

**T H E  
U S E R S  
G U I D E T O  
H O L O G R A M  
S T A M P I N G**

**KLUGE®**



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KURZ



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# WHAT IS A HOLOGRAM?

The word hologram comes from the Greek term 'holo', which means whole, and 'gram' meaning message. It can easily be described as the recording of a 3D image on a 2D surface.

The hologram image is made from an encoded pattern that bends the light into the image we can see. When looked at closely through a microscope you can see the hologram as thousands of structured lines. Approximately 2000 lines make up just one millimeter of the hologram. These lines are called fringes, and have the lens effect properties, needed to make the image visible to the naked eye. They are encoded to the surface of the hologram at different angles and thickness, therefore emitting different colors across the surface.

Hologram images are recorded to the photo sensitive film using intense and even light sources such as a laser, and must be of a single wavelength. A white light of the same intensity can be used to produce a full spectrum of colors resulting in a colorful hologram. At least two light sources are needed to produce the hologram. The first is angled facing the surface of the film with the subject away from the surface. A lens is placed between the film and the subject diffusing the light, which is projected from an angle. The second light source is then added which creates an effect on the film, the result being a holographic image.

Many mediums may be used as the 'subject' such as film, computer graphics, hand drawn illustrations etc. The patterns however, are most effective when captured in sharp detail. Therefore, everyday air movement or vibrations should be removed and so holograms must be captured in custom studios.

When processed, the plate that is created shows areas of exposure and non-exposure as tiny grooves in the plate surface. Additional processing of the plate produces holographic 'printing' plates, used to emboss the pattern into appropriate materials, like polyester film, creating the final holographic image.

# HOLOGRAM HISTORY



*Dennis Gabor*

Holography is a process that creates the illusion of three-dimensions on a two-dimensional surface. Though discovered in 1947 by Nobel physicist Dennis Gabor, holograms were limited to the laboratory until the early 1960's development of the laser, a device instrumental in creating a split beam of light.

During this period, holograms largely remained a scientific curiosity, simply because images could only be produced one at a time, and recorded only to the emulsion of photographic film in a tremendously time consuming process.

By the early 1980's, technology had developed enabling holographic film images to be transferred to a metallic plate, and subsequently be mass-produced onto the mirror-like surface of hot stamp foil. This progression allowed a holographic image to be adhered to any surface that could be foil stamped, creating a new opportunity for foil stampers that has now come into its own.

Today, nearly any image or model can be transformed into holographic foil via hologram converting bureaus.





# TYPES OF HOLOGRAM AVAILABLE TODAY

Nearly anything that can be photographed can be made into a holographic image. However, there are different characteristics that will each produce different results.

There are several holographic effects that can be captured in a foil image:

**Holographic Patterned Foils** are available in a variety of standard styles. Although not actually three-dimensional, the shimmering, prismatic patterns that cut into these foils create an image of depth and a rainbow of shifting color as the angle of view changes. Because many of these foils are readily available in standard styles, this foil is the most affordable of all holographic foils.

**Three-Dimensional Holograms** are created from inanimate objects. Here the 3-D illusion is quite realistic, as the object seems to rotate in space as the angle of view changes. This type of hologram also creates the illusion of "looking around" a foreground object to reveal background that was not present in a different angle of view.

**Multiple Plane Holograms** layer two to four images into separate "planes," creating the illusion of a 3-D scene. This process is highly versatile in that individual layers can incorporate two-dimensional shapes. This allows even flat, 2-D artwork or photo subjects to take on 3-D characteristics, as the planes will appear to "float" at different depths within the image.

**Stereograms** are sophisticated holograms of live, moving models that, incredibly, render the illusion of a brief 3-D "movie" on a two-dimensional surface. In most cases, a motion picture camera is employed to capture a sequence of movement. By panning the camera across the subject in an arc, individual frames of motion can be transferred to the foil, creating an illusion of three-dimensional movement that typically moves forward and backward.

**2-D-holograms** are based on a two-dimensional graphic which contains all information in one single image plane. *Copyright LEONHARD KURZ GmbH & Co. KG 2003*

# TYPES OF HOLOGRAM AVAILABLE TODAY *(continued)*



**Heliograms** are based on a line graphic in a single plane with good visibility even under diffuse light conditions. The combination of graphic elements with movement effects results in a highly memorable and eye-catching value.

