print hpl
high pressure laminates

h i g h p r e s s u r e l a m i n a t e s

Postforming

HGP - Horizontal Grade Postforming

ABET LAMINATI

POSTFORMING

HGP
(Horizontal Grade Postforming)

This material is made up of sheets of kraft paper and a decorative sheet impregnated with thermosetting resins, submitted to the combined action of pressure (9 MPa) and heat in a special press which results in polycondensation of the resins.

An important feature of Print HPL Postforming is that it can be postformed, convexly or concavely by heating to 150-220 °C, according to the technique chosen and the radius required.

This characteristic, typical of the Postforming qualities of Print HPL, significantly increases the number of possible applications of this laminate. It is for example possible to create rounded edge profiles to meet the highest safety standards, with advantages both in style and function.

The curved elements are without joints, which makes them easy to clean and hygienically safe.
The edges will not swell as a result of the penetration of water or other liquids.

Some finishes can, on request, be supplied with a special protective film, which does not have to be removed before or during Postforming.
The following factors must be borne in mind for film coated laminate:
- The laminate must not be bonded on the flat surface at temperatures above 90°C for more than 5 minutes at a pressure above 5 bar.
- The postforming temperature must not exceed 163°C.
- The bending temperature applied to the HPL must not exceed 163 °C and varies according to type of material, curve profiles and postforming technologies.

N.B.: *exposing the protective film to sunlight, even for brief periods, may alter the properties of the film and underlying glue: in this case it may prove difficult to remove the film.*

TECHNICAL DATA

Property	Test method	Property or attribute	Unit	Values
Thickness	EN 438/2.4	thickness	mm	0,60 ± 0,10 0.9 ± 0.10
Resistance to surface wear	EN 438/2.6	wear resistance	revs.	min 350
Resistance to immersion in boiling water	EN 438/2.7	mass increase thickness increase	%	abaut 20
Resistance to dry heat at 180°C	EN 438/2.8	appearance: - glossy finish - other finishes	 grade grade	 min 3 min 4
Dimensional stability at elevated temperature	EN 438/2.9	cumulative dimensional change	% L % T	max 0,65 max 1,15
Resistance to impact by small diameter ball	EN 438/2.11	spring force	N	min 20
Resistance to cracking	EN 438/2.13	appearance	grade	min 4
Resistance to scratching	EN 438/2.14	load	N	min 2
Resistance to staining	EN 438/2.15	appearance: groups 1 and 2 groups 3 and 4	 grade grade	 5 min 4
Resistance to colour change in xenon arc light	EN 438/2.16	blue wool scale grey scale	 -	min 6 min 4
Resistance to cigarette burns	EN 438/2.18	appearance	grade	min 3
Formability	EN 438/2.21	radius	mm	10 times * nominal thickness
Resistance to blistering	EN 438/2.23	time min.	sec.	15
Resistance to steam	EN 438/2.24	appearance	grade	min 4
Volume electrical resistance	NFPA 99	-	Ohm	1.10^{8}-1.10^{11}
Reaction to fire	UNI 8457 UNI 9174	-	class	2

* To get curvature degrees lower than 6 mm, we can produce one special Print PF R3 (curvature degrees < 3 mm). For thickness 0,6 mm, it is possible only for some collections, colours, sizes, finishes.

COMMERCIAL DATA

Collection	Size	Thickness	Finish
STANDARD PRODUCTION	305x130 cm	0,6 - 0,9 mm	all finishes produced
STANDARD PRODUCTION	366x161 cm 420x161 cm	0,9 mm	GLOSS
	420x130 cm	0,6 mm	other finishes

The information in this catalogue does not apply for the Serie Metalli MET 1 - MET 2 type materials.

STORAGE

Panels should be stacked by laying them flat so that their entire surface is supported horizontally.
The decorative surfaces of two panels should be laid face-to-face.
The panel on the top should be placed with the decorative surface face-down.
In order to avoid excessive deformation and preserve the pliability of the product for as long as possible, panels should be stored in a closed, dry place at a temperature of between 15° and 30° and with humidity between 50-75%.
Very low relative humidity levels tend to advance the ageing process of laminates and must therefore be avoided at all costs in the warehouse.

POSTFORMING CONDITIONS

Laminated panels for postforming must be heated to the temperature given below in the areas to be bent.
The reaction of the laminate during Postforming depends on the process used and on the interaction of heat, pressure and time.
The area may be heated by:
- Infrared rays (medium-long or short waves)
- Heated plates or bars
- Heated metal pipes

The temperatures and maintenance of the heating medium, which are essential to achieve successful Postforming, are influenced by the following factors:
- Wavelength
- Source of heat
- Distance of the piece from the radiating source
- Voltage variation
- Heat absorption by the laminate, because of colours, finish and thickness
- Type of adhesive and quantity applied on the section to be bent
- Temperature of the laminate and substrate
- Thickness of the substrate
- Bending/speed.

