

Section 5. Ink

General Information

Semiconductor manufacturers use the vision system of automatic pick and place equipment during the assembly process to detect damaged and/or rejected die. This is done by shining a combination of different lights on the wafer surface to create a “white” background. Ink dots and defects such as chipped corners are easily recognizable against this background.

Xandex 8103, 8104, 7824, 7824T and Markem® 6993 inks are opaque and easily recognizable under all lighting conditions. Xandex Glycol Free 8103 ink is thick in viscosity and delivers opaque dots ranging from 6 to 40 mils. Xandex 8104 is not as viscous as 8103 and provides thinner dots with excellent geometry and adhesion in a larger dot range up to 86 mils. Markem® 6990 and 6997 are less opaque and may not offer sufficient contrast under all lighting conditions.

Xandex 8103 ink is certified to contain less than 10 ppm of Sodium (Na) and Chloride (Cl). Xandex 8104 ink is certified to contain less than 20 ppm of Sodium (Na) and Chloride (Cl). Both 8103 and 8104 premium inks are free of glycol ethers, which are identified reproductive hazards and carcinogens. Xandex 7824 and 7824T inks are certified by Xandex to contain less than 10 ppm of Na and Cl. Markem® 6990 is certified by Markem® to contain less than 25 ppm of Na and Cl. Analysis reports are available upon request from Xandex Customer Service.

Although Markem® 6993 and 6997 are not contaminant controlled, periodic test data indicates that these inks typically contain less than 100 ppm of Sodium (Na) and 300 ppm of Chloride (Cl). These levels are not certified or guaranteed by Markem or by Xandex¹.

Xandex Glycol Free 8103 and 8104 inks have a 4 month shelf life, rapidly air dry at ambient conditions and will give consistent flow for 3 days after cartridge opening. Markem® 6990, 6993 and 6997 inks have a 4 month shelf life, require heat curing to be permanent, and will give consistent flow for 5 days after cartridge opening. Xandex 7824 and Xandex 7824T inks have a 4 month shelf life and will give consistent flow for 3 days after cartridge opening. Xandex 7824 and 7824T can be air or “heat set” cured.

Xandex Glycol Free 8103 and 8104 inks are thermally stable at temperatures up to 150° C and can be used in hot chuck or oven drying applications without cracking or loss of adhesion. Use of either Markem® 6990, 6993 and 6997 or Xandex 7824 and 7824T inks in hot chuck applications is not recommended as the elevated ambient temperature in the probing area can reduce cartridge life and cause inconsistent ink flow. However, use of a hot chuck to heat set dots during offline inking has reportedly been successful when employed by some customers. All of the inks offered by Xandex are non-magnetic.

Material Safety Data Sheets (MSDS) are available for all inks offered by Xandex. To obtain MSDS or information about choosing the appropriate ink for your application please contact your local distributor ~~XANDEX~~ Customer Service at (707) 763-7799 • Toll Free in the United States: (800) 767-9543 • FAX (707) 763-2631. • Visit us on the Internet at www.xandex.com or email info@xandex.com.

Ink Curing

The procedure for curing will depend on the type of ink used. Markem[®] 6990, 6993, and 6997 should be cured/baked within 2 hours of inking due to the evaporation of solvents in the ink over time. If a wafer (or boat of wafers) is left on the prober for an extended period of time, the dots may crack and/or flake after the baking process.

Markem[®] 6990, 6993, and 6997 inks, which are air-dried, will not smear when touched. They are not permanent, however, and will not withstand most post-probe handling or processes. Conversely, Xandex 7824 and 7824T inks air cure within 2.5 hours (≤ 20 mil, up to 8 hours for >20 mil dots). Xandex 7824 and 7824T may also be “heat set” at 120°C for 10 minutes.

Xandex 8103 and 8104 Glycol Free inks hard cure under ambient conditions in the least time of any of the inks offered by Xandex. Ink dots of ≤ 25 mil air dry to a hard cure in 45 minutes. The following tables provide specifics for each type of ink:

INK CURING			
CURE TYPE	TEMPERATURE	CURE TIME	RESULT
Markem[®] 6990, 6993, and 6997			
Soft Cure	100-150°C	5-15 minutes	Ink is semi-permanent and will not withstand wash of alcohol, acetone, or photoresist removers
Hard Cure	150-185°C	30-60 minutes	Ink is permanent and resistant to wash process
Xandex 7824, 7824T			
Hard Cure	Air dry, ambient conditions	2.5 hours \pm 0.25 hrs for ≤ 20 mil, up to 8 hrs >20 mil.	Ink is permanent and may only be removed with great difficulty
Hard Cure	150 watt heat lamp at 5-6 inches OR oven at 110-120°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty
Xandex 8103 and 8104 Glycol Free			
Hard Cure	Air dry, ambient conditions	5-15 minutes for 5-15 mil 15-45 minutes for 15-25 mil 45-min-2.25 hours for 25-40 mil	Ink is permanent and may only be removed with great difficulty

Note: Longer drying times are required for larger dot sizes.

Note: Markem[®] is a registered trademark of Markem Corporation, Keene, NH

Ink Removal Information

A rinse with isopropyl alcohol or acetone generally removes ink completely if the wafer is washed shortly after inking (within 5 minutes). An ultrasonic bath is recommended to ensure complete removal of ink residue. Ink dots, which have been air dried or hard cured, require the application of an ink remover.

DieMark Remover 8000

Xandex has developed DieMark Remover 8000 specifically for the semi-conductor industry. DieMark Remover 8000 thoroughly removes all inks supplied by Xandex, including oven baked ink dots. DieMark Remover 8000 has very low levels of organic and inorganic contaminants and is an efficient and thorough ink remover when used in simple bench top cleaning methods. Due to its high flash point, DieMark Remover 8000 is also safe and effective when used in ultrasonic, temperature/pressure cycling under vacuum and deep bath heating and agitation ink removal processes.

DieMark Remover 8000 is carcinogen free (NTP, OSHA) and all ingredients used are TSCA listed. For an MSDS or more information on using DieMark Remover 8000 in your specific ink removal process, contact Xandex Customer Service.

Ink Removal Procedure

The following is the recommended bench top procedure for removing ink from wafers using DieMark Remover 8000. *



CAUTION: All procedures should be performed under a laboratory hood, following the proper safety precautions (protective goggles, gloves and clothing).

1. Apply sparingly with an eyedropper to a localized area of the wafer.
2. Allow 2-3 minutes for the DieMark Remover 8000 to begin solvating. Time required will vary depending on the degree that the ink was cured.
3. For highly cured ink dots, use longer soak times, then wipe gently with a clean lint-free cloth to facilitate removal. If necessary, repeat steps 1 and 2.
4. For large areas or removal of ink from entire wafer, soak a clean lint-free cloth with DieMark Remover 8000, then lay the wet cloth over the entire surface and allow time to soak/solvate ink, then remove wet cloth. Repeat as necessary.
5. After dots are removed, clean wafer via standard procedures, such as vapor degreasing, and/or rinse with a clean solvent (Isopropyl Alcohol) followed by a bake cycle at 65° C to dry.

* The following ink removers may be substituted for DieMark Remover 8000, however, Xandex does not guarantee that satisfactory results will be obtained. None of the following solvents or ink removers are available from Xandex.

- ◆ Aptek 6515 Ink Remover
- ◆ Markem® 540
- ◆ P-300 Resist Remover
- ◆ 712-D Resist Remover
- ◆ Uresolve Resist Remover
- ◆ Methyl Ethyl Ketone (MEK)
- ◆ N-Methyl-2-Pyrrolidone (M-Pyrrol)