Veralite®

Veralite® : Processing Guide

IPB NV
PLASTIC SHEET EXTRUSION

I.P.B. nv/sa, Steenovenstraat 30, B-8790 Waregem, Belgium
Tel : + 32.56.60.79.19 - Fax : + 32.56.61.08.85
e-mail : info@iplast.be - URL : www.iplast.be

Veralite® Processing guide - Index

Veralite® - Introduction

Veralite® is the registered trade name of I.P.B. nv for a range of advanced and universal transparent sheet products with unique properties based upon thermoplastic polyester. More specific, Veralite® is a PET-based sheet (polyethylene terephthalate).

Veralite® sheets are produced through an extrusion process.
All Veralite® products are produced under a ISO 9001 quality system.

Veralite® sheets are environment-friendly products which go in stream with conventional recycling streams.

Veralite® sheets are available in 2 versions :

Veralite® 100 :	APET - sheet
Veralite® 200 :	PETG - sheet

Veralite® sheets can be used in following applications :

Advertising/communication :	Displays	Poster covering
	Signs	Vending machines
	Screen printing	Advertising panels
Industry :	Thermoforming	Machine guards
	Safety applications	Food applications
	Indoor glazing	Medical equipment
Construction/building :	Outdoor glazing	Clean rooms
	Safety glazing	Street furniture
	Cladding	Partition walls

Veralite® sheets are being used as an alternative for PMMA, PC and PVC sheet.
Veralite® is a relatively new product which is quickly taking market share in above markets.

Veralite® - Raw materials

Both Veralite® 100 & 200 are thermoplastic polyester based products. More specified PET-based products. Polyethylene terephthalate has been developed around 1940 for production of fibres, later it has been used for production of bottles and now has been discovered as a clear film and sheet material.

These broad applications testify to the interesting properties of PET : good transparency, high impact resistance and through its crystallinity a high chemical resistance.

There are 2 versions of PET raw materials :

APET (Veralite® 100) :

This is the standard version of PET, Amorph PolyEthylene Terephthalate. Characteristics are that APET is crystallizable, which makes it lose impact resistance and transparency, but gives it higher temperature resistance (e.g. for microwave trays) When APET is crystallised, it is called CPET, Crystallised PET.

Properties :	*APET*	*CPET*	
Impact resistance	++	-	
Stiffness	+	++	
Temperature resistance	-	++	
Chemical resistance	+	++	
Transparency	++	-	(opal)

Veralite® 100 : is an APET sheet which is non-crystallised, but can eventually be crystallised after thermoforming if required.

Veralite® - Raw materials

PETG (Veralite® 200) :

PETG is a modified APET version. More specifically a Glycol modified version.
The addition of a modified glycol makes that PETG is not able to be crystallised afterwards. That explains the name : PETG = PolyEthylene Terephthalate Glycol modified. Main advantages of the Glycol modification are :

Properties :	*APET*	*PETG*
Transparency	+	++
Stiffness	++	+
Chemical resistance	++	+
Temperature resistance	+	+
Processing	+	++

For more specific information, please feel free to contact our technical department :

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Features and benefits

Veralite®, through its excellent mechanical, optical and chemical properties, matches your needs for almost every application. A short summary of benefits :

Optical quality
- good light transmission
- high surface gloss

Impact resistance
- excellent impact resistance
- good breakage resistance

Fire behaviour
- excellent fire ratings (B1/Y1/M2)
- no toxic fumes/gasses whilst burning

Food approved
- according to FDA and EEC regulations

Chemical resistance
- excellent chemical resistance

Weather stability
- UV-version available with a 10 year warranty

Ecological aspects
- easily recyclable
- no dioxyns, heavy metals or plasticizers

Veralite® - Features and benefits

Light weight
- with an SG of 1,33 g/cm³ (APET) and 1,27 g/cm³ (PETG), half of glass.

Easy processing
- easy sawing, cutting, diecutting, drilling, milling and routing
- good printable, weldable or bondable
- faster and easier processing

Easy forming
- easy thermoforming, faster cycle
- easy cold or hot bending
- no predrying needed

Ready to process
- no pretreatment needed for bonding or printing
- no predrying needed

Crystallizable
- Veralite 100 crystallizable after thermoforming

Cost-effective processing
- faster cycle times than with conventional materials
- no part breakage
- lower energy consumption

Excellent post-processing features
- very low shrinkage after thermoforming

Veralite® - Differences between V100 & V200

The main differences between Veralite® 100 and 200 are following :

	Veralite® 100	Veralite® 200
<u>Various</u>		
Thickness range	+	++
Cost	++	+
Specific Gravity (weight)	+	++
<u>Optical properties</u>		
Transparency	+	++
Gloss	++	++
<u>Mechanical properties</u>		
Impact strength	++	++
Stiffness	++	+
<u>Thermal properties</u>		
High temperature resistance	++	++
Low temperature resistance	+	++
<u>Other properties</u>		
Chemical resistance	++	+
Recyclability	++	++
Food contact	++	++
Fire resistance	++	++
Processability	+	++
Thermoforming	+	++
Cold or hot bending	++	++
Bonding/Printing	+	++

++ = best
+ = good

Veralite® - Advantages vs. competitive materials

Veralite® vs. acrylic (PMMA)

Veralite®	.....	*has a higher impact strength*
		can be hot-bended in half the time
		can thermoform at lower temperatures
		can thermoform complex parts easier (better definition)
		can be diecut
		can be cold bended
		is available in smaller thicknesses
		doesn't require predrying before thermoforming
		has fire certificates Y1 - B1 - M2

Veralite® vs. polycarbonate (PC)

Veralite®	.....	*is more economical (less expensive)*
		doesn't require predrying before thermoforming
		has a better chemical resistance
		has a faster thermoforming cycle
		is food approved
		has a better shrinkage resistance

Veralite® vs. polyvinyl chloride (PVC)

Veralite®	.....	*has a higher impact strength*
		is easier to cut
		has better transparency
		is 100 % recyclable
		is environment-friendly (no acid rain when burning, no dioxins)
		is food approved
		has a superior gloss
		is available in smaller thicknesses

Veralite® - Technical data sheet

PHYSICAL PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Specific gravity	*ISO 1183*	*g/cm³*	*1,33*	*1,27*
Water absorption	*ISO 62*	*%*	*0,15*	*0,15*

MECHANICAL PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Tensile strength	*ISO 527*	*MPa*	*53,5*	*51,5*
Elongation at break	*ISO 527*	*%*	*> 100*	*> 100*
Tensile modulus	*ISO 527*	*MPa*	*± 2600*	*± 2200*
Impact strength unnotched	*ISO 180*	*KJ/m²*	*no burst*	*no burst*
Impact strength notched	*ISO 180*	*KJ/m²*	*3,9*	*9,0*
Rockwell hardness	*DIN 2039*	*M / R*	*M80 / R114*	*M85 / R115*

THERMAL PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Dilatation coefficient	*ASTM D696*	*mm/mC°*	*± 0,060*	*± 0,060*
Specific Heat	*DSC*	*J/gC°*	*1,13*	*1,13*
Heat deflection temp. (0,45 MPa)	*ISO 75*	*°C*	*70*	*72*
Heat deflection temp. (1,82 MPa)	*ISO 75*	*°C*	*67*	*68*
Vicat softening point (1 kg)	*ISO 306*	*°C*	*78*	*82*
Vicat softening point (5 kg)	*ISO 306*	*°C*	*73*	*78*