The maintenance and control of a precise, constant temperature on the laminate is of vital importance and it is thus advisable to use temperature sensors. and thermal paints or pencils such as TEMPILAQ.
If the recommended temperature is exceeded, the layers may separate (blistering). If on the other hand the temperature is too low, cracking may occur (microcracks). The bending speed depends basically on the thickness of the laminate, the radius and the type of bending required (concave or convex), and also on Whether the sheet is bent along or across the grain.
It is important to note that the laminate is usually bent along the grain. Cases of bending across the grain should be examined beforehand with the manufacturer.
To avoid excessive drying of the laminate during bending it must be heated as rapidly as possible. And to avoid heat dispersion, bending must take place immediately after heating.
Due to the many factors that may influence the postforming process, we recommend that you discuss the matter previously with the HPL, equipment and glue manufacturers. This will cut costs and waste. Verification tests should be performed regularly and at least every time the product batch and/or curve profile is changed.

SOME INFORMATION ON ADHESIVES

All the glues normally used for HPL can be used to bond the flat surfaces of the PF (Postforming) panels.
Some information is given in Table A.
There may be some restrictions regarding bonding of the bent areas, and for prebent panels. The adhesives mentioned in the table below have proved suitable.

TABLE A

Pre-bending of laminate and subsequent bonding	Simultaneous bending and bonding			
	Static process		Continuous process	
	Flat surfaces (1)	Bends (2)	Flat surfaces (1)	Bends (2)
PVAc glue (one and two-part)	PVAc glue	Special PVAc glue	PVAc glue	Special PVAc glue
Condensation resin based adhesives (urea-formaldehyde resin)	Condensation resin based adhesived (eg. urea) (3)	Condensation resin based adhesived (eg. urea)	Condensation resin based adhesived (eg. urea) (3)	Contact adhesives
Contact adhesives	Special contact adhesives (4)	Contact adhesives	Special contact adhesives (4)	

N.B.: the more porous the support the thicker the layer of glue needed in bend areas.
1) Bonding of flat surface is performed separately
2) These adhesives must have special properties (see para. B.1)
3) When using this type of rigid adhesive, it is important to avoid allowing excess glue to collect in bend areas. For this reason incisions or "steps" are made (Fig. 1).
4) Adhesives with high thermal resistance to avoid softening and collapse of the bonded section during heating and subsequent bending.

Bonding - A) Static process

A.1 Pre-bending of HPL panels and subsequent bonding

A.1.1 Bending over rods or heated pipes (manual or automatic)

By this method the laminate is secured in a special bending device on the edge of which there is a heated pipe with the appropriate diameter to give the required bending radius. This pipe can be heated electrically, by steam or by oil, making it circulate rapidly in the pipe to maintain a constant temperature.
The HPL PF panel is held in the device as shown in Fig. 2a, with the section to be bent protruding over the heating pipe.

When the laminate has reached the bending temperature, a second unheated pipe is lowered, holding the laminate tightly against the heated pipe, and gently bending the laminate around it.
The laminate must be bent to an angle higher than required and then cooled, maintaining it in the shape obtained to prevent it from unbending (Fig. 2b). A jet of compressed air or a damp sponge may be used to cool bent laminate on an electrically heated pipe. A jet of cold water may be used on those heated by steam or oil (Fig. 2c).
The maximum diameter of the electrically heated pipes is usually 25 mm. Larger diameters (up to 100 mm) can be used with pipes heated by oil, steam or over-heated water (Specification: Tab. 1-2).

