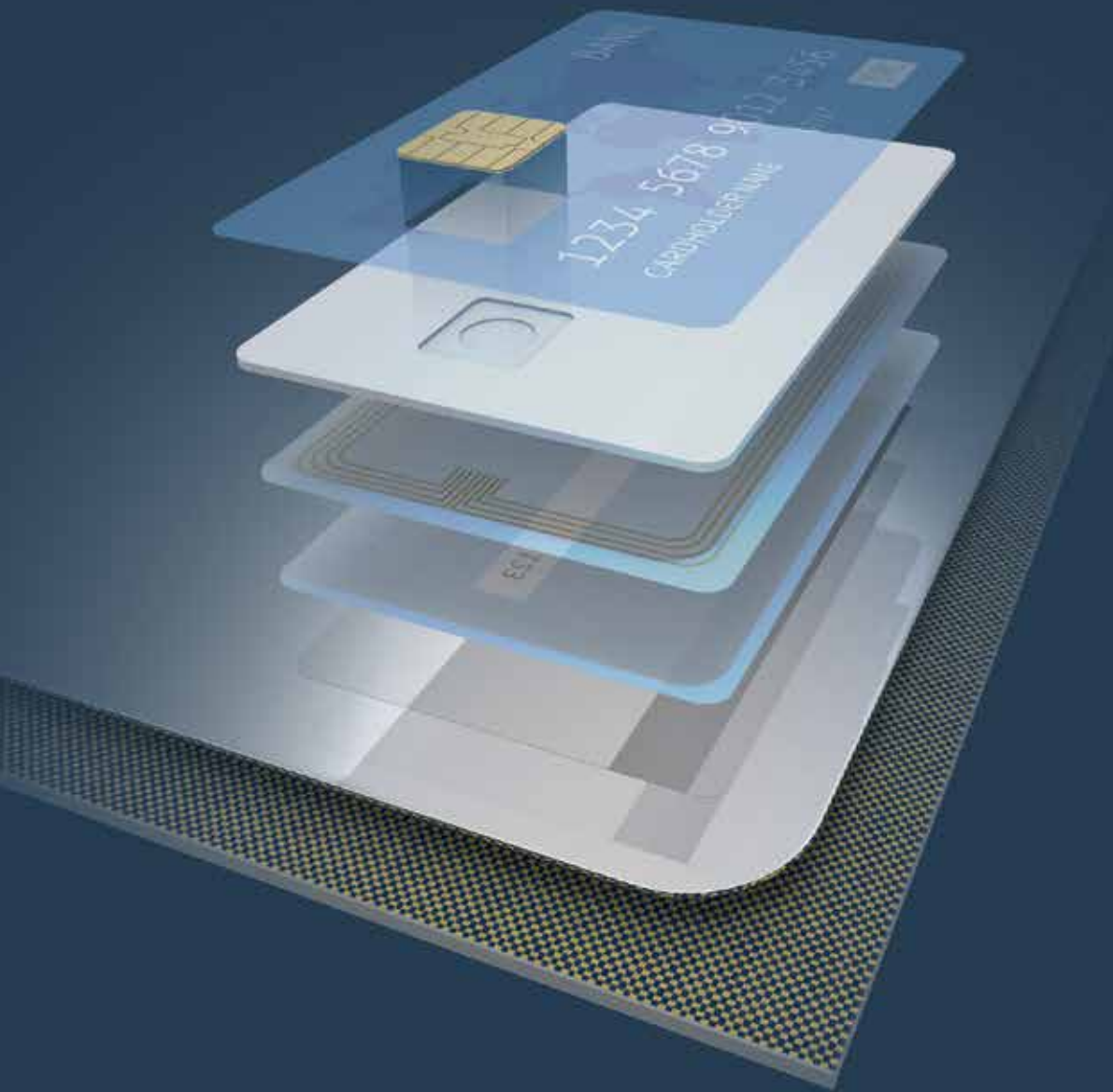




HIGH PERFORMANCE MATERIALS FOR CARD MANUFACTURING AND PERSONALISATION



Welcome to Cardel Ltd.

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Cardel Ltd. is a member of the international Cardel Group and specialises in efficient manufacturing technology and distribution. Our products are used worldwide in card manufacturing and personalisation.