OPTICAL PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Light transmission	*ASTMD1003*	*%*	*82 - 89**	*86 - 90**
Haze	*ASTMD1003*	*%*	*1,9*	*< 1*
Gloss (60° angle)	*ASTMD1003*	*units*	*148*	*159*

Veralite® - Technical data sheet

ELECTRICAL PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Surface resistivity	*ASTMD257*	*Ωxcm*	*1*E15*	*1*E15*
Dielectric constant	*ASTMD150*	*1 MHz*	*3,1*	*2,4*
Dissipation factor	*ASTMD150*	*1 MHz*	*0,056*	*0,020*
Dielectric strength (500V/sec)	*ASTMD149*	*KV/mm*	*18*	*16*
Filament test	*IEC 695/2.1*	*C°*	*650*	*650*

BARRIER PROPERTIES				
Properties	**Method**	**Units**	**Veralite® 100**	**Veralite® 200**
Water Vapour	*ASTMF372*	*g/mm/m²/24h*	*1,5*	*1,5*
Gas permeability for CO_2	*ASTMD1434*	*g/mm/m²/24h*	*28*	*49*
Gas permeability for O_2	*ASTMD3985*	*g/mm/m²/24h*	*5,1*	*10*

** Test results from 1 - 3 mm*

Temporary and limited list made to our best knowledge at this time - based upon 3 mm sheet.

All above information is based on current knowledge and experience. The data does not imply any warranty from the manufacturer towards third parties. Users should consider the above data as a guideline and gather additional information, to make independant decisions regarding the proper use, disposal, safety towards other parties and the protection of the environment.

For more specific information, please feel free to contact our technical department :

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Weather stability

In general, plastics are sensitive to atmospheric conditions in outdoor use, they have deterioration of optical, physical and mechanical properties, such as light transmission, impact resistance, gloss, etc. Also deterioration is allied to geographic location and climate conditions.

In order to prevent this deterioration, Veralite® has an outdoor version, developed for outdoor applications : **Veralite® UV**

Veralite® UV is a one- or both-sided coextruded sheet with a UV-absorbing cap-layer.

The light transmission of Veralite® UV remains stable during a period of 10 years of outdoor exposure in Central Europe. So the sheet will retain its clarity and will experience practically no yellowing.

Regarding mechanical properties we can state that after 10 years of outdoor exposure in Central Europe no significant decrease in rigidity or tensile strength will occur on Veralite® UV

For Veralite® UV there is a warranty certificate available, valid for Central Europe stating the above. More details can be found in it. Available on simple request.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Burning behaviour

Obtained fire certificates :

FIRE CERTIFICATES		Veralite® 100	Veralite® 200
Germany	*DIN 4102-1* *DIN 5510-2*	B1 S4/SR2/ST2	B1 S4/SR2/ST2
U.K.	*BS 476 Part 7*	class 1Y	class 1Y
France	*Préfecture de Police* *NF F 16-101 & 102*	M2 F1	M2 F1 (RM)
Italy	*CSE RF-2-75A/RF3-77*	class 1	class 1
US	*UL 94*	V2/HB	HB

(RM) = raw material

The addition of UV-protection, opal colour or anti-reflective surface is not expected to modify the burning behaviour of the sheet.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Food approval

Both Veralite® 100 and 200 are suitable for food contact.

The raw materials used to extrude Veralite® sheets have obtained a recommendation by the Food and Drugs Approval (FDA) and by the Bundesgesetzamt (BGA).

Also the EEC, European Directives for Plastics did approve the material according to the food regulations.

	Veralite® 100 (APET)	**Veralite® 200 (PETG)**
FDA	21 CFR-177-1315	21 CFR-177-1315
EEC	90/128/EEC	92/39/EEC

The Veralite® UV-version has not been approved for food contact.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Chemical resistance

Chemical resistance for most of the plastics is poor, a lot of plastics lose impact resistance or optical qualities when they are in contact with chemicals.
Veralite® has in general a good chemical resistance.

Please find below the most common agents ranked alphabetically and the reaction of Veralite® when being in contact with them :

Acetic Acid, 40% aq	1	Chloral Hydrate, solid	4
Acetic Acid, glacial	3	Chlorobenzene	4
Acetic Anhydride	4	Chloroform	4
Acetone	4	Chromic Acid, Plating Soln	4
Aluminium Sulphate, solid	1	Citric Acid	1
Ammonia, 10% aq	4	Citronellol	2
Ammonia, 0,88 SG aq	4	Cupric Sulphate, solid	1
Ammonium Chloride, solid	1	Cyclohexane	1
Ammonium Persulphate, solid	1	Cyclohexanone	4
Ammonium Sulphate, solid	2	Cyclohexanol	2
Amyl Acetate	3		
Amyl Alcohol	4	**D**iacetone Alcohol	1
Amyl Methyl Ketone, solid	1	Di-alkyl Phthalate	1
		Di-butyl Phthalate	1
Barium Chloride, solid	1	Di-non Phthalate	2
Benzene, solid	4	Di-octyl Phthalate	1
Benzoic Acid	1	Dimethyl Formamide	4
Benzyl Acetate	4	Dioxane	4
Benzyl Alcohol	4	Dipentene	2
Benzyl Benzoate	3	Di-1-phenyl Ethanol	3
Butyl Acetate	4		
Butyl Alcohol	1	**E**thyl Acetate	4
Butyl Lactate	2	Ethyl Alcohol	1
Butyl Stearate	1	Ethyl Benzene	3
		Ethyl Digol	1
Calcium Hypochloride, solid	2	Ethylene Chlorohydrin	4
Camphor, solid	1	Ethylene Dibromate	4
Camphorated Oil	2	Ethylene Dichlorate	4
Carbon Tetrachloride	2	Eugenol	4
Castor Oil	1	2-Ethoxy Ethanol	2
Cetyl alcohol, solid	1		

Ferric Nitrate, solid	1
Formaldehyde, 40% W/W aq	1
Formic Acid, 3 % aq	2
Formic Acid, 30 % aq	2
Furfuryl Alcohol	4
Geraniol	2
Glycerine	1
Glycol	1
Hydrobromic Acid, 50% aq	1
Hydrochloric Acid, 10% aq	2
Hydrofluoric Acid, 50% aq	3
Hydrofluoric Acid, 50% conc	4
Hydrogen Peroxide	1
Hydroquinone, solid	1
Isopropyl Alcohol	1
Lanoline	1
Linalol	2
Linseed Oil	2
Lubricating grease	1
Magnesium Chloride, aq sol.	2
Maleic Acid, 25% aq	2
Maleic Acid, 50% aq	2
Mercuric Chloride, solid	2
Mercury	1
Methyl Alcohol	1
Methyl Cyclohexanol	1
Methyl Ethyl Ketone	4
Methyl Methacrylate	3
Methyl Salicylate	4
Methylene Chloride	4
Mineral Oil	1
2-Methoxy Ethanol	3
Naptha, crude	1
Naptha, solvent	2
Nitric Acid, 10% aq	2
Oil	1
Olive Oil	2
Oxalic Acid, solid	1
Oxalic Acid, solution	2
n-Octane	1
Paraffin (medicinal)	1
Paraffin Oil	1
Petrol	2
Petroleum Ether	1
Phenol	4
Pinen	2
Potassium Bromide, solid	1
Potassium Chromate, solid	1
Potassium Cyanide, solid	1
Potassium Dichromate, solid	1
Potassium Hydroxide, 1% aq	4
Potassium Hydroxide, 10% aq	4
Potassium Permanganate, sol	3
Propionic Acid	4
Propyl Alcohol	1
Propylene Glycol	1
Salicylic Acid, solid	1
Sodium Bicarbonate, solid	1
Sodium Borate, solid	1
Sodium Bromide, solid	1
Sodium Carbonate, anhydrous	1
Sodium Carbonate, 2,5% aq	1
Sodium Chloride, 1% aq	1
Sodium Chloride, 10% aq	2
Sodium Cyanide, solid	1
Sodium Hydroxide, 1% aq	4
Sodium Hydroxide, 10% aq	4
Sodium Nitrate, solid	2
Sodium Phosphate, solid	1
Sodium Sulphite, solid	2
Sodium Thiosulphate, solid	1
Stearic Acid, solid	2
Sulphur, solid	1
Sulphuric Acid, 3% aq	2
Sulphuric Acid, 30% aq	2
Tartaric Acid, solid	2
Tetrahydrofuran	4
Tetralin	1

