

FOIL STAMPING ADVICE

Foil printing on linen is the result of applying a relief in the surface of a book binding, an album or a cardboard box. The heated embossing stamp used in this process causes localized material deformation at the same time as the transfer of the foil particles. If stamping occurs without the use of foil, a blind imprint is created due to the pressure and the scorching or discolouration of the material. When the embossing stamp is engraved with differing depths, a relief print is the result. It used to be the case that stamps for the colour- printing of bindings were dipped in ink and then pressed cold onto the material. For gilding, extremely thin gold leaf was used. Not only was the application an intricate and time- consuming task, the excess gold also had to be wiped off by hand.

Nowadays, a wide selection of coloured and metal foils is available that are suitable for use on linen. These are always applied using heated stamps. Foil stamping is therefore a dry printing technique. The layers of foil used in the process are applied to the linen in dry condition and require no further treatment. Depending on the text or illustrations, the desired print is made by exerting a high or extremely high pressure. This produces a relatively deep 'dent' or impression in the linen and board of the binding. The thickness of the threads used and the fineness of the fabric determine the sharpness of the print. The most important factors in foil printing are: the linen used as the covering material, the type of foil, the compressive stress, the stamp and its temperature and the duration of the pressure. The foil print is produced due to the raised sections in the stamp which press the foil into the binding. The heat of the stamp frees the foil to be transferred from the carrier and activates the adhesive power that causes the foil to bond to the linen.

The applied pressure ensures that the coloured or metal film of the foil remains bonded to the linen. The creation of a dent results in an additional advantage: the foil is applied at depth, which means it does not rub off as easily and is better protected against further damage. The required compressive stress, duration of the pressure, the temperature of the stamp and the foil must be adapted to the delicacy of the print and the characteristics of the fabric. It is important that the board used has a smooth surface and good hardness. In the case of very light-coloured linens, light-coloured board should also be applied. After stamping, the partially used foil is fed through and rolled up by machine. The success of this 'press-through' system depends on the foil being released from the carrier, the creation of a sharp imprint and good adhesion of foil and linen.

A variety of effects can be produced on linen by applying different types of foil. Coloured foil with a mat or higher-gloss finish can be used. Gold and silver foil is also available in mat, satin and high gloss. On linen, satin and mat foils are often more attractive than foils with a high gloss finish. A relatively heavy imprint for a title frame in mat foil ensures that the structure of the linen is smoothed out completely.

In a later production process, a sharply defined title in small lettering can be printed over this, using gold or silver foil. If this title were printed directly onto the linen, there would be a high likelihood of certain sections of the letters being filled in. Printing with stamps in which the text has been cut away is

another attractive option. The title is then visible in relief. Gold and silver foils are more suitable than coloured foil for this application. These metal foils give better coverage than coloured foil, produce a sharper print and are more scratch-resistant.

Foil printing is widely recognized as an environmentally friendly printing technique. The absence of solvents and dust is a further advantage. The used foil remnants can be disposed of along with the normal waste, and the recycling of paper products printed with foil is no problem whatsoever.

COMPOSITION OF THE EMBOSSING FOIL

Embossing or hot-press foil consists of various layers. The thickness and number of these layers determines the actual application. The carrier acts as the base layer and transport medium for the other layers. Strong polyester film of 12 microns is generally used as the carrier, due to its special properties of good dimensional stability, elasticity and heat-resistance. The foil is unrolled and fed through the gilding press under tension, and comes into contact with the heated stamps during the stamping process, after which it is re-rolled. The thinner the carrier, the sharper the subsequent print on the linen. The separation layer or release coating ensures that layers applied over each other for the print and adhesion on the linen are released from the carrier and transferred to the stamp, without damage. A colourless wax with a melting point of 55-70°C is used for this separation layer. This is completely dissolved due to the heat of the stamp. Naturally, the minimum temperature of the stamp must exceed the melting point of the wax. The thickness of this wax layer determines how easily the foil comes loose from the carrier. A thick layer of wax is required for easy separation. This 'oily' foil is used for the printing of large solid areas and heavy texts. A thin separation layer enables sharp, small characters or illustrations to be printed on linens with a fine structure. The thickness of the wax layer is then 0.1 to 0.2 microns. The top or coloured coating of metal foil has a thickness of 1.0 microns. This coating is usually coloured, and therefore partially determines the colour of the subsequent print. The coating also protects the underlying layer of aluminium against oxidation and makes the final print colourfast and resistant to rubbing. The difference between silver and gold foil is that in the latter type, the transparent top coating is yellow, which colours the aluminium layer. The remaining specifications such as the finish (mat, satin or gloss) and weather resistance are also determined by this top coating.