Fig. 1
Types of support to avoid build up of excess glue

Fig. 2
Bending on rod or heated pipe

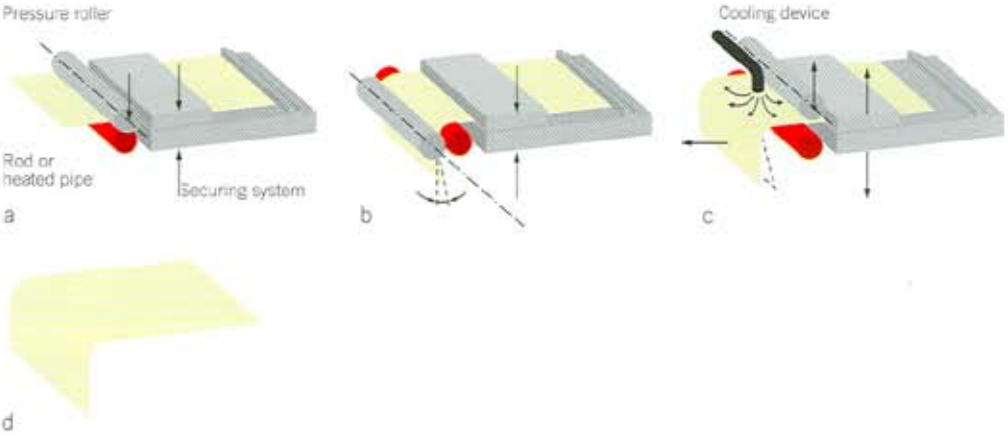


Table 1
Bending specification sanded side in contact with heated pipe

Laminate thickness	Tube radius	
0,6 mm 0,9 mm	6 - 12 mm 9 - 12 mm	Rod temperature (of operation): 190-210 °C* Bend time for angle of 90°: 40-60 secs Start the bend when the laminate has reached at least 157-163 °C on the surface
0,6 mm 0,9 mm	≥ 14 mm ≥ 16 mm	Temperature: 170-190 °C* Bend time for angle of 90°: 40-60 secs Start the bend when the laminate has reached at least 150-156 °C on the surface

*the temperature is measured on the hot pipe.

TABLE 2
BENDING SPECIFICATION DECORATIVE SIDE IN CONTACT WITH HEATED PIPE

Laminate thickness	Tube radius	
0,6 mm 0,9 mm	6 - 12 mm 9 - 12 mm	Temperature (of operation): 170-190°C* Bend time for angle of 90°: 40-55 secs Start the bend immediately to avoid burning the melamine surface. For very large radii, lower the temperature to avoid burning the decorated surface.

*the temperature is measured on the hot pipe.

N.B.:
for angles above 90° the bend time must be progressively raised.

A.1.2 BENDING WITH HEATING BY INFRA-RED RAYS AND SIMPLE EQUIPMENT

The area of the panel to be bent is heated by infra-red rays. As soon as the desired bending temperature is reached, the laminate is secured in a device of the type shown in Fig. 3, which consists of a securing support and a bending flap. The device should be made of wood to avoid excessive heat dispersion. The bending operation should be performed as rapidly as possible. The bent laminate must be kept in the bent position until it is cold. (Specification: Tab. 3)

FIG. 3
BENDING WITH HEATING BY INFRA-RED RAYS AND SIMPLE EQUIPMENT

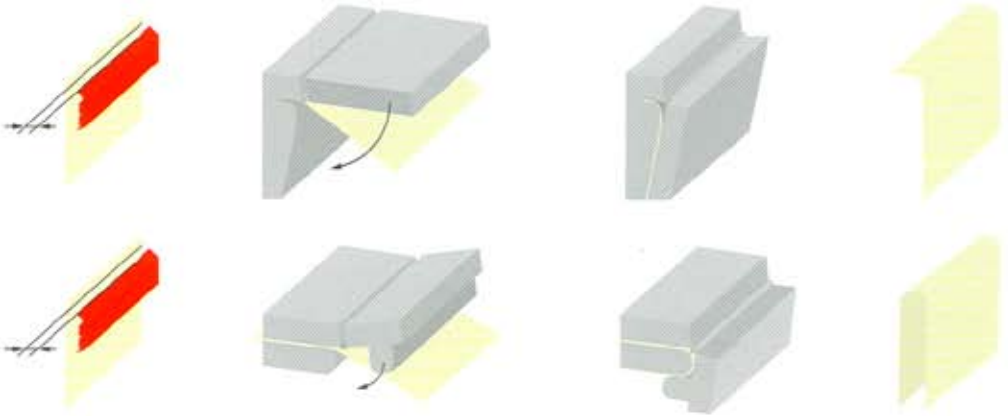


TABLE 3
INFRA-RED RAY BENDING SPECIFICATION

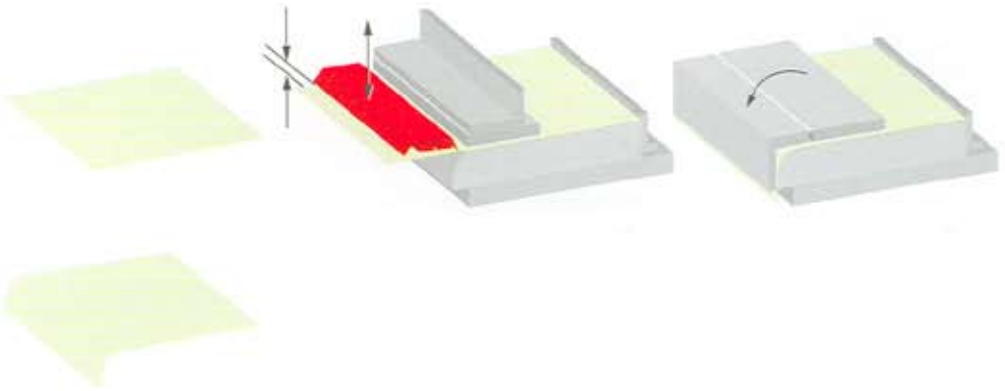
Laminate thickness	Radius of hard wooden form	
0,6 mm 0,9 mm	≥ 6 mm ≥ 9 mm	An infra-red lamp is placed at a distance where it can reach a temperature of 163 °C* in 25-30 secs. Then proceed with the bending operations described in paragraph A.1.2 - A.1.3
0,6 mm 0,9 mm	≥ 14 mm ≥ 16 mm	An infra-red lamp is placed at a distance where it can reach a temperature of 153 °C* in 25-30 secs. Then proceed with the bending operations described in paragraph A.1.2 - A.1.3

*the temperature is measured with thermal enamels.