Toluene	2	**V**inegar	2
Transformer Oil	2		
Trichloroethyl Phosphate	1	**X**ylene	2
Trichloroacetic Acid	4		
Trichloroethylene	4	**Z**inc Chloride	2
Trietholamine	4		

1 = Unaffected
2 = Satisfactory, but slight distortion, probably caused by absorption
3 = Some attack,causing a long term deterioration in transparancy, no loss of strength,eg. cloudiness
4 = Unsatisfactory, immediate attack, deterioration in properties, eg. embrittlement and discolouration

All above information is based on current knowledge and experience. The data does not imply any warranty from the manufacturer towards third parties. Users should consider the above data as a guideline and gather additional information, to make independant decisions regarding the proper use, disposal, safety towards other parties and the protection of the environment.
For more specific information, please feel free to contact our technical department :

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Other obtained certificates

Veralite 100® and Veralite® 200 have specific mechanical, thermal and chemical properties. Due to these specific properties, the application field is very wide.

For every application there are specific certifications needed, that is why IPB is continuously having the products tested for new applications, with the necessary certifications.

A list of current obtained certificates :

Fire classifications :

Construction material following DIN 4102 (Germany)

for Veralite® 100	*B1*
for Veralite® 200	*B1*

Fire classification following BS 476 part 7 (U.K.)

for Veralite® 100	*class 1 Y*
for Veralite® 200	*class 1 Y*

Fire classification following NF-P-92-501 (France)

for Veralite® 100	*M 2*
for Veralite® 200	*M 2*

Smoke and toxic release following NF-P-16-101 & 102 (France)

for Veralite® 100	*F 1*
for Veralite® 200 raw material	*F 1*

Underwriter Laboratories Listing according to UL 94

for Veralite® 100	*V 2 / HB*
for Veralite® 200	*HB*

Fire classification following CSE RF-2-75A/RF-3-77 (Italy)

for Veralite ® 100	*class 1*
for Veralite ® 200	*class 1*

Gas and Toxic release whilst burning according to DIN 5510-2 (Germany)

for Veralite ® 100	*S4/SR2/ST2*
for Veralite ® 200	*S4/SR2/ST2*

Clear safety lenses (goggles/face protection) according to DIN EN 166 (Germany)

for Veralite ® 200	*DIN EN 166*

Food approval according to FDA and EEC regulations :

for Veralite ® 100 raw material	*FDA 21 CFR-177-1630 / 90-128-EEC*
for Veralite ® 200 raw material	*FDA 21 CFR-177-1315 / 92-39-EEC*

Filament test at 650°C according to IEC 695-2-1 1980 (Switzerland)

for Veralite ® 100	*passed test*
for Veralite ® 200	*passed test*

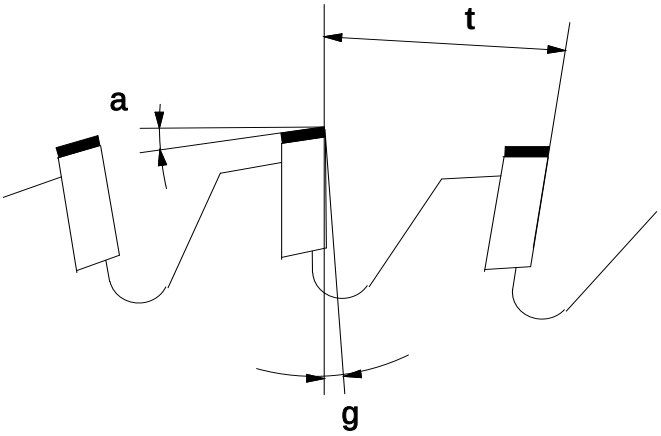
I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Sawing

Veralite® can be sawn by use of a circular saw or a band saw, following guidelines :

1) Circular saw :

Try to avoid high heat-development during sawing.
Sawing with a circular saw will give better results than sawing with a band saw.



Advised lip clearance **a**	10° - 30°
Cutting clearance **g**	5° - 15°
Saw speed	2500 m/min. - 6000 m/min.
Teeth distance **t**	3 mm - 11 mm

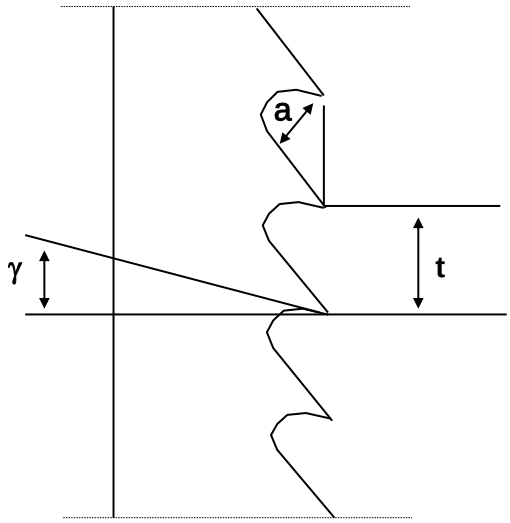
It is advised to keep the saw blade 1,5 teeth higher than the pile of sheets to be sawn.
With Veralite 100 sheets with a thickness < 2 mm, it is advised to slow down the carriage speed while coming out of the pile of sheets, as following :

Sheet thickness of :	Carriage speed :
0,50 mm >>>>	0,50 m/min.
0,75 mm >>>>	0,75 m/min.
1,00 mm >>>>	1,00 m/min.
1,50 mm >>>>	1,50 m/min.

If there occur height differences in a pile of sheets (because of thickness tolerances), it is avised to restack the sheets or support the sheets, to have an equal pile of sheets.
Avoid using hard rubbers on the clamping bar, so you can compensate this height differences.