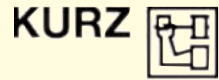
*Copyright LEONHARD KURZ GmbH & Co. KG 2003*

**Digital Image** uses computer-generated dynamic design components in a single image plane with halftone dot resolution. This makes specially defined color separation and movement effects possible.

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## KURZ TRANSFER PRODUCTS FEATURE: *EXCLUSIVE OVD SECURITY PRODUCT*



Visit KURZ on the web at [www.kurzusa.com](http://www.kurzusa.com)

### **OVD - Patch Application**

Single OVD-pictures (patch) applied in an advanced hot stamping process onto monetary and ID documents, plastic cards and a wide range of commercial products are covering the majority of OVD-applications nowadays. Sophistication of the used optical technology resp. or combinations of security components, the authentication potential, as well as the functional integration in the overall document concept, determine the security value of the OVD-feature.

In close cooperation with respective Central Bank Printers, KURZ developed highly durable OVD-hot stamping foils for the application onto polypropylene substrates, finally leading to the **polymer banknote** technology promoted now worldwide for long life banknotes.

### **OVD-Stripe Application**

#### **STRAP®**

BANQUE DE FRANCE and KURZ jointly developed and patented the STRAP® (Système de Transfert Réfléchissant Anti Photocopie), an effective and economic OVD-stripe to prevent photocopy and reproduction of documents such as banknotes and similar security documents.

The specific partially demetallized discontinuous "bar" - pattern has been designed regarding dimensional and geometric frame conditions in order to generate black reproduction, which obviously differentiates the appearance of the photocopy when compared to the original. The additional overprinting of the STRAP® by offset and intaglio improves the design integration as well as security against simulation.

# KURZ TRANSFER PRODUCTS FEATURE: *EXCLUSIVE OVD SECURITY PRODUCT* (continued)



## **OVD-Stripe Application**

### **Diffraction OVD-Stripe**

The economical advantage of the continuous OVD-stripe application combined with the security provided by KURZ OVD-components of diffractive and partially demetallized features, generated the basis for the growing interest in this type of OVD-application in all levels of the security market. Extensive R&D-work at KURZ with regard to adhesion chemistry and application processing finally lead to a highly resistant OVD-stripe directed to the low denomination banknote field where a long lifetime of the document in circulation under drastic handling conditions is obligatory. Primer based OVD-Stripe solutions is using the described advantages of the KURZ OVD-stripe performance.

## **OVD-Laminate Application**

Protectus®, the KURZ product group of high security laminates offers the benefits of diffractive metallized or transparent OVD's embossed into a laminate film to protect against alteration of the personal data recorded on passports and ID-cards. Protectus® incorporates all kinds of OVD-components as an integrated part of the laminate. Any attempt to remove the laminate. Any attempt to remove the laminate destroys the OVD-features immediately and shows that an attempt of falsification has occurred.

## **Tamper Evident OVD-Stickers**

Self Adhesive OVD-stickers with tamper evident properties are the ideal solution to protect commercial products especially those representing a brand name of high market reputation against forgery, manipulation and simulation. The alternative between manual or automatized labeling allows an almost unrestricted usage also in areas of lower standards of industrialization.





## KURZ TRANSFER PRODUCTS FEATURE: *EXCLUSIVE OVD SECURITY PRODUCT* (continued)

### **Synthesize Your Tailor-made OVD-Feature**

Since the key philosophy in KURZ' commercial strategy is customer orientation, especially in the security field, our team in the division Security Concepts is used to the process of developing tailor-made security OVD-features according to the actual project related requirements in close cooperation with the client.

The functional OVD-tools as basic components for this development work, are summarized in the KURZ Security Construction Kit. Obviously, any of its components may be used as a "stand alone" feature providing its specific functional security value. In order to meet existing high requirements of:

- recognition of authenticity
- protection against counterfeiting and simulation
- integration in banknote design
- machine detection of authenticity and quality

It may be necessary to synthesize the suitable OVD-feature by combining several of the described OVD-components. The beauty of the KURZ Security Construction Kit is the potential provided by the freedom of combination of the components.