A.1.3 STATIC BENDING WITH INFRA-RED BENDING MACHINE

This method secures the laminate in a special bending device. The section of the laminate that protrudes from the hard rounded wooden form is heated by infra-red rays. As soon as the desired temperature is reached, the infra-red ray lamp is removed from the bend area and the laminate is bent over the former by a manual or mechanical flap (Fig. 4) (Specification: Tab. 3).

FIG. 4
STATIC BENDING WITH
INFRA-RED BENDING MACHINE



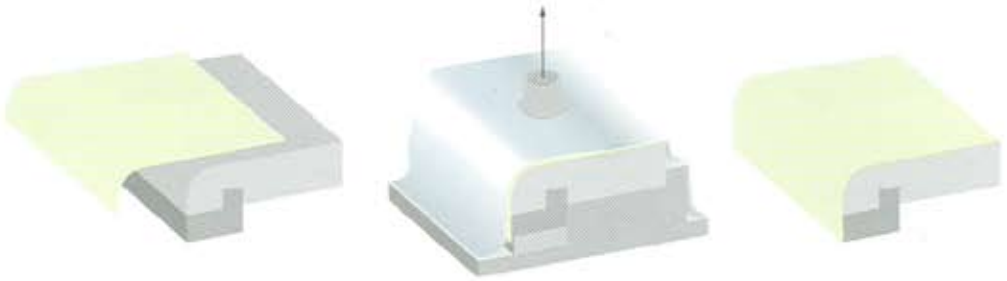
A.1.4 BONDING OF PRE-BENT LAMINATE

See Table A for adhesives suitable for this process.

Bonding may be performed using moulds (Fig. 5) or sheet presses (Fig. 6).

FIG. 5
BONDING OF PRE-BENT
LAMINATE USING A MOULD

FIG. 6
BONDING OF PRE-BENT
LAMINATE WITH SHEET PRESSES



A.2 SIMULTANEOUS BENDING AND BONDING OF LAMINATE, BY STATIC PROCESS

This process is similar to that described in paragraph A.1.3, except that the actual substrate material (eg. particle board or "MDF") is used instead of the hardwood former. In this case the laminate is prebonded on the flat surface of the substrate, allowing a section to protrude beyond the rounded part of the substrate. The rounded part of the substrate (eg. the wood compound) and the protruding part of the laminate are coated with the appropriate adhesive.

A.2.1 Bending with heating by infra-red rays

The protruding laminate is heated to the desired bend temperature and bent as described in paragraph A.1.3 (Figs. 7b-d shows the part of the laminate being bent and bonded simultaneously).

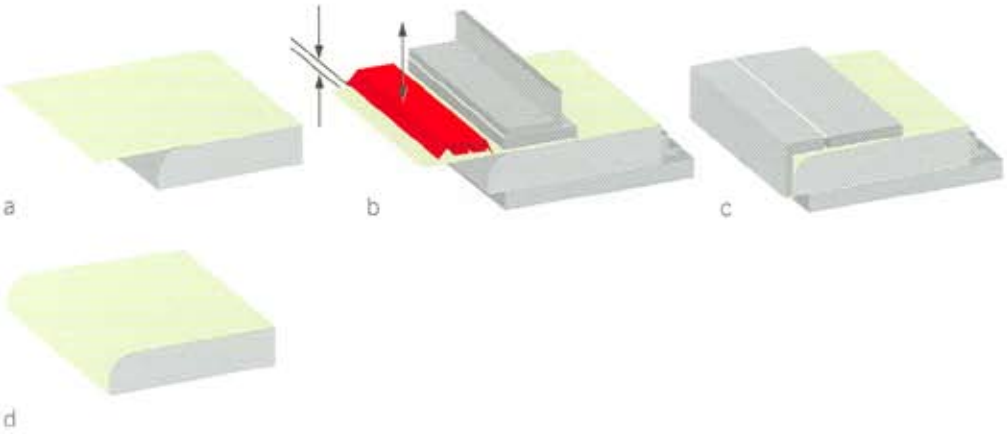


Fig. 7
Simultaneous bending and bonding by static process

A.2.2 Bending with heating by contact

This process can achieve convex bends on single pieces or small-medium sized batches. The laminate is bent and bonded to the rounded support using a mobile, flat plate, which is heated to a precise temperature along its entire length (Fig. 8). By pressing the laminate against the support, with a uniform, constant pressure, the plate follows the contours of the same, simultaneously bending and bonding the laminate.
The temperature and the speed with which the plate advances can be adjusted for different types of laminate and bend. The heated plate can advance either manually or automatically.

