Section 1: General considerations concerning the security printing

For many decades machines and equipment dedicated to security printing have been conceived only for banknote printing. Banknotes are produced in large quantities and have a life long enough to depreciate both the high costs of the printing presses and that of the realization of what is necessary to print (banknote design, films, plates).

In the past there was more than a doubt in the use of web Intaglio printing for security products due to the lack of relief that the old web intaglio presses produced in Germany could produce on printed paper. Getting rid of the past, our Phoenix IV web intaglio press, has at least the same pressure and printing quality of the most up to date sheet fed presses used daily for printing high security products worldwide.

Web Intaglio printing is widely used to produce postage stamps, tax stamps, tax banderols, passports, Visa, bonds, checks and other high value security documents.

Web Intaglio printing technology is daily used for printing banknotes by Denmark, France, Algeria and Finland. Even if unofficially, many other countries have been and are still using web security printing presses.

The web printing process can assure at the same time the highest production quality and the shortest production time, two key process qualities always seen as essential by any customer, particularly in the security printing market.
Section 2: Our company and our products

Company is dedicated with its security printing sector to the development and realization of web security printing presses and their accessories.
Using the latest 3D CAD design engineering software tools and leveraging its high expertise in the overall machine automation process and construction, We provide to the customer the following machines and the necessary expertise to enter the security printing market with success:

“Phoenix IV” Four colour web fed intaglio printing press

“Helios” Laser engraving system for printing plates

“RCM II” Rubber cutting machine for inking plates and cylinders.

We are therefore able to provide to the customer, new to the security printing market or willing to upgrade his present printing plant, a complete solution that goes from the realization of the printing plate to the finishing of the printed product itself.
Any auxiliary system or software desired or needed by the customer can be provided and integrated in line or off line by our staff such as:

- Security design software system (design products with advanced security features).
- Quality inspection system (in line and off line).
- Stamp perforator/notcher.
- Rotary sheeters.
- Numbering systems.
- Plate bending mechanisms.
- Traditional plate making equipment.

Our company is thus able to provide to the customer any material needed to operate in the security printing market such as:

- Paper
- Inks
Introduction

Phoenix IV brings a new concept in the intaglio security printing field: the variable printing format. The variable printing format guarantees an unbeatable flexibility, giving the user the possibility to adapt the machine to the format that best suits the job that has to be printed rather than constraining the user to adapt the job to a fixed printing format that always leads to an expensive paper wastage. Phoenix IV is therefore the best choice for any printer that needs to print on demand security documents with different sizes worldwide.

The main characteristic of the Phoenix IV Intaglio Web Fed machine are:

- Economic viability and low material consumption.
- Low running costs.
- Can be operated also by just one operator (low cost).
- Use of a printing plates with short mounting times.
- Use of a wiping paper system (no chemicals needed)

This means that the production cost of security documents printed with our printing press is absolutely cheaper than any other solution available on the market nowadays.

Phoenix IV printing press description

The Phoenix IV intaglio web-fed press is a continuous production machine based on the “stop- and-go” system implemented by the most reliable and innovative electronic control systems. Several years of experience acquired in the Security Printing industry have enabled us to provide the most sophisticated process technology available, thus assuring the best up-to-date response to any market requirement. Although the machine is highly sophisticated, it guarantees maximum simplicity, offering the operator all the necessary instruments in order to run and control all printing phases in real time.
These are the extended characteristics of our printing press:

- Four colors (compatibility with high density inks, OVI ink, etc.)
- Four rubber inking plates (low cost) with short mounting time.
- Software variable printing format between 15” and 29” with ¼” incremental steps.
- Stop and go mark registration system.
- Perfect intaglio print registration on preprinted paper, watermark paper and white paper with register mark.
- Reel-to-reel and reel to sheet printing (the reel can be post processed for continuous forms by the customers).
- Continuous thermal regulation on both master cylinder and inking units.
- Mechanically variable printing pressure.
- Full automation of the working process: gives both an high and constant printing quality and simplifies the operator’s activity (almost absent during press running).
- Independent thermoregulation unit available for each inker: permits the printer to fully adhere to the ink supplier specifications in terms of working temperature and to obtain high quality printings and save inks.
- Wiping paper system with variable speed (no chemicals, no solvents).
- Moving cylinders coupled with high performance brushless motors and high performance reduction gears.
- Forced two sectors air oven: allows to dry any kind of paper form 45 g to 250 g and furthermore, gummed, self adhesive and sticker label paper too.
- After oven cooling cylinders.
- After over paper humidifier.
- Remote maintenance.

