

INTEGRATION OF QINSTRUMENTS THERMAL/SHAKING MODULES USING GEARS



TECHNICAL NOTE TN235

TECHNICAL FEATURES

- Seamless integration of QINSTRUMENTS devices
- Shaking, heating, and cooling of vessels
- Range of adapters available for all vessel types

TECHNICAL BENEFITS

- Reactions (derivatization) prior to solid phase extraction (SPE)
- Liquid handling processes involving timed reactions such as kinetics

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INTRODUCTION

The GX-Series of Liquid Handlers, along with TRILUTION® LH Software, are used in many laboratories around the world for many different liquid handling processes. These range from the processing of solid phase extraction (SPE) methodologies and sampling from bioreactors to diluting and delivering samples to ICP instruments, and more.

However, sometimes a laboratory method requires a process or technique that the liquid handler cannot do by itself or with any of the existing standard accessories. For this purpose, TRILUTION LH was designed with a software component called GEARS (Gilson Ethernet Asynchronous Remoting System) so that third party devices could be seamlessly integrated with both the software and hardware. This enables Gilson to provide solutions to meet the needs of a wider number of laboratories and laboratory workflows.

This Technical Note covers the integration of the heater, chiller, shaker products supplied by QINSTRUMENTS GmbH into both GEARS and TRILUTION LH for use on the of liquid handlers, see Figure 1.



Figure 1

GX-271 Liquid Handler with a VERITY® 4020 Single Syringe Pump

EXAMPLE APPLICATIONS

Redissolving synthetic purified samples for analytical testing. In many drug discovery laboratories after synthesis of drug candidates or APIs, samples are purified and the collected fractions evaporated to dryness. The next part of the workflow will typically involve redissolving these dried fractions into a suitable solvent and aliquoting them into vessels suitable for further analysis. The remainder of the redissolved compound is transferred to a suitable storage vial for future use or reference.

The GX-Series Liquid Handlers can transfer solutions accurately to NMR tubes, Spectrophotometer cuvettes, and HPLC, LCMS, and GC analysis vials. However, to enable robust and reliable redissolving, there must also be a way to heat and shake the fraction tubes after the solvent has been added. For this purpose, the QINSTRUMENTS BioShake 3000-T can be used.

Kinetic testing. Reactions between samples and reagents often occur optimally at specific temperatures and over specific time periods. Discovering these optimum conditions can be time consuming when performed manually, as there are many possible values to test. Using a GX-Series Liquid Handler with the QINSTRUMENTS ColdPlate allows for the vials or tubes to be held at a specific temperature and through the TRILUTION LH Software samples can be taken from the tubes or vials at multiple timepoints and either injected directly on HPLC or moved to alternative vials or tubes for quenching. When using multiple ColdPlate devices, multiple different temperature 'zones' can be used, either for testing different temperatures simultaneously or for maintaining reactions at a raised temperature while keeping quench reagents at a lower temperature.

Derivatization prior to (SPE). In some SPE methodologies, there is a distinct benefit to performing a derivatization prior to loading the sample. The addition of a functional group to the compound of interest can encourage retention on the solid phase and make it possible to achieve a separation from interferences that wouldn't otherwise occur. Often these derivatizations occur best at a raised temperature and for a



Figure 2

The QINSTRUMENTS BioShake Q1 device - for heating, chilling, and shaking

defined length of time. Shaking or agitation during this time may also be a requirement. A GX-Series Liquid Handler equipped with a QINSTRUMENTS BioShake Q1 device (Figure 2) allows for the shaking of a batch of samples at a raised temperature for a period defined in the TRILUTION LH software before then rapidly reducing the temperature back to ambient or below, so that the samples remain stable while each one is sequentially extracted on the SPE cartridges.

Liquid/Liquid Extractions (LLE). In some analytical methodologies LLE is preferred to SPE. The GX-Series Liquid Handlers have specialised racks for handling SPE extractions but setting up a GX-Series Liquid Handler to handle both SPE and LLE together on the same rack layout is not possible with the standard Gilson Orbital Shaker, due to its size. By adding the smaller QINSTRUMENTS BioShake 3000 it is possible to run both SPE methods and LLE methods on the same GX-Series Liquid Handler, even combining the two techniques during the same method if necessary. Also, the GX-Series Liquid Handler's ability to detect and follow liquid levels and their precise and repeatable movements allow for accurate aspiration of layers from biphasic solutions. As seen in [Application Note 1049 Using Liquid Level Detection to Measure Partition Coefficients of Vanillin in Biphasic Solutions](#).

All the QINSTRUMENTS devices can hold a variety of different labware items depending on the thermal block used. These may

be vials, as described above, tubes, or microplates. In the case of microplates, there are several different thermal blocks including those for shallow well plates, qPCR plates, and deep well plates. Custom thermal blocks can also be requested.

Additional Racks

In addition to the vessels being heated, chilled or shaken there will be a need for additional sample vials, tubes or plates, reservoir bottles or reservoir plates, and other accessories for most applications. Gilson has a large range of racks and accessories that can be selected. Typically for an application where heating is used, septum-capped vessels are common to prevent evaporation of solvents, which is important to ensure correct and reliable results. The GX-Series Liquid Handlers can pierce most septum caps for this purpose. Gilson have a range of probes to cover most applications including septum piercing.

CONCLUSION

Adding one or more of the QINSTRUMENTS devices to a GX-Series Liquid Handler and integrating control into TRILUTION LH adds functionality to the liquid handler and allows for a more seamless workflow experience with Gilson automation. Devices are available that can be used for heating, cooling, and shaking and with a temperature range allowing cooling to -20°C and heating at up to 99°C. The versatility of these devices and the ability to change temperatures rapidly allows for the automation of processes that require reactions or derivatisations prior to SPE, LLE, and many other liquid handling procedures, as well as any other workflows that might benefit from agitation or thermal control.

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