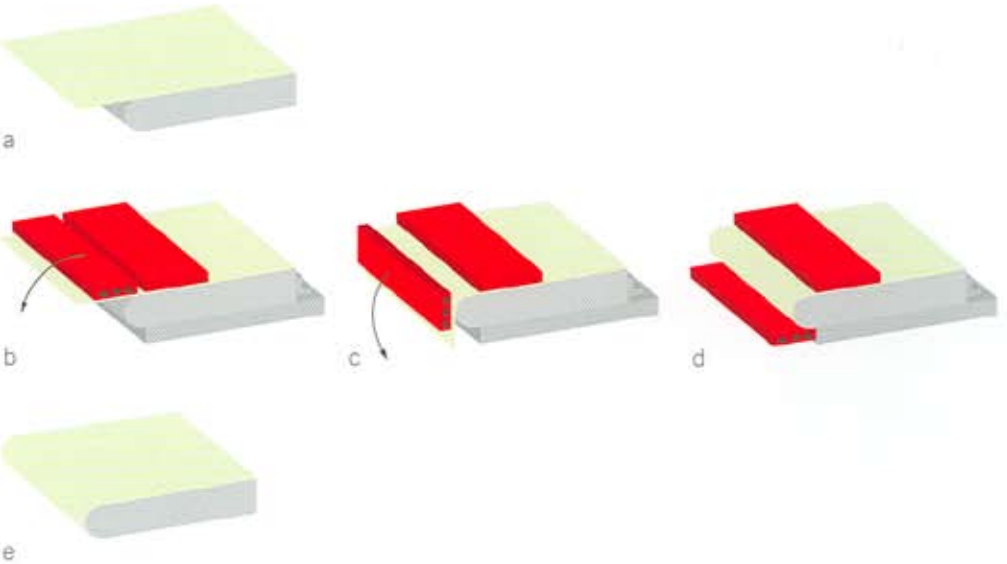


Fig. 8
Bending and bonding with contact heating

Bonding - B) Continuous process

B.1 Continuous bending and bonding

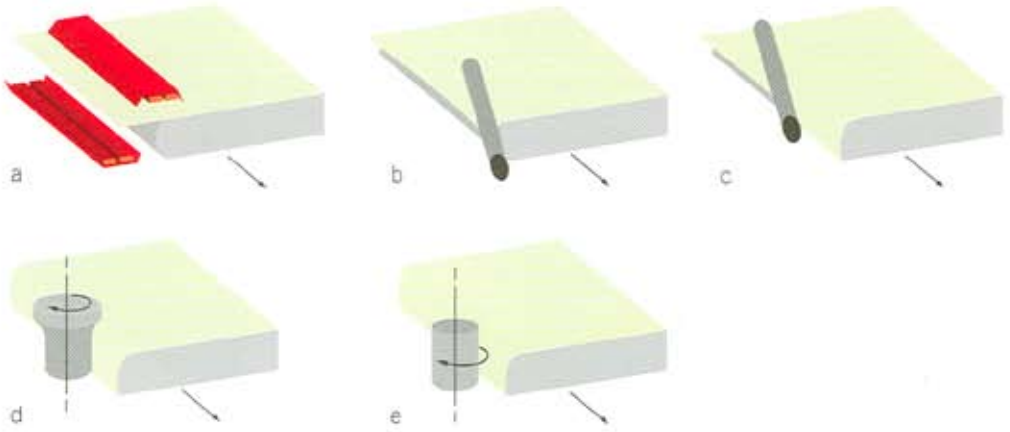
The following processes are only appropriate for convex curves. All modern methods follow the same principle and only vary with relation to the different adhesives used and the instruments required to perform the bend. The laminate is initially bonded to the flat surface of the support, as described in paragraph A.2, with the part to be bent protruding over the rounded support. The piece to be treated passes through the bending machine with a coat of special adhesive on the rear of the laminate and on the rounded part of the support. During this process the protruding section of laminate is heated to the required bending temperature (Fig. 9a), after which the metallic bending bars force the laminate against the rounded part of the support, bending it (Figs. 9b-c).
Finally, specially shaped metal rollers press the laminate against the support to ensure good bonding in all points (Figs. 9d-e). Suitable adhesives for continuous processes are listed in Table A (Specification: Table 4).