Key advantage of our Phoenix IV security printing press is the unnecessity of any high specialized staff or labor for machine operation.

Any new machine operator can to be trained within a relatively short time.

The supervision of all machine parameters is performed by a programmable logic controller (PLC) interfaced to an industrial panel PC.

The real-time synchronization between all motors that guarantees the perfect running of the printing press is realized on the motor drivers themselves leveraging a real-time synchronizing net.

All the main commands needed to run the press are easily available on the touch panel console in a clear and easy to use way. By means of a dedicated diagnostic page, the user can detect and diagnose possible damages to the machine in order to act immediately to avoid further problems and/or corrections; using the information reported in the alarm/warning page the operator can decide whether to act directly to solve the problem or if a specific maintenance operation must be done.

To help the operator diagnose the press state, a remote maintenance service is available.

In order to allow the operator to control the complete production process from the main console, an optional high resolution camera with image control shall be installed on the machine after the printing group.

An average training period of five weeks at our facilities in Italy is considered optimal for acquiring an adequately knowledge of the printing press and process. The printing personnel training is completed during the installation at the customer premises giving all the assistance to start the first jobs on production.

Further assistance and training is yearly provided by us according to the customer needs.

We have encountered various levels of expertise amongst its clients, from South America to USA, from Europe to Asia. In any case, within a short period of time, the clients' technicians were able to approach commercial production in a state of confidence.

One of the most important things to be considered about the printing process is the reduced start-up time of the press and the low job changing time: normally within 2-3 hours the press can be set up to begin a brand new job giving the printer the possibility to print efficiently and economically also short run jobs.
Phoenix IV Technical Specifications.

- Press specifications:

  Max. Printing paper width 540 mm
  Max. Printing width 520 mm
  Printing gap 4 mm (available Gap 0 option)
  Printing length Adjustable between 15" and 29". The printing length is adjustable electronically without changing any cylinder.

  Number of plates 1
  Printing plate dimensions 875 x 550 mm
  Printing plate thickness 0.7 mm
  Number of printing colors 4
  Wiping wiping paper (no water, no chemicals)
  Nr. of unwind units 2 for max. web diam. of 1000 mm.
  Nr. of rewind units 2 for max. web diam. of 1000 mm.
  Printing pressure max 2000 Kg/linear cm.
  Maximum printing speed at perfect register max. 5000 prints/h
  Maximum printing paper speed 62 m/min (29" image format)
  Typical cleaning paper weight 60-70 gr/m²
  Maximum cleaning paper weight 100 gr/m²
  Cleaning paper type craft paper (smooth)

- Electrical requirements

  Voltage 400 V/ 3 phases
  Frequency 50/60 Hz
  Max. power required 150 KW
  Max. consumption 400 Amps. (electrical dryer/oven)
  Average power required 60 KW
  Average consumption 120 Amps.

- Press dimensions:

  Length x width x height: 12.5 x 4.2x 5.5 meters
  Weight: 31.500 Kg approx.

The "Phoenix " intaglio web fed machine has been tested and certified in accordance with EEC standards 89/392/EEC

The machine’s testing procedure complies with the following standards:

89/392/EEC EEC norms relevant to the machines
EN 1010 Technical safety requirements relevant to machines for paper working.
EN 292 T.1 + T.2 Machines safety
EN 294 Systems to avoid contacts with dangerous point
EN 954 T.1 Part of controls effecting dangerous operations
EN 349 Minimum distances to prevent pressing
EN 418 Systems for machines emergency stop.
EN 811 Minimum distances for dangerous point criteria
EN 894 T.1 - T.3 Ergonomical displacement of instruments
EN 60204 T.1 Machine’s electrical system
Introduction

To create the best products one of the key aspects that has to be tailored is the realization of a perfect printing plate: to help our customers who always strive for perfection, we have developed our “Helios” Laser Engraving System.

