

Digital Printing Platforms Descriptions & Certifications

There are four recognized platforms of digital printing on which we can expect the Kallima® sheet will be used **Xerography, HP Indigo, Direct Imaging and Ink Jet**. Digital printing is an imaging process where all printed matter, text, photos, etc. is in digitized file format from its creation to the printed page. In some circles, digital printing and conventional offset printing are considered on even terms.

The four basic processes function as follows:

1. Xerography

A beam of light, typically a laser, strikes the original material, a white or light surface with black lettering or photo. A photo sensitive plate, on which electrical charges have been spread, receives the reflected light from the original material. This neutralizes the charges on the areas, which were struck by the reflected rays and charges are retained on the areas, which correspond to the image areas of the original.

The dry toner, comprised of plastic pigments, is introduced and sticks to the electrically charged image areas. The paper is passed between the plate and a charged drum and the powder is drawn from the plate to the paper and forms the positive image of the original. The powder is then fused to the paper with heat. Since the image on the electrically charged drum is projected rather than transferred by contact, it is possible to alter the size of the original to a larger or smaller version than the original. Variations, in more simplistic processes, are laser printers and some fax machines.

Certification

The digital production presses on which Kallima® product is either qualified, via a certification process, or is being run in the field include the Xerox iGen 3, the Kodak NexPress 2100 and the Xeikon generation of presses.

Kallima® has been officially certified through the RIT Printing Applications Laboratory using the Kodak Nexpress 2100 certification protocol. Press scripts for Kallima®, which represent the press set-up unique to the Kallima® product, can be found on the NexPress 2100 (www.nexpress.com) and RIT (www.printlab.rit.edu) web sites. These press scripts optimize the print performance on the Kallima® product. Calipers certified were 8 pt., 10 pt. & 12 pt. Kallima® C1S Plus, front & backside and 8 pt. and 10 pt. Kallima® C2S, front and backside, with 12 pt. certified by extrapolation of the 8 pt. and 10 pt. data.

2. HP Indigo

This process uses liquid toners (inks), which require some assistance for transferability and adhesion to the substrate. The image transfer is from a blanket cylinder. This assistance of transferability is provided in the form of a thin, film primer, known as sapphire coating. This coating is a water-based suspension and has a shelf life of up to six months in a vapor barrier poly-wrapping and is dependent on storage and environmental conditions.



The following are the tests conducted on substrates, which receive the HP Indigo Digital Offset Color™ press approval certification:

- **Runnability**—to certify that the substrate will run smoothly through the press.
- **Ink Transferability**—quality of the ink transfer from the blanket to the substrate.
- **Blanket-to-substrate compatibility**—interaction between the substrate and the blanket, which may cause a blanket-memory effect, also referred to as “ghosting” and manifests itself as mottle.
- **Ink-Substrate Interaction** as reflected in—
 - The degree of ink fixing to the substrate, or adhesion of the image to the substrate
 - The resistance of the ink layer to abrasion
 - The degree of flaking of the ink layer, which reflects the printed substrate's ability to withstand a variety of press and bindery finishing operations.

Certification

Kallima® has been tested and certified for use in this process through the RIT Printing Applications Laboratory. Kallima® is **not** listed on the RIT PAL or HP websites as a certified substrate because it did not reach the test target sheet count of 15,000 necessary to satisfy the protocol requirements. The most critical aspect of this process is that the substrate requires the sapphire coating to assist ink transfer and blanket compatibility to prolong blanket life and maintain image quality on 2nd transfer. However, sapphire coating has a six-month shelf life in the most optimum packaging and storage conditions. A short press run of 1,500 **sheets** can be successful without sapphire treatment on Kallima® stock, but a more prolonged run will eventually result in “ghosting” and residue dots from the first transfer. This condition will only worsen with increased sheet count and result in a damaged blanket. There is one option to successfully running longer runs on non-sapphire-treated substrates. This option requires the

press operator to run “yellow only, full-length, full-width” cleaner sheets at every 1,000 sheets. Yellow is the tackiest ink and act as a cleaner for residue. Calipers run were 8 pt., 10 pt. & 12 pt. C1S Plus front and back sides and 8 pt. and 10 pt. C2S, front side only. Kallima® Digital is guaranteed for press runs of 1,500 sheets or less.