For over 20 years, we've been supplying our customers with an exceptionally wide range of solutions that allow them to get the most out of their production machinery, boost productivity and cut down on waste. As a technological innovator, we're continuously developing our existing products and launching new ones to help our customers compete. We'll always find a solution for any challenge, however demanding.

In terms of engineering, we go that extra mile. But it also goes without saying that we deal with our customers, suppliers, and employees fairly and in a way that engenders trust. This combination has turned us into a respected and successful company in the card industry. And it's these factors that will drive and motivate us in future too.

Marshall Haldane



Marshall Haldane
CEO Cardel Ltd.
CEO VTT

■ ■ ABOUT THE CARDEL GROUP

The Cardel Group is a leading manufacturer of high-quality products for card manufacturing and distribution. We're a global player with several production facilities and a network of sales partners. Our customers include private and public sector issuers of cards and documents who demand the highest levels of flexibility, quality, security, and efficient production.



Hi Bond™ Adhesives



The Cardel Hi Bond™ range of high performance micromodule adhesives for smart card embedding. A unique range of dry film/heat activated adhesives specifically developed to meet the demands of bonding modern micromodule chips to a range of card materials.

Over the last few decades, the shelf life of cards has been increased significantly for commercial and ecological reasons. To boost their durability, polyester and polycarbonate have increasingly been used alongside traditional materials like PVC and ABS. At the same time, the micromodules containing the chip have become stiffer. These developments place new demands on the adhesives used to stick the chip.

Cardel has adapted its existing Hi Bond™ range to reflect this development and come up with adhesives that ensure an exceptional bond between the micromodules and the card. They can withstand mechanical stress and the impact of external factors for several years and are widely used for microprocessor GSM SIM and bank card applications. Hi Bond™ adhesives have become the preferred choice of leading chip card manufacturers worldwide.

Hi Bond™ general features

- > Optimum bond strengths (for PVC, ABS and blends polyesters and polycarbonate).
- > Rapid reaction speed enabling high throughput.
- > Fabricated as a translucent film to minimize shadowing on the back of the cards.
- > High resistance to plasticiser migration.
- > Up to two years' shelf life.
- > Fully compatible with all major micro-module implantation machines.

The Hi Bond™ range

Hi-Bond™ 3	The worlds most commonly used adhesive for embedding chips into Banking cards (1 in 3 cards globally).
Hi-Bond™ 2	Primarily used in the embedding of SIM cards (GSM) for the Telephony industry.
Hi-Bond™ 70-1	For use with FR4 and FCOST™ modules in PVC, ABS, PETG and PC cards.
Hi-Bond™ B (Black)	Specialist version of Hi-Bond 70-1 with laser protective properties for embedding of SIM cards (GSM). Protects against laser burn through damage in laser personalisation (Saves Cardels customers the considerable cost of loss of yield and inconvenience that is caused by this issue.)
Hi-Bond™ V Range	All existing Cardel Hibond products utilising a stronger carrier material.

Suitability table

Card material	Hi-Bond™ 3	Hi-Bond™ 2	Hi-Bond™ 70-1	Hi-Bond™ B (Black)
PVC	+	+	+	+
ABS	+	-	+	+
PETG	-	-	+	+
PC	-	-	+	+
SIM	-	+	-	+

+ Exceeds ISO and internationally recognized standards for bonding strength, mechanical and environmental performance.

- Not suitable

Specifications

	Hi-Bond™ 3	Hi-Bond™ 2	Hi-Bond™ 70-1	Hi-Bond™ B (Black)
Machine Setting	180°–200°C	180°–210°C	160°–190°C	170°–200°C
Av. adh. wt.	40 gsm	35 gsm	40 gsm	45 gsm
Width	25–30 mm	25–50 mm	25–30 mm	25–50 mm
Length	100/200m	100–400 m	100/200 m	100–400 m
Carrier (siliconised)	90 gsm	90 gsm	90 gsm	90 gsm
Core	3" spiral core	3" core	3" spiral core	3" core
Storage	30°–50°C	30°–50°C	30°–50°C	30°–50°C
Shelf life	2 years (under recommended storage conditions)			

Compatible with all major smartcard production machines including
 > Muhlbauer,
 > Cybernetix,
 > Daticard (Gilles Leroux),
 > Ruhlmat.