The Helios laser engraving system for Intaglio plates has been completely designed and realized by us with the aim to introduce an absolutely innovative and unique engraving system that gives the security printing market players the possibility to completely exclude any chemical element throughout the plate engraving process.

The Helios Laser Engraving System developed by our company is an all in one system that realizes a perfect engrave on metallic plates starting from the image file representing the desired engraving. The engraving process can be divided in just two steps:

1. The image to be engraved is processed by the operator with the help of our Helios Laser Engraving Software.

2. The Helios Laser Engraving System realizes the engraving.

The system uses a laser source that takes the place of all the chemicals, normally used in the traditional chemical engraving process, for engraving the metal plate. The engraving operation occurs in a protected way and in a totally harmless way for the operator, as on the machine we used the highest security standards.
**Helios laser engraving system description**

Main characteristic of the system, besides its absolutely security, is the possibility to perfectly reproduce the same plate, as a plate is damaged after the normal production cycle, without any imperfection and difference, if compared to the one previously engraved. The system is composed of an all in one processing station for the control of the engraving process (CTiP). Engraving is possible on printing plates made with the following materials: brass (standard), copper, nickel. Plate thickness from 0.5 mm to 1 mm (others on request).

Engraving main features (material dependant):
- Engraving maximum depth: up to more than 200 μm
- Engraving minimum width: from 20 μm
- Laser head engraving area: from 40x40 to 110x110 mm

With our laser engraving system you can obtain full three dimensional control over the engraving process. The laser engraving machine provides you with a very sophisticated tool to engrave the metal plate: with our laser engraving system you can engrave on nickel, brass, copper choosing the right machine configuration, the same machine can be configured to engrave on more than one kind of metal. Custom request based studies can be done to set up the machine to be able to engrave on other kind of materials.

Considering the laser as an etching tool you can calculate and simulate any type of engraved image you need to obtain and add features such as:

- Multilevel engraving
- V-shape proportional engraving (line depth is proportional to line thickness).
- Micro letters (available engraving optimization based upon font used);
- Fine dots with different depth.
- Different types of foot/grip for the engravings.

The images to be engraved can be processed with three precision modes that are available to the customer through our Helios Laser Engraving Software to better suit the needs of the engraving (faster or with the best precision):

- Normal.
- Fine.
- Ultrafine (microletters optimization).

**Helios Technical Specifications.**

- Moving System (X,Y,Z optional):
  - Total travel area (XY): 1000 mm x 1000 mm (customizable)
  - Total engraving area: 900 mm x 900 mm (customizable)
  - Drive system: Electronically controlled
  - Resolution (X, Y, per axis): 1 μm
  - Repeatability (X, Y, per axis): +/- 3 μm/m*
  - Accuracy (X, Y, per axis): +/- 5 μm/m*
  - Feedback (X and Y axis): High precision optical encoder
  - Feedback resolution: 0.1 μm
  - Feedback accuracy: +/- 1,5 μm/m*
Resolution/accuracy/repeatability are temperature stability dependent. The system needs to be installed in a temperature controlled room for best resolution/accuracy/repeatability results.

- Vacuum fixing chuck with temperature control
  
  | Size          | Standard chuck for 900x900 plates |
  | Material      | Metal                      |
  | Operating temperature | from room temperature to 40 °C |

- Air filter station

  Suction station with multiple filters (available: labyrinth pre-filter, chemical and electrostatic).

- PC Workstation

  The Helios laser engraving system is provided with the most up to date PC workstation configuration suitable for full use of the capabilities of the machine.

- UPS System

  The system is delivered with an integrated uninterruptible power supply unit (UPS) that can sustain the operation of the system in case of power interruption.

- Software

  The image processing software has been totally designed and realized by Cattaneo Meccanica Spa to suit the security printing market necessities.

