MagTek ExpressCard

Card Design Recommendations
Design Reference Manual

November 2020

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Table 0-1 - Revisions

Rev Number	Date	Notes
80	Nov 2020	Updated format

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1 Purpose of the document

The purpose of this document is to guide *Designers* in the process of creating artwork to result in the best possible card production on MagTek ExpressCard devices. MagTek knows that designing your own instant issuance cards can be a challenging task. That is why we have created this card design document to help you design your own cards and better understand what card formats you need, in order to produce beautiful custom cards that distinguish you from your competitors. This document discusses the capabilities and technologies incorporated into ExpressCard devices to enable the design of *Processed* cards and card *Blanks* to yield the best results.

Processed cards are defined as cards that have gone through the lithographic process as further discussed below. *Blanks* are cards that are blank white card stock that only have a magstripe and/or a Chip as further discussed below. The two primary topics addressed are **Physical Card Design** and **Printed Card Design.**

MagTek is always available to advise and assist customers with both elements and we encourage customers to engage with us during this process. Should you require any assistance, please email: carddesign@magtek.co.uk

PLEASE NOTE: the following are guidelines to better assist you in your card personalisation program. Your card brand and card stock production house will have their own set of guidelines and specifications that you will need to follow. You must confirm all design details with them prior to creating personalized cards.

ALL ARTWORK MUST BE APPROVED BY YOUR CARD BRAND.

2 Executive Summary

Instant issuance meets the increasing need to provide a personalized customer experience by producing a variety of personalized card options that deliver instant issuance of permanent Visa® and MasterCard® credit and debit cards, ATM and gift cards. MagTek's comprehensive security ensures reliable issuance, reading, transmission and safety of cards, PINs and identification documents.

No matter which ExpressCard Card Personalisation Device you are using, we can help get you started. Our devices securely and fully personalize CR80-sized credit, debit, ATM, gift, loyalty, or membership cards. Traditionally, centrally issued cards are produced using offset lithographic printing methods. ExpressCard devices add additional personalisation to Lithographic Processed Cards or blank card stock. ExpressCard is the next generation, in-branch, instant card issuing hardware platform and incorporates full colour Printing, Embossing, Indent printing, Tipping, and dual sided dye-sublimation thermal transfer printer into a single in-branch card personalisation device.

3 Lithographic Process

Centrally issued cards are issued using an offset lithographic process. Instant issuance card stock benefits from partial lithographic printing and final Personalisation occurring on-location. Offset lithographic printing is a traditional printing process often used for general printing of newspapers, books, and magazines. Colours are laid down individually to build up the image, followed by spot colours such as black. In card production, card designs are printed in large sheets with multiple cards per sheet. Front and back printed sheets are then layered with a top overlay, a magstripe overlay, and are then laminated using high pressure and heat. After lamination, the cards are cut from this sheet, the hologram, and signature panel are then added. Finally, a recess is milled out of the card for the EMV chip and metal contact plate

to be glued into place. The result is a ***Processed*** card ready for Personalisation on an ExpressCard device. Cards that have been through a lithograph process, fitted with the EMV Chip, magstripe, signature panel, and hologram are best suited for instant issuance Personalisation.

Use your lithographic printing process to prep the cards for instant issuance by doing the following:

- Pre-printing as much static card data as possible using the lithographic process. This will save on consumables and speed the on-location card Personalisation process. Often, much of the rear of the card contains static data and is best suited for lithographic printing.
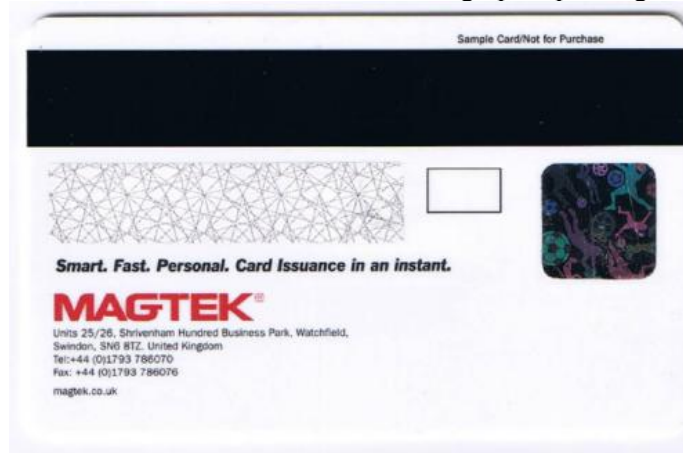
4   ExpressCard Personalisation Process

