TECHNICAL DATA
06

FAQ's — *You've got questions, we've got answers.*

Does my volumetric glassware need to be calibrated prior to use?

If your glassware selection includes a certification of accuracy/calibration document, the calibration information will be included. Otherwise for non-certified volumetric glassware and beyond regulatory requirements under current Good Lab Practices (cGLP) Guidelines (per 21CFR58) Guidelines, performing an initial calibration should be standard practice to help avoid volumetric errors once the glassware is placed into service.

What do the letters "TC" and "TD" represent?

"Volumetric glassware is either calibrated "To Contain" (TC), or "To Deliver" (TD). The temperature "20°C" is also printed on the glassware which indicates the temperature at which the precisely contained volume was calibrated to contain or to deliver.

If a product is calibrated To Deliver (TD), the TD line on the vessel accounts for a larger volume of liquid than stated, due to the smallest amounts of liquid which is left over in the vessel, after the liquid in the vessel has been emptied, due to the inherent properties of liquids and capillary action.

For volumetric flasks and cylinders which are calibrated To Contain (TC) the calibration line indicates the amount of liquid the vessel will hold at that point. For volumetric pipets the TC line is used in dilution practices where the final volume of liquid left over at the tip is expelled.

What do the accuracy classes Class A and Class B mean?

ASTM defines Class A as having the lowest error tolerance; thus, highest level of accuracy. Class B represents a fifty percent higher tolerance for error which means it is less accurate than a Class A designation. This difference can be significant for instrument calibrations, data integrity and error limits of various methods.

When cleaning volumetric instruments, what needs to be observed?

Handling and washing of volumetric glassware (by hand or lab dishwasher) must be carefully done as improper or incomplete cleaning, surfactant use, stains, scratches, abrasion, chemical etch, or mechanical stress can alter calibration values and thus introduce unwanted error. Please refer to the following pages under "Care & Handling of Volumetric Glassware" or contact us at 800.225.1437 (Option 4).

What is the proper calibration procedure for my volumetric glassware?

Some laboratories have pre-defined SOP's or procedures for calibrating volumetric glassware.

A typical procedure involves using a calibrated analytical balance which is first tarred with another vessel which will be filled with water measured using a volumetric vessel. The mass of the volume of water delivered will be used to calculate the final volume delivered using the formula below and the density of water which is 0.99823 g/mL at 20°C.

$$\text{Volume} = \frac{\text{mass}}{\text{density}}$$

Is a certificate available for all volumetric instruments?

All Serialized & Certified glassware ships with a Certificate of Accuracy or Certificate of Calibration. In most cases, certificates are also available upon request. For volumetric flasks, certificates can be downloaded at **http://certificates.kimble-chase.com.mx/index.php**

KIMBLE® VOLUMETRIC GLASSWARE

Cleaning, Maintenance and Usage of Volumetric Glassware

The most crucial objective in cleaning and maintaining your volumetric glassware is to ensure that day-to-day laboratory practices do not cause the glass to lose its calibration or compromise the safety of laboratory personnel. If a volumetric glassware loses its calibration it will no longer contain or deliver volumetric accuracy and precision.

Always inspect glassware before each use and discard if scratched, chipped, cracked or damaged in any way. Glassware stress is not visible to the human eye.

Glassware Cleaning Guidance

Glassware should be cleaned as soon as possible after use to avoid setting and caking of residues.

1. **Preliminary rinse**
   A. Prior to performing the full cleaning procedure it is recommended that a preliminary rinse or soak is performed using organic solvent for non-water-soluble leftovers followed by a water rinse or water for water soluble leftovers. Water rinsing must be done thoroughly if acid will be used later to clean the glassware. Pipets, for example, may be placed in a convenient jar containing a weak antiseptic solution, immediately after use.

2. **Cleaning reagents**
   A. Do not use strong alkaline products and hydrofluoric acid as cleaning agents, they are glass dissolvers and can damage the glassware and eventually cause breakage which can result in injury.

   B. Do not use any abrasive cleansers, including soft cleansers (i.e. Bon Ami®, Comet®, Soft Scrub®, etc.), as these will scratch the glass and cause eventual breakage and injury.

   C. Before using any cleaning solution, refer to its Material Safety Data Sheet for precautions to be observed during use. Keep your application needs in mind. Organic solvents are acceptable cleaning agents when conditions warrant their use. Some cleaning materials may leave trace residues which can be problematic for trace applications such as chromatography. When glassware is to be calibrated, the final rinsing must be distilled water. If an article is to be dried after cleaning, as is necessary for all vessels marked "To Contain", ethyl alcohol or acetone (American Chemical Society Specification) may be used. Drying may be followed by blowing clean, dry air into the vessel (or sucking the air through the vessel). Efficient air filters must be provided to remove any particles of oil or dirt from compressed air. Drying should be done in a fume hood.

   D. There is a wide variety of cleaning agents available that will remove surface contaminants such as silicone and other organic and biological residues, blood residues and other contaminants that may interfere with trace analyses. These cleaners are available in biodegradable, phosphate-free and chromium-free formulations if desired and can be obtained from laboratory supply houses. Specific contaminants may require specialized cleaning methods, and some are given here:
      i. *Permanganate stains* - Use a mixture of equal volume of 3% sulfuric acid and 3% hydrogen peroxide.
      ii. *Iron stains* - Use a solution containing one-part hydrochloric acid and one-part water.
      iii. *Bacteriological material* - Glassware should be soaked in a suitable disinfectant solution or steam autoclaved followed by cleaning with a suitable agent.