The aluminium coating is applied under vacuum at extremely high temperatures and condenses during cooling. The result is a very thin and uniform opaque metal film.

The adhesive coating or bonding layer is 1.0 to 1.3 microns thick and determines the degree to which the foil bonds to the substrate. This layer consists of an adhesive that is melted, and is thereby activated, by the heat of the stamp. The adhesion on the linen must be stronger than the adhesion on the carrier. The relatively impervious adhesive coating also seals the various layers of foil, in addition to ensuring the bond with the linen. Coarser varieties of linen require a thicker adhesive layer, which also evens out irregularities in the substrate. Linens with a fine or smooth structure can be printed with a thinner adhesive layer. Foil manufacturers often give the various adhesive coatings a different colour, so

that they can be recognized by the user. Pigment or coloured foil has the same structure as described above. The top coating and the metalized film are combined to form a pigment-rich, thicker coloured layer. The lighter the colour, the coarser the pigments used.

TYPES OF FOIL

The foil type is determined by the optically active layers. Metalized and coloured foils are important for printing on linen. The optically active layers of the unvaporized aluminium foil are sealed with a transparent coat of lacquer: the top coating. This coating protects the metal film and provides the sheen and in some instances, the colour. By using a colourless lacquer, the aluminium remains visible, which we see as a reflective silver sheen. The application of a transparent yellow lacquer results in gold foil. Top coatings in other colours produce different types of high gloss foil. On linen, high gloss foil is suitable for a small line of text, but not for the printing of large solid areas. Furthermore, the adhesion to the linen is not optimal with this type of foil. The wax and coloured or dyed coatings are applied before the production of foil with the aid of ceramic or chrome-plated steel rollers. The extremely uniform application can be controlled to a thickness starting at 0.01 to 0.02 microns. In many instances, several layers are applied over each other in a single machining operation, with the aid of forced drying. The metalized effect is obtained through vacuum evaporation. The thickness of this layer is even smaller. In a standard roll of foil of 0.61 x 61 m, two grams of aluminium is sufficient to produce the silver or gold effect!

ORDERING COLOUR CHARTS AND FOIL

Upon request, all foil suppliers will provide extensive colour charts to bookbinders, designers, publishers and printers, to help them make a selection from the many different colours and types. Although much has been done to match the most widely used printing colours and covering materials, designers are advised to select foil colours on the basis of those shown in the colour chart. The mixing of colours, which occurs in offset and silk-screen printing, is not possible in foil printing. It is also inadvisable to use two colours from different manufacturers during a single printing operation.

Not all the types of coloured foil shown in the colour chart will be suitable for linen. In most cases, this is indicated by a particular code. The demand for foil for use in linen printing is relatively low compared to other applications. It is therefore advisable to contact the supplier in advance and enquire about suitability, amounts in stock and the delivery time. Sample rollers are always available to carry out press trials on the linen involved. The colour on the linen can differ from the colour on the chart, particularly in the case of light foil colours. It is therefore convenient for the bookbinder if the designer and/or printer use the same colour chart. Correspondence with the aid of code numbers is effective and prevents mistakes.