Table 4
Bending specification

Laminate thickness	Support radius	It is impossible to give general specifications because of the different types, measurements and speeds of these machines
0,6 mm 0,9 mm	≥ 6 mm ≥ 9 mm	The operator must check carefully that the surface of the laminate is bent at a temperature of between 157-163 °C* and that it is not kept under the lamp for more than 10 secs.
0,6 mm 0,9 mm	≥ 14 mm ≥ 16 mm	The operator must check carefully that the surface of the laminate is bent at a temperature of between 150-156 °C* and that it is not kept under the lamp for more than 10 secs.

*the temperature is measured with thermal enamels.

Fig. 9
Continuous bending and bonding



B.1.1 Contact adhesives

When contact adhesives are used, the flat and the rounded parts of the support must be simultaneously coated with adhesive, by manual or automatic spray. The laminate panel must also be coated with adhesive. If the flat surface of the support has been bonded with a different type of adhesive, both the protruding laminate and the support must be coated with contact adhesive, applied by spray gun, spatula or hand rollers.

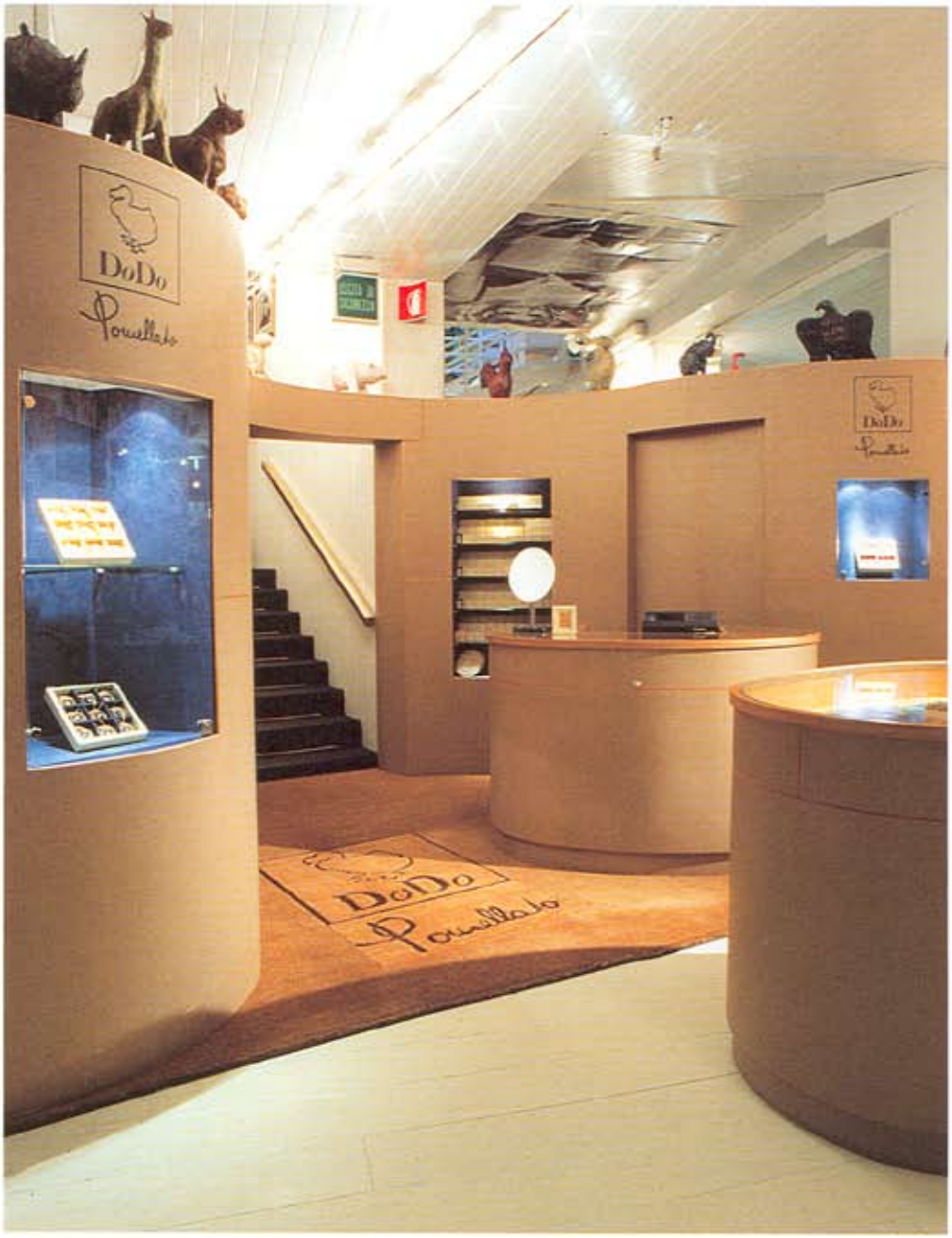
N.B.: it is important that the room in which contact adhesives are applied should be well ventilated.

