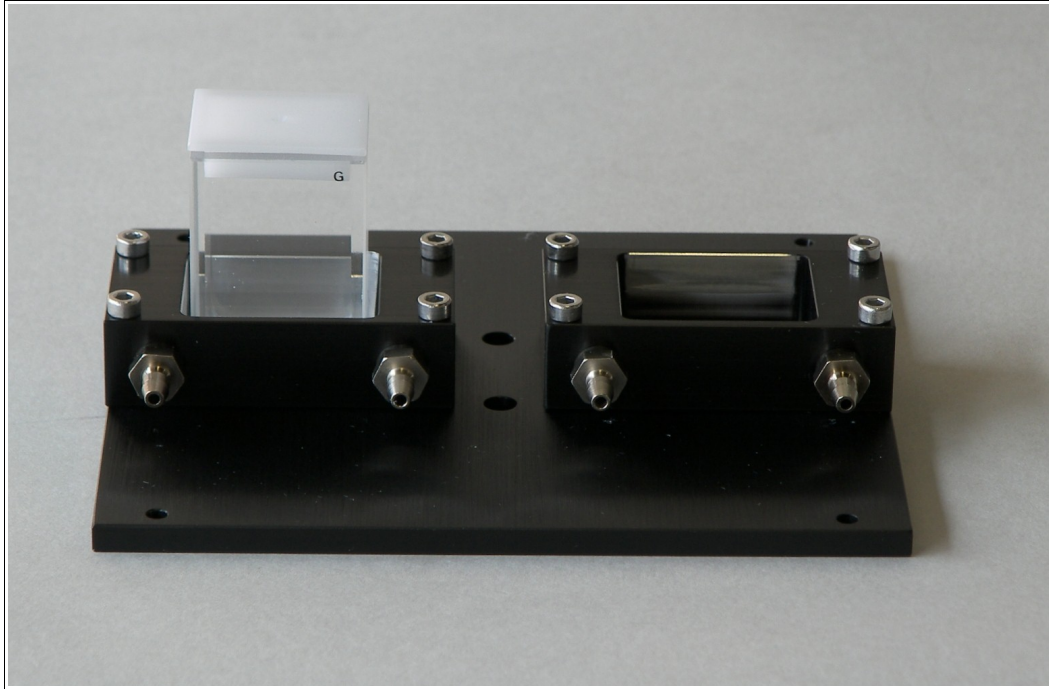


Liquid Liquid Measurement Cuvettes

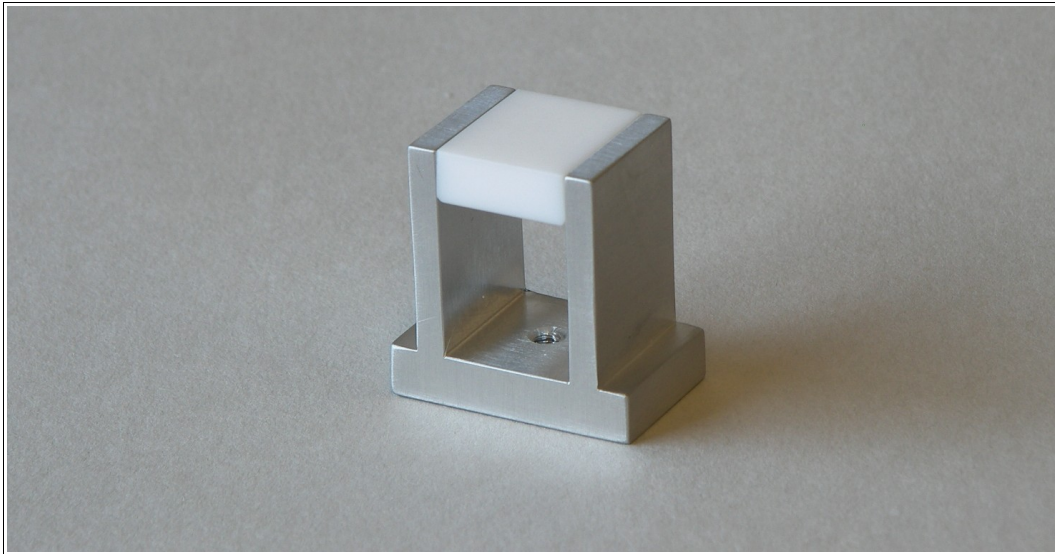
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FTA provides several configurations for performing liquid-liquid interfacial tension measurements. These vary in cost, complexity, and ease of cleaning:

- Sealed IFT chamber. This chamber is available for the FTA1000 and is the same as previously provided for the FTA200. It is capable of being internally pressurized to 6 bar. It offers excellent thermal stability when used with an external circulating bath. The body is a solid block of anodized aluminum and the ports are sealed with Viton O-rings. It offers direct, straight needle access from above and below and it includes a small (centimeter sized) table for contact angle specimens. It has moderate internal volume. In the FTA1000 catalog, this is chamber “BA” and “CA”. A link on the website is <http://www.firsttenangstroms.com/accessories/iftchamber/IFTChamber.html>
- 12.5mm Cuvette Holder. This holder provides good thermal stabilization when used with an external circulating bath. It may be used upright or inverted, with a straight needle coming through a tight fitting Teflon cap. Plastic or quartz cuvettes can be used. These cuvettes have a 10mm internal path, so the space inside for contact angle samples is small. This holder is available for the FTA1000 and is the same as previously provided for the FTA200. In the FTA1000 catalog, it is “BB” and “CB”. A link on the web is <http://www.firsttenangstroms.com/accessories/cuvetteholder/CuvetteHolder.html>
- 20mm Cuvette Holder. This holder is specifically designed for Starna brand cells. These are polished glass cells with outstanding optical characteristics. While not truly “disposable” in cost, they are affordable enough that you can have a number and they are strong enough that they have a good lifetime (quartz cuvettes break easily). This holder is designed for the Starna 96G20 cell which has internal dimensions 24mm x 20mm (optical path) x 37mm (height). The interior volume is large enough that small support structures can be placed inside for contact angle specimens (see photos on next page). Thermal control is through the aluminum support well which is stabilized by an external bath. A small amount of liquid is placed in the well to ensure good thermal contact between the well and the cuvette. Miniature temperature sensors are available that will go inside the cell itself to guarantee accurate temperature control. The cell includes a tight fitting cap to improve thermal control. J needles are available for inverted bubble measurements. Unlike the two previous choices, the Starna cells can not be turned upside down. Starna link: <http://www.starna.com/>.



