



Cleaning and Handling The TruFlo™ Sample Monitor

Summary

The TruFlo sensor is a highly sensitive measurement device that should be properly cleaned to ensure high performance. Improper cleaning (or no cleaning) may leave deposits on the internal capillary wall that can cause measurement deviations. This should be avoided by cleaning the sensor after usage and before storing the sensor for longer periods.

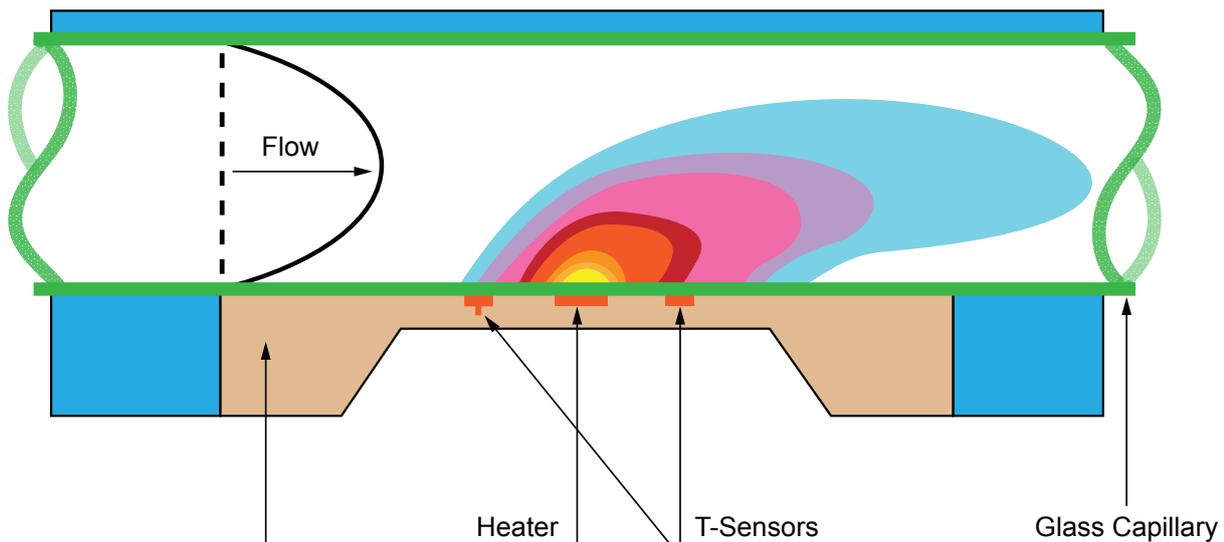
1. Explanation

Inside the TruFlo is a sensor chip that measures the flow through the wall of a thin walled glass capillary.

Because the measurement uses the heat propagation through the glass wall and the heat exchange with the medium, it is critical that the coupling of the chip with the medium is not altered. Formation of deposits on the glass wall inside the capillary may block the heat transfer.

Because the scale of the sensor is so small and the glass is very thin (~50-100 μm), even the slightest deposition layer can cause measurement deviations. Depending on the kind of depositions, a few micrometer might be sufficient to cause considerable deviations. These depositions may be permanent (i.e., mineral or salt deposits) or transient (layer of previous liquid among alternating media types).

Typical signs of depositions on the glass are measurement deviations over the whole flow range and/or offsets of the measurement. The measurement deviations can be positive or negative.



2. General Handling

Do not allow the sensor to dry with media in the capillary tube without flushing clean first. Also try to avoid letting the filled sensor sit for extended periods (depending on your liquid).

Before storing the sensor, always drain of fluid, flush with cleaning agent, blow out, and dry the capillary. Sensor plugs should be installed for storage. The cleaning agent (detergent, solvent, etc.) should be chosen for its effectiveness in removing the liquid media, and compatibility with borosilicate glass.

In general we recommend finishing any cleaning with an acetone and/or isopropylalcohol (IPA) flush before letting the sensor dry out and closing it for storage. The advantage of using clean IPA is that it evaporates without residue (in contrast to acetone, for example).

3. Examples & Cleaning Procedures

Working with Multiple Liquids:

Switching between multiple liquids can leave transient deposits in the form of liquid layers inside the glass capillary. This is especially common for insoluble liquids, but can happen even with miscible liquid combinations. For example, when IPA is followed by water in a sensor without drying in between, large offsets can be observed for hours after switching to water.

If possible, dedicate a separate sensor for each different liquid to be measured. If not possible, use caution when switching media and clean properly.

Working with Water:

When working with water it is recommended to not let the sensor dry out. All salts and minerals in the water will deposit on the glass and are difficult to remove. Although salt solutions are particularly prone to problems, even clean water can still contain enough dissolved minerals to form a deposition layer. Flush with DI water on a regular basis to prevent build-up. If you still encounter problems, occasionally flush the sensor with slightly acidic cleaning agents.

When working with water containing organic materials (sugars, etc.) microorganisms often grow on the walls of the glass capillary and form an organic film that can be difficult to remove. Flush on a regular basis with solvents such as acetone, ethanol, methanol or IPA, or with cleaning detergents to remove organic films.

Working with Oils:

When working with oil it is recommended to not let the sensor dry out. Edible oils can become rancid, dry out or simply change their composition over time and leave sticky films on the wall of the capillary. This will typically happen if the sensor is only drained after usage but not properly cleaned. Then the oil film on the capillary wall becomes a constant deposition and will be more difficult to clean than right after emptying the sensor. These films might not be dissolved by oil anymore and cause measurement deviations.

Flush with solvents such as acetone, methanol, ethanol, IPA, etc or cleaning detergents on a regular basis to remove oil films.

Working with Silicone Oils:

When working with silicone oil it is recommended to not let the sensor dry out. Silicone oils can be cleaned out using acetone or special cleaners. Check with your silicone oil supplier for cleaning agents compatible with glass surfaces.

Working with Alcohols or Solvents :

Unlike most other fluids, alcohols and solvents are not critical and a short flush of acetone followed by IPA (or only IPA) is sufficient to clean the capillary walls.

4. Cleaning Methods that are not Recommended

In general, any cleaning by mechanical means should be avoided. Never enter the sensor's flow path with sharp objects that could scratch the glass surface.

Furthermore, no abrasives or liquids containing solids that can grind the surface clean should be used. Anything that affects the glass wall will cause deviations in the measurement performance or permanently damage the sensor. Strong acids and bases should also not be used to clean the sensor.

Acids can sometimes be used in low concentration and at low temperatures. Before using the acid check how compatible it is with borosilicate 3.3 glass (Pyrex® or Duran®).

5. Other Liquids or Applications

If uncertain about your application and how to clean the flow sensor, please contact Glass Expansion for additional support, email enquiries@geicp.com.