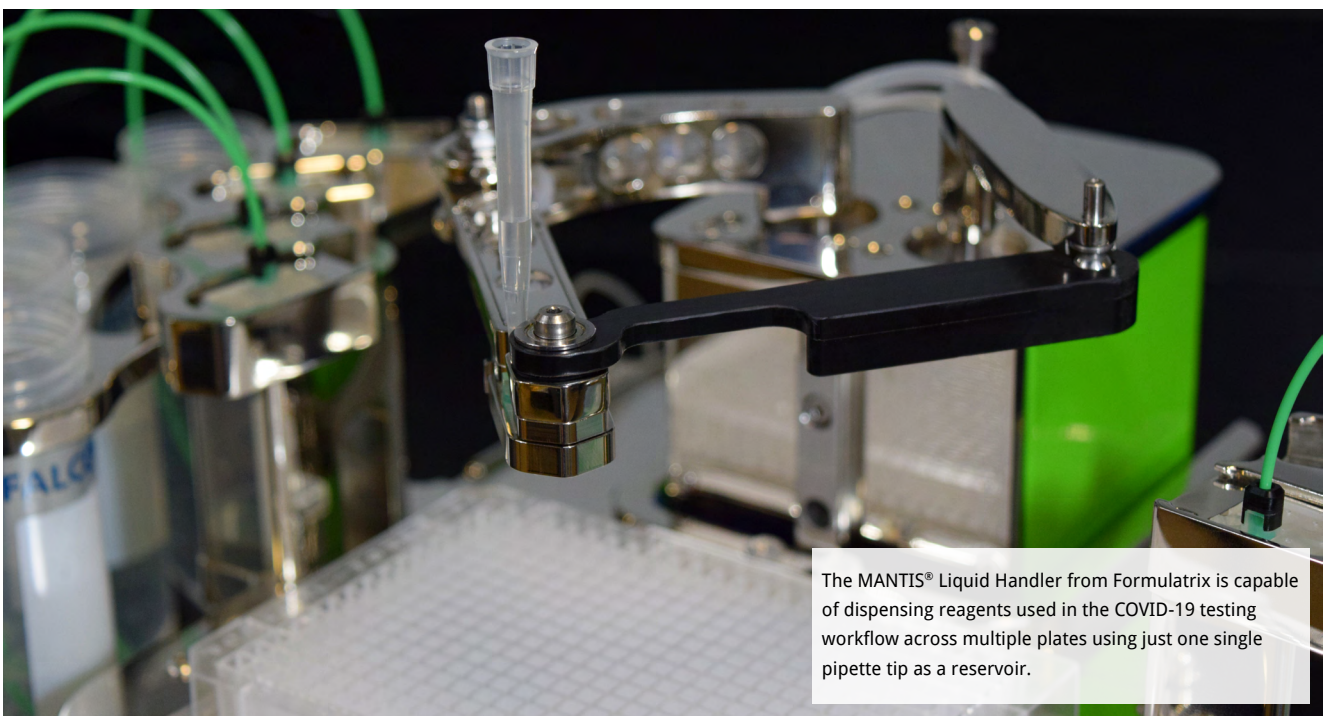


# Tackling the Challenges of Limited Resources During a Pandemic

AUTOMATION HAS A RANGE OF BENEFITS INCLUDING INCREASED REPRODUCIBILITY AND REDUCED EXPOSURE FOR LAB STAFF



The MANTIS® Liquid Handler from Formulatrix is capable of dispensing reagents used in the COVID-19 testing workflow across multiple plates using just one single pipette tip as a reservoir.

**As laboratories around the world tackle the challenges of screening large numbers of samples for SARS-CoV-2, the managers of these labs have turned to the use of automation to address some key concerns.**

Whether the scale of these labs is at a national level, processing hundreds of thousands of samples a day, through to small-scale and agile laboratories testing at an organizational level, there is a place in the workflow to accommodate automation. The implementation of automation within a process brings some significant advantages. By reducing the number of manual handling steps, reproducibility is increased. As there are fewer steps carried out by hand this reduces potential exposure for laboratory staff as well.

**The Challenge:** The demands of many labs simultaneously beginning COVID-19 screening programs are leading to a scarcity of resources like pipette tips and reagents. Laboratory automation brings significant benefits to testing and screening processes but can further exacerbate this problem, with high-throughput instruments using significant levels of these consumables.

**The Solution:** Using small, flexible liquid handling solutions that do not depend on disposable tips, and can virtually eliminate reagent waste due to excess dead volume, empowers laboratory managers to benefit from the advantages of automation and decrease dependence on scarce resources. The technology behind the [MANTIS®](#) and [TEMPEST®](#) liquid handlers from FORMULATRIX® is unique, us-

ing positive displacement microdiaphragm-based chips. This means reagents can be dispensed directly into the 96- or 384-well plates and deep well blocks used in both sample preparation and in qPCR analysis, without the need for disposable plastic pipette tips. As the minimum dispense volume of these liquid handlers is just 100 nL and 200 nL, respectively, this also opens the avenue for total reaction volume reduction through miniaturization, enabling the saving of precious reagents.