B.1.2 Special PVAc-based adhesives

Special PVAc-based adhesives, with good initial bonding and rapid hardening times have been developed for continuous processes. In continuous bending machines both the protruding laminate and the rounded part of the support are coated with adhesive, applied by roller or spray, before the bending process.
Immediately after this coating a jet of hot air, combined with infra-red heating, causes any water in the adhesive to evaporate and softens the laminate sufficiently so that it can be bent and bonded simultaneously.
Simpler bending machines, used only for bending, do not include the application of an adhesive. This is applied manually, by spray or spatula, just before the piece is introduced into the machine. However further details may be obtained directly from the adhesive supplier.

N.B.: This informative brochure is the result of our direct experience and that of our customers. The above information is given for your guidance only, we strongly recomend that it be verified in each specific case, with regard to the Postforming equipment and methods to be used and the specific application.

This information does not constitute any form of guarantee.



ITALY

ABET LAMINATI Filiale
Via Cogne 42 - 10155 TORINO
Tel. 011 / 256090 Fax 011 / 202946
e-mail: to01@abet-laminati.it

ABET LAMINATI Filiale
Viale Brianza 6 - 20092 Cinisello Balsamo (MI)
Tel. 02 / 6124851 Fax 02 / 6170379
e-mail: mi01@abet-laminati.it

ABET LAMINATI Filiale
Via Galvani 2 - 35030 Rubano (PD)
Tel. 049 / 631777 Fax 049 / 8975298
e-mail: pd01@abet-laminati.it

ABET LAMINATI Filiale
Via del Cantone 66 - 50019 Sesto Fiorentino (FI)
Tel. 055 / 316551 Fax 055 / 318553
e-mail: fi01@abet-laminati.it

ABET LAMINATI Filiale
Via Bruno Buozzi 12 Loc. Corte Tegge - 42025 CAVRIAGO (RE)
Tel. 0522 / 942434 Fax 0522 / 942436
e-mail: re01@abet-laminati.it

ABET LAMINATI Filiale
Via Toscana 91 - Villa S. Martino 61100 PESARO
Tel. 0721 / 453405 Fax 0721 / 453936
e-mail: ps01@abet-laminati.it

ABET LAMINATI Filiale
Via Stefano della Bella 5/7 - Loc. Giardinetti - 00133 ROMA
Tel. 06 / 2020074 Fax 06 / 2040478
e-mail: rm01@abet-laminati.it

AUSTRALIA ABET Pty Limited
11-13 Smoothy Place Arndell Park NSW 2148
P.O. Box 663, Blacktown NSW 2148
Phone 02 / 96727300 Fax 02 / 96727303
Free Call 1800 / 263950 e-mail: info@abet.com.au

FRANCE PRINT FRANCE sarl Gruppo ABET
Siège social et bureau de vente
BP 9154 108, Av. Aristide Bergès Z.I.
73091 CHAMBERY cedex 9
Phone 04 79621326 Fax 04 79622044
e-mail: stratifies@print-france.fr

PRINT FRANCE sarl Gruppo ABET
Bureau Promotionnel: 12, Rue d'Armenonville
F-92200 NEUILLY-sur-SEINE
Phone 01 / 47452310 Fax 01 / 40883781
e-mail: showroom@print-france.fr

GERMANY ABET GmbH
Füllenbruchstrasse 189-32051 HERFORD
Phone 05221 / 3477-0 Fax 05221 / 33196
e-mail: abetde@t-online.de

HOLLAND ABET B.V.
Lagedijk 4 - 3401 RG IJSSELSTEIN
Phone 030 / 6868450 Fax 030 / 6888204
e-mail: verkoop@abet.nl www.abet.nl
Promotion Office 030 / 6868452 e-mail: promotie@abet.nl

POLAND ABET Sp.zo.o.
Ul. Mokotowska 46.1 00543 WARSAW
Phone 22 / 6225532 Fax 22 / 6228542
e-mail: abet@abet-spzoo.com.pl www.abet-spzoo.com.pl

SPAIN ABET LAMINATI S.A.
Poligono Industrial Pla d'en Coll C/ Segre, n° 8-10
08110 - Montcada i Reixac BARCELONA
Phone 93.575.41.97 Fax 93.575.41.99
e-mail: barcelona.abet@retemail.es

Delegación Norte - Ribera de Deusto, 6 - 48014 BILBAO
Phone 94.476.09.31 Fax 94.476.31.55
e-mail: bilbao.abet@retemail.es

SWITZERLAND ABET AG
Oberfeld 9 - CH-6037 ROOT/LU
Phone 041 / 4556030 Fax 041 / 4556033
e-mail: abet@abet.ch www.abet.ch

UNITED KINGDOM ABET LIMITED
70 Roding Road, London Industrial Park LONDON E6 4LS
Phone +44.20.74736910 Fax +44.20.74766935
e-mail: sales@abet.ltd.uk www.abet-ltd.co.uk