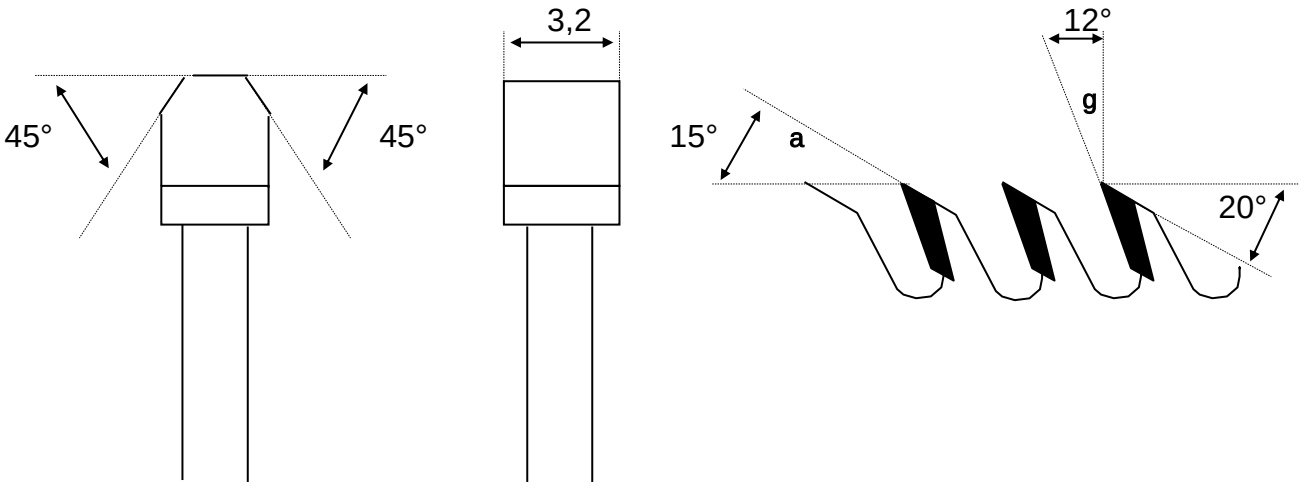
Veralite® can be sawn by use of a circular saw or a band saw, following guidelines :

2) Band saw :

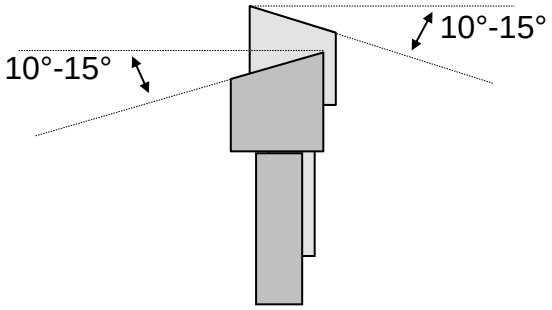


Advised lip clearance **a**	30° - 40°
Cutting clearance **g**	0° - 5°
Saw speed	1200 m/min. - 2000 m/min.
Teeth distance **t**	2 mm - 3 mm

Some technical advice on usable saws :



Type : **AKE21.220.30Z64**



Type : **AKE16.300.2,9Z96**
With inclination of teeth switching left, right, left, ...

Troubleshooter sawing :

	Teeth dimension	Saw speed
Notched edges	decrease	increase RPM
Melted edges	increase	decrease RPM

It is to be preferred to use a thick sheet(+-3mm) to cover and support the pile of sheets,
and so preventing that the first and top sheet will tremble and cause shattering of the sheet edges.
The use of an forsaw which saws underneath instead of above can solve the problem of shattered edges without the use of a supporting sheet.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

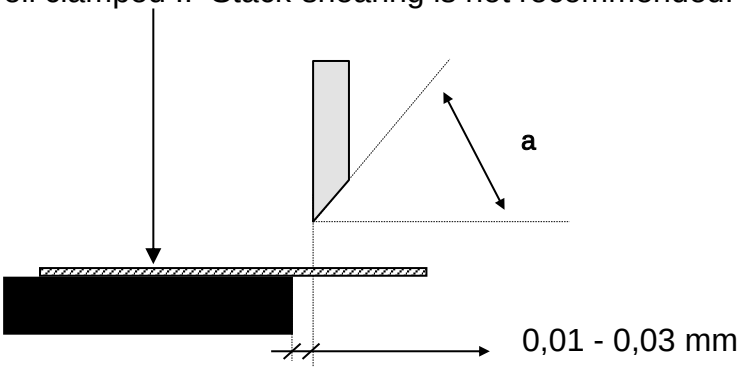
Veralite® - Shearing and diecutting

1) Shearing :

Shearing possible up to : 1,0 mm for Veralite 100
1,5 mm for Veralite 200

Shearing angle **a**	max 45°
Distance shearing-knife/table	0,01 - 0,03 mm

The sheet needs to be well clamped !! Stack-shearing is not recommended.

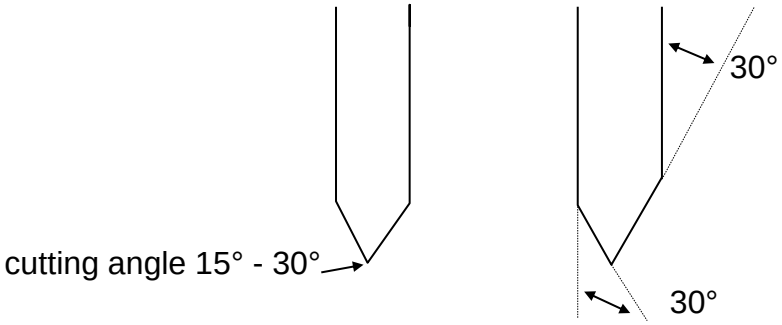


Always shear opposite to the extrusion direction.
Keep the clamping force as high as possible, to avoid vibrations in the pile of sheets.
Do not shear the sheets at temperatures lower than 15°C, it is always advised to do this at room temperatures (23°C).
If shearing very small parts, be sure the lenght of the parts to be sheared is at least half of the length of the shearing knife (to avoid tension build up).
It is advised to shear the sheets always with the printed film facing the knife (topside).
It is also important to have a nice equal adhesion of the film on the sheet, before shearing.
The pile of sheets to be sheared should be kept lower than 10 mm height to obtain the best result.

2) Diecutting :

Veralite® can be diecut with steel rule dies. The steel rules must be sharp.
If not, they have to be replaced or sharpened.

Advised thickness of steel ribbons	0,8 - 2,5 mm
Cutting angle (sharpened on one edge)	15° - 30°



Diecutting presses have to be programmed to cut completely through the Veralite® sheet with a stroke that will prevent damaging the cutting rule. Proper testing is advised before starting production.

The thickness of sheet that can be diecut varies on type of sheet and type of diecutting method used :

	Veralite® 100	**Veralite® 200**
Pneumatic diecutting	2,0 mm	3,0 mm
Table diecutting	not advised	2,0 mm

For diecutting of thicker sheet, please do appropriate testing.
Diecutting of printed sheets is more critical, and is preferably done with the printed side facing the cutting knives.

For more specific information, please feel free to contact our technical department :

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Lasercutting

Veralite® can be cut with a laser beam, up to thicknesses of 4,50 mm.
Lasercutting is useful for custom-made articles.
Tolerances are better controllable than with conventional machining operations.
Laserpower and carriage speed must be optimised to avoid whitening of the sheets.

Technical recommendations for lasercutting :

Lasertype	CO_2laser
Sheet-thickness 1 to 3 mm	Laserpower : 300 W - 330 W Carriage speed : 2 - 2,5 m/min. Assist gas : air at 1 Bar
Sheet-thickness > 3 mm	Laserpower : 330 W - 400 W Carriage speed : 1,8 - 2 m/min. Assist gas : air at 1-1,2 Bar

It is advised to lasercut the sheet with the protective masking film on the sheet, since this will reduce deposition of vapours on the surface of the sheet.

A sheet that has been lasercut, contains a lot of stress, and is not cold bendable afterwards.