- Overall machine dimensions

  | Size       | 3000x3000 mm. |
  | Weight     | 2 ton approx. |

- Electrical requirements

  Mains: 400/380 V 50/60 Hz, 3P+N+PE, 63A

- Compressed air requirements

  Inlet: 6 bar, 600m^3/h
Introduction

The “RCM II” is a computer aided rubber cutting machine capable of grinding:

- rubber inking cylinders.
- rubber inking plates.

Rubber inking plates or cylinders are used in the inking group of intaglio printing presses to transfer the ink from the inking unit to the printing plate: every rubber plate or cylinder must be perfectly shaped to be able to ink only a specific area of the printing plate in order to be able to print with more than one color at a time without facing color overlapping.

The RCM II rubber cutting machine can be realized to be able to engrave on different sizes of cylinders or plates in order to suit the customer needs.

Main characteristics of the system are:

- the same machine can be configured to engrave cylinders with different diameters or plates with different dimensions.
- easy to use PC based software interface.
- can be configured to be able to work in automatic mode if provided with an automatic tool changer.
- customization available for non standard cylinder diameters and plate dimensions.
RCM II rubber cutting machine description

RCM II system can digitize and engrave on different types of inking cylinders or plates the desired image for the inker rubber cylinder or plate.
Using the image processing software created by us, the system is capable of engraving almost seamlessly any image file that represents the shape that the rubber has to adhere to given by the graphic designer.

After setting up the system to know which kind of cylinder or plate it is going to engrave, the graphic image file loaded by the operator is translated into the right tool path used by the system to control the CAM station and then the job is started.
During the engraving job, the system is able to choose between different kinds of tools available in his tool set to differentiate the engravings.

The RCM II system with its high performances and precision eliminates the traditional make-ready and imprint phase needed for each printed color before manually engraving the desired inking images onto the cylinders or plates, saving valuable down time for the intaglio press.

The engraving program automatically calculates the image shortening or stretching deformations needed for a particular machine due to a specific inking cylinder diameter.

Cylinders or rubber plates can be prepared in advance for the following job while the printing machine continues its regular production, transforming a needed job change into a very fast process.

The intaglio inker image is stored in the computer and can be recalled and reproduced exactly when needed, allowing an immediate replacement of an original cylinder in the event of a damaged image on it.

The graphic design station can be placed in the graphic arts preparation department, and can be shared with other computer design programs, saving an additional design station, while the CAM control station remains in the production department, close to the Intaglio printing machine, both connected by means of a network cable or transferring files in diskette.
RCM II rubber technical specifications

(standard configuration for Phoenix IV rubber plates)

- Moving System (X,Y,Z optional):
  
<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total travel area (XY)</td>
<td>900 mm x 762 mm (30&quot;, customizable)</td>
</tr>
<tr>
<td>Total engraving area</td>
<td>520 mm x 762 mm (30&quot;, customizable)</td>
</tr>
<tr>
<td>Drive system</td>
<td>Electronically controlled</td>
</tr>
</tbody>
</table>

- Air filter station

Suction station: dust aspirator with filter and tank for easy rubber dust removal.

- PC Workstation

The RCM II rubber cutting machine is provided with the most up to date PC workstation configuration suitable for full use of the capabilities of the machine.

- UPS System

Available with uninterruptible power supply unit (UPS) that can sustain the operation of the system in case of power interruption.

- Software

The image processing software and machine control software have been totally designed and realized by us.

- Overall machine dimensions (to be customized upon rubber cylinder diameter or plate size)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>1600x1600x700 WxLxD mm.</td>
</tr>
<tr>
<td>Weight</td>
<td>300 Kg approx.</td>
</tr>
</tbody>
</table>

- Electrical requirements

  Mains: 230 V 50/60 Hz, 32A

- Compressed air requirements

  Inlet: 6 bar, 400 m^3/h
Section 3: Products and Market

Passports and other identity documents.

The use of intaglio printing, combined with good security inks (up to four) and security papers grants to both booklets and passports the highest quality in terms of anti-counterfeiting capabilities.

