IR Blocking Inks

Description

H. W. Sands' series of IR Blocking Screen Printing Inks are unique in that they strongly absorb in the Near IR region of 800nm -1000nm and transmit a high percentage of light in the visible spectrum (400nm - 700nm). These inks have been specially formulated for the production of translucent transaction cards to meet the infrared wavelength range requirements of the ISO/IEC 7810:2003 specification for transmission density (O.D.) of 1.3 from 800nm – 950nm and 1.1 from 950nm – 1000nm. Transaction cards printed with these inks, in accordance with the guidelines herein, should perform properly in ATM machines and other readers possessing IR sensors to detect the presence of the card.

These inks are similar in structure and body to conventional solvent screen inks; however, the highly technical dyes used in their production necessitate special consideration in their storage and use. While each screen printing operation has its own differences and nuances, H. W. Sands IR Blocking Screen Inks are formulated to work around these differences. This bulletin outlines procedural guidelines that should be followed to obtain the optimum, desired results.

Application Suggestions

IR blocking inks must be printed and dried in a clean environment. Always be sure that the screens, squeegees, knives, spatulas, or any other equipment that comes into contact with the IR blocking inks are clean and dry, completely free of all solvents or other matter. In addition, the sensitivity of the IR blocking inks to UV light and high temperatures and specific chemicals should always be considered.

Product Properties

Thinning

Thinning of IR Blocking Inks to reduce the viscosity is not suggested. This will cause a decrease of the IR Blocking component in the inks resulting in decreased lay-down of the IR blocking components and ultimate non-conformance of the card. If thinning is required to meet a preferred viscosity goal, testing must be performed to determine the appropriate screen mesh and/or number of print passes required to meet the IR blocking requirements. Cyclohexanone is the preferred solvent for thinning with complete mixing being of critical importance to insure homogeneity of the resulting ink.

If the IR Blocking Ink is to be used with a complementary interference ink layer, thinning may be used to meet a preferred (lower) viscosity goal and/or lay-down goal. A higher screen mesh will also achieve the same goal.

H. W. Sands' IR Blocking Inks are formulated using a laminating varnish; therefore, any thinning of the ink may reduce post lamination peel strength.

Mixing of IR Blocking Inks

IR Blocking Inks may separate slightly upon standing. It is highly recommended that the inks be thoroughly mixed/stirred prior to use. If separation is of concern, the inks should be brought to approximately 35°C for 30 – 60 minutes with subsequent mixing. This process will re-dissolve any dye component that has separated during standing.

It is not recommended to mix IR Blocking Inks with any other ink. The IR dyes contained in the inks may react negatively with components in other inks causing them to either react or precipitate out of solution. If they precipitate out the result will be loss of clarity and IR blocking in the final card. If a color other than that of the IR Blocking Ink is desired, the interference process of printing is the preferred method. By printing on an alternate surface, interactions of the inks are minimized therefore maintaining the integrity of the individual ink components.

If overprinting on top of the IR Blocking Ink is required, it is suggested that an aqueous, non-amine containing ink be used so as not to react with or dissolve the IR Blocking Ink. In addition, the layer of IR Blocking Ink should be completely dry prior to the overprinting. If the IR Blocking Ink layer is not dry, interactions between the layers can occur resulting in less than optimum translucent colors.

Printing Recommendations

Print Equipment

H. W. Sands' IR Blocking Screen Inks are press ready inks formulated to work on hand or automatic; sheet or web-fed screen printing equipment.

Squeegee

Flatbed - It is preferable to use a medium or medium-hard (65 durometer) rounded edge squeegee.

Cylinder – It is preferable to use 80 durometer semi-rounded squeegee at a 15 degree angle. Tip: use a fine emery paper to smooth the squeegee after sharpening.

Screen

Flatbed - A US 230-mesh polyester monofilament screen (230 lines/inch) or 90 metric (90 lines/cm) or lower is recommended.

Cylinder – A US 280-mesh polyester monofilament screen (280 lines/inch) or 110 metric (110 lines/cm) or lower is recommended. Recommend speed for cylinder printing is approximately 2,000 sheets/hour.