   E. Do not soak KimCote® plastic-coated glassware for long periods of time; this will result in shortening the life of the coating. Do not allow used KimCote® plastic-coated glassware to sit unwashed for long periods of time, as this will make cleaning more difficult.

3. **Use of cleaning tools or machines**
   A. If wiping or other mechanical cleaning action is necessary, it should be done gently using non-abrasive cleaners and wiping materials. The use of abrasive materials will damage the glass surface, degrading its inherent strength.

   B. Washing machines may be used. Support racks on the washer must be well maintained. The support pins should be coated with a non-abrasive material to prevent metal to glass contact and scratching.
   C. For manual washing, use only plastic core brushes that have soft, non-abrasive bristles. Soft, clean sponges or other wiping materials may be

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Cleaning, Maintenance and Usage of Volumetric Glassware

used. Do not use these brushes or wiping materials with abrasive cleaning solutions. Keep them clean. Scotch Brite® and similar scouring pads will scratch glass and should not be used.

4. **Improper cleaning procedures.**
   A. Do not place metal or other hard objects, such as spatulas, glass stirring rods, or brushes with metal parts, inside the glassware. This will scratch the glass and cause eventual breakage and injury.

   B. Do not place hands inside glassware while wearing any jewelry, particularly diamond rings, as these will score the inside of the glassware and eventually cause breakage and injury.

   C. Do not heat glassware to temperatures (>800°F) needed to burn out carbon residues. This will result in the introduction of permanent stresses in the glass that will eventually cause the glassware to break resulting in possible injury.

   D. KimCote® plastic-coated glassware should not be cleaned with harsh, chemical grade detergents; use a non-abrasive grade detergent. If using a dishwasher or dryer, avoid temperatures greater than 110°C (230°F). Scouring pads and brushes are not recommended for use on KimCote® plastic-coated glassware.

5. **Avoid Impact.** Glass will break as a result of impact. Use care when handling to avoid impacting hard objects, such as spigots, other glassware, counter tops, etc.

6. **When Heating Uncoated Glassware.**
   A. Use either low or medium heat settings when using a hot plate. High hot plate settings will cause excessive localized heating of the glassware and will eventually cause breakage and possible injury.

   B. Do not heat glassware designated as heavy duty unless recommended by manufacturer. Even though these items have added mechanical strength, they are more susceptible to breakage from thermal stock when heated.
   C. Do not allow the contents of the container to boil dry as this may induce permanent stresses that will eventually cause breakage. Discard containers that have been boiled dry. **DO NOT** evacuate or pressurize glassware unless the conditions are recommended by the manufacturer.

7. **Care and Use of KimCote® Plastic-Coated Glassware**
   A. Do not expose coated ware to dry heat above 110°C (230°F)

   B. Do not place coated ware over direct heat or open flames

   C. Do not use coated ware on hot plates

   D. Steam autoclaving temperature is 121°C (250°F) maximum

   E. Freezing temperature is -20°C (-4°F) maximum

   F. Coated ware is dishwasher safe if the above guidelines are followed

   G. Coated ware is microwavable provided standard microwave safety guidelines are followed

   H. Labeling and marking on the coating is permitted

KIMBLE® VOLUMETRIC GLASSWARE

Maintaining and Usage

1. **Chemical Compatibility**
   A. Glasses used in chemical apparatus have excellent resistance to acids, except hydrofluoric. Strong alkaline solutions, such as hot caustic solutions, will attack any glass if contact is prolonged. This is true even though a particular glass may not exhibit any visible effect, due to the solubility of the reaction products. Borosilicate volumetric glassware will hold its calibration indefinitely if it is not exposed to hydrofluoric acid; hot phosphoric acid; or strong, hot alkalis, and that it is not heated above 150°C when dry. Dilute detergent solutions, up to about 2% strength, will have no serious effect on the glass unless the glass is exposed for unnecessarily long periods or the detergent is allowed to dry on the glass.
2. **Graduations and Markings**
   A. The scales and inscriptions of many items of glassware are colored by staining a thin layer of the glass. Since the colored portion is of the same composition as the glass object, the resistance to chemical attack is the same as that of the rest of the glass. These fused-on enamels are quite resistant to acids and alkalis. In most cases they should last as long as the piece of apparatus if cared for properly. However, by their nature, they cannot be as resistant as the ware to which they adhere. Consequently, the graduated lines should not be subjected to prolonged immersion in acids or alkalis. Whenever the lines are wetted by reagents, they should be rinsed as soon as conveniently possible.
3. **Use of Abrasives**
   A. Take great care when applying stress (using brushes) or pressure that will introduce glassware stress, scratches and alter surface characteristics. Do not use abrasives on glassware, particularly volumetric ware. The surface will be marred in time, and the resultant scratches may prevent proper drainage or act as resting places for adulterants, which will be difficult to remove. Volumetric glassware is a precision instrument and avoiding these behaviors will minimize out-of-calibration results which can lead to errors, recalibration or replacement.