- **Stamps.**

Intaglio stamps printed with our web presses in USA by the Banknote Corporation of America, have been acknowledged as possessing excellent intaglio anti-counterfeiting characteristics by the Central Post Office.

It's also interesting to consider the possibility of printing other security items such as fiscal stamps or visa permit which have characteristics in common with stamps.

- **Certificates.**

For this kind of product the continuous format key advantage is that, once printed, the web could be easily handled over to the competent Authority for further computer based personalization.

Pondering the fact that the value of a certificate could be really high, (ownership of land or cars, university’s degrees) a proper use of security features is strictly recommended.

Ownership Certificates, Ownership Documentation and Registration papers for Insurance Companies and other similar items are produced with security features and under security restrictions. We believe that bigger quantities of this kind of documents could be secured using intaglio printing with almost no increase in cost.

- **Lottery tickets.**

Without the need to remember the size of lottery ticket’s market, it’s important to highlight that a good lottery ticket needs a very high security degree. The majority of our customers are actually printing these documents using our equipment with high returns in terms of profit and quality.

- **Railways and transport tickets.**

The growing number of passengers using domestic flights and using mass transport systems requests every company and/or Authority attention.

If we consider that the ticket has the same value as that of the banknote needed to buy it, an improvement of the security features used for this kind of documents is almost imperative.

- **Checks.**

The checks market could be considered one of the major commercial target areas.

Today’s market is facing a growing number of fraud on a worldwide scale. As stated by American Bankers Association together with other major US and European newspapers the total loss for the economy could be calculated in billions US dollars.

As the products are generally very non-descriptive and often of doubtful quality with a low degree of security, they could be easily printed with any commercial offset printing line.

This situation allows any last generation color copiers to reproduce the document without problems. We should not leave aside the fact that the main international banking system requests the check’s security.

The checks shall be secured by the peculiar computer assisted realization system and then printed with the intaglio press, the final document will be a real security document with a cost that will be still competitive.

- **Gift certificates.**

The market for this kind of items is very large. It’s believed that an introduction of a qualitative high rated product, economically priced, well designed and combined with a very high degree of security would find an even wider use.
A correct evaluation of the market numbers is quite difficult due to the very wide range of products. The ability to offer a multicolor Intaglio printed Gift Certificate or Voucher can be considered mandatory for every commercial security printer.

- Bonds and shares.

This market is still rather conservative and divided in two parts:

- Larger Companies Bonds or Shares are actually very expensive: the work needed for their personalization requires accuracy and in many cases the style and design of the product is old-fashioned.

- Smaller Companies Shares and Bonds are usually graphically designed with very little attention to security features and with low accuracy giving to the consumer an impression of low value even if the bond or share has a high nominal value.

- Vouchers and payment documents.

This is a specialized section within the banking system. Printed products supplies and type of documents would have to be studied usually in association with individual banks.

It’s important to highlight that the potential turnover represented by these documents is close to the check’s one therefore an accurate marketing survey to determinate their characteristics is very important.

- Security labels.

There are numerous types of self-adhesive labels on the market. Their security is absolutely nil. With the huge amount of piracy production worldwide, particularly of well-known USA brand names, the pirates simply forge the labels at the same time and with the very same standards.

Through an appropriate printing process, we do not claim to eliminate forgery or piracy production entirely but through the use of methods and systems which are controllable by the true producer, all within commercially acceptable terms, the forgers and pirates will be very much discouraged to produce " the very same product ".

Such types of security labels do have a promotional effect and are of great advertising value when designed professionally and integrated either within the corporate identity or with regards to the type of product, or both, and printed professionally in multicolor, making full use of technical instrumentation available in modern plants. Besides stamps, also labels can be produced on self adhesive paper, standard paper, in reels etc.

- Vehicle or property certificates.

Among Ownership Certificates, Ownership Documentation and Registration papers for Insurance Companies a relevant number of these printed items are realized with security features and under security conditions. These documents can only be printed with web fed machines because of their continuous format related with the fact that all these documents have to be personalized only upon delivery by the relevant Authority.