

# Density Cups

Density is defined as weight per unit volume at a specified temperature. Density cups are used for quality control because errors in paint composition will result in different density readings. Density cups have also been described as liquid pycnometers.

BYK-Gardner Density cups use a cylindrical shape which provides a large opening for easy filling, emptying, and cleaning. The tightly fitted stainless steel covers have an upward slope to a small hole in the center to allow excess sample material to be expelled without entrapping air bubbles, which increases accuracy.

## ASTM Cup Volume

In North America the term “weight per gallon” (wpg) is used in the coating industry. The volume of the weight per gallon cup is such that, at a specified temperature, the numerical value in grams of water that it can hold is equal to, or ten times greater than, the numerical value in pounds of water that a gallon container can hold. A US gallon of water weighs 8.32 pounds, thus a Regular US weight per gallon cup holds ten times this amount in volume, 83.2 ml. When taking a measurement, the cup and the sample must be brought to the same equilibrium temperature (usually 25 °C or 77 °F). Regular and Imperial Cup tolerance are 0.5%; the Midget Cup tolerance is 1.2% measured at 25 °C with distilled water.

## ISO Cup Volume

ISO Cups are machined from stainless steel, and use the metric system. The cups hold a defined volume of liquid of 50 or 100 ml. A tolerance of 0.1% is guaranteed. Testing is carried out in accordance with ISO at 23 °C ± 2 °C.



Made of corrosion resistant steel

### Standards

<b>ASTM</b>	D 333, D 1475, D 2805
<b>BS</b>	3900 A 19
<b>DIN</b>	53217
<b>ISO</b>	2811

### Procedure

- Weigh cleaned density cup empty and record weight
- Temper density cup and test liquid (Refer to appropriate test standard for proper temperature)
- Fill density cup
- Put cover on without tilting
- Avoid air bubbles
- Remove overflowing liquid carefully with absorbent cloth
- Weigh filled density cup
- Calculate density

### Determination of Density and Specific Gravity

	Volume (ml)	Density	Specific Gravity (relative to water)
<b>U.S. Standard Cup</b>	83.2	$[\text{weight full (g)} - \text{weight empty (g)}] \times 0.1 = \text{lbs/gal}$	$[\text{weight full (g)} - \text{weight empty (g)}] \times 0.01202 = \text{specific gravity}$
<b>U.S. (Baltimore) Midget Cup</b>	8.32	$[\text{weight full (g)} - \text{weight empty (g)}] = \text{lbs/gal}$	$[\text{weight full (g)} - \text{weight empty (g)}] \times 0.1202 = \text{specific gravity}$
<b>ISO Cup</b>	100 or 50	$[\text{weight full (g)} - \text{weight empty (g)}] / \text{volume (ml)} = \text{g/cm}^3$	specific gravity = density
<b>British imperial Cup</b>	100	$[\text{weight full (g)} - \text{weight empty (g)}] / \text{volume (ml)} = \text{g/cm}^3$	specific gravity = density

1 ml = 1 cm<sup>3</sup>; 1 liter = 1000 ml; specific gravity of water = 1 g/ml  
1000 ml = 0.2646 U.S. gallon; 1 U.S. gallon = 3.785 liter

# Density Cups

BYK-Gardner offers four different sized density cups:

- Regular US Cup with a volume of 83.2 ml
- Midget cup with a volume of 8.32 ml. The Midget cup offers a direct conversion to lbs/gal, eliminating the need for dividing the full cup weight by 10.
- British Imperial Standard size with a volume of 100 ml.
- ISO standard size with a volume of 100 ml and 50 ml.

All the BYK-Gardner Density Cups come uncertified except for the ISO Cups with part numbers 1130 and 1140. Certification is available for a fee. The certification is provided by BYK-Gardner's ISO 17025 accredited service departments. Please contact your BYK-Gardner representative for pricing.



ISO Density Cups

## Ordering Information

Cat. No.	Description
9654	US Density Cup
9655	US Density Cup w/tare weight
9664	US Midget Cup w/tare weight
9658	BSI Density Cup
9659	BSI Density Cup w/tare weight
1132	ISO Cup L
1130	ISO Cup L certified
1142	ISO Cup S
1140	ISO Cup S certified

## Technical Specifications

Volume ml	Dimensions	Shipping Weight
83.2	38 x 76 mm (1.5 x 3 in)	0.23 kg (0.5 lbs)
83.2	38 x 76 mm (1.5 x 3 in)	0.45 kg (1 lbs)
8.32	25 x 32 mm (1.0 x 1.25 in)	0.23 kg (0.5 lbs)
100	38 x 89 mm (1.5 x 3.5 in)	0.23 kg (0.5 lbs)
100	38 x 89 mm (1.5 x 3.5 in)	0.45 kg (1 lbs)
100	52 x 62 mm (2.05 x 2.44 in)	0.45 kg (1 lbs)
100	52 x 62 mm (2.05 x 2.44 in)	0.45 kg (1 lbs)
50	52 x 34 mm (2.05 x 1.34 in)	0.23 kg (0.5 lbs)
50	52 x 34 mm (2.05 x 1.34 in)	0.23 kg (0.5 lbs)