the glue line when bonding with 2-component polymerisation adhesives. Solvent adhesives: For a better removing of the solvent out of the glue line (within 24 h). This will avoid stress cracks.

Heating up rate 10°C/h to avoid formation of bubbles.



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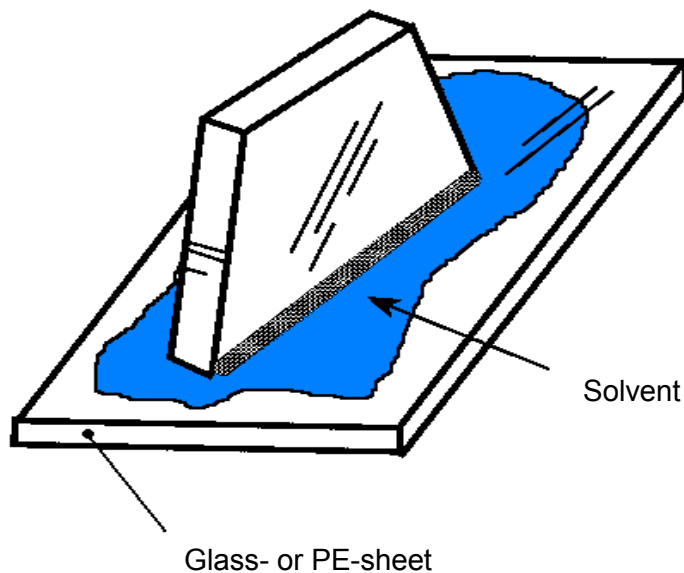
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BONDING TECHNIQUES SOLVENT ADHESIVES:

- for narrow and flat surfaces only
- limited or no gap-filling (depends on viscosity of used adhesive)
- no bonding of larger surfaces possible, due to formation of bubbles (disabled evaporation of solvent)
- bubble formation can be reduced by smoothing the surface (e.g. with peeling blade)

Dipping technique:

- application of solvent on a glass- or PE-sheet, max. 1mm high
- dip adherent surface of one part into solvent until the surface softens
- press the parts each against other without high pressure
- after approx. 30 sec. load with approx. 1N/cm²



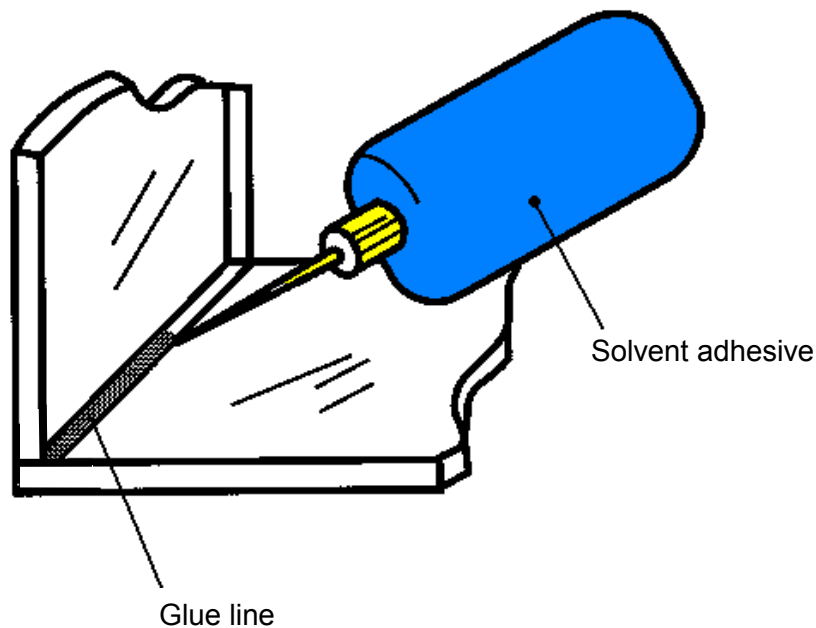
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BONDING TECHNIQUES SOLVENT ADHESIVES:

Capillary technique:

- positioning and fixing the parts without adhesive and without load
- application of solvent adhesive along the glue line using a PE-bottle or an injection
- solvent is absorbed into the glue line due to capillary effect and softens the adhesive surfaces
- after approx. 30 sec. load with approx. 1N/cm²