Contact Cardel for guideline settings and technical advice on set-up.

Lamination Plates



High quality lamination plates for the production of all types of ISO standardbank, credit and smartcards including contactless and combi cards. Produced from steel, manufactured to a high standard and specification suitable for ISO card lamination.

The variety of card materials and thickness' has diversified so that the plates are required to work with a range of card types. All steel is continuously inspected to strict acceptance criteria before being selected as suitable for further processing.

- > Available in a wide range of gloss, silk and matt finishes.
- > Surface finishes suitable for dye sublimation printing, magnetic stripe encoding, GSM cards and all types of smartcard including contactless and combi cards.
- > In-house lamination trials are conducted on an ongoing basis to ensure only the highest possible lamination quality is achieved.
- > Each lamination plate is processed with a protective PVC coating with 'light water-based tack' adhesive allowing ease of removal without leaving residue.
- > Multiple precision security image lamination plates are available to customer specification.



Areas of application

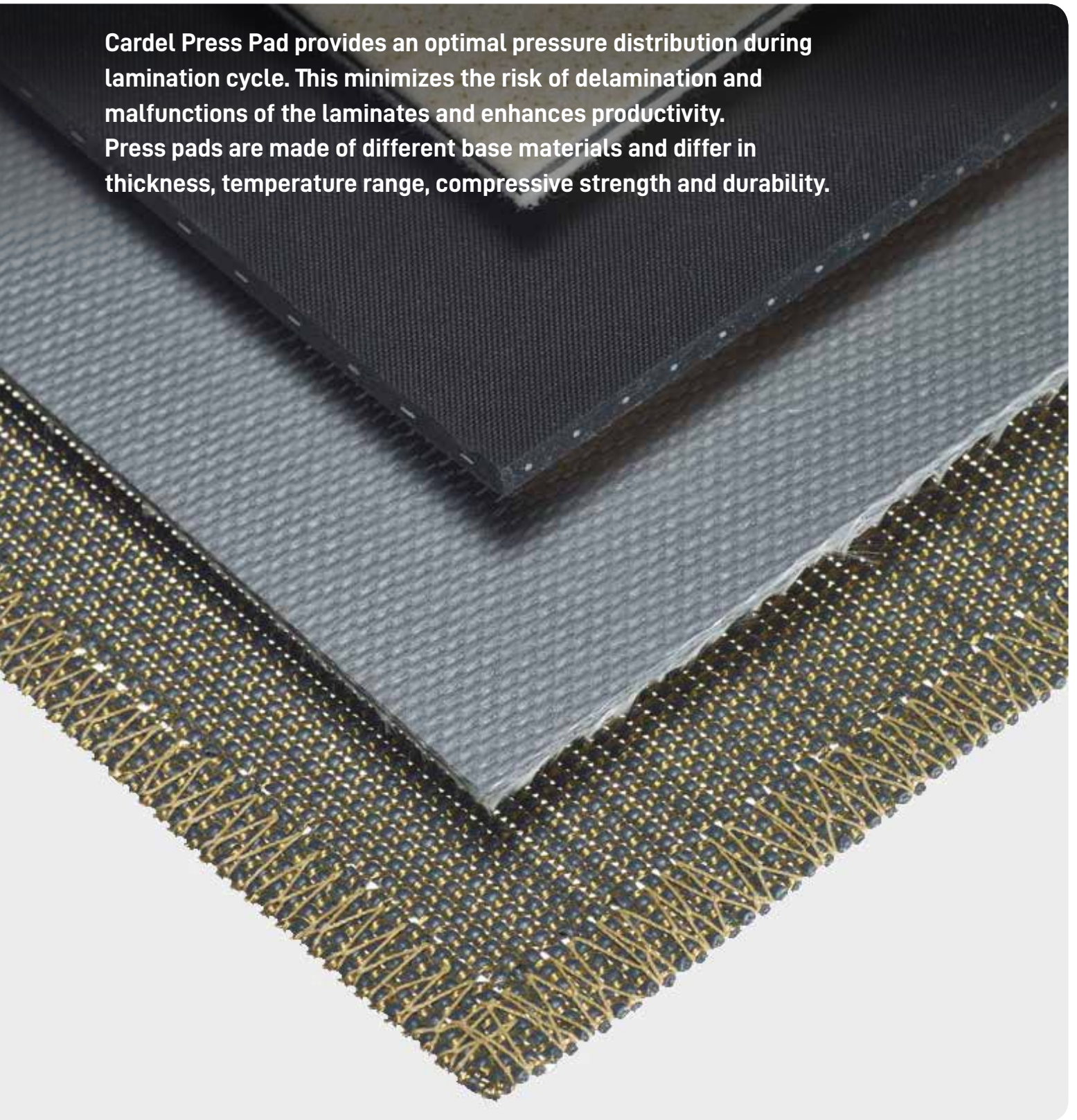
	Bank Credit	Magnetic Stripe (ISO)	Commercial/ Loyalty	Smart	Contactless
Ultragloss 1	+	+	+	+	+
Ultragloss 2	+	+	+	+	+
Ultrasilk DS	+	+	+	+	+
ISO	+	+	+	+	+
Ultrasilk	-	-	+	-	+
Ultramatt	-	-	+	-	+
Ultra Rough	-	-	+	-	+