Always check whether a particular 'selected' colour is still part of the product line. If so, reservation is recommended. It is especially important in batch productions to take into account the timely availability of a specific coloured foil. Commissioning the manufacture of foil is a lengthy and expensive process. The minimum order for manufactured foil is generally 100 master rolls of 0,61 x 122 m.

The length and width of foil destined for use in a bookbindery is adapted to the gilding presses that will be employed. Rolls are mainly ordered in the standard width of 610 mm or 24 inches.

In special cases, widths of 670, 760 or 1220 mm are also available. The standard roll length is 61 meters (200 feet) or a multiple thereof. To calculate the required amount, foil spooling charts can generally be obtained from the supplier. The supplier can also cut the rolls to the required width. Bookbinders normally cut widely used standard varieties to size themselves. The product label on the roll is important for the processing of the foil. Without this indication, all silver and gold foils look alike. The article code and batch number are also stated on the label. These will certainly be requested for repeat orders. All the important production data is recorded in the coding. The names of the best-known suppliers of metal and coloured foil for printing on linen are given at the end of this book.

TECHNICAL SPECIFICATIONS AND FOIL CHARACTERISTICS

In some instances the foil printing must be extremely precise; in others, a large solid area must be covered. For this reason, a large number of different foils are available on the market, with just as many differing characteristics. In the printing of bindings, the bookbinder mostly has to deal with a combination of title and decoration. A universally applicable foil is the goal of every foil manufacturer, but the development of such a product probably lies far in the future..... Upon request, all foil suppliers will provide the technical specifications for the types in their product line. The information consists of technical data and recommendations for processing and application.

The following will be given:

- The adhesion and suitability for use on the given surfaces, such as linen, printed covers, paper, labels, synthetic leather, leather, PVC, or laminated sheets.
- The edge sharpness of the print.
- The suitability for printing fine and medium texts.
- Example applications, such as: linen bindings, covers or labels.
- Embossing temperature for the processing in knuckle-joint or cylinder presses.
- Colour availability and further specification per type of foil. This information provides a guideline only, and is subject to change. A trial print is always recommended. With regard to the equipment to be used, the printing or refinement of the material and the skill of the printer are aspects, which differ too widely to provide an all-encompassing recommendation.

Coated substrates are generally more receptive to foil stamping than uncoated “dry” materials. Substrates which are smoother or have a shallow, open texture or pattern are easier to foil than those with deep, dense texture or pattern. More heat and pressure will increase the degree of foil transfer, which can help to fill texture or pattern, but can also lead to excess foil on image areas and could cause offsetting.

STAMPING DIE

Copper and brass recommended as they are relatively hard and long lasting. Magnesium is much cheaper but is soft and can be easily damaged.

Van Heek Textiles recommends the following foils for our textile cover materials:



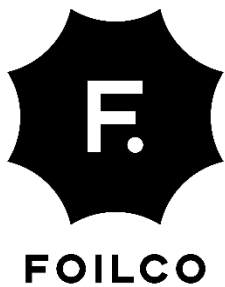
- LUXOR ALUFIN AFS: gold, silver for our coated products
Stamping Temperatures
105 - 115 °C (221 - 239 °F) e.g. on Kolbus Machines
- LUXOR ALUFIN AB: gold, silver for our natural cloths
Stamping Temperatures
100 - 105 °C (212 - 221 °F) for example on Kolbus machines
- COLORIT VB/V: matte pigment, for both coated as natural cloth
Stamping Temperatures
approx. 120 °C / 248 °F for up-down stamping
approx. 150 - 170 °C / 302 - 338 °F for cylinder stamping



- AV SERIES: a metallic foil designed for PVC coated substrates, real and imitation leathers, coarse, grained and woven materials.
- MH & UBH SERIES : a metallic foil for most rough, uncoated and textured substrates.
Recommended temperature range for most standard metallic hot stamping foils being typically 100 °C – 140 °C.
- PG & UA: matte pigment, for both coated as natural cloth.