Processed and ***Blank*** cards are personalized on ExpressCard devices. Following are the Personalisation process: encoding the magnetic stripe; then personalizing the EMV chip (when applicable); then the card goes through the ink printer where custom images/text/barcodes etc., are added to the front and rear of the card using dye-sublimation; then CVV/CVC is indent printed onto the rear; card holder data is embossed onto the front; and finally the raised embossed characters are foil tipped (using black, silver, or gold ribbon).

4.1   Dye Sublimation

Dye sublimation is a printing process that uses heat to transfer ink to the card, embedding the image into the card instead of just placing the image on top of the card. Dye sublimation printing is particularly well suited to certain types of printing such as photographs and text.

4.2   Limitations of Dye Sublimation

Dye sublimation is less suited to the printing of large areas of solid colour or gradients. Dye sublimation printing is not 100% edge to edge but is close. The sublimation process is designed to produce a pleasing representation, though not an exact match to lithographic cards. Some colour variation from target is normal and expected.

4.2.1 Dot Gain

Dye sublimation is a heat activated ink transfer process that produces dot gain. This means there may be some "bleeding" which impacts all reversed or "knocked out" art (when you put white text on a coloured background, since white is not a colour option and merely just the blank card space). When reversed elements are too small, the dot gain may fill in the reversed area or eliminate it completely. For this

reason, we recommend all reversed type be set to bold. Serif fonts such as Times should be set at 18 point or greater and sans serif fonts like Helvetica should be set at 12 point or greater. All reversed lines should be 1.5 points or greater.

5   Physical Card Design

5.1   Meeting standards

ExpressCard is designed to use card stock that meets the following specifications.
-    ISO/IEC 7810
-    ISO/IEC 7811-1 thru -6
-    ISO/IEC 7816
-    PVC CR80

These specifications detail the physical dimensions of the card and adherence to this is critical for effective card Personalisation using ExpressCard. These specifications also detail the physical position of the embossing, signature panel, indent printing, cardholder data, hologram, and other elements on cards. Whilst we recommend that these specifications are followed, there is an element of flexibility within ExpressCard outside of these specifications. When personalizing any card, it is essential to ensure that the card can be used in any POS terminal or ATM/Kiosk anywhere in the world. We strongly recommend therefore that customers consult MagTek to discuss any plan/proposal to diverge from the ISO specification. carddesign@magtek.co.uk.

Traditionally, all payment cards are made of Rigid PVC. The traditional design is four layers of PVC, as follows.
-    Layer #1 – Clear PVC Overlay (Front)
-    Layer #2 – Printed PVC Layer (Front)
-    Layer #3 – Printed PVC Layer (Rear)
-    Layer #4 – Clear PVC Overlay (Front)

This standard construction has been the industry norm since the very first cards were made and is the foundation on which ISO 7810 and 7811 were written. However, these standards don't refer in great detail to the actual material norms. As a result, in recent years some card manufacturers have tried to use non-industry norm materials to enhance their card design. Although in principal, these cards might meet the specification, there have been many occasions where a divergence from the norm has caused problems either during the Personalisation process or at the POS or ATM.

5.2   Card Variances

The following are real life examples.