Technical data

Size Tolerance	± 0.5 mm
Thickness	0.8 and 1.0 mm ± 5% – Other thicknesses by agreement.
Squareness	1 mm per 1 m length
Number of Cycles	Approximately 4,000 – 6,000 cycles dependant on controlhandling and use.
Surface Finish	Controlled to specific RA/RZ and reflective value to application or customer specification.
	All Cardel lamination plates are shipped in high quality export cases to prevent transit damage.

Lamination Heatpads

Cardel Press Pad provides an optimal pressure distribution during lamination cycle. This minimizes the risk of delamination and malfunctions of the laminates and enhances productivity. Press pads are made of different base materials and differ in thickness, temperature range, compressive strength and durability.





Cardlam™ 200

Cardel Cardlam™ 200 lamination pads offer controlled heat and pressure transfer characteristics for all types of plastic card lamination for optimum laminated card quality.

Cardlam™ 200 composite lamination pads are specifically designed for high quality lamination of all types of Credit, Bank and Loyalty cards and offer:

- > Optimum lamination quality.
- > Regulated control over heat and pressure distribution, input and output.
- > Excellent pressure compensation qualities.
- > Good durability – typically 2000 – 4000 operations.
- > Compatible with all types of high volume laminators.
- > Easy handling – suitable for tilt table systems.
- > Proven to assist in elimination of lakeing, frosting and distortion in card lamination.

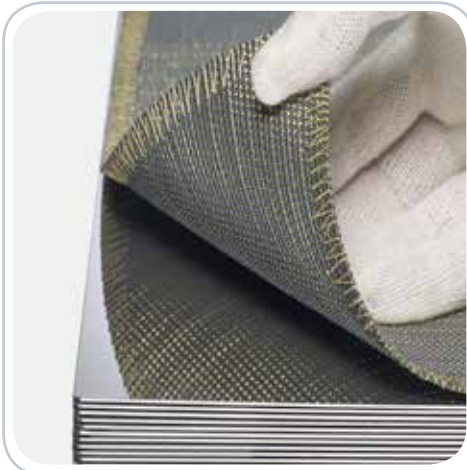


Cardlam™ 220

Cardel Cardlam™ 220 lamination pads offer increased productivity and quality in all types of plastic card lamination including Smartcards.

Cardlam™ 220 lamination pads have been developed for specific use in high performance lamination of Credit and Smart cards achieving:

- > Up to 20% increase in lamination output.
- > Thermally "dynamic pad" – ability to adjust conductivity during cycle stages for optimum cycle time
- > Rapid and even heat distribution.
- > Excellent compressive qualities.
- > Clean pad – no fibre contamination.
- > High durability – typically 4000 – 6000 operations.
- > Compatible with all types of Single and Twin Stack laminators.
- > Easy handling – suitable for tilt table systems.
- > Enables reduced lamination cycle time in multiple daylight high volume laminators due to thermal efficiency.