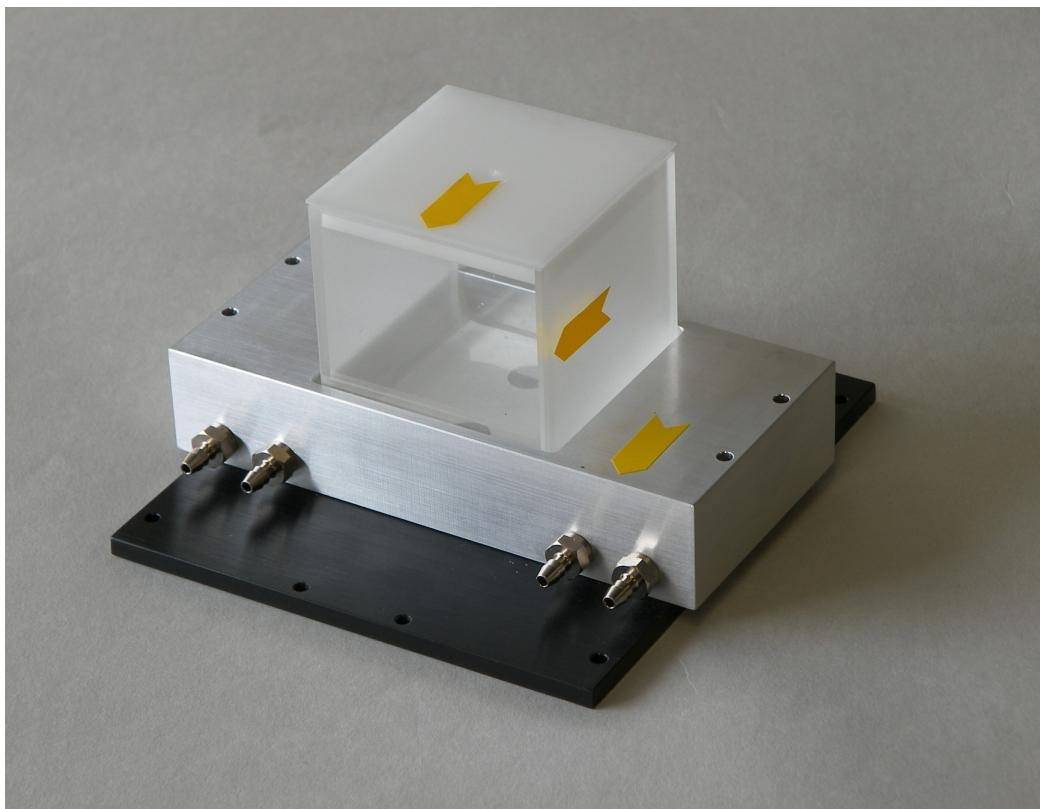
20mm cuvette holder with Starna 96G20 in left unit. Holder can support two two separate cells.



Sample holder fabricated for customer using a 96G20 cell. This fixture both supports a contact angle specimen and provides an inverted needle orifice for inverted bubble work (no J needle required).

These holders are shown in the FTA1000 catalog as “BF” and “CF”. The 2007 catalog does not make it clear that these are available for the B frame, but they are.

- 50mm Cuvette Holder. This holder is specifically designed for the Starna 93G50 cell which has an internal volume of 50mm x 51mm (optical path) x 53mm. Relatively speaking it is quite large. It has a similar holder, cap, and thermal stabilization means. Its advantage is the large working room inside.



50mm cuvette holder with Starna 93G50 cell. The yellow arrows indicate assembly direction for the first time user because the cell is not quite square and it will not fit in the holder if rotated. Holder has two circulating bath loops for improved thermal control.

The 50mm holder carries the FTA1000 part numbers “BH” and “CH”. It does not appear in the 2007 catalog.

Why are Starna Cells the Preferred Approach?

Starna cells combine economy with outstanding performance. Roughly speaking, the 20mm 96G20 is about \$50 and the 50mm 93G50 is about \$100. While you would not necessarily throw them away after a single use, they are inexpensive enough to own a number and clean them on a batch basis. Their fused glass construction makes cleaning relatively easy. They are rugged enough so that you can expect them to survive many use cycles.

Starna cells provide outstanding optical performance. It is important to understand that the Laplace-Young drop shape technique is *extremely* sensitive to image distortion in the cuvette. This topic is explored in length in the FTA paper on the website:

<http://www.firsttenangstroms.com/pdffdocs/IFTCuvettesAndJNeedles.pdf>.

The litmus test is to measure a pendant drop inside an otherwise empty cuvette, then remove the cuvette and measure to see if there is any change in the answer due to the presence of the cuvette. This is what was done in the above paper.

The second, and perhaps more subtle advantage of the Starna glass cells over plastic is their good thermal conductivity and their stability at higher temperatures. There are real problems with plastic cells above 50C. The issue is their optical performance and image distortion. Verify your plastic cuvettes before using them at elevated temperatures.