U.S.A.
ABET Inc. 60 West Sheffield Avenue ENGLEWOOD, NJ 07631
Phone 800/228/2238 - 201/541/0700 Fax 201/541/0701
e-mail: abetusa@aol.com www.abet-laminati.com

ABET Inc. 7307-H Edgewater Drive OAKLAND, CA 94621
Phone 510/5671400 Fax 510/5671404
Toll Free 800/228/2238

ABET Inc. 1043-B S. Melrose Street ANAHEIM, CA 92870
Phone 714/238/7880 Fax 714/238/7884
Toll Free 800/228/2238

ABET Inc. 2740 West Grand Avenue CHICAGO, IL 60612
Phone 773/292/1600 Fax 773/292/1619
Toll Free 800/228/2238

ABET Inc.
3033 North West 25 th Ave., Bay 9 POMPANO BEACH, FL 33069
Phone 9549354755 Fax 9549354711 Toll Free 800/228/2238

CANADA ABET Corporation
50 Paxman Road, Unit 10-11 - Toronto ONTARIO, M9C 1B7
Phone 416-620-6556 800-228-2238 Fax 416-620-5330

BELGIUM ABET B.V.
Promotion Office Koning Albert I Laan, 48 - 1780 WEMMEL
Phone 02 / 4601910 Fax 02 / 4603337
e-mail: promotion-office@abet.be

DENMARK-NORWAY-SWEDEN ABET LAMINATI
Representative Office International House Center Boulevard
DK 2300 KOBENHAVN S
Phone 45 / 32473167 Fax 45 / 32473166
e-mail: abet@abet-laminati.dk

CHINA ABET LAMINATI
China Shenzhen Representative Office
Unit C, 17/F., Hangdu Building, Huafu Road,
Futian District, SHENZHEN
Phone 0755 / 379 0055 - 379 0056
Fax 0755 / 379 0213 Postcode 518031
e-mail: abetsz@public.szptt.net.cn

MAIN SOLE DISTRIBUTORS

BRAZIL RAMUTH & RAMUTH
Rua Dinamarca 69/49 F S.ta Terezinha
CEP 12231 200 SAO JOSÉ DOS CAMPOS
Phone 011 30 641516 Fax 011 30 812079
e-mail: abet@unisys.com.br

CZECH REPUBLIC RETA
P.O. Box 2 - 53012 PARDUBICE
Phone 40 6670689 Fax 40 6670938
e-mail: reta@pce.cz www.reta.cz

FINLAND OY LORE AB
Linnankoskenkatu 11 - 00250 HELSINKI
Phone 00358 9 440505 Fax 00358 9 445056
e-mail: info@lore.fi

HONG KONG DIAMOND CHEMICAL IND.
Unit A, 2/F - Wing Hong Centre - 18 Wing Hong Street
Cheung Sha Wan, KOWLOON
Phone 2396 3280 Fax 2789 9708
e-mail: mphplhse@netvigator.com

PORTUGAL PINTO LEITAO SA
Av. Fontes Pereira de Melo 242 - Apto 11245 - 4104 PORTO
Phone 02 6105782 / 5 Fax 02 6178296

RUSSIA JSC SLOTEX
Highway of Revolution, 84 - SAINT PETERSBURG
Phone 812 529 22 75 Fax 812 529 22 71
e-mail: slotex@infopro.spb.su

SINGAPORE-MALAYSIA-BORNEO-INDONESIA
LAM CHUAN IMPORT EXPORT PTE LTD
12 Sungei Kadut Way - SINGAPORE 728778
Phone 368 6669 Fax 368 6665

TURKEY ALPAY ORMAN URUNLERI VE TICARET A.S.
Keresteciler Sitesi - 3. Ada. 2.Sokak n° 11 - Ikitelli ISTANBUL
Phone 212 6700370 Fax 212 6700369
e-mail: alpay@alpayorman.com www.alpayorman.com

VENEZUELA LAMINATI DE VENEZUELA
Carretera Petare-Sta Lucia Km 1
Entrada Arpigra, Edif. F4, Local 1, P.B., MARICHE
(al lado de depositos Central Madeirense)
Phone 0058.212.290. 00 39/01 70/01 83
Fax 0058.212.290 00 70
e-mail: laminati@telcel.net.ve

AGENTS IN OVER 80 COUNTRIES WORLDWIDE

ABET LAMINATI

ABET LAMINATI spa
Viale Industria 21 - 12042 BRA (italy)
Tel. +39 0172 419.111 - Telegr. ABET-BRA
Telefax +39 0172 431571 - 419523 - 419524
http://www.abet-laminati.it/
e-mail: abet@abet-laminati.it

Zelig•Torino Layout: Fotolito FB Printing: MARIOGROS 09.2001 M499