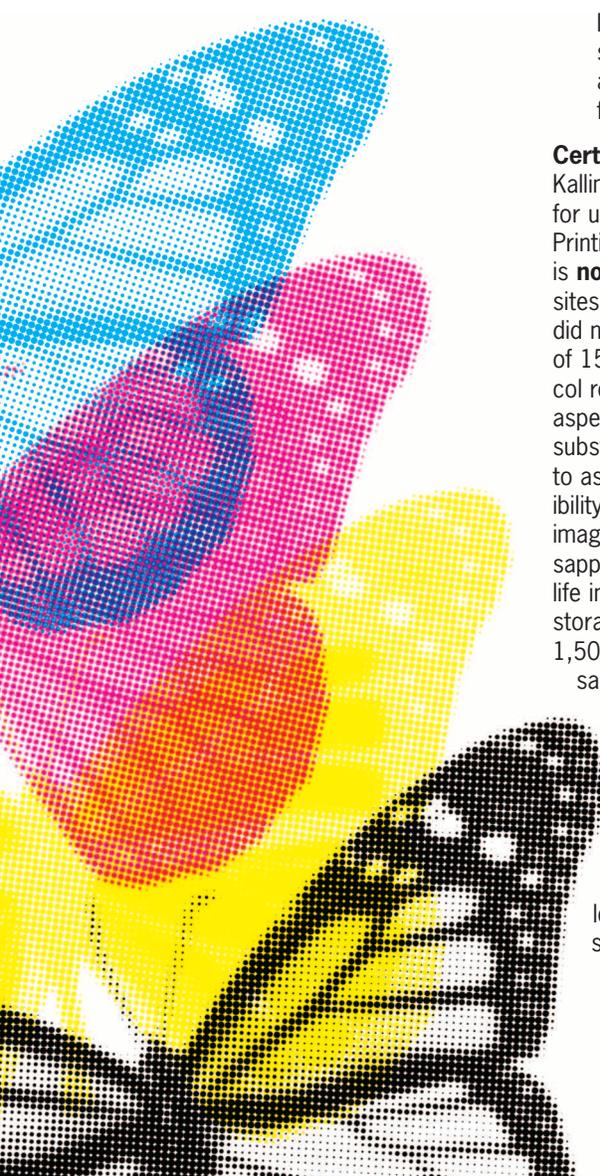
3. Direct Imaging

This represents the smallest, but fastest growing segment of the digital print market, led primarily by Heidelberg. It is a waterless offset print method, which still uses digital information technology for print files and non-solvent, water-based or soy-based inks and no dampening system. Since there is no pre-press or on-press chemistry and the plate material is 100% recyclable, this is an environmentally friendly process.

The image is laser-etched onto a polyester-based, silicone-coated film, which forms the printing plate. The etching is simultaneous on all printing units, which maintains consistency with register through the press. Wherever ink is to be laid down, a laser removes the silicone and image-forming layers from the plate, thereby exposing the base layer of polyester, which accepts ink. The remaining silicone film repels the ink from the non-image area. Ink viscosity is very important to the reproduction and the ink rollers are temperature controlled to maintain consistency in this phase of the process.

The run life for plates in this process is up to 20,000 impressions and can accept the waterless offset inks as well as metallic inks and aqueous and UV coatings, which are formulated for this process. Due to the elimination of pre-press plate-making operations and manual handling of plates on the press, the average make-ready time with this process is substantially less than conventional offset.

In addition to Heidelberg, other digital presses in the marketplace are the 74 Karat, Ryobi 3404 and Adast 705C-DI.



Certification

Kallima® has been certified for use on the Heidelberg QMDI through the RIT Printing Applications Laboratory for printability only. The preferred range of substrates for the direct imaging presses is 24 lb paper to 12 pt. Board. The conventional rule is that any substrate within this range that will print acceptably in conventional sheet-fed offset should perform acceptably on the DI presses. This includes all Kallima® Coated Cover grades and calipers, as well as Litholam and Folding grades. Printability is the only performance factor that is evaluated for this process.

4. Ink Jet

These systems are considered part of the digital print market because the data used to perform the printing application is in digital format. They are primarily used in variable data, transactional printing, personalization and labeling and bar code systems, which require sharp, readable ink lay. The method, which is a non-contact printing method, works by expelling fine droplets of ink using a series of nozzles onto the substrate to form a seemingly fluid stroke of ink. Mostly monochromatic, some systems can use multi-color inks to produce color imaging, similar to what is printed on ink jet office printers. The most critical characteristic for ink jet application is an open, or porous, surface for compatibility of ink setting and curing.