Nd-YAG lasers are not suitable, because of the good transparancy of the sheet , wavelenghts in the visible range are non effective for lasercutting the sheet.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Drilling and milling

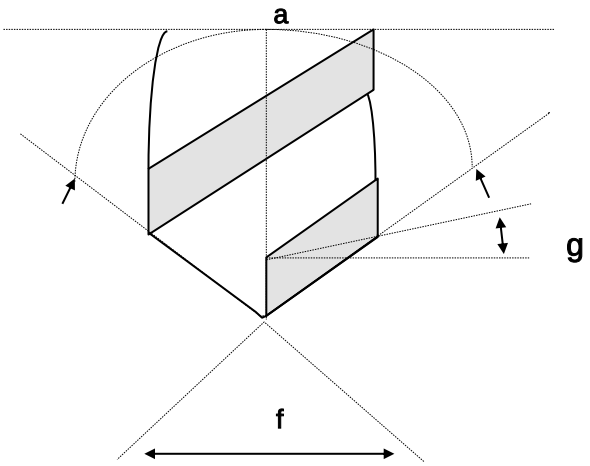
Veralite® can be drilled and milled according to following guidelines :

1) Drilling :

Veralite® can be drilled with conventional drills for steel (HSS drills). Very good results can also be obtained by use of special drills for plastics, that create less friction heat :

Advised lip clearance **a**	5°
Cutting clearance **g**	3° - 5°
Top angle **f**	60° - 90°
Drilling speed	12 m/min. - 25 m/min.
Starting speed	0,2 mm/tour

(see drawing)



2) Milling :

Advised lip clearance **a**	2° - 10°
Cutting clearance **g**	0° - 15°
Milling speed	100 m/min. - 500 m/min.
Starting speed	0,1 mm/tour - 0,5 mm/tour

(see drawing above)

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Tapping

Veralite® can be tapped easily, following advice :

Conventional 4-flute taps can be used to tap internal threads in Veralite® sheets.

However, we advise to use 2-flute taps, as 4-flute taps tend to generate a considerable heat production whilst tapping.

2-flute taps do not only have a longer lifetime and higher tapping-speed, but they also provide better clearance for chip discharge.

The flute has to be fixed in a way that both edges cut simultaneously, to obtain uniform thread on the part.

Cutting edges have to be 85° from the center-line, giving a negative rake of 5° on the front face of the lands so that the top will not bind in the hole when it is backed out.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Routing

Veralite® can be routed easily, following advice :

Routers with sharp one-flute straight cutters provide very smooth edges.
They are useful for trimming the edges of Veralite® sheet, when the part has a complicated form or for oversized parts.

Portable overarm and under-the-table routers also work fine.

Veralite® sheets have to be fed to the router slowly, to avoid excessive frictional heating.
Compressed air can be used to cool the part and to help removing eventual chips.
(Vortex system)

A few practical guidelines :

Type of cutting tools	Solid carbide 1 flute end mills diameter 8 to 12,5 mm (type MV of Star Tools)
Carriage speed	1500-3000 mm/min.
Cutter speed	15.000 RPM (for 8 mm diam. cutters)

Always feed the part counter-rotation-wise and cool with compressed air only.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Bending

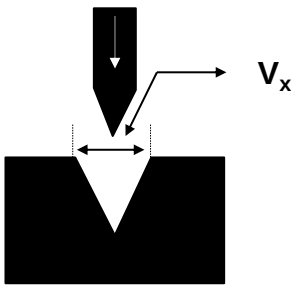
1) Cold bending :

Veralite® can be bended up to angles of 90° or less. Keep in mind that internal stress is proportional to the inclination of the angle.
For example, the impact strength of a 45° angle will be lower than a 90° angle.
When bending you should keep the sheets at room temperature : above 15°C.
Also keep in mind that there will occur a backbend of app. 5° before stabilisation of the cold bend.

Bowing : minimum radius = 150 x the sheet thickness

Practical guidelines to obtain angles of 90° :

Bending speed in mm/sec.	**Veralite® 100**	**Veralite® 200**
Sheet thickness ≤ 1,0 mm	V_{12} = 5-8mm/sec	V_{12} = 5-8mm/sec
Sheet thickness ≤ 2,0 mm	V_{12} = 2-4mm/sec V_{20} = 3-6mm/sec	V_{12} = 2-4mm/sec V_{20} = 3-6mm/sec
Sheet thickness ≤ 4,0 mm	V_{30} = 1-3mm/sec V_{40} = 2-4mm/sec	V_{30} = 1-3mm/sec V_{40} = 2-4mm/sec
Sheet thickness ≤ 6,0 mm	- -	V_{40} = 0,5-1mm/sec V_{50} = 1-1,5mm/sec



Remarks :

Proper testing is advised for cold bending of sheets of thickness > 2 mm. (internal stress level too high) Cold bending of shorn and diecut sheets is harder than for sawn sheets.
We don't advise to cold bend sheets that are shorn/diecut at following thicknesses :
Veralite 100 in > 1,5 mm - Veralite 200 in > 2 mm

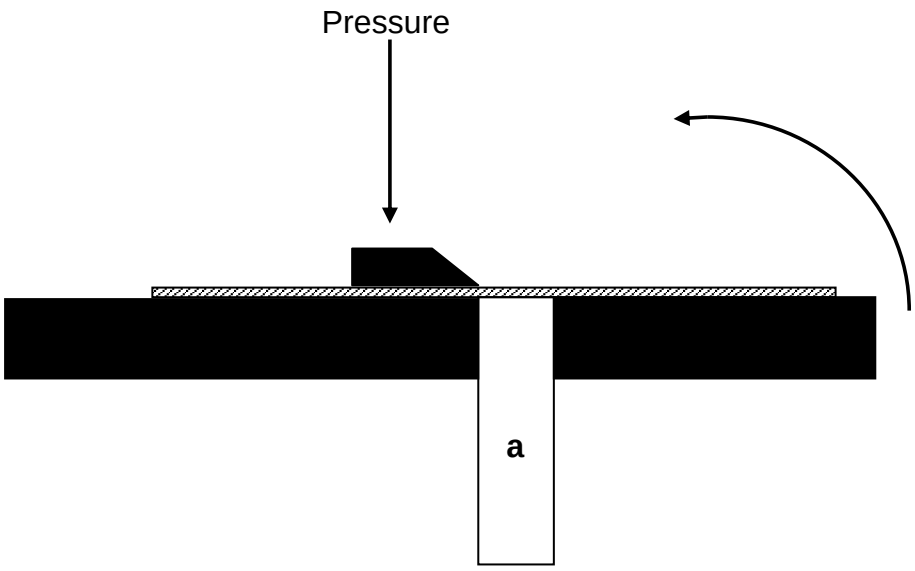
Cold bending of printed sheets requires proper testing before production.
Cold bending of lasercut sheets is not possible.

<u>If you use a bending table instead of bending tools, following advice :</u>

- machine adjustment for thickness (**a**) is <u>+</u> 2,5 X sheet thickness.
- bending with a bending table is less critical so thicknesses up to 4 mm can be used.
- for thicker sheets we advise proper testing.

<u>Practical guidelines to obtain angles of 90° :</u>

Cycle time in sec.	**Veralite® 100**	**Veralite® 200**
Sheet thickness <u>≤</u> 2 mm	2-5 sec.	2-5 sec.
Sheet thickness <u>≤</u> 4 mm	5-10 sec.	5-10 sec.
Sheet thickness <u>≤</u> 6 mm	-	10-18 sec.