Cardlam™ 230

Cardel Cardlam™ 230 lamination pads offer optimum productivity and quality in all types of plastic card lamination including Identity cards and smartcards.

Cardlam™ 230 lamination pads have been developed for specific use in high temperature lamination of Identity and Smart cards achieving:

- > Used globally in the manufacture of polycarbonate Identity cards, banking cards and RFID pre-lams.
- > Up to 30% increase in lamination output.
- > Assist in the elimination of laking and frosting.
- > Rapid and even heat distribution.
- > Excellent compressive qualities and reduces static for improved handling.
- > Clean pad – no fibre contamination.
- > High durability – typically 8 – 10,000 operations.
Compatible with all types of laminators.
- > Easy handling – suitable for tilt table systems.



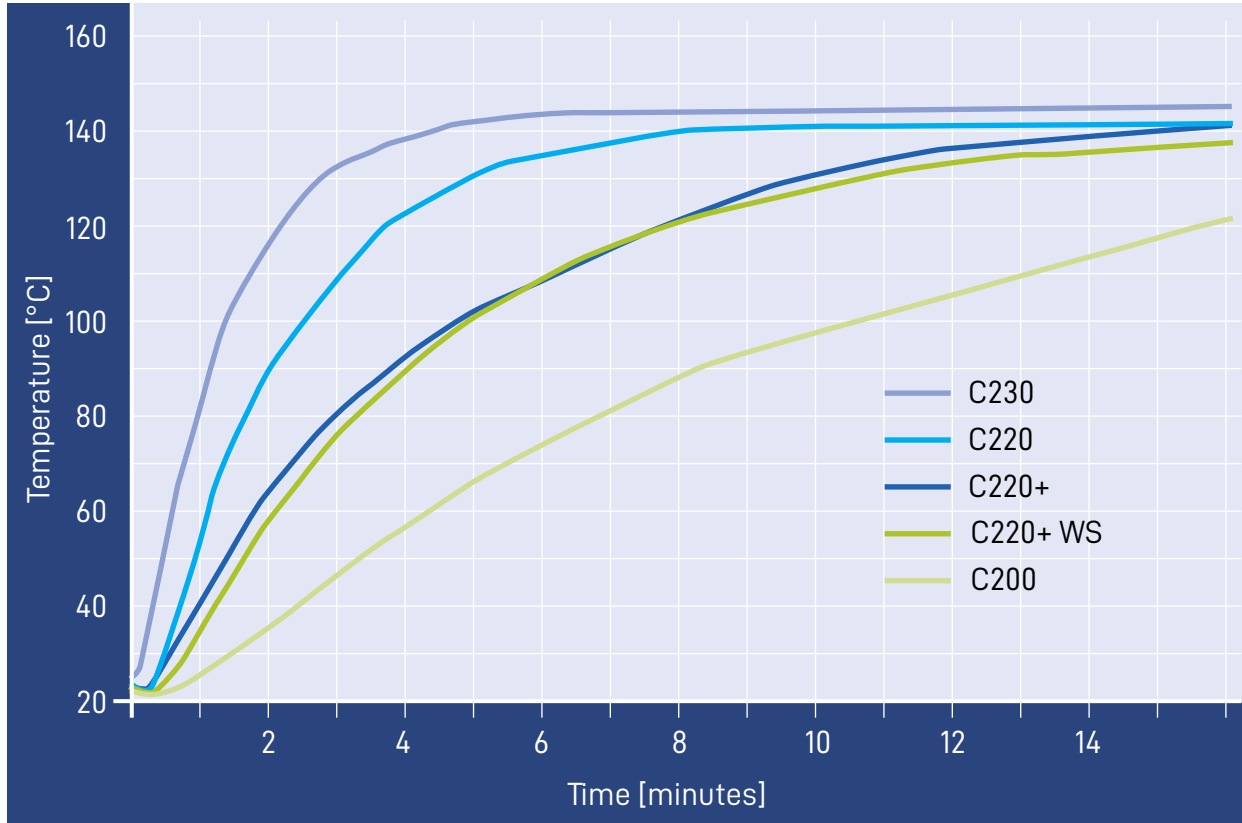
Cardlam™ C220+WS

Cardel Cardlam™ 220+WS lamination pads offer increased productivity and quality in all types of plastic card lamination including Smartcards.