Stamping Temperatures:

- UA in white and black only: approx. 80 - 170 °C / 302 - 338 °F. Depending on machine type and application parameters.
- PG: approx. 100°C – 150°C with activation at 85°C and recommended top temperature 170°C. Depending on machine type and application parameters.



- **EY, SH, MN** metallic colours. Specifically designed for embossed, rough or dry substrates. Maintaining a high standard of brightness on these difficult applications. Available in all colours of the spectrum in both gloss & satin finishes.
- **NX and HMD** pigment colours. A large range of pigment foils should always be considered when printing on dry or textured substrates.

For stamping directions and recommended temperatures, please visit the website of Foilco. In general more texture foiling needs more pressure. Lasher print area (panel) needs a higher temperature.

BINDING STAMPS

In the past, the bookbinder would print bindings using the individual letters, lines, ornaments and stamps he had in stock. A variety of letter types, in serif and sans serif, with different faces, enabled the bookbinder to create a binding appropriate to the typography used in the interior. Nowadays, designers are no longer restricted to existing lettering material or particular stamps. They can create any design they wish in order to match the book's binding to the style of its content, by having the stamps custom-made for the binding material in question.

Stamps for printing on linen bindings can be manufactured from light metal or brass. Magnesium stamps are etched and brass stamps engraved.

The light metal of magnesium stamps is easily etched away during the etching procedure, which results in a good-quality binding stamp. After the necessary print image has been applied photographically, the magnesium stamp is produced on a large plate, together with others, and then sawn free. A trial print using ink on paper is carried out for every stamp on a test press. The customer or bookbinder can then perform the necessary initial inspection on the basis of this print.

The surface of magnesium stamps is sufficiently compact to make them suitable for small to medium print runs. In many instances, the decision will be taken to have two identical stamps made for a print run, instead of just one. The reasons for this are price and delivery time. The stamp manufacturer requires images to be supplied on positive film.

Brass stamps are considerably more expensive and have a longer delivery time. Like magnesium stamps, they are made in the standard thickness of 7 mm. This relatively small height is designed to withstand the high compressive stress. The brass used in binding stamps is an alloy consisting of roughly 58% copper, 40% zinc and 2% lead. It is therefore a hard metal, which can be machined quickly and precisely by the rotating mills on the engraving machine. This prevents burrs and creates a more regular edge. Moreover, brass has good wear resistance, is an excellent heat conductor and can withstand high temperatures, which is necessary in high-speed printing machines. Due to its densely compacted surface, brass gives a high gloss to gold, silver or coloured foil, which is visibly superior to the effect produced by magnesium stamps.

A good-quality engraved stamp must meet the following requirements:

- the contour and large sections must be milled out to at least 2 mm; the depth in the small sections must be maximized;
- and the slope of the print image must be as steep as possible everywhere.

Brass stamps used to be engraved on pantograph engraving machines. Nowadays, the engraving machines are computer controlled, which means that texts and/or images can be supplied on line in digital format. The major advantages of this are the high degree of precision attainable and the

knowledge that in emergencies, when a stamp is no longer useable, the stamp manufacturer will be able to make a new one quickly. The stamp manufacturer can also easily adjust the width of the text to a different spine width, without altering the height of the letter. In special cases, stamps can be engraved with a particular design or figure. These enable gloss and mat surfaces to be applied in a single image.

The difference in price between etched and engraved stamps has become smaller thanks to modern production methods. This means that brass stamps tend to be selected for quality books and small print runs.

Specially adapted stamps can also be made for embossing. Surprising printing results are achieved by engraving the stamp at different levels. After the blind stamping, light falling on the book creates a varying effect of light and shadow. In the case of high-precision foil printing, the stamp manufacturer must take into account the expansion of the heated stamps.

If there are no stamp manufacturers in your area, the stamps you require can be obtained by other means. For example, Universal Engraving, Inc of Kansas USA provides substantial information on their website at www.universalengraving.com. All the stamps in their line are displayed and described. An on-line ordering system is also available, which allows you to send the information relating to the manufacture of a stamp via email and an attachment. By indicating the type and depth of the engraving required, the most complicated varieties of stamps can even be made at this 'remote' location, enabling clients all over the world to benefit from the latest developments in this field.