<u>2) Hot bending :</u>

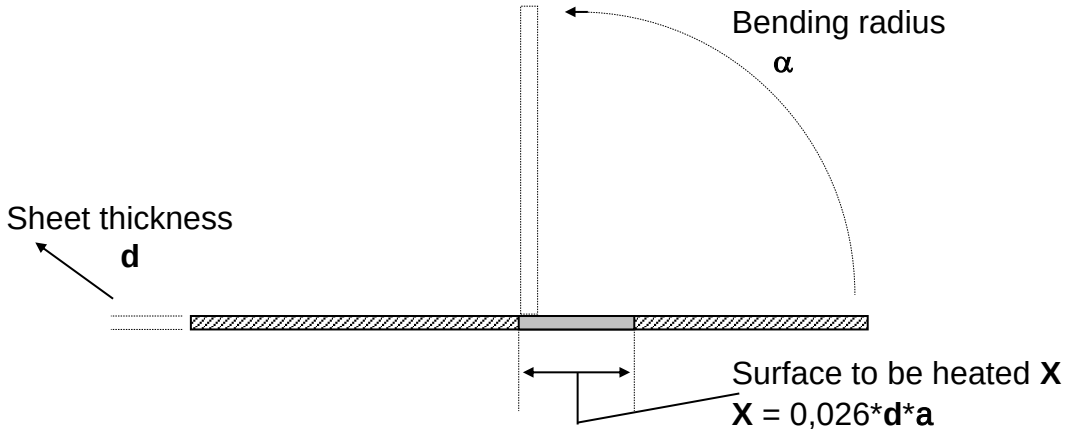
Veralite® can be bended on a small radius by preheating one or both sides of the sheet.
Predrying of the sheet is not required.
Heating elements as electric strip heaters, quartz tubes, ... can be used.

Following guidelines for hot bending :

	Veralite® 100	Veralite® 200
Sheet temperature	105°C-110°C	105°C-110°C
Heating on one side possible till ...	1,5 mm	2,0 mm
Avoid heating above ...	130°C	150°C
Avoid hot bending under ...	100°C	100°C

Adapt the surface to be heated, to the thickness of the sheet and the radius of the desired angle.
Bend the sheet when you still feel some stiffness/resistance in the sheet.
If Veralite® 100 is heated at temperatures that are too high, crystallisation will occur.
If no sandwich heating is available, turn the sheet periodically during the heating cycle.
Always bend the sheet with the heated side forming the outside radius.
If inner angles are below 45°, the masking film should be removed on the inner side.

Surface to heat :



Please calculate as follows :
For angles < 135° : X = 4 x sheet thickness
For angles > 135° : X = 2 x sheet thickness

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Thermoforming

Veralite® can be thermoformed according to the principles of positive, negative or free forming, with or without the use of air pressure or vacuum.
Male forming gives a thicker bottom, whereas female forming implies thicker walls.
Free formed Veralite® needs to be kept in its desired shape, until it has reached a temperature lower than 70°C.

Following guidelines :

	Veralite® 100	**Veralite® 200**
Sheet temperature in °C [1]	120-140°C	120°C - 200°C
One-sided heating till	1,50 mm	3,00 mm
Mold temperature in °C [2]	30°C - 60°C	30°C - 60°C
Used vacuum	0,66 atm. / 0,067 mpa	0,66 atm. / 0,067 Mpa
Shrinkage after thermoforming	0,40%	0,40%
Thermoformable until [3]	3,00 mm	6,00 mm

The thermoforming cycle is shorter than the cycle of PVC, PMMA or PC.
Power supply needs to be as constant as possible and may not be too high.
Annealing is not needed when parts are formed according the technical guidelines. If stress cracks are occuring on a thermoformed part, the part can be reconditioned at 70°C.
Chromium steel molds give the best optical results.
Conduction heating and high frequency heating are not suitable.
Predrying is not required, however if sheets are in stock during a very long period, moisture may be absorbed, requiring predrying then. If predrying is necessary, we advise to heat the sheet during app. 24 hrs at 60°C before thermoforming the part.
Don't heat the sheet too fast, heat accumulation will damage the sheet and cause embrittlement on the formed part.
Don't cool the formed part too fast, since this may generate stress, resulting in cracking of the formed part.

[1] When Veralite® 100 is heated at temperatures that are too high, it will become white and brittle. Overheating of Veralite 200 will also cause brittleness.
[2] A mould that is too cold may cause tensions in a thermoformed piece, depending on thickness and complexity of the formed piece.
[3] With both-sided heating of the sheet.

Drape forming :

Unaxial bent parts can be achieved by drape forming.
Moulds can be made out of wood or aluminium covered with felt.
Slight pressure is sufficient to drape the sheet over the positive mould.
Advised sheet temperature for drape forming is 130°C.
Remove the masking tape before putting the sheet into the heating oven.
Place the sheet on the mould immediately after the heating.
Let the sheet cool down in room temperature, don't force the cooling with air.
Avoid cool drafts during the processing, which may cause distortion/stress in the draped part.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Crystallising

Veralite® 100 sheets are supplied in an amorph structure (glass clear), however they offer the possibility to be crystallised after thermoforming, where they switch from an amorph structure (APET) to a crystalline structure (CPET) (opaque).

When overheating the sheet after thermoforming (first thermoforming it at regular temperatures and afterwards leaving it on the mould and heating it up for 1-3 min. at 120-170°C) you will obtain an opaque sheet, with following characteristics :

- superior temperature resistance (up to 160 °C)
- higher stiffness
- better chemical resistance

Disadvantages are : loss of impact strength, brittleness and loss of transparency.

This procedure is used a lot for microwave trays, because of high temperature resistance and good chemical resistance.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Printing

Veralite® doesn't require pretreatment before printing, since the surface tension is high enough to obtain good results.

Veralite® must be completely clean before the printing. It is advised to leave the masking film on the sheet, until it has to be printed.
Veralite® can be cleaned with a lukewarm soap solution. After sufficient rinsing, you can dry it with a shammy leather.
Dots of ink can be removed by using ethanol or petrol-ether.

Veralite® can be printed through : dry-offset, lithography, flexo, screen printing, etc ...

Although almost all printing inks can be used, it is advised to do proper testing before going into production.

Printed Veralite® sheets are more brittle, since to obtain good adhesion, the surface will be chemically attacked.

Veralite®, because of the good chemical resistance, does not absorb the printing ink, which implies that it is sensitive to abrasion. This can be minimised by applying a light coat of clear lacquer on the printed surface, or can be solved by reverse printing.

Please find on following page a list of printing inks giving excellent results on Veralite®.

Avoid exceeding the heat distortion temperature of 63°C during the cure/dry process.

Veralite® sheet can also be coated. We advise Kolorbond® coatings. If applied to Veralite® 100, it is advised to use a primer before spraying the colour coating.
Crystallised Veralite® 100 gives poor results concerning adhesive strength of the coating.

Only Veralite 200 can be offset printed,taking into consideration that only UV-type inks are suitable.

