



Designation: D6073 – 08a (Reapproved 2020)

Standard Test Method for Relative Setting of Heatset Printing Inks¹

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1. Scope

1.1 This test method describes the procedure for determining the relative setting speed of heatset inks using a tester consisting of a forced hot air oven and print delivery system.

1.2 This test method is applicable to printing inks intended to be dried by the application of heat and for which a suitable reference standard is available.

1.3 Although heatset inks are normally printed by the offset process, this test method specifies the direct letterpress mode because the higher ink film thicknesses obtained tend to amplify subtle differences in ink setting speed. Prints are prepared by a flatbed printing apparatus using a constant depth printing gage.

1.4 This tester reads temperature and belt speed in nonmetric terms; therefore, instrument settings in this test method are stated first in U.S. Customary Units (inch pound units of measurements). The values given in parentheses are for information only.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.56 on Printing Inks.

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2. Referenced Documents

2.1 *ASTM Standards*:²

D6846 Practice for Preparing Prints of Paste Printing Inks with a Printing Gage

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *heatset printing ink, n*—an ink typically containing aliphatic hydrocarbon solvents that evaporate at elevated temperatures.

4. Summary of Test Method

4.1 A printing gage is used to prepare a laboratory print containing both the test sample and a standard ink. The freshly prepared print is immediately subjected to forced hot air in the tester, which is initially set at 350°F (177°C) and a belt speed of 30 fpm (0.15 m/s).

4.2 The print is cooled, overlaid with a clean sheet of stock, passed through the printing apparatus, and examined for setoff.

4.3 The process is repeated at different belt speeds or temperatures until either the test sample or the standard exhibits setoff and the other does not, or it is established that both are the same. The sample is then reported to dry faster than, slower than, or equal to the standard.

5. Significance and Use

5.1 The setting speed of heatset printing inks is important because it influences the efficiency of the drying process. This test method provides a means for comparing the setting of a heatset ink directly against a standard at the same conditions of temperature and exposure time. While the method does not determine the setting speed of an ink on a production press, it is useful for specification acceptance between the supplier and the customer.

5.2 The setting speed of a printing ink depends on a number of variables such as the substrate on which it is printed, the film thickness on the print, the temperature of the forced air, the rate of air flow, and the time that the print is subjected to heat. For

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

these reasons, it is important to conduct the tests under conditions that are controlled and as realistic as practical.

6. Apparatus

6.1 *Tester*, equipped with a forced hot air oven and print carrier system consisting of heat resistant revolving belts that act as the print delivery system. The air temperature is adjustable between 100 and 600°F (38 and 315°C) and the speed of the print delivery unit between 0 and 100 fpm (0 and 0.5 m/s). The print delivery system allows the print to be exposed to hot air from the top and bottom at the same time.

6.2 Laboratory Flatbed Printing Apparatus.

6.3 *Printing Gage*,³ conforming to Practice **D6846**, consisting of a type-high block of steel 0.918 in. (23.3 mm) in height; the top surface is precision-machined to contain a single constant-depth path approximately 3 by 7½ in. (76 by 190 mm), which is inked by means of a drawdown blade. A milled depth of 0.4 mils (10 µm) is recommended for coated paper and other smooth substrates. Deeper plates may be necessary for rougher substrates. Typical path depths and corresponding ink film thicknesses are given in **Table 1**.

TABLE 1 Relationship Between Gage Depth and Ink Film Thickness

Machined Depth of Gage		Ink Film Thickness		
mils	µm	On Substrate		
		On Gage ^A	Letterpress, ^B	Dry Offset, ^C
		µm	µm	µm
0.2 ^D	5	4	2	1
0.3	7.5	6	3	1.5
0.4 ^{D,E}	10	8	4	2
0.6 ^D	15	12	6	3

^A Presuming 80 % path fillage.

^B Presuming 50 % ink transfer from gage to substrate.

^C Presuming 50 % ink transfer both to blanket and to substrate.

^D Available on the 3-path FPBAA Plate C. Each path is 1¼ by 4 in. (3.2 by 10 cm).

^E Available on the single-path gage⁴ (described in **6.3**).

6.4 *Drawdown Blade*,³ 4 in. (102 mm) in length, so as to span the width of the printing gage.

6.5 *Metal Surface*, to cool the print immediately after it has passed through the tester.

6.6 *Metal Block*,³ type-high, of similar top dimensions as the printing gage.

7. Materials

7.1 *Standard Heat-set Ink*, as agreed upon between the supplier and the customer. The standard ink must be of the same color and transfer characteristics as the test ink. This ink should not be so old that changes in properties have occurred since its manufacture.

³ The sole source of supply of the apparatus known to the committee at this time is the Precision Gage and Tool Co., 375 Gargrave Rd., Dayton, OH 45449. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

7.2 *Printing Substrate*, such as paper, paperboard or other as agreed upon between the supplier and customer, cut to 8½ by 11 in. (216 by 280 mm) or other size appropriate to the printing apparatus.

7.3 *Carrier*, consisting of a sheet of cardboard approximately 8½ by 11 in. (216 by 280 mm), with a hole cut in the center that is slightly larger than the size of the print produced by the laboratory printing apparatus.

7.4 *Setoff Sheet*, cut to the same size as the printing substrate (7.2). If the printing substrate is paper, film or foil, use the same material. If paperboard, use coated paper 5 to 6 mils (1.1 to 1.4 µm) in thickness.

7.5 *Wash-up Materials*, including an appropriate solvent and lint free rags or tissues.

8. Sampling and Test Specimen

8.1 Carefully select a sample that is free of skin and other contamination and representative of the lot being evaluated. The minimum sample per print is less than 0.034 oz. (1 mL). Transfer to a clean container, protect with skin paper, close and seal.

8.2 When ready to make a print, remove enough sample for one test, then close and reseal the container.

9. Preparation of Apparatus

9.1 Tester:

9.1.1 Prior to operation of the tester, carefully read the instructions in the manufacturer's literature.

9.1.2 Set the tester on a work bench in a laboratory having adequate ventilation and space to accommodate the printing apparatus in close proximity.

9.1.3 Provide a power supply sufficient to accommodate the two heat guns capable of reaching desired temperature.

9.1.4 Adjust the speed control to the starting point for the tests, typically 30 fpm (0.15 m/s). In older units, it may be necessary to adjust the speed with the carrier on the belt.

9.1.5 Prior to the first use of the day, warm up the tester to 350°F (177°C) by turning on the two heater units.

9.2 Printing Apparatus:

9.2.1 Remove the normal plate and the setoff plate (if any) from the bed of the printing apparatus.

9.2.2 Place an inked gage (in accordance with **10.2**) in the bed of the press and pull a print in order to check whether the printing pressure is adequate. If not, place tympan or shim under the gage, or adjust according to the manufacturer's instructions.

9.2.3 Replace the printing gage with the metal block (6.6). Determine the number of setoff sheets needed for developing maximum practical pressure to achieve adequate setoff in **10.8**. One sheet is usually sufficient.

9.3 Printing Gage:

9.3.1 Prior to use, clean the printing gage and drawdown blade with solvent. Make certain they are free of dust, lint, grease, solvents or oils.

9.3.2 Information relating to care of the gage and blade before and after use is given in Test Method **D6846**.