Safety and Method Creation

Ian Billinge

August 6, 2025

Human safety considerations

There are three major risks associated with this instrument: chemical exposure, pinches/crushes, and needle sticks.

To mitigate risks around pinch/crush and needle sticks, take reasonable safety precautions: wear eye protection and other appropriate PPE. Take reasonable precautions around the instrument: don't put any part of your body or clothing within reach of the arm when it is moving.

Chemical exposure: Since the arm is dispensing experimental liquids, there is risk of chemical exposure if the waste container is improperly set up, overflows, or if the needle gets stuck somewhere it shouldn't (i.e., if you improperly set up a method, and the experiment dispenses overnight into a vessel that overflows).

Be aware of the tubes connecting your experiment to the autosampler. The tubing will move along with the arm, so there is potential for tubing to snag on experimental equipment and pull/tip something over. *Always* make sure there is enough slack in the tubing to allow the autosampler to operate without pulling something over, and make sure the tubing is positioned so that it won't snag on anything.

Instrument safety considerations

The only really damaging thing that you can do to the instrument is attempt to manually move the arm (i.e., with your hands) while the instrument is on. If you need to move the sampling arm or needle by hand, turn the power off (on the back of the instrument). The needle and arm can then be moved (it takes a reasonable amount of force).

Other than that, Gilson informs me that the instrument is very robust.

Method Creation Directions

1. Open Trilution LH software. A software window should open up with a username and password. Wait a few seconds while the computer establishes a connection to the instrument.

   > *Note: A dialog window will appear in the lower left showing three connections. If that window does not appear, connection to the instrument has not been established.*
   >
   > *Try: restarting the software, restarting the instrument, restarting the computer, and checking the cable connections.*

   Once instrument connection has been established after a few seconds, enter the following:

Username	Password
`Administrator`	*there is no password*

2. Click on `Methods`.

3. Select `Configuration` tab. Go to `Liquid Handlers` Add 223 Sample Changer by dragging and dropping it into the main window.

4. Click on `Sample Tray` tab. Load `4x22-vertical`. This represents the instrument with the four Code-22 trays, with the sample trays elevated on posts to increase the height of the sample tray.

   > *Note: `4x22-vertical` allocates all wells to sample dispensing, with none for source. If, in the future, some applications require source wells, you will need to define a different Sample Tray.*

   (a) If defining a new set of trays, for example to accommodate a 3D-printed rack, click on each section sequentially and allocate the wells.

5. Click on `Method` tab. A blank page should show up. This is a graphical programming environment, a bit like the Scratch programming language. To add things to the method, drag and drop Tasks into the working space.

   Tasks can be found in the lower-left window. We don't typically use most of these tasks. In fact, entire folders of tasks are not used, including (currently) all `Liquid Handling` tasks. The most used are `Tweaks/Move To (Scheduled)`

Name	Description
`Tweaks/Move To`	Moves the autosampler to either: top z-axis position, Home position, XXX, YYY, Rinse position
`Tweaks/Move To (Scheduled)`	Moves to a well in the Zone. To move autosampler to Rinse position, make sure Zone is set to Rinse. To move autosampler to sample position, make sure it is set to XXX and

   > *Note: To avoid crashes, it is **highly recommenable** to begin every method with a `Move to: Home`. This helps prevents the instrument from crashing.*

6. Add loops. Most methods involve loops. To do this, drag and drop a loop into the main workspace. The loop workspace is on the far right. To add `Tasks` into the loop, click and drag the tasks into the loop workspace.

Diverting valve

Purpose

The Gilson 223 comes with a three-way diverting valve attached to the sampler arm. The inlet to this valve is on the top of the valve (as mounted on the instrument). The fluid can come out of either side of the valve. The purpose is multifold:

- Stop sample from dispensing into vials as the needle passes over them. If the valve is not used, liquid is constantly coming out of the sample needle. With low flow rates, this is often not a problem. But with high flow rates, it means that water is constantly squirting out. As the needle passes over the rack of vials, liquid may end up in unwanted places, causing sample contamination.
- Allow recirculating experiments. While valve is set to not dispense to the needle, the fluid can be recirculated back to the reactor, allowing you to divert flow to take a sample.

Operation

To operate the diverting valve, a GSIOC task must be used (GSIOC is Gilson's proprietary language for communicating with the instruments). The GSIOC task can be found at `Auxiliary/GSIOC`. Select the Liquid Handler instrument (or use a GSIOC with ID command, with `ID = 10`).

GSIOC Command	Description
`V0`	Sends fluid to recirculation/waste (the port pointing away from the instrument's body)
`V1`	Sends fluid to the needle (the port pointing at the instrument's body)

Ports

The ports of the valve take 1/4"/28 connectors. We have a variety of hose barbs, but they can also be used with PEEK connectors if you want to use a very thin tube. If you need to purchase connectors, industrial suppliers like McMaster carry them.

Top tips

- When doing method development, which involves testing of unfamiliar methods, it is often good to remove the needle to avoid needle stick risk.
- It is often a good idea to add a `Move to: Home` to the beginning of methods. This will help prevent the instrument from crashing.