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# COMMON USES FOR HOLOGRAMS



Hologram foils are truly unique expressions of creativity and a highly effective form of visual communication that demands attention. The unexpected rendering of a "moving" dimensional, color-shifting image interacts with the viewer in ways no other static, 2-D image can. Today foil holograms are being used for:

- **P.O.P. and Packaging** - a growing trend among retailers who need high-impact packaging in an over-crowded market. Holograms are also a preferred method of brand protection, used to prevent counterfeiting and as tamper-evident seals.
- **Print Ads, Direct Mail and FSI** - with the volume of mail and ads today, hologram foils can really make a product stand out. Hologram foils can also be used very effectively to demonstrate aspects of a product, for instance, reflective objects such as the facets of a diamond, or moving objects that desire maximum impact.
- **Security** - who today does not have a credit card with a security hologram? Holograms are also being used as anti-duplication devices for documents, event tickets, credentials, checks, transportation passes, and credit vouchers.
- **Sports Trading Cards** - already replete with foil, holograms and stereogram images of sports heroes in motion represent the ultimate in trading card value.



Flyer



Ski pass



Children's book cover

- **Book Covers** - in a long-time domain of foil stamping, many publishers are using holograms to add further impact to their book jackets. An example would be the famous National Geographic hologram cover of a pre-historic skull that became one of the magazine's most requested issues.



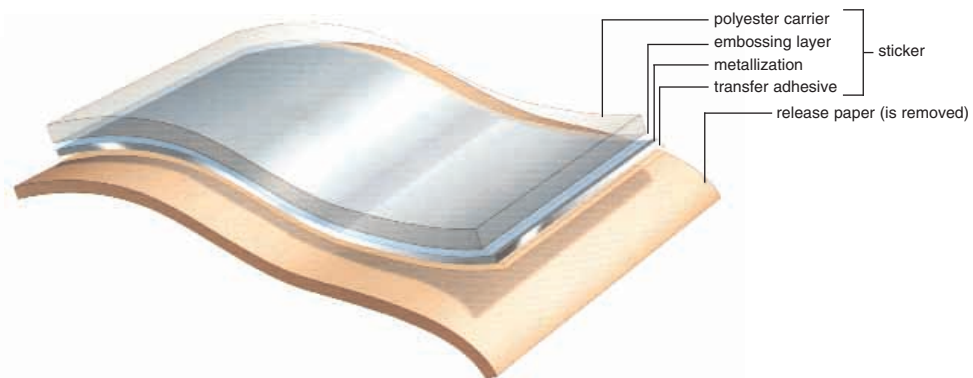
# HOLOGRAM FOIL STRUCTURE

## The structure of hot stamping foil



Hot stamping hologram foil is made up of a polyester carrier, a number of lacquer layers and an adhesive sizing. During stamping a heated stamping wheel or engraved stamping die activates the very thin lacquer layers by means of heat and pressure. This causes the lacquer layers to bond permanently with the substrate of plastic, paper or thermal paper. The polyester carrier is then peeled off.

## The structure of a self-adhesive label



A tamper evident holographic sticker is a self-adhesive, stamped label with a holographic structure, which is destroyed by attempts to remove or tamper with it. Silicone paper is used as carrier. Hologram stickers can be applied manually or by machine. Tests are necessary to decide on the actual application process used, as this depends on the machine and the substrate.

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# BASIC PRINCIPLES OF HOLOGRAPHY



The following points, based on experience in the use of hologram types should always be taken into account in hologram projects:

**1** Graphic or computer generated artwork can be integrated into the holographic process as one or several colors. Independently, however, only certain colors are visible when the hologram is viewed from a certain angle and these change sequentially when the angle from which it is viewed or illuminated is altered.

When viewed under a direct light source (a spotlight), the colors and edges of a hologram appear bright and clear. Extended light sources (a fluorescent light). Cause the colors to lose contrast. This is also true when holograms are viewed in diffuse light.

**2** When computer-generated graphics are integrated, best results are obtained by using up to three colors in the image plane (i.e. surface of the holographic print). For the background both single color and two color separation give excellent results.

