



DYNACOLOR™ DATA SHEET

THERMOCHROMIC OFFSET INK (INCLUDING LITHO, DRY AND UV CURE OFFSET INKS)

DESCRIPTION

DYNACOLOR™ thermochromic offset inks, in printed form, are a pastel color below a specific temperature, and change to colorless or to another, lighter color as they are heated through a defined temperature range. These inks are available in various colors and activation temperatures. Standard activation temperatures are 15, 31 and 45° C (59, 88 and 113° F). Other activation temperatures are also available, from -5° C to 65° C. The activation temperature is defined as the temperature above which the ink has completely changed to its final clear or light color end point. The color starts to fade at approximately 4° C below the activation temperature and will be in between colors within the activation temperature range. The color change is “reversible,” i.e., the original color will be restored upon cooling. See Color Availability Chart for a complete list of available colors. **DYNACOLOR™** offset ink is ideal for document security, promotional items, temperature-indicating labels, packaging, games, novelties, etc. Offset inks are available for lithographic, dry offset, letterpress and UV cure wet and dry offset processes.

TYPICAL PROPERTIES

	<u>Standard Wet Offset</u>	<u>UV Wet Offset</u>
Viscosity (at 25° C)	250-350 poise	300-500 poise
Tack (Initial) at 1,200 rpm/1 min.	9.0-11.0 g*m	12.0-14.0 g*m
Percent Solids (Approx.)	79%	90%
Percent Volatiles (Approx.)	<6.4%	<4.2%
Food Contact Compliance Status	Approved for Indirect Food Contact	
Recommended Substrates	Uncoated Paper	Paper, Film
Yield Range (Approx.)	100,000-200,000 in ² /lb. (depending on film thickness)	

SPECIAL CARE & USE INSTRUCTIONS

- Consult Technical Notes for instructions for use.
- **DYNACOLOR™** thermochromic offset inks are patented, U.S. Patent Nos. 5,591,255 and 5,997,849. Technical notes are available upon signing a confidentiality agreement. Contact CTI for details.
- Run Speed: **DYNACOLOR™** ink has been run at 1,400 feet per minute for several hours at a time without serious press problems. On certain presses, one may need to stop the press every hour or so to clean the blanket due to piling.
- Four-Color Process: Though we do offer a magenta ink, thermochromic inks cannot be substituted for process colors. The color will not be correct for four-color work.
- Carbonless Paper: The ink can be printed on either side of the CB sheet, or on the uncoated side of the CF. In the case of multi-ply, the ink can be printed on the CFB side. In other words, the ink is incompatible with the CF side of CF paper.

STORAGE AND HANDLING

The inks have excellent stability when stored away from heat. The material is combustible and should not be used near open flame. Store below 90° F. Should be used within nine months of purchase. Storage longer than twelve months is not recommended. Consult product MSDS prior to use.

SENSITIVITY

Thermochromic materials are sensitive to adverse environmental conditions. These are listed below, along with a description of the nature of the sensitivity, and recommendations with regards to them.

LIGHT: Most significantly, long exposure to UV and some fluorescent lights can degrade color intensity and changing characteristics of the ink. Extreme exposure of more than several days of direct sunlight may degrade the color of the ink, though it will probably still change colors. More than 600 hours of a strong fluorescent light may also cause a loss of color in the thermochromic. This is true of many different pigments and dyes. In handling these materials, a good rule of thumb is to assume that they are about as sensitive to light as fluorescent pigments are.

HEAT: Extended exposure to very high temperatures, i.e., 100° F or higher, can also degrade the pigment. The effect of light exposure seems to be additive over time. However, with heat, the exposure only has an effect if a given temperature is constantly maintained for a given amount of time. For instance, if a printed piece is left in a car on a hot day, out of the sun, at a temperature of around 130° F for eight hours, one might see slight degradation of the piece. If the same piece is left in the car on a cooler day, say 100° F for the same amount of time, no degradation would be seen. This could happen for months on end before any degradation was seen, as long as the piece were returned to a cooler temperature for the other sixteen hours of the day. If the piece were left in an environment where it remained at 100° F for many days, one might then expect to see a reduction in color. In other words, the effect is time- and temperature-dependent.

CHEMICALS: Thermochromic materials are sensitive to chemical exposure as well. Since it is very unlikely that the printed piece will come into contact with deleterious chemicals under normal conditions, this should not be of great concern. On the other hand, because of the chemical sensitivity and softness of this ink, it also has excellent anti-alteration properties.

CONCLUSION: In short, this ink should be stored in a cool, dry place, away from direct exposure to light, especially sunlight. This is true of both the printed ink and the wet ink. Ink in the can should be used within six months of receiving it. If the color or color reaction is compromised in a security environment, one need only to continue to verify the authenticity of the document by other means; ghost watermark, bleed through inks, etc. We predict that with proper handling, the failure rate of the ink will be less than one half of one percent, and as mentioned above, this means that one need only continue to verify authenticity and not redeem the document for cash until confirmation is established.

NOTE REGARDING HYSTERESIS: Reversible thermochromics exhibit what is referred to as “hysteresis.” In other words, if a standard “Body Temperature” ink is raised to an extreme temperature, say above 150° F (as with a curing unit), then left to cool under normal ambient conditions (65° to 75° F), the ink may not achieve its full color, even after it reaches room temperature. Although, under normal circumstances the ink should have full color up to 7-8 degrees below the stated activation temperature, once exposed to this kind of temperature “spike,” one may need to lower the ink’s temperature to below 50° F to gain improved behavior. **ALL APPLICATIONS USING COLOR-CHANGING INKS OF ANY KIND SHOULD BE THOROUGHLY TESTED PRIOR TO APPROVAL FOR PRODUCTION.**

For further information or assistance, please contact Chromatic Technologies, Inc. at (888) 294-4CTI.

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