In the examples below, we highlight the experiences of three different laboratories using the MANTIS liquid handler.

The [Weatherall Institute](#) of Molecular Medicine in Oxford, [Biogazelle](#), a biotechnology company in Ghent, and the [Centre For Proteome Research](#) at the University of Liverpool.

**Highlight #1** Dr. Neil Ashley, the [Single-Cell Core Facility](#) Manager at the Weatherall Institute of Molecular Medicine (WIMM) in Oxford, U.K., presented the SARS-CoV-2 qPCR workflow that had been implemented over the summer at their facility.

**If you want to do a lot of Covid tests, clever little machines [like the MANTIS] can easily beat big impressive looking robots**

- Neil Ashley, Core Facility Manager, Weatherall Institute, Oxford UK

In his [webinar](#), Neil discussed the use of the MANTIS as part of a workflow, highlighting the reduction in the number of pipette tips used as well as the successful miniaturization of their overall reaction size. By integrating the MANTIS liquid handler into an existing RT-qPCR workflow for COVID-19 testing, consistent and reliable contact-free dispensing

has enabled increased throughput and eliminated dependence on manufacturers for proprietary tips meaning global supply shortages need no longer be a barrier preventing RT-qPCR assays from running at the required capacity. The MANTIS liquid handler has also been pivotal in reducing assay volumes, providing significant cost savings, and again helping to avoid delays where reagents are in short supply.

**Highlight #2** Professor Jo Vandesompele is a research professor in [Functional Cancer Genomics](#) and Applied Bioinformatics in the Faculty of Medicine and Health Sciences (Ghent University) and also the co-founder and CSO of Biogazelle, an innovative bioanalytical services company offering RNA and DNA biomarker services in an accredited environment.

In April 2020, Biogazelle introduced a high-throughput, modular and scalable SARS-CoV-2 RT-qPCR testing platform to process up to 6,000 patient samples per day. The diagnostic test is run under an ISO17025 quality management system, which requires new instruments be validated according to a predefined plan with strict acceptance criteria.



A member of the FORMULATRIX® team installs a MANTIS® at Ghent University Hospital for SARS-CoV-2 virus screening.

Biogazelle chose the MANTIS as the automated liquid handler in their diagnostic SARS-CoV-2 RT-qPCR test because of its small footprint, flexibility, and high-speed accurate dispensing. In addition to the technical capabilities of the instrument, the easy-to use software ensures rapid deployment in screening with minimal training requirements. The full [application note](#) and [webinar](#), which details the work that the team at Biogazelle carried out in order to incorporate the MANTIS into their ISO 17025 accredited laboratory, can be found on the FORMULATRIX website.

**“**  
**We use the MANTIS to add 4  $\mu$ L spike-in and carrier RNA... after doing more than 200,000 tests the MANTIS has never failed us**  
**”**  
- Jo Vandesompele CSO,  
Biogazelle

**Highlight #3** Professor Ed Emmott is the leader of the [Emmott Lab](#) in the Centre for Proteome Research at Liverpool University. The lab's goal is the use and development of proteomic methods to study RNA virus replication and virus-host interactions and in particular the use of single-cell proteomics to aid in this research. As the race for an effective SARS-CoV-2 vaccine continues to attract attention both from the public and the pharmaceutical industry, it is important to recognize concurrent research efforts in further understanding viral-host interactions, as these could uncover new targets for therapeutics.

The Emmott Lab is using single-cell proteomics, following the SCoPE2 protocol, to carry out fundamental research into the COVID-19 virus. Compared to previous techniques in single-cell proteomics, SCoPE2 benefits from reduced cost thanks to significant miniaturization and reduction in reagent usage as well as less hands-on time, in addition to significantly increased throughput for both sample preparation and measurement. In a recent application note, Ed discusses how The MANTIS liquid

handler has been pivotal to this success, providing reliable dispensing of sub- $\mu$ L volumes, even for notoriously difficult liquid classes like the 100% acetonitrile used to store the Tandem Mass Tags (TMT).

By incorporating the MANTIS and TEMPEST liquid handlers into their COVID-19 testing workflows, many labs around the world have recognised these significant benefits.

## **BENEFITS OF FORMULATRIX® LIQUID HANDLING TECHNOLOGY**

**Reduces dependency on pipette tips by using non-contact micro-diaphragms**

**Increases throughput with fast and reliable liquid handling**

**Miniaturizes reactions through precise submicroliter dispensing**

**Facilitates fast adoption into workflows with minimal training requirements**

With the rapid explosion of testing taking place in both established laboratories that have begun to include COVID-19 screening and the set-up of new coronavirus-specific testing labs, the MANTIS and TEMPEST provide solutions to the increased pressure on supply chains. By cutting the dependence on pipette tips to achieve fast and accurate dispensing of reagents, users conserve scarce resources for sample transfer and mixing steps.

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