This recommendation is based on the expectation of the IR Blocking Ink being the only vehicle for blocking IR light. If interference printing is to be used, a higher screen mesh may be suitable, as the corresponding opacity of the interference ink may diminish the overall requirements for the IR Blocking Ink. The intended mesh should be tested, with the final test card analyzed for opacity prior to finalizing the process conditions and moving forward with full scale production.

IMPORTANT: When using IR Blocking Inks, a dedicated screen should always be used. Using a screen that has been used with pigment inks (e.g. pearlescent inks) can cause insufficient transfer of the IR Blocking Ink to the substrate due to screen blockages. The result will be insufficient blocking of IR light. Also, the solvent base of the IR Blocking Inks can dissolve inks used previously with a non-dedicated screen, resulting in discoloration of the printed substrate.

Heat and Drying

Drying/Lamination

Drying through use of racks or forced air at a temperature of 50^{O}C is standard with IR Blocking Inks. It is important that the printed stock be completely dry before laminating. If the printed ink is not allowed to dry completely or properly (e.g. drying is performed too quickly, and/or at too high a temperature, or printed sheets are not racked for a sufficient amount of time) the potential to "skin over" is a real concern. In this situation the top layer is dry but the ink remains wet under the surface with the print appearing dry to the eye and touch; however, upon sitting, the wet ink below the surface will re-dissolve the surface layer resulting in a tacky or wet print surface. This is a primary cause of "blocking" during storage and can result in poor lamination with a reduction of print clarity in the final card.

Lamination temperatures of 150 ^{O}C for 20 – 30 minutes are standard for IR Blocking Inks. These inks are capable of withstanding higher temperatures with an appropriate decrease in the overall exposure time. Prolonged exposure at higher temperatures will decrease the IR blocking efficiency of the ink.

Stability

UV Light

Excessive exposure to UV light can degrade the IR dyes contained in the ink thereby causing a decrease in their IR blocking efficiency. If the screen printing equipment contains UV curing lamps, it is imperative that these lamps be disabled/turned off when processing IR Blocking Inks. It is important that any UV cured inks used in the card body construction be printed prior to the application of the IR Blocking Inks to minimize any potential of the IR Blocking Ink being subject to UV exposure.

Chemical Interactions

Laminating adhesives containing ammonia, ammonia containing compounds or amine compounds can decrease the IR Blocking efficiency of these inks. These types of chemicals are common in some water based laminating adhesives. In general, a laminating adhesive is not required when using the IR Blocking Inks, as the base varnish is a laminating varnish; however, it has been seen that even using these types of adhesives, on alternate core layers, can negatively impact the IR blocking efficiency of these inks.

Storage and Handling

It is recommended that IR Blocking Screen Inks be used as soon as they are received. Prolonged storage of these inks for more than 3 months could cause deterioration of certain dyes contained in the inks and therefore the IR blocking efficiency deteriorates with a corresponding change in the original color. Short term storage of these inks should be in a humidity and temperature controlled environment, with the temperature being at 16-24^{o}C, but not below 8^{o}C. **Do not refrigerate.**

IR Blocking Inks should be stored out of direct sunlight, preferably in the dark, to minimize the impact of UV light on the inks. If the inks are transferred to another container, that container should also be opaque.

Printed Sheet Storage and Shelf Life

In general, once printed the IR dyes are extremely stable. Printed sheets (core stock) should be maintained in a humidity, temperature and light controlled environment. A temperature of 23^{o}C or below is preferable, with the printed sheets being covered to minimize the impact of UV light on the ink. Under these conditions, there is no reason that a six (6) month shelf life, or greater, should not be achievable.

Printed sheets should not be stored in the direct presence of solvents or other chemicals. One should be certain that the inks are completely dry prior to stacking, and stacking should be kept to a minimum. If the inks are not completely dry prior to stacking, this will result in “blocking” where sheets stick to adjacent sheet causing a transfer of ink with the potential to ruin the sheets. If the sheets are stored in an environment where solvents are used on a regular basis, the printed inks can absorb these solvents with the potential to cause “blocking”.

All applications using this product should be thoroughly tested prior to approval for production.