**3** The most important holographic information (company logo etc.) should generally be placed in the image plane as it is then most clearly visible in almost all light conditions. Objects or graphics behind the image plane are clearly visible under direct light but slightly reduce brilliance and definition when viewed in diffused light.

As with 3-D-holograms, the brightness of the message of 2-D/3-D-holograms is also reduced in the deeper background levels.

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# HOLOGRAM TECHNOLOGY - KLUGE'S HOLOGRAM REGISTRATION UNIT

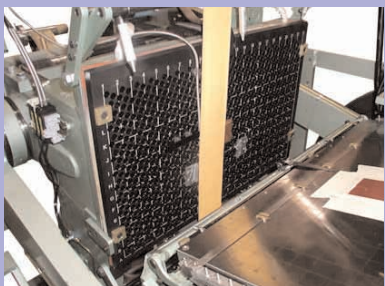
Since the early 1980's when hologram technology progressed to foil stamping machines, the use for holograms has become more and more wide spread. Today the hologram has a whole range of uses from security tags to packaging, book covers and advertising.

The Kluge Hologram Registration Unit is built onto the Electronic Foil Control System, Low Mount. It enables you to accurately register holograms using your Kluge press. Note: the hologram registration unit is not compatible with the mechanical foil control system.

The Hologram Registration Unit utilizes fiber optic technology as the hologram registration mark detection system. The fiber optic sensor is mounted to the toggle base in line with the edge of the foil. The sensor is connected to the signal pick up device, also known as the 'amplifier' which is then electronically adjusted until the registration mark can be seen. This innovative system allows you to digitally align hologram foil on the die with registration accuracy of +/- .012".

Two #30 gage wire guides are positioned on the toggle base just below the die, one is placed under the foil and the other is placed over the foil. These wire guides effectively prevent the hologram foil from curling as it is fed through the machine (see photograph, left).

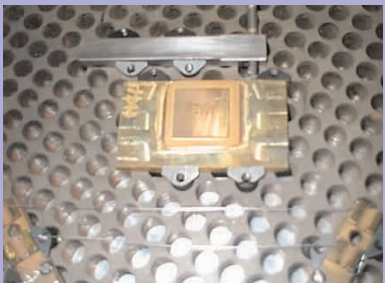
Easy access to the configuration and controls of the Hologram Registration Unit is made available from the touch screen control system.



*Hologram registration Unit set up on etched toggle base. Shows fiber optic sensor, wire guides, die and foil to the center of the toggle base.*



*Fiber optic signal pick up device mounted to the side of the press (shown on EHF).*



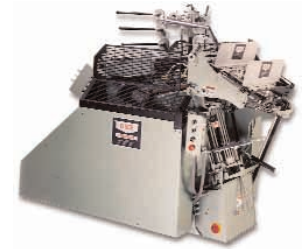
*Close-up view of the die area showing fiber optic sensor, die and guide wires.*

# HOLOGRAM TECHNOLOGY - KLUGE'S HOLOGRAM REGISTRATION UNIT

*(continued)*

The Hologram Registration Unit has been developed for EHD, EHF and WFE presses.

Often called "the workhorse of the industry", the **Kluge EHD** is already a legend. Featuring speeds up to 3,300 impressions per hour, the EHD can accommodate up to 15"x 24.75" (381mm x 629mm) sheets, with up to 80 square inches of die area.



The **Kluge EHF Series Press** takes the standard EHD and raises it to the next level. A stronger main frame, stronger platen bolts and heavier side arms give the press greater impression strength. Improved side arm design gives the press almost three times the preload pressure.

The **13 x 19 WFE series web-flow press** from Kluge is designed to handle increased specialty forms production of 4,000 to 10,000 iph. With all the advanced features of the legendary WFD series presses, Kluge's WFE web-flow presses handle 2-1/2" to 20" (64mm to 508mm) web widths-and paper advancements in 1/96" (.25mm) increments with 3" to 17" (76mm x 178mm) stock advancements.