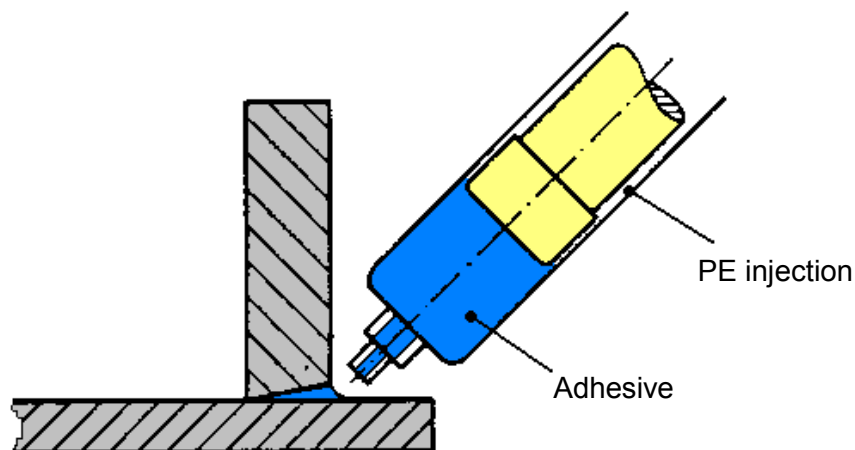
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BONDING TECHNIQUES POLYMERISATION ADHESIVES:

Angle bonding (butt joint and internal angle joint):

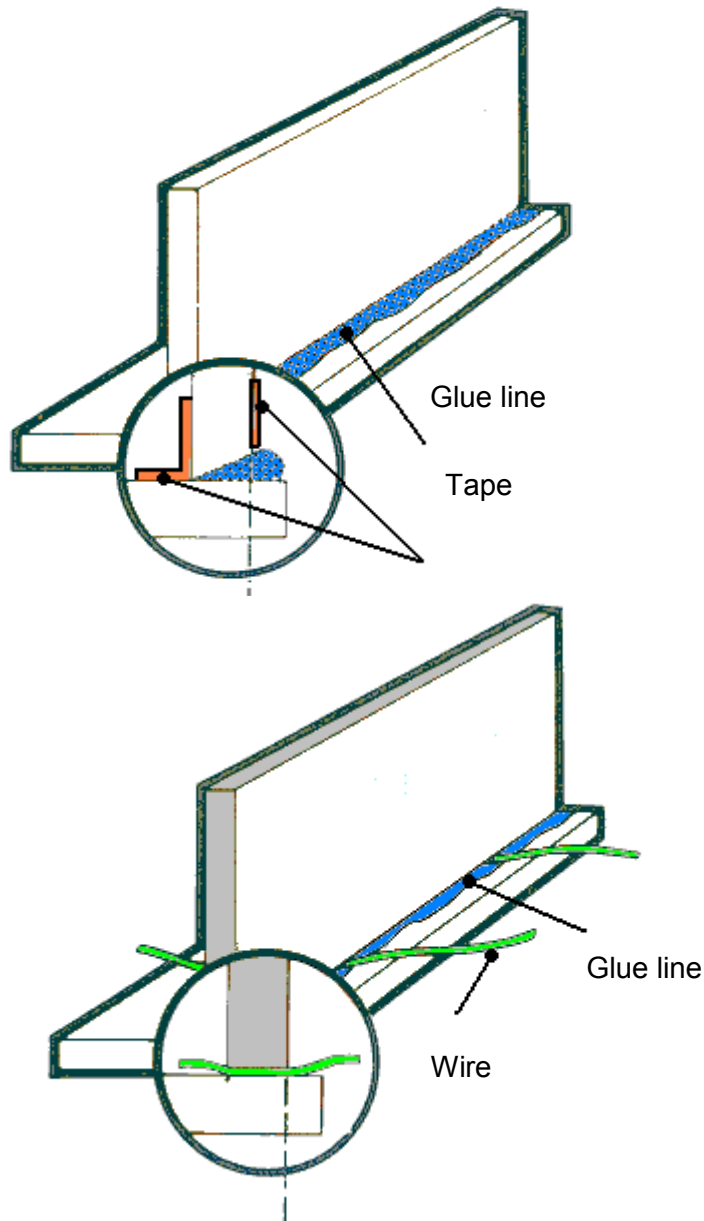
- to chamfer adherent surfaces, max. 3mm opening of the glue line to avoid formation of bubbles
- positioning and fixing the parts, and protection the surfaces with a suitable tape or film
- the horizontal sheet should overlap, this overlap can be milled after bonding
- use a 0.5 up to 3mm wire or PE-stripe between the adherent surfaces in order to increase the capillary effect and to warranty a defined gap width. Wire/strips should be placed in a way that warranties an easy removal after bonding.
- use surplus of adhesive, to compensate the volume shrinkage of the adhesive