IPB NV
PLASTIC SHEET EXTRUSION

Veralite®

PRODUCER	TYPE	INK-NAME	ADDITIVES	Ver 100	Ver 200
Sericol Limited	Solvent	Polydyne YD	10 % ZC 521(thinner)	X	X
		Polyplast PY	20% ZV557 (thinner)		X
		Mattplast MG	10% ZC521 (thinner)		X
		Mattplast MH	10% ZC521		X
	UV	Uviplast Omniplus UL			X
		Multidyne UV	5% ZE824	X	
			before printing clear with IPA		
	Water	Aquaplast PW			X
Marabu Werke	Solvent	Maraflex FX		X	X
		Maragloss GO		X	X
		Libraprint	3% WM1		X
		Maramold MPC		X	X
		Marapoly P	hardener H1 8:1	X	X
		Marastar SR	hardener H1 10:1	X	X
		Marapol PY	hardener H1 8:1	X	X
	UV	Ultraform UVFM		X	X
		Ultraplus UVP	3% UV HV 4	X	X
		Ultrastar UVSM	2% UV HV 4	X	X
Unico N.V.	Solvent	Turboprint TP	5% plasticizer nr 4 + fast thinner	X	X
	UV	UVEPLAST UVP	5% UVD hardener	X	
		UVEPLAST UVP			X
Visprox B.V.	Solvent	TCI 8700	15% retarder nr. 8	X	
		TCI 8700			X
		V2000	20% retarder nr 7		X
		V2000	20% thinner nr 103		X
		PP3000	15 % retarder nr 68		X
		Multiplast 300	15% retarder nr 7		X
		Vipro PP3001	hardener nr. 2 + 15% retarder nr. 8	X	
Dubuit	UV	Multiprint	5% ST305 (catalysator)	X	X
		Multiprint	5% AM 9049 (catalysator)	X	X
Coates Screen	Solvent	PK-Jet/CP/J	10% hardener	X	X
		Z_PVC (2-comp. Inkt)	10% hardener	X	X
Ernst Diegel	Solvent	Screenprinting HV/Z	15% retarder 46038		X
		2K screenprinting AR/Z	10% H19074 + 15% R19479		X
Arets	Water	Flexo PP/3032			X
		Flexo PP/3024			X
Zeller+Gmelin	UV	Eurocur			X
Tripette & Renaud	UV	UVISOFT (US) Blanc opaque 103	10% à 20% thinner 39301	X*	X

* = Has a good addition on one side (the side of the transparant film)

Marabu Werke Gmbh	Tel.	+ 49-1.48.02.89	Fax.	+ 49-1.48.02.43.19
Visprox B.V.	Tel.	+ 31-235.24.81.31	Fax.	+ 31-235.24.78.62
Zeller + Gmelin Gmbh	Tel.	+ 49-7.16.18.02	Fax.	+ 49-7.16.18.02.00
Unico N.V.	Tel.	+ 32-2.582.16.90	Fax.	+ 32-2.582.52.40
Ernst Diegel Gmbh	Tel.	+ 49-6631.785-0	Fax.	+ 49-6631.46.46
Sericol Limited	Tel.	+ 44-1843.87.20.63	Fax.	+ 44-1843.87.20.68
Arets	Tel.	+ 32-3.827.78.71	Fax.	+ 32-3.830.06.69
Dubuit	Tel.	+ 33.1.64.67.41.60	Fax.	+ 33.1.64.67.41.89
Coates Screen	Tel.	+ 32-2.216.02.36	Fax.	+ 32-2.216.36.14
Tripette et Renaud	Tel.	+ 33-4.66.60.98.98	Fax.	+ 33-4.66.60.87.25

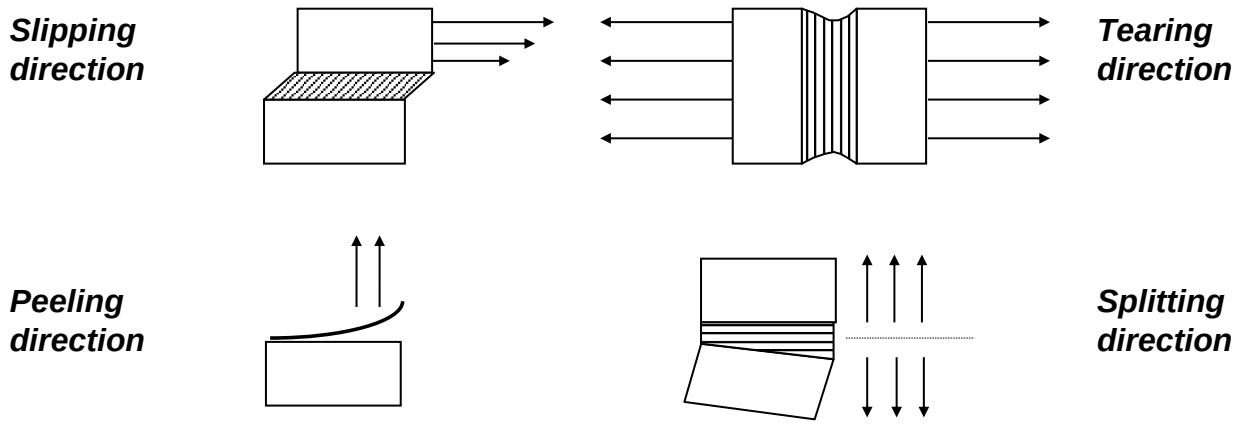
All above information is based on current knowledge and experience. The data does not imply any warranty from the manufacturer towards third parties. Users should consider the above data as a guideline and gather additional information, to make independant decisions regarding the proper use, disposal, safety towards other parties and the protection of the environment. For more specific information, please feel free to contact our technical department :

Veralite® - Bonding

Veralite® has a high surface tension which makes every pretreatment unnecessary before the bonding of it.

Following guidelines on bonding :

- The surface to bond needs to be clean and free of contamination. To clean this surface, it is advised to use 10 % ethanol in a watersolution or a mixture of iso-propanol and water or a washing benzine
- Bonding strength is proportional to : pressure time and pressure force.
- Bonding is preferred in the tearing or slipping direction rather than in the peeling or cleaving direction, in order to have a strong bonding force. (see drawing)



Bonding types with filling properties :

- Hot-Melt types
- Polyurethane glues
- Epoxy 2 component glues, PVC (hard) adhesives and double coated acrylic foam tapes.

Veralite® 200 is easy bondable, whereas Veralite® 100, is more susceptible to whitening (crystallising), because of the higher chemical resistance.

IPB NV
PLASTIC SHEET EXTRUSION

Veralite®

Bonding of Veralite® 100 on :

Bonding type	Ver 100		Reference
Adhesive	VG/T		Lorenz Chemie MR-AP/35
Adhesive	VG/T		Lorenz Chemie SR-AP/49

Bonding of Veralite® 200 on :