5.2.1 Example #1

To create a different finish, a manufacturer used a metal layer inside the card. The use of metal in the card can cause a severe build-up of static that results in an Electro-Static Discharge (ESD) when the Card is personalized or used at the POS or ATM. A card subject to high levels of ESD can have a detrimental effect on the personalisation process, the EMV chip itself, the POS terminal and/or the ATM. In one case, a batch of non-industry cards with high levels of ESD caused a significant amount of POS terminal failures and caused a great deal of problems across the industry.

5.2.2 Example #2

To create a card that looks unique, a manufacturer cut the corner off a card creating a unique shape. They appreciated that this could cause problems if the card is used in an unattended environment such as an ATM, Kiosk or Parking Meter. The reason for this is that insertion readers use optical sensors to detect a card and if the sensor is positioned where the corner was cut off, the card would not be seen. The manufacturer printed 'Not for ATM use' on the rear of the card to try and address this issue. However, cardholders are familiar with using cards in all environments and didn't read, understand, or just ignored this warning. Thousands of these cards were stuck in thousands of unattended terminals and caused a great deal of problems across the industry.

5.3 To Conclude:

ExpressCard is designed to personalize an industry-norm, rigid PVC ISO Card and we recommend that all card designs meet these requirements. If issuers or card designers want to personalize anything different to the industry norm, please do contact MagTek for advice before card production; carddesign@magtek.co.uk

6 Printed Card Design

Many card issuers are issuing approved cards centrally. ExpressCard allows issuers to issue the same, pre-approved designs instantly in-branch, or at any remote location. This section focuses on the design of instant issuance to provide the best results.

6.1 Matching Centrally Issued Cards to Instant Issuance

Centrally issued cards used offset lithographic printing methods. The variance between lithographic printing and dye-sublimation have already been discussed above. One additional detail is that the same exact card stock should be used between centrally issued cards and instantly issued cards to result in the closest match to each other.

ExpressCard incorporates a dual-sided dye sublimation thermal transfer printer to allows elements of the *Processed* cards to be printed locally. We recommend using the ExpressCard thermal printer to be used for dynamic data including:

- Printing cardholder photo's
- Printing BIN numbers.
- Printing additional text such as 'Credit' or Debit'
- Printing Bar Codes
- Printing customer specific images, either pre-selected by the customer from standard stock or uploaded themselves.

6.2 EMV Chip Plates

The ISO specification for a card blank requires the EMV chip/contact plate be recessed from the surface of the card and the recess be finished without burrs. In the real world however, some cards may be outside of this specification and can cause some printing problems. It is essential therefore that the card manufacturer pays particular attention to this part of the ISO specification. One way to avoid print imperfections around the chip is to pre-print a border using the offset lithographic method. You can then set a no-thermal print area around the chip reducing the chance of imperfections. The highlighted area can

be pre-printed on the card or left as a no print area. The image below shows minor printing blemishes with an instant issuance process caused by the chip not being perfectly recessed:

Minor print imperfections around the chip caused by imperfections of the chip installation.

The highlighted area can be pre-printed on the card via lithographic printing or left as a no print area.

7 Design Artwork Recommendations

7.1 Resolution and Canvas Size
Set image size to 1016 x 648 pixels for horizontal cards or 648x1016 pixels for vertical cards at a resolution of 300 dpi. The card template is set at-size for print production essentially matching the plastics at 3.375 x 2.125in (85.725 x 53.975 mm) rectangle for horizontal cards or 2.125 x 3.375in (53.975 x 85.725mm) for vertical cards.

7.2 Card Corners
Corners should maintain a 90' angle with no rounding. Do not add a rounded corner radius for the card print design. The corners must be at square angles. Please note, there is up to a 2mm shift in cards design from edge and the corners will be printed on rounded card stock and therefore will not be seen on the final card design.

7.3 Image resolution
The image must be 300 dpi.

7.4 Colour settings

7.4.1 Colour Mode
The colour mode must be CMYK.

7.4.2 Black Ink
Black should be set to: 60%C, 40%M, 40%Y, 100%K.

7.4.3 White Ink
ExpressCard devices assume that any instance of white means to leave that area blank and assumes white will be the white card stock showing through.