*For more information on any of these Kluge products, visit us on the web at [www.kluge.biz](http://www.kluge.biz) or call us at 1-800-826-7320*

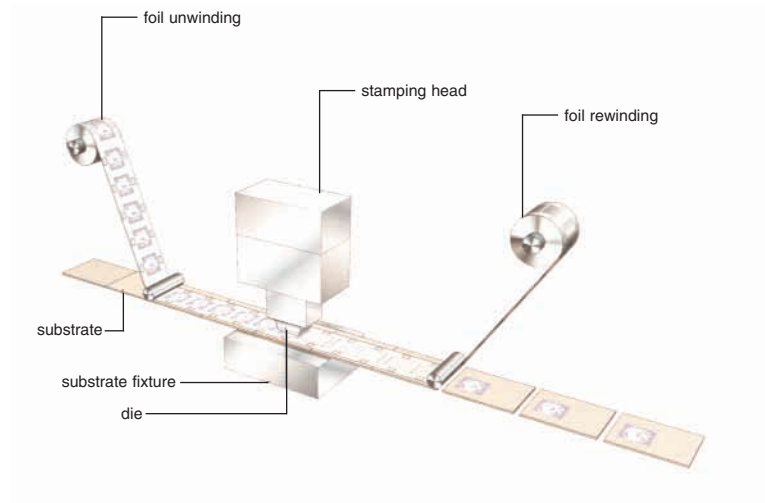
*Visit [www.kluge.biz](http://www.kluge.biz) for more information on Kluge's hologram registration equipment*



# UP-AND-DOWN STAMPING ON A KLUGE PRESS

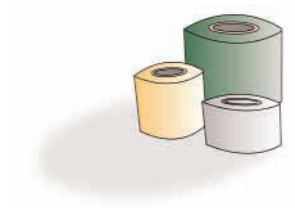
Kluge hologram technology relies on the 'up-and-down' stamping method for registering hologram images accurately on products.

During the up-and-down stamping process the foil is transferred to the substrate by means of a heated metal silicone die with an intermittent up-and-down movement. The shape of the die determines the shape of the stamping is among others suitable for the high precision, perfectly-defined application of single hologram images.



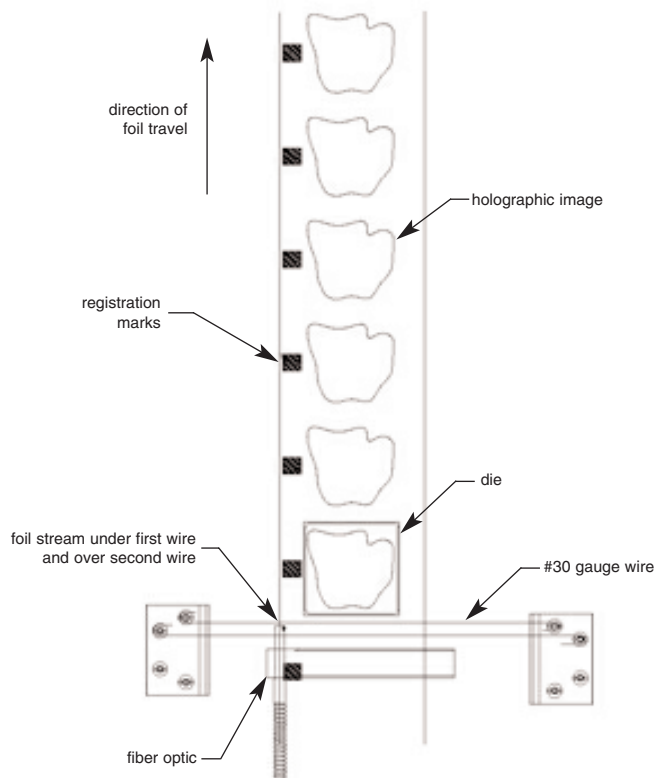
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# SETUP AND REGISTRATION ON A KLUGE PRESS



With the optional Hologram Registration Unit, Kluge presses have the ability to register holograms as accurately as +/- .012". To produce this highly accurate registration, Kluge presses should be configured using the set up diagrams below as a guide.

