



Operating Instructions

Flow Cups

**Cat. No. 0173, 0174, 0115,
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BYK-Gardner GmbH

Lausitzer Str. 8
D-82538 Geretsried
Germany
Tel. 0-800-gardner
(0-800-4273637)
+49-8171-3493-0
Fax: +49-8171-3493-140

www.bykgardner.com

BYK-Gardner USA

9104 Guilford Road
Columbia, MD 21046
USA
Phone: 800-343-7721
301-483-6500
Fax: 800-394-8215
301-483-6555

Flow Cups

Standards

ASTM D 333, D 365, D 1200

DIN 53211* (was withdrawn in October 1996)

DIN EN ISO 2431, ASTM D 5125

Flow Cup

For many applications it is not necessary to know the absolute viscosity of a paint or varnish. A parameter permitting a relative classification and estimation is considered sufficient. The efflux time, measured in seconds, is such a reliable parameter. It is determined using flow cups of various designs. These cups hold a defined volume of liquid which flows through an orifice. The reproducibility of such measurements depends on:

- ∞ The accuracy of the size of the cup
- ∞ A constant temperature during measurement
- ∞ The Newtonian flow of the liquid.

BYK-Gardner guarantees the accuracy of the size of its flow cups by using NC machines for the manufacturing process, surface refinement, quality control of raw materials through the manufacturing process until shipment, and by examining every single piece using test oil in a climatic chamber. Sufficiently long tempering of the cup and test sample produces a constant test temperature. For measurement at temperatures differing from room temperature, the cup is put into a temperature control jacket, which contains a liquid that is heated up or cooled down by means of a thermostat. The liquid under test flows over a thermometer, thus allowing the actual test temperature to be determined. For efflux time measurement it is important to note that a cup can only produce satisfying and reproducible results when used within its defined viscosity range.

Flow cups cannot measure high viscosity liquids, pastes etc.

Flow Cup in accordance with DIN 53 211*

This cup holds 100 ml $\pm$ 1 ml and has an integrated orifice with an orifice diameter of 4 mm $\pm$ 0.02 mm. The cup is made of anodized aluminum while the orifice is made of stainless steel, with the interior polished.

For determining the efflux time in accordance with DIN 53 211* temper the cup and test liquid to e.g. 20 °C $\pm$ 0.5 °C (68 °F $\pm$ 1.0 °F).

- ∞ Put flow cup in a precisely horizontal position into the ring stand or temperature control jacket
- ∞ Close orifice
- ∞ Pour in test liquid
- ∞ Draw clean glass plate over the rim of the cup, thus removing superfluous liquid into overflow reservoir and closing the cup
- ∞ Open orifice
- ∞ Remove glass plate horizontally and start stop watch
- ∞ Stop the watch with the first break in the efflux stream
- ∞ Repeat measurement three times each with a new sample of the same material

Flow Cups

Generally, this DIN Cup is used for liquids of viscosities ranging from approx. 100 - 500 cSt (mm²/s), which corresponds to an efflux time of 20 - 110 s.

Flow Cup in accordance with DIN EN ISO 2431, ASTM D 5125

The international standard describes a process to determine the efflux time using a 4 mm cup with dimensions differing from the DIN 53 211* Cup. A longer orifice, less tapered body and slightly different inner dimensions provide efflux times different from those of DIN 53 211* Cups, thus extending the measurement range and making the DIN EN ISO Cup a useful supplement to the DIN Cup. For measuring procedure see description of DIN Cup. DIN EN ISO Cups are primarily recommended for international use.

In addition to the 4 mm orifice, the DIN EN ISO standard describes 3, 5 and 6 mm orifices. The most favorable measuring range for each cup is:

DIN EN ISO Cup 3 mm viscosity 10 - 40 mm²/s = 30 - 100 s
 DIN EN ISO Cup 4 mm viscosity 25 - 130 mm²/s = 25 - 100 s
 DIN EN ISO Cup 5 mm viscosity 70 - 360 mm²/s = 25 - 100 s
 DIN EN ISO Cup 6 mm viscosity 130 - 700 mm²/s = 25 - 100 s

Ford Cup in accordance with ASTM D 1200, D 333, D 365

The ASTM D 1200, D 333, D 365 standard prescribes 3 cups with different orifices:

Ford Cup No. 2 = 2,53 mm vis. at 25 °C 25 - 120 mm²/s
 Ford Cup No. 3 = 3,40 mm vis. at 25 °C 40 - 220 mm²/s
 Ford Cup No. 4 = 4,12 mm vis. at 25 °C 70 - 370 mm²/s

For measuring procedure see description of DIN Cup. The efflux times measured should not fall below 20 s or exceed 100 s.

* DIN 53 211 was withdrawn in October 1996