7.5 Card Stock

7.5.1 Using White Card Stock
If a card issuer wants to reproduce their current card designs, they should use the same, offset lithographic printed card stock that they currently use. Using blank white card stock will produce a completely different result as is therefore not recommended. If the issuer wants to use white card stock to issue a new card design then consider the recommendations in the lithographic and dye sublimation sections of this this document.

7.5.2 Printing on Coloured Card Stock
If the card has a pre-printed colour/finish (metallic silver in this example) any colour photo printed over the top will appear semi-transparent as the ribbon colour panels are translucent. Only the black, gold, and silver resin panel / ribbons are opaque. This photo illustrates a colour photo printed over a pre-printed metallic silver card. The actual background of the photo is white. The printer assumes that the surface of the card is white and the ribbon does not have a white panel therefore it allows the surface of the card to show through.

PLEASE NOTE: if you use coloured card stock, it will change the colour of any elements that you lay on top and any white elements will be the colour of the card stock.

7.6 Gradients and Transparencies
Gradient art should be created in Photoshop. Gradients should NOT be produced in vector art (e.g. Adobe Illustrator), nor should transparencies or shadow features be created in vector art (e.g. Adobe Illustrator). These often create unpredictable rip/print problems, including colour banding and distortion.

Transparencies are not recommended as they do not translate well. If used, be certain to flatten the file and use a transparency greater than 30%. Half tones and percentages are acceptable but should not be less than thirty percent (30%). Lithographic printing will result in the best-looking image.

7.6.1 File Format
Artwork needs to be saved as a JPG file. Colour mode should be set to CMYK at 24 bits/ channel. Save all raster (photo) images as uncompressed TIFF file(s) and then save again as a JPG file.

8　Design Element Recommendations

8.1　Institution & Account Description
Place your brand and logo elements on the card. Your logo is a key element of your card design and should be placed prominently on the card. The logo should be 300 dpi at final size, or for best results use Vector artwork. Be sure to avoid all embossing and other card element areas. Placing the logo over similar coloured objects or images will result in poor visual clarity.

The text "Not a Valid Card" are in white and the dog is blond causing a difficult visual clarity.

8.2　Account Information
Sometimes there are additional details that are required. Depending on your card type, or card brand there may be other card elements or certain account details that are required on your card.

8.2.1 Elements to Consider:
- **First 4-digits of BIN:** The first 4-digits of the card Bank Identification Number may be required on your cards. It is typically placed just under where the personal account number is printed or embossed. Sometimes this is indent printed.
- **Expiration text** (good thru, exp date, expiry, valid thru, month/year).
- **Membership text** (card member since, cardholder since, member since) can be placed is different areas on the card.
- **Account type** detail (debit, business, electronic use only) is placed per the card brand and card type requirements.
- **Contact details**: such as phone numbers, may vary depending on the type of card so these might be printed with ExpressCard.

- In some countries, it is common to print the cardholder photo on the rear of the card, this can be easily achieved using ExpressCard.


Here the ExpressCard thermal printer has been used to print the cardholder Photo and Signature.

8.2.2 Artwork Blocking Regions

Not every card is manufactured the same. There are variances within the card brand, but this should help you get started. Certain elements come pre-printed or embedded in your *Processed* card stock. If you ordered your card stock with any pre-printed or embedded elements, be certain to place a blocking region (a white box) in your artwork. Blocking regions should be created 2 mm larger than the actual region as there is a small amount of shift per card grab during production. Please be certain to get the exact measured placement and sizing of these elements from your card stock production house. Inaccurate sizing or placement will result in poor production.