MOUNTING OF STAMPS IN THE GILDING PRESS

Stamps or individual letters can be secured with the aid of a special inclusion plate between the frames and end pieces. This method is mainly applied at binderies where the bindings are made by hand.

Bindings for a series of books are printed on a semi- or fully-automatic gilding press, in which the stamps are generally secured by means of melting tape on the heating plate.

To prevent differences in height during the pressing and release of the stamp, it is advisable to cover the entire stamp with tape. After a warming-up period of at least one minute at 100°C, the stamp is solidly fixed to the printing plate. The latest gilding presses are supplied with a special fastening plate with predrilled holes. These holes are drilled adjacent to and above each other at fixed intervals of 10 mm. By programming this grid on the computer, the stamp manufacturer can etch the fixing holes at the correct positions, outside the print image, during the engraving process. The holes are drilled out afterwards. The major advantage of this is that the press gilder can position and secure the 9 stamps for the cover and spine with extreme accuracy, outside the machine. This significantly reduces the set-up time.

EMBOSSING OR GILDING PRESSES

In binderies where books are bound by hand, manually operated gilding presses are used to stamp a few issues or small batches. Depending on the make and type, these machines have a printing surface of approximately 21 x 30 cm. These are mechanical devices equipped with a knuckle-joint press and lever. The press gilder himself determines the duration of the pressure by pulling the lever slowly or quickly. The machine may be equipped with an adjustable foil spooling device; a thermostat is standard.

A simple spine or cover title can also be printed using a Prägnant. This is a manually operated knuckle-joint press in which the foil is fed through by hand on a narrow roller. The individual letters or the ornament is placed line-by-line in a heated composition stick and then pressed onto the feeded binding. The position on the binding is determined by the position of the lay edges.

The Easymark, or the latest version Präzemark, is a computer-controlled foil stamping device, specially developed for printing varying titles, names or texts in foil. This machine is used by library bookbinders, for the varying titles on the spine and cover, and by the manufacturers of diaries, calendars and promotional gifts for personalizing the name on the end product.

Stamping occurs letter-by-letter using a heated letter roller, which contains between 90 and 200 characters, depending on the letter type and typeface. Titles and texts can be typed in or read in from disk. The information is then sent to the stamping device via the screen. For library work, it is possible to save the positioning of the different titles, making them easy to adapt. The production rate is roughly 40 to 50 different bindings, spine and cover titles per hour, printed at random. For the printing of varying names on diaries, over 200 copies per hour can be processed.

In semi-automatic gilding presses, the bindings are placed by hand against the lay edge on the retractable feed table. It is then transferred mechanically under the heated printing plates, where the bindings are stamped. The printing time is adjustable. The removal of the bindings from the drawn-out feed table also occurs manually. The foil spooling rate, the feed rate and the temperature and duration of the printing process are set in advance.

Publishing binderies generally work with fully automatic gilding presses. The bindings are fed into the press in a pile, where the undermost binding is pushed forward, placed on the press table and aligned between moving lay edges with the aid of mobile suction arms. Stamping then occurs, at very high pressure if necessary. The bindings are then gathered together again by the suction arms and conveyed out of the machine in staggered form or in small piles. The most widely used machine is the Kolbus PE gilding press. The latest version has a maximum working format of 660 x 405 mm and a printing plate of 420 x 355 mm. The maximum production rate is 80 bindings per minute. Such machines can also be positioned in line. It is then possible to execute two different prints for a single input and output process.

The unrolling of the foil is set digitally. The two motors are both able to spool up to three different

colours of foil at the same time. The extremely precise settings enable substantial savings in foil consumption to be made, since a small separation between the two prints can be achieved. Furthermore, the foil is not spooled if the machine makes a stroke 10 without a binding being present. Gilding presses are characterized by their sturdy construction and have a working life of many years.