## Preferred standard setup



*NOTE - wire guides not required if die is located at extreme lower work area*

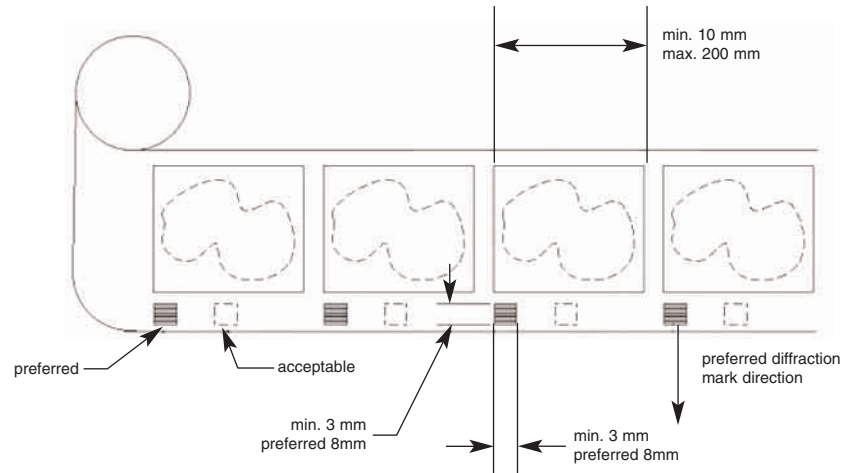
The above diagram shows the processing of hologram foil as it is run through the press. The highest accuracy for registered holograms is achieved when the registration mark is located inline with the end of the hologram image. This enables the fiber optic sensor to pick up the registration mark more effectively.





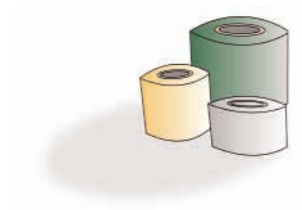
# SET UP AND REGISTRATION ON A KLUGE PRESS *(continued)*

Gauge wires through which the foil is fed prevent curling and creasing. These wires are positioned after the die, to prevent pre-impresion foil damage.



The diagram above shows the preferred layout of the hologram images and registration marks on the foil. By following these guidelines, you will ensure the highest accuracy during impression.

# GLOSSARY OF TERMS



**Approval shim:** Produced by the holographer and sent to the customer for inspection and approval.

**Color separation:** The allocation of certain colors.

**Embossing layer:** The holographic structures are transferred into the embossing layer.

**Half-tone:** Immerging shades from light gray to deep black.

**Hologram:** An interference pattern, which shows the result of a reference light meeting diffused on an object and stored as such in a light-sensitive medium.

**Image channel:** Motives may be superimposed in the image plane (or the background) i.e. one image per channel. Only one motive is visible at a time, depending on the viewing angle. Thus there is an "image flip" where two motives are superimposed. A dynamic movement effect can be achieved, if a number of almost identical motives are superimposed.

**Interference:** The coherent superposition of two light waves where their in-phase amplitudes form a sum in each point. When there is interplay between two coherent waves (the same wavelength and phases) the amplitude increases or reduces. The result is an interference pattern/strips, which expresses the relative relationship of the phases of the two waves to each other.

**Metallization:** Metallization is an added metallic layer (usually aluminum) forming a mirror, which enhances the visibility of the hologram (thickness approx. 0.00003 mm).

**Parallax:** The difference between two different views of an object.

**Plane/image plane:** A 2-D/3-D-hologram consists of a number of planes, each of which contains piece of information. Linking these different planes produces a spatial effect. A foreground, mid-ground or/and background effect can be achieved depending on the positioning in the hologram. The main information, which is to be shown most strongly, is called the image plane.



## GLOSSARY OF TERMS *(continued)*

**Polyester carrier:** The polyester film that acts as a carrier support for the lacquer layers in a hot stamp foil. It can also be the base film material in the self-adhesive label.

**Pressure sensitive transfer adhesive tape:** The pressure sensitive transfer adhesive tap is acrylic-based and fixes the self-adhesive label to the substrate. The transfer adhesive is on a liner (silicone paper). It has good resistance to UV and aging and is temperature resistant in the range -40 C to +120 C, for short periods even up to +180 C. (These values are averages, individual tests should always be made as adhesion to a substrate can be influenced by many factors.)