Blocking regions should have a 2mm variance range.
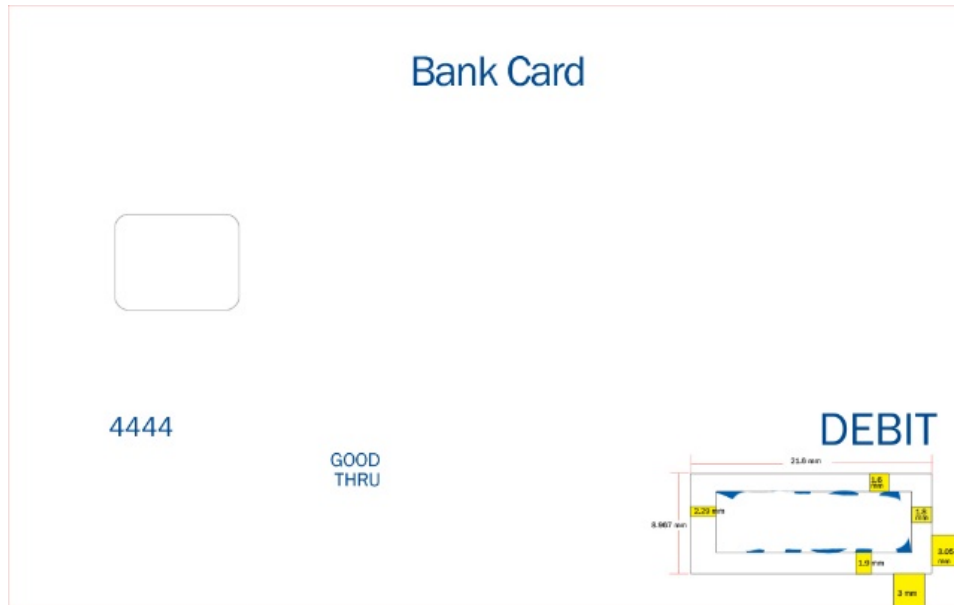
Card brand logo locations change and current guidelines should be requested from your card brand

Front-Six Contact Chip
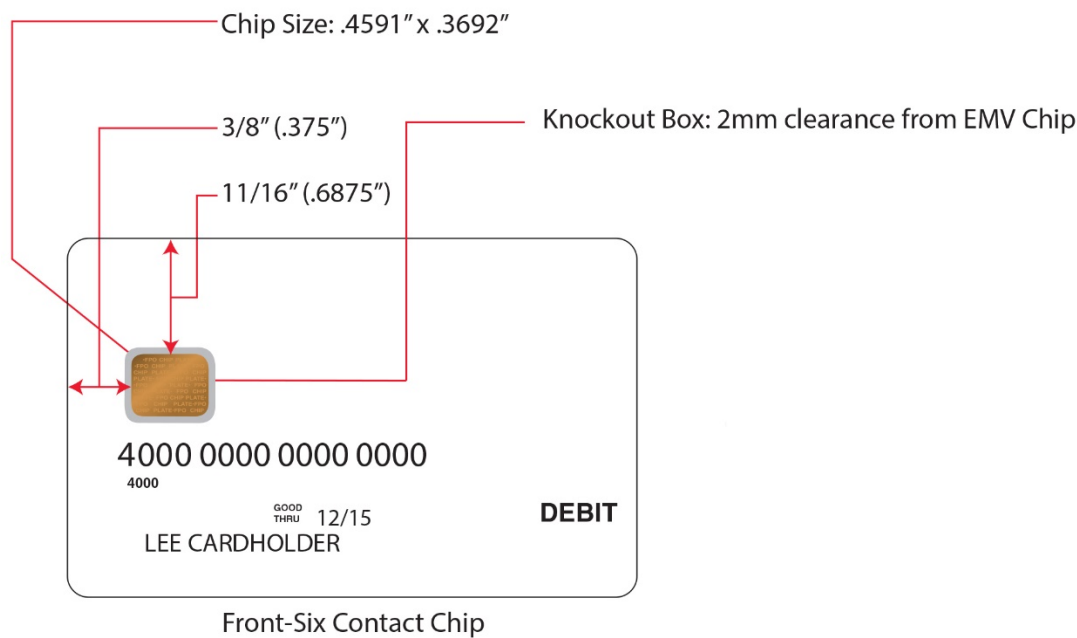
An example of chip size and knock-out regions for a 6-pin chip. Request sizing and knockout box from your chip manufacturer and chips sizes and locations vary.