BLIND STAMPING AND EMBOSSING

Before bindings were printed with gold or coloured foil, the title or decoration was applied to the leather or parchment by means of blind stamping. Using heated letters or stamps required for the binding material, the image was then pressed into the binding with great force. A print was created as the result of this pressure and the scorching or discolouration of the material surface. Now, blind stamping can also be applied as an independent printing technique instead of e.g. foil printing. Large blocks or titles, a line motif or an ornament look particularly good on linen. Many illustrated books and art books that are bound in linen, and have a colourful dust jacket, receive a blind stamp on the binding, so that the book is also recognizable without its jacket. The blind stamping technique can also be applied as a pre-treatment if certain areas of the raw linen need to be pressed smooth, to enable a fine text or small illustration to be printed on the material afterwards. This technique is recommended for a ribbed fabric like Regina or a coarser fabric such as Halflinnen Dark. Blind stamping is also necessary when an illustration, previously printed by offset on paper or a self-adhesive material, must be applied to the binding. In this instance, the blind stamp determines the positioning of the label to be applied 'at depth'.

In blind stamping the same stamps are needed as in foil printing. With regard to embossing, a patric and a matrix or a stamp and a counterpart are normally required. This presents no problem for blind or foil stamping on paper and thin cardboard. The same does not apply when bindings need to be stamped that will be glued around a book block by means of the end papers. In such cases, a relief print must not be visible on the inside of the book. A coat of arms or medallion is embossed into a linen binding by means of a blind imprint stamp that has been etched or engraved at several depths. When the area surrounding the image is pressed flat, the image itself becomes raised. Surprising results can be achieved by working alternately with solid density and a line screen. In addition to blind stamping, embossing can also be carried out with gold and silver foil.

COMMON PROBLEMS EXPERIENCED IN FOIL STAMPING

The coloured layer of the metal or coloured foil does not bond to the linen or detaches at the slightest bending of the material.

Cause: temperature too low or insufficient compressive stress applied.

Solution: set the temperature correctly and apply a greater compressive stress, locally or universally.

Increasing the printing time has no effect on a print when too little stress is applied. It is possible to partially compensate for a temperature that is too low by increasing the printing time. It is advisable to

start at low temperatures, since heating occurs faster than cooling.

Contours not printed sharply; the gloss gold or silver foil becomes mat; a rainbow effect is visible on the print; the polyester carrier melts.

Cause: temperature too high.

Solution: Set the temperature correctly.

The print has not bonded sufficiently to the linen.

Cause: printing time too short or machine speed too high. Insufficient heat transfer has occurred.

Solution: increase the printing time and input correctly or reduce the operating speed of the machine.

Certain pieces of the foil are missing in the print.

Cause: the foil spooling rate has not been set correctly, which means that due to the preceding print of the previous image on the foil, it is impossible to create a good print. The guide that determines the angle at which the foil is released from the stamp may also have been set incorrectly. It may be necessary to slow down the foil spooling rate, to allow the foil and linen substrate more time to cool, which will improve the adhesion.

Solution: Increase the space between two prints and set the guide at the correct angle, so that the foil comes free from the carrier more easily after stamping. It is important that the foil is released after stamping at the correct moment.

Uneven print of the stamp on the linen.

Cause: worn or damaged stamp; more compressive stress will only result in a thicker print. Solution: replace the stamp or ensure that the substrate is adapted where necessary. Using a soft substrate decreases the quality of the print. Small letters and fine ornamentation require a hard substrate. It is highly important that the bottom board on the printing plate has a hard and smooth surface.

Oily, blurred print of text or illustrations.

Cause: the duration of the pressure is too high.

Solution: set the embossing time correctly. Obviously, the factors required for a good-quality print (temperature, duration and magnitude of the compressive stress) together with the linen substrate and the skill of the press gilder ensure the desired result.