Bonding type	Ver 200	Ver 100	Pmma/C	Pmma/XT	PC	PS clear	PS col.	Pvc-clear	Pvc foam.	Pvc stru.	Reference
CH_2CL_2	VG/T*	VG	VG/T*	G/T*	VG/T*	G/T*	G/T*	VG/T*	VG/T*	G/T*	Methylene
MEK	VG/T**	A	A	G/T**	VG	G/T**	G/T**	VG/T**	VG/T**	VG/T**	-
PVC (hard adh.)	VG/T*	G/T*	VG/T*	VG/T*	VG/T*	G/T*	G/T*	VG/T*	VG/T*	VG/T*	Bison, Pattex, ...
Contact adhesive	G-VG	G-VG	G	G	-	G	G	G	G	G	Bison, Henkel, ...
Epoxy 2 comp.	VG/T	A/T	A/T	P	-	A/T	A/T	P	P	P	Bison
UV-adhesive	VG/T**	G/T**	-	P	-	-	-	-	-	-	Loctite 305
Adhesive	VG/T	VG/T	G/T**	P	-	P	A/T**	VG/T**	VG/T**	P	Lorenz Chemie MR-AP/35
Adhesive	VG/T	VG/T	G/T**	P	-	P	A/T**	VG/T**	VG/T**	P	Lorenz Chemie SR-AP/49
Cyano acrylate	VG/T**	VG/T**	VG/T**	VG/T**	VG/T**	VG/T**	VG/T**	VG/T**	P	P	Loctite406/3M E1100/Evot.TC731
Polyurethane	VG	VG	-	-	-	-	-	-	-	-	Henkel/Bison
D-coat.acr.f-tape	A/T	A/T	A/T	A/T	A/T	A/T	A/T	A/T	A/T	A/T	AFT4932/AFT4952/ATTF9460PC
Extrufix	VG/T	P	VG/T	VG/T	-	-	-	VG/T	-	-	Evo-Plas/Evode
Sicomet 40	VG	-	-	-	-	-	-	-	-	-	Henkel
Sicomet 77	VG	-	-	-	-	-	-	-	-	-	Henkel
Ruplo M 804	VG/T*	-	-	-	-	-	-	-	-	-	Ruplo Holand
Hot Melt types	A	A	A	A	A	A	A	A	A	A	EastobondA747S/Thermelt2157
2 component PU	VG/T	G/T	VG/T	VG/T	-	-	-	-	-	-	Acrifix 200-(Röhm)-HE1908(Evode)
Silicone	G/T*	G/T*	-	-	-	-	-	-	-	-	Omnivisc 1050/Evo Stick
Parasilico	G	G	-	-	-	-	-	-	-	-	DL Chemicals (non transparent)
Parabond 600	G	G	-	-	-	-	-	-	-	-	DL Chemicals (white)
Ruderer 118	VG/T**	VG/T**	-	-	-	-	-	-	-	-	Ruderer (Dtsl)

LEGEND	**VG**	= very good bonding strength (≥2N/mm²)	**T**	= optically transparent
	G	= good bonding strength (>1N/mm² <2N/mm²)	**T***	= optically transparent in case of edge-bonding
	A	= Acceptable bonding strength (>0,5N/mm² ≤1N/mm²)	**T****	= transparent when the surfaces to be bonded are
	P	= Poor bonding strength (<0,5N/mm²)		<15 mm and high pressure is exercised.
			NT	= non transparent; white

Bonding may cause loss of impact resistance.(especially with solvent or cyano-acrylic bonding)
Bonding of cold bent sheets is not advised (stress may cause cracking).
Proper testing is advised before bonding printed sheets.
When sheets have been diecutted or sheared, it is not advised to bond on the edges of the sheet when using cyano-acrylic or solvent bonding agents.
This causes stress in the sheet, which can result in cracking.
(Avoid bonding on the edge areas)

Solvent bonding :

For precision work on small objects, you can use a hypodermic needle, allowing the solvent to flow throughout the area to be cemented.

When using the edge-dipping method, you need to dip the sheet into a shallow pan until it becomes soft.

Solvent boiling paints :

Methylenedichloride :	40,5 °C
Acetone :	56,5 °C
Chloroform :	61,1 °C
M.E.K. :	79,7 °C

Solvents with a low boiling point may cause whitening and improper joints.

To prevent early evaporation, use a mixture of MEK (42%) and Trichlorethylene (42%).

Special attention should be paid to avoid the formation of air bubbles in the bond after curing.

Veralite® - Welding

Veralite® 200 can be heat welded by temperatures of 260°-300°.

Welding rods of PETG, PVC or ABS can be used for welding Veralite® 200.

Prevent temperatures that are too high, because of stress creation that may lead to part breakage.

We advise against welding of Veralite® 100, crystallization may occur at high temperatures. Ultrasonic welding is possible with Veralite® 100.

Fastening :

Veralite® can be nailed, stapled or rivetted in thicknesses up to 1,5 mm.
It is not advised to use the above fastening methods for industrial applications.

We advise to use screws with a cylindrical head. Never use screws with chamferred heads since they cause stress cracking. The wholes that are predrilled for the screws should be 0,5 mm larger in diameter than the screws theirselves.
Use galvanised screws only. Never use glue on the bolts.
After tightening the screws firm by hand, never exceed two more twists of the screw.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Polishing

Please note that polishing is a time-consuming process which is only used in critical applications. Keep in mind that because of the specific edge color of the sheet, a glassclear edge will rarely be achieved.

The saw cut edges can be improved by :

1) Flame polishing :

Veralite® 200 is preferred to Veralite®100 (crystallisation of Veralite® 100 by extreme heat) Veralite® can be flame polished by use of a standard propane torch or a hot nitrogen welder. Flame polishing requires accurate control of distance between the sheet and the heat source. Also an electrical hot-air device can be used for flame polishing.

2) Solvent polishing :

Used only on Veralite® 200, Veralite® 100 not possible (has a chemical resistance that is too high). We advise to use a hot solvent, the vapour should be led along the sheet edges. Sometimes it is required to add a slow drying component (as diacetone alcohol) to prevent humidity blush on the edges after drying.

3) Mechanical polishing :

Use a grating material for polishing. In case of sandpaper, work in steps of hardness of the sandpaper. Start with 200,400,600,800 up till 1000 of fineness.

Polishing can be achieved with abrasive-charged wheels, following methods :
- a wet abrasive (n° 00 pumice) applied to a loose muslin wheel
- a grease or wax-filled abrasive bar applied to a rotating muslin wheel
- a wax compound applied on a polishing wheel of loose flannel

Please note that heat development has to be avoided during polishing. It may be necessary to use a coolant in some cases.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Sterilising

Veralite 100® and Veralite® 200 can be easily applied in the medical and food industry because of the fact that they can both be sterilised.

Methods of sterilising :

- Gamma radiation
- Ethylene Oxyde fluid

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Recycling

Environmental and toxicological statement :

Veralite® is free of heavy metals, chlorine or plasticizers.
It complies with the compositional requirements of the US Food and Drug Administration, obtained a BGA recommendation and complies with the European Union Directives for plastics used in food contact applications.

When burning, Veralite® doesn't release toxic fumes.

Veralite® 100 and 200 do not contain any class 1 and class 2 ozone deflecting substances (ODS)

Recycling :

Veralite® 100 and 200 are "code 1" products and can go in with established recycling streams.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Stocking and handling

Stocking of sheet :

Veralite® should be placed on flat pallets, with a size equal to the sheet dimension.

Veralite® must be stocked indoors, sheet and protection material may not be exposed to sun and rain.

If vertical stocking is required, sheets must be in an upright position and must be supported over the complete length.

Handling of sheet :

It is advised when handling, not to slide the sheets over each other to avoid scratching.

For more specific information, please feel free to contact our technical department :

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85

Veralite® - Cleaning

Veralite® sheets can be cleaned very easily, by means of :

- a lukewarm soap solution
- an antistatic sheet cleanser (to remove dust from the sheets)
- a mixture of 50% isopropanol and water

After cleaning and sufficient rinsing, dry the sheets with a shammy leather.

Never clean the sheets dry, this may cause scratches.

Fresh paint dots or grease can be removed before drying, by rubbing lightly with a soft cloth with Isopropylalcohol on it. Thorough washing and rinsing is required afterwords.

Dusting with a regular air-gun or a cloth only moves the particles rather then removing them. A solution is using an air-gun with ionised air.

I.P.B. nv
Steenovenstraat 30
8790 Waregem
BELGIUM
Tel.+32.56.60.79.19
Fax +32.56.61.08.85