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BONDING TECHNIQUES POLYMERISATION ADHESIVES:



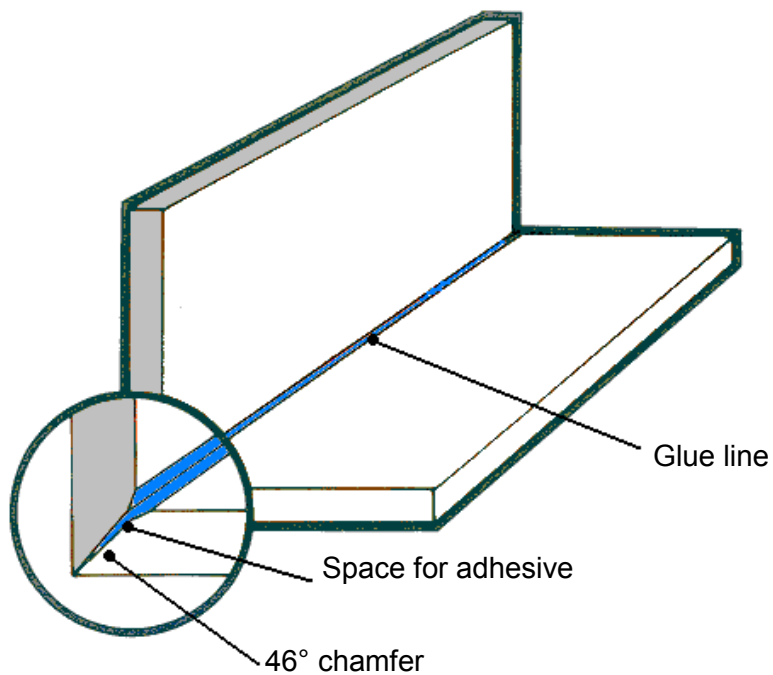
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BONDING TECHNIQUES POLYMERISATION ADHESIVES:

Mitre bonding:

- 1° opening angle on each mitre surface to give the adhesive enough space



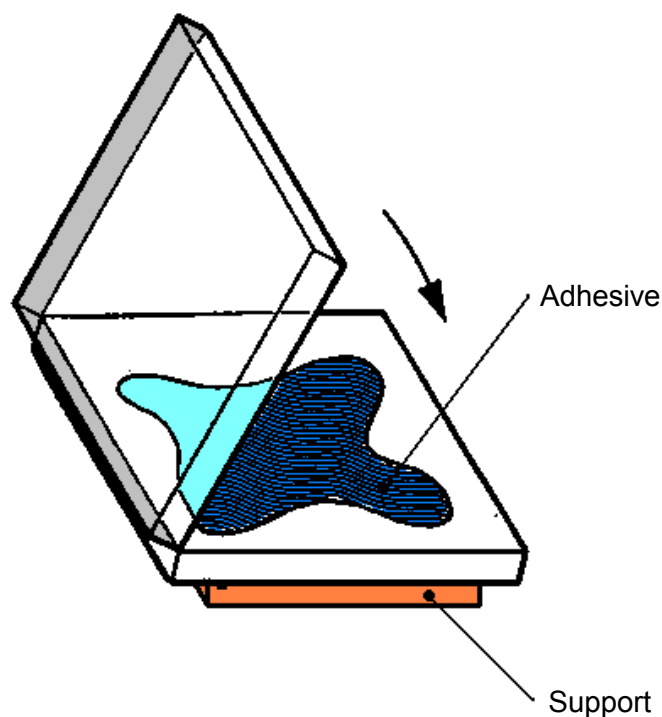
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BONDING TECHNIQUES POLYMERISATION ADHESIVES:

Bonding of large surfaces:

- base plate should be placed on top of a smaller, plain and stiff supporting plate
- apply the bubble-free adhesive in an even way on the surface of the base plate using a PE cup, avoid air entrapments
- tilt the base plate slowly over the longitudinal edge to the bottom sheet
- the base plate should be fixed to avoid floating movement of this upper sheet
- in case of heavy sheets and blocks, a PE-cord (0.5 – 1,5mm) can be used to warranty a defined gap



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ADHESIVES AND SILICONS:

	SAN	CRYLON AKRYLON	CRYLUX	HIPEX G	IMPEX
Solvents					
Methylenchlorid	•	•	•		•
MEK	•			•	
Extru-Fix [®]		•	•	•	•
Solvent adhesives					
Altuglas [®] SPC		•			
Acrifix [®] 106/116	•	•			
Acrifix [®] 107/117	•	•			
Acrifix [®] 109	•	•			
Ruderer [®] 108/118					•
Shergil [®] 444				•	
Tensol [®] 12			•		
2-component polymerisation adhesives					
Acrifix [®] 2R 0190	•	•	•		
Acrifix [®] 2R 1200	•	•	•		
Agovit [®] 1074 (only for application in dry atmosphere)	•	•	•		•
Agovit [®] 1900 (low viscosity)	•	•	•		
Tensol [®] 70		•	•		

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	SAN	CRYLON AKRYLON	CRYLUX	HIPEX G	IMPEX
Light curing 1-component polymerisation adhesives					
Delo Photobond® 4455				•	•
Vitralit® 9103VL & 9106VL				•	•
2-component-PU adhesives					
Araldite® 2026					•
Scotch-Weld® DP 610				•	
Epoxy adhesive					
UHU® Endfest 300	•	•	•		•
Cyanacrylate adhesives					
Several products e.g. from Bostik, Ruderer, etc. (only for application in dry atmosphere)	•	•	•	•	•
Silicons					
GE Silglaze® N		•	•		•
GE Silpruf®		•	•		•

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Producer

Methylenchlorid MEK	Chemicalshops	Altuglas SPC	Altumax Deutschland GmbH Paulusstrass 21-23 53227 Bonn Germany
Rudrerer 108 Rudrerer 118 Araldite 2026	Rudrerer Klebetechnik GmbH Harthhauser Strasse 2 85604 Zorneding Germany	Acrifix 106/116 Acrifix 107/117 Acrifix 109 Acrifix 190 Agovit Standard Agovit 1074 Agovit 1900	Degussa AG Röhm GmbH Kirschenallee 64293 Darmstadt Germany
Delo Photobond 4455	Delo Industrie Klebstoffe GmbH & Co. KG Ohmstrasse 3 86899 Landsberg Germany	Scotch-Weld DP 610	3M Deutschland GmbH Carl-Schurz-Strasse 1 41453 Neuss Germany
Shergil 444	Sherman Chemicals Brickfields Business Park Gillingham Dorset SP8 4PX England	UHU Endfest 300	UHU GmbH & Co. KG Herrmannstrasse 7 77815 Bühl Germany
Vitralit 9103VL Vitralit 9106VL	Panacol-Elosol GmbH Obere Zeil 6-8 61440 Oberursel Germany	Extru-Fix Tensol 12 Tensol 70	Bostik Limited Ulverscroft Road Leicester LE6 6BW England
Silglaze N Silpruf	GE Deutschland Maria-Theresia-Straße 35 81675 München Germany		

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MISTAKES WHEN BONDING AND SOLUTIONS:

POLYMERISATION ADHESIVES

Problem	Reason	Solution
Cracks in sawed edges.	Stress cracks effected by influence of adhesive components.	Adjust sawing conditions. Check and adjust content of hardener (maybe the pot life is too long). Tempering before bonding.
Cracks inside the bonded, not manipulated surfaces.	Unsuitable cleaning agent.	Use suitable compatible cleaning agents.
	Stress cracks effected by adhesive components.	Check content of hardener component. Tempering of parts before bonding.
	To high load during curing-time.	Reduce pressure during curing; distribute the load in an even way. Use distance spacers for heavy parts.
Cracks at the inner side of bonded parts.	Influence of monomer containing air.	Narrow cavity areas have to be aired with fresh air. Closed cavities should be aired until glue is complete cured.
Glue line or gap needs a long time for complete curing.	Low processing temperature.	Temperature of sheet, adhesive and ambient temperature should be approx. 20°C.
	Low hardener content.	Dose hardener according instructions.
	Influences from aiding materials, e.g. tapes, wires from steel, copper, brass, rubber, etc.	Fix aiding materials in areas without adhesive contact.

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POLYMERISATION ADHESIVES

Problem	Reason	Solution
Soft areas inside the glue line, uneven curing.	Uneven distribution of hardener in main component of adhesive.	More accurate mixing of hardener and main component.
Adhesive peels from adherent surfaces.	Residues on adherent surfaces, e.g. grease, sweat from hands or residues from protection film.	More accurate cleaning of adherent surfaces.
	Bonding with adhesives which are at the end of their pot-life. This effects an insufficient solving of the adherent surfaces. Maybe also the percentage of hardener is too low.	Adhesives should have to be applied until the half of their recommended pot-life. Percentage of hardener has to be checked and adjusted.
	Skinning effect due to long open assembly time (time between application of glue and joining). In case of one-sided application of adhesive, the wetting of the other side is insufficient.	Joining of parts directly after application of adhesive. In case of longer open assembly times, applicate the adhesive on both sides.
Glue line shows peeling off (bubble-like).	Not clean surfaces, maybe there are residues from machining at the adherent surfaces.	Accurate cleaning of adherent surfaces. Machine cutting edges in a secondary step (peeling blade). Adjust machining conditions, renew or sharpen machining tools.
	Adhesive peeling off due to uneven glue line thickness, effected by volume shrinkage of adhesive.	Abrade the adherent surfaces, especially with cast blocks (due to high thickness tolerances).

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POLYMERISATION ADHESIVES

Problem	Reason	Solution
Air bubbles in adhesive joint.	Air which was inserted during mixing of components.	Degassing of adhesive solution.
	Bubble formation during application of adhesive on the surfaces.	Application of adhesive bubble-free.
	Monomer-bubble formation due to high temperature during curing of the adhesive.	Reduction of adhesive layer-thickness. Application of adhesive in two or more steps.
	Formation of voids due to shrinkage effected by too fast curing.	Reduction of hardener-percentage. Reduction of adhesive layer-thickness.
Colouring of adhesive joint.	Too much hardener percentage.	Adjust content of hardener according formulation recommendations of adhesive maker.
	Influence of incompatible aiding devices, e.g. parts made from brass at injection-needles, etc.	Use devices made from glass, PE, aluminium, stainless steel, etc.
Cracks in the surface of the glue line.	Stress cracks due to weathering influences or due to interaction of corrosive chemicals.	Post tempering after bonding.

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SOLVENT ADHESIVES

Problem	Reason	Solution
Haze or white-colouring of glue line.	Low ambient- or material-temperature.	Increase ambient- or material-temperature.
	Moisture in atmosphere condenses at the adhesive-surface (cold surface due to evaporation of solvent) and the water is inserted inside of the adhesive.	Avoid bonding of material which was taken from a cold stock.
Formation of cracks inside the glue line.	High internal stress inside of sheet.	Tempering before bonding.
Bubble formation.	Gap for solvent too large. Adherent surfaces too rough.	Reduce gap. Adjust form closure. Smoothing adherent surfaces.
	Load too low.	Increase load 30 sec. After joining.
	Too fast temperature increase during tempering after bonding.	Increase temperature slowly, to warranty enough time for evaporation of the solvent out of the glue line.

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