Cardlam™ lamination pads have been developed for specific use in high performance lamination of Credit and Smart cards achieving:

- > Up to 5% to 20% increase in lamination output.
- > Thermally "dynamic pad" - ability to adjust conductivity during cycle stages for optimum cycle time
- > Rapid and even heat distribution.
- > Excellent compressive qualities.
- > Clean pad – no fibre contamination.
- > High durability – typically 4000 – 6000 operations.
- > Compatible with all types of Single and Twin Stack laminators.
- > Easy handling – suitable for tilt table systems.
- > Enables reduced lamination cycle time in multiple daylight high volume laminators due to thermal efficiency.

Comparative Pad Heat Transfer



Pad Technical Data

	Cardlam 200™	Cardlam 220™	Cardlam™ 220+WS	Cardlam 230™
Construction	Synthetic Felt & Rubber	Reinforced Silicone	White Silicone Rubber and Fibre Fabric	Brass 70/30 Alloy Annealed Copper & Silicone
Max. Temperature	150°C continuous 200°C peak	180°C continuous 220°C peak	200°C continuous 210°C peak	265°C
Max. Pressure	500 psi (35 kg/cm ²)			1,450 psi (102 kg/cm ²)
No. of Operations	2,000–4,000	4,000–6,000	4,000–6,000	8,000–10,00
Thickness	4 mm	2 mm	3.3 mm ± 0.2 mm	2 mm

Pre-laid Magnetic Tapes



Premium quality PVC overlay with pre-laid magnet-ics for high quality bank credit and all ISO cards with magnetic stripes. High quality PVC substrate in 50, 60, 80, 100 and 120 micron gauges.

- > Uncoated or coated overlay (providing excellent lamination adhesion for bleed edge cards).
- > Flush bonded magnetic stripes in 300oe, 650oe 2750oe and 4000oe (ISO & high readback).
- > 6.35mm (1/4"), 8.4mm (5/16") or 12.7mm (1/2") magnetic tape widths.
- > Optimum pitch accuracy. Available in sheet or roll.
- > Specialist magnetics available for access control and cashless vending applications.
- > Customer specified materials available upon request.
- > Also available on other substrates.
- > Core materials up to 200 µm can be processed.
- > Coloured magnetic tape available on request.
- > Dual stripe per card and signature panels available.



Areas of application

	Bank Credit	Magnetic Stripe (ISO)	Commercial/ Loyalty	Smart
300	-	+	+	-
2750	+	-	-	+
4000	-	-	+	+

- + Suitable
- Not suitable

Personalization & Distribution



Cardel Cardmate

A range of high performance mailing labels and stickers for efficient high speed card mailing. Secure and high speed card mailing is now a common requirement and a range of machines are available to carry out this function. The technology to apply the card to the carrier has moved towards use of labels to provide high speed with secure attachment.

Equally, the variety of card materials and thickness' has diversified so that the labels are required to work with arange of card types.

- > Optimum production/attachment speeds.
- > Secure attachment to both card and carrier.
- > No damage to card.
- > No residue on card.
- > Ability to work with different card materials.
- > Suitable for all card mailing equipment.

- | | |
|--------------------|------------|
| - Kunnecke | - CIM |
| - Bowe | - Kern |
| - Atlantic Zeisser | - Handmail |
| - Matica | |



Clear Zone Label

Innovation in Card Application

End Customers often complain that the attaching label stays on the card when it is removed from the carrier. Cardels research and development team identified that if the attaching label has a clear adhesive zone on the edges of the card side, it ensures that the label remains on the carrier letter. Following extensive laboratory and field testing Cardel has now released our new clear zone label for continuous tape products.

- > Label stays on the paper, not the card.
- > Improved customer experience.
- > Easy card removal.
- > Continuous adhesive labels.
- > Suitable for card attaching equipment e.g. Künnecke.



Pin Mailers

Laser PIN stationery for printing customer PIN number letter

- > Wide range of secure certified products for Banking / Government applications.
- > Multiple formats available including A4, A3 and one piece mailers (pressure seal).
- > Can be supplied as white stock for customer printing or in full colour with customer branding (available 4 colour process + spot pantone to both sides).

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