**Prismatic:** One of at least two intersecting planes in a given area, which cause changes to the direction and dispersion of light rays through diffraction. These areas give intense color changes of high brightness.

**Protective lacquer (top layer):** The top layer improves resistance to abrasion and liquids (i.e. solvent, juices, caustic solutions etc.).

**Recombination:** Reproduction of an image on the working shim (a single image or part of a continuous design). The large production shim necessary for the production process is created, this either contains a large number of single images distributed in a way which fits the reproduction machine or a large continuous area for continuous designs.

**Release layer:** In a hot stamp foil, this layer acts to release the polyester film after stamping.

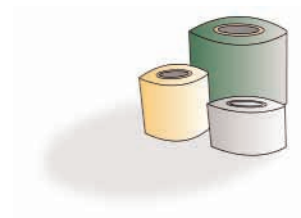
**Replication:** Adding the holographic structure to a lacquer layer in an embossing machine using the production shim.

**Sizing:** Sizing ensures that the lacquer layers bond with the substrate (hot bonding layer). Sizing must bond firmly with the substrate during stamping and create a bond with the other foils, which make up the stamping layer.

**Working shim:** Nickel metalwork produced by the hologapheur from which the actual production shims are created at KURZ by recombination and galvanic molding processes.

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# MANUFACTURERS OF HOLOGRAM FOIL



This page provides you with a listing of hologram foil manufacturers. For ordering information, you may follow the web link below each listing or contact the manufacturer using the details available.

**KURZ**  **LEONHARD KURZ GmbH & Co. KG**  
Schwabacher Straße 482  
90763 Fuerth  
Germany  
Phone: +49 911 7141 0  
Fax: +49 911 7141 357  
Email: sales@kurz.de  
URL: www.kurz.de

**KURZ**  **LEONHARD KURZ (U.K.) LTD**  
Garnet Close  
Greycaine Industrial Estate  
Watford, Herts  
WD24 7JW  
United Kingdom  
Contact: Mr. Ferrer  
Phone: +44 1923 24 99 88  
Fax: +44 1923 25 25 16  
Email: sales@kurz.co.uk  
URL: www.kurz.co.uk

**KURZ**  **KURZ TRANSFER PRODUCTS**  
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Charlotte, N.C. 28206  
United States  
Phone: +1 704 927 3700  
Fax: +1 704 927 3701  
Customer Service:  
+1 800 333 2306 or +1 800 950 3645  
Email: ktp@kurzusa.com  
URL: www.kurzusa.com

*For more worldwide locations visit [www.kluge.biz/fsconsumables.htm](http://www.kluge.biz/fsconsumables.htm)*

*Visit [www.kluge.biz](http://www.kluge.biz) for more information on Kluge's hologram registration equipment*



# MANUFACTURERS OF HOLOGRAM FOIL *(continued)*

**API Foils**

Astor Road  
Eccles New Road  
Salford, Manchester  
M5 2DA  
United Kingdom  
Contact: Stephen Shea, Security Products Sales Manager  
Phone: +44 161 789 8131  
Fax: +44 161 707 8556  
Email: [stephen.shea@api-foils.co.uk](mailto:stephen.shea@api-foils.co.uk)  
URL: [www.api-foils.com](http://www.api-foils.com)

**API Foils**

3841 Greenway Circle  
Lawrence, Kansas 66046  
United States  
Contact: Jennifer Hoyt  
Phone: +1 785 842 7674  
Fax: +1 785 842 9748  
Email: [apifoils-na@apigroup.com](mailto:apifoils-na@apigroup.com)  
URL: [www.api-foils.com](http://www.api-foils.com)

**API Foils**

Unit 2A 30/F The Centrium  
60 Wyndham Street  
Hong Kong  
China  
Contact: Gary Cheung  
Phone: +85 2 3426 4906  
Fax: +85 2 3426 4926  
Email: [apifoils-ap@apigroup.com](mailto:apifoils-ap@apigroup.com)  
URL: [www.api-foils.com](http://www.api-foils.com)

*For more worldwide locations visit [www.kluge.biz/fsconsumables.htm](http://www.kluge.biz/fsconsumables.htm)*



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Fax: (715) 483-1640*

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