8.2.3 Blocking Elements

- Card Brand Mark: The actual card brand logo bug (e.g. Visa, MasterCard, Discover). The blocking region for these varies, please review card brand specifications.
  - o Card type: Typically, this text is in the same colour as the 4-digits and in all caps. Placement, font, and sizing need to be confirmed with the card brand specifications. The

example shown here is in Helvetica at 12 point and aligned with the right edge of the Visa rectangle.

- o Visa® Bug: Debit blocking region. Create a rectangle that is 21.6mm x 8.967mm. Place it 3.05mm from the right most edge and 3.00mm from the bottom most edge. Variances are possible.
- o MasterCard blocking region Place blocking oval 3mm from the right edge of the card and 2 mm from the bottom edge of the card.

- **Holograms:** card brands determine hologram placement if they apply. Please check with your card manufacturer as to the exact measurements: x/y coordinates, corner radius and size.

- **EMV Chip:** it is recommended to make your blocking region 2 mm larger than the actual chip to accommodate for shift that can occur in any instant issuance device. The blocking region for these varies and will depend on your card vendor, whether you have a 6-pin or 8-pin chip and other variances. Please review card brand specifications provided by your card manufacturer.

- **Cardholder data**: includes (but is not limited to) primary account number (PAN), cardholder name (first, middle initial and last), expiration dates (month/year), member year, business name, etc. Check with your card brand requirements to see if there are colour, placement, and sizing restrictions. ExpressCard devices have industry standard default ranges.
  - o 4-digit PAN: Approximately placed 10mm from the left edge of the card and 15mm from the bottom of the card, the font is a sans serif font (Arial or Helvetica are standard) at 6 point. Please check with the card brand regarding requirements.
  - o **Expiration Text:** The "Good Thru" is often 40mm from the top edge of the card and 30mm from the left edge of the card. Typically this text is: in the same colour as the First 4-digits; in all caps; in a sans serif font (Helvetica or Arial); approximately 4.5 point; and placed directly above or directly to the left of the printed expiry date.

- **Member since:** Typically this text is: in the same colour as the PAN; in all caps in a sans serif font (Helvetica or Arial); approximately 4.5 point; two lines of text; left justified or centered; and placed on the bottom third of the card.

6.2 Framing

There may be a very slight white border in the production of your artwork. This frames the artwork and card image. To prevent blank framing, have a coloured frame printed in the lithographic process. A full edge to edge print is not 100% possible using a Thermal Printer. Thermal printing on white card stock will leave a very small unprinted margin around the edge of the card, typically this is no more than 0.25mm. With good card design this can be hardly noticeable. However, the darker and more solid the colour, the more noticeable the border.
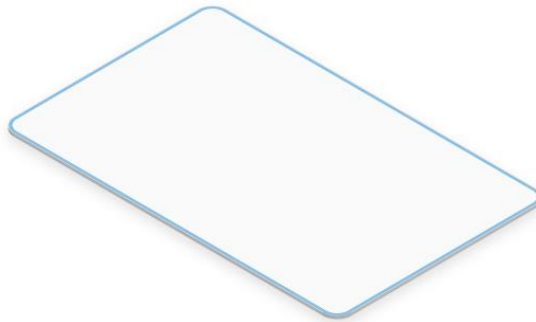
The white line shows the unprinted frame.

MagTek always recommends the offset lithographic process when printing dark, solid colours. However, if card issuers want to use the Thermal printer, then pre-printing a small border around the edge of the card is a technique that can be used to reduce the visibility of the border.

Blank white card stock is not recommended.

Card stock with printed border to blend the edge in with dark solid colours/photos is recommended

Safe print zone shown in green.

Examples

Fully pre-printed card blanks personalized on ExpressCard.