Certification

Testing was conducted by Kodak Versamark (Scitex) on Kallima® C1S Coated Cover, Kallima® C2S Coated Cover and Kallima® C1S Folding. The samples were printed using three Kodak Versamark printing stations – the PH 90 print head used on the V-series CIJ printer for water-soluble inks, the 4350 UV printer, and the 7122 solvent-based printer. In summary, the two Kallima® board grades tested work well in Versamark (Scitex) ink-jet applications for black text and line printing, with special attention given to specific characteristics and testing to the properties and tests described below:

V-series results (water-based) Process Results

This evaluation determines how papers perform with standard water-based inks printed using continuous ink jet printing in various widths with black only and color printing. The key properties and their results are the following:

- **Optical Density** – ink used was black 1036; results indicate the coated side of both Kallima® Coated Cover and Folding grades had acceptable density levels and the back-side print density indicated a highly absorptive surface, allowing the ink to penetrate the sheet. *Ink jet applications to the backside should be tested in specific applications to ensure customer satisfaction with substrate performance.*
- **Water-fastness** – this test incorporates placing printed samples in water for 60 seconds and showed neither Kallima® Coated Cover nor Folding grades have water permanence and allow too much ink migration and loss of the print integrity. *These substrates should not be used in any application where water permanence is critical for water-based ink-jet application.*
- **Black Ink Feathering** – this test measures the line raggedness and line width and is most critical to bar code printing, but is also important to line text printing. All Kallima® Coated Cover and Folding grades exhibit acceptable ink spread levels as measured by this test. *Kallima® can be recommended and used in this process. Ink jet equipment and inks may vary by user from Kodak equipment and it is advisable to test products for compatibility.*
- **Color-to-color bleed** – this test determines how well the substrates handle process color inks in the ink jet system. Using the KodakVersamark process, the inks are applied “wet on wet” and the Kallima® substrates did not perform well. This is primarily due to the coated and/or sized surfaces of the Kallima® boards. This process is not one in which Kallima® would typically be used, since it was developed primarily for document and variable data printing for which papers are specially formulated. *Kallima® should never be used in this application.*



4350 (UV) & 7122 (solvent-based) Process Results

These two systems are used to print black ink on a variety of substrates and are primarily used for addressing and text applications. Kallima® was compared to both paper and non-paper substrates for comparative purposes. A grade or measurement is then assigned to each property, and rated as acceptable or unacceptable. The critical properties in these applications are Darkness (optical density), Image uniformity, Dot spread, Wet Rub and Scratch Test and Bend and Fold. Overall, Kallima® C1S Plus, C1S and C2S and Folding met all requirements, with some concern for bar code scanning. However, the bar code scanning results are highly dependent on the scanner to be used and should be tested accordingly.

- **Darkness (optical density)** – rated acceptable on the coated sides and marginally acceptable on the uncoated back-sides, indicating the absorptive characteristics of the back-side of all Kallima® uncoated grades which diminishes the optical density of the print. *Any application of this process to the backside of Kallima® Coated Cover or Folding grades where optical density is critical should be tested but cannot be guaranteed to maintain consistency or meet end-use requirements.*
- **Image Uniformity (evenness of print)** – rated acceptable on the coated side with some concern over ink absorption resulting in low bar code scanability and higher ink feathering as measured by line roughness and width. Rated very good on the back-side of Kallima® Coated Cover and Folding grades, which is an indication of the printing and hold-out properties of the coated side and the absorptive nature of the backside of these substrates. Imaging on the top-side should be tested while the uncoated side is acceptable. *Kallima® can be expected to perform acceptably in this application and where this property is critical.*

- **Dot Spread (black line uniformity)** – rated acceptable on the coated side and equal to or better than the control on the back-side, which is very acceptable for this property in this process application. This application is critical to both text and bar code printing. *These substrates can be recommended to perform well for this process where this property is critical, although the bar code reader equipment i.e., scanner, is important to the end results and testing is recommended.*
- **Wet Rub and Scratch Test (tests for ink adhesion to the surface)** – rated acceptable, equal to or better than the control, on all coated and backside surfaces of the Kallima® Coated Cover and Folding substrates. *These grades can be recommended to perform well in the application of this process.*
- **Bend & Fold (test for ink disruption at fold)** – rated acceptable on the coated side and the back-side of all Kallima® Coated Cover and Folding grades. *All Kallima® Coated Cover and Folding substrates can be used in this application with good process results, which also reflects the good results in the previously-mentioned 'ink adhesion' test.*

Only the most critical characteristics and test results to each of the three ink-jet processes has been outlined in this technical bulletin. More extensive testing and the resulting technical data was provided by the testing facility used to provide this technical bulletin and will be maintained in the Tembec Technical Resource Center for reference purposes only. Please contact the Tembec Technical Director or the Technical Representatives with any questions or where clarification is required.

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