ExpressCard is used to personalize the card as follows:

- The magnetic stripe is encoded
- The EMV Chip is personalized
- The CVV/CVC is indent printed onto the rear
- Cardholder data is embossed and tipped on the front

Partially Pre-Printed Card Example

ExpressCard is used to personalize the card as follows:

- The magnetic stripe is encoded
- The EMV Chip is personalized
- Any custom images/text/signature are printed onto the front and rear
- The CVV/CVC is then indent printed onto the rear
- Cardholder data is embossed and tipped on the front

Lithographic card on right and personalized card on right (showing slight blank edge)

9   Express Card Print Ribbons

There are many different types of print ribbon. Your choice of which will depend on the design of the card that you wish to personalize. Each ribbon is made up of panels and each panel represents a different colour. Two examples below:

YMCKO (part no. 93400048)

1	2	3	4	5	6	7
Y	M	C	K	O		
Yellow	Magenta	Cyan	Black	Overlay		

The panels of colour are displayed in the order in which they are printed: Yellow (Y), Magenta (M), Cyan (C), Black (K), Overlay (O). This ribbon is used to print colour text and images along with resin black for text and barcodes etc. Both infrared and visible-light bar code scanners can read bar codes printed with black resin. An overlay panel (O) is included to protect colour in sunlight.

YMCKOK (part no. 93400047)

1	2	3	4	5	6	7
Y	M	C	K	O	K	
Yellow	Magenta	Cyan	Black	Overlay	Black	

As YMCKO but with an additional Black (K) (used for backside, black only printing).This ribbon configuration assumes that the card will be printed on the front side using CMYKO and then the back side of the card will print with Black (K) only.

Example Ribbons and their applications:
- Black Resin Ribbon (part no. 93400049): This ribbon is used for black printing only e.g. Text, Electronic Signatures, Barcodes, etc.
- Gold Metallic Resin Ribbon (part no. 93400052): This ribbon is used for printing Text in Metallic Gold.
- Silver Metallic Resin Ribbon (part no. 93400051): This ribbon is used for printing Text in Metallic Silver.

10 Tips and Checklist

10.1 Quick Tips:

- Avoid printing too close to the chip. Use lithographic printing if colour is required around the chip.
- Remember that embossing may cover some of the artwork
- Keep artwork inside the Safe Print Zone as shown above.
- If an issuer wants to instantly issue the same card designs that they currently centrally issue, it is essential that the same card stock is used.
- The ExpressCard thermal printer should be primarily used to 'add value' to the card Personalisation process such as printing: Cardholder photo, cardholder signature, a bar code, a QR code, the word's 'Credit or Debit', BIN number, Barcodes, customer specific images, either pre-selected by the customer from standard stock or uploaded themselves.
- Use the off-set lithographic printing process to print ALL static data.
- Only use white blank card stock for a new card design.
- When using white blank card stock, be aware of the limitations of ExpressCard thermal printing and outlined in this document.
- When using white blank card stock, be aware of card stock QA issues such as EMV chips being recessed and the existence of burrs.

10.2 Designer Checklist

- Logo - Correct placement - Vector art format or 300 dpi.
- Account Information - Does your card require the first 4-digits of the PAN - check size, colour and location.
- Does your card require expiration text - check size, colour, location, and text.
- Does your card require membership details - Check size, colour, location, and text.
- Does your card require additional account detail - Check size, colour, location, and text .
- Blocking Regions
  - Have you created blocking regions for any pre-printed or embedded elements in your card stock.
  - Have you checked size and placement.
  - The blocking region around the EMV chip is 2mm more than the size of the chip on all sides. The EMV chip will already be recessed and glued into the card.
- The following items should NOT be included on card templates when designing:
  - Images of smartcard chips. These are embedded in your card stock.
  - Images of holograms. These are embedded in your card stock.
  - Images of card brand logos. These are pre-printed on your card stock. You are not allowed to print the Visa or MasterCard logo with ExpressCard.
  - Cardholder Information
    - This will be personalized on your cards at the time of card processing
- Chip location and sizing will vary. Please contact your card manufacturer and request chip location and sizing. See examples below.