

Ground-breaking low-cost molecular diagnostic tests

Will be delivered using Festo automation technology

The recent pandemic taught us that rapid and reliable tests at low cost are key to future prevention and control of transmissible diseases. High throughput testing for many upper respiratory tract pathogens is now possible, using automation technology.

Fast MDx is the first fully automated, high-throughput, near-patient testing system. It can detect many pathogens with unrivalled speed without the need for expensive biosecure laboratories. Developed by London-based social enterprise company Fast MDx, the eponymous testing system cuts the typical 24 to 48 hour waiting time to just one to two hours.

"The Fast MDx test platform is mobile and can be used anywhere," explains Richard Lewis, founder and CEO of Fast MDx. "Only one technician is required to operate it, rather than the five normally needed in a central laboratory to process up to 1,000 patient samples in an 8-hour shift."

Thanks mainly to economies of scale, Fast MDx is the first system in the world to make molecular testing and diagnostics accessible everywhere, not just in more affluent countries. It will be launched in June 2023 with a multiplexed, CE-IVDr-approved test for the most common respiratory pathogens: influenza A, influenza B, RSV A, RSV B and Covid-19. The company will be expanding the range of tests in 2023/24 to include tests for infections such as C-Diff and MRSA, as well as for sepsis, which kills about 11 million people worldwide every year. It is also the perfect system for conducting genomic testing, which informs doctors what screening tests to request based on their patients' own DNA, in order to detect hereditary diseases at an early stage.

Automation reduces errors

The Fast MDx platform relies on automation technology from Festo for pipetting and dispensing. Included in the system are Festo handling gantries with electric axes, heat sealing from Kbiosystems and Fast MDx's patented, ultra-fast qPCR thermal cycler, the NGX2.

During sample preparation, Festo's EXCM planar surface gantry operates in the X and Y planes. The 92 patient samples are scanned using Festo's optical sensors to track and confirm that all the samples are present. The automated pipetting system, consisting of the Festo DHOE pipetting head and the DHAO disposable syringe ejector, is mounted on the planar surface gantry in the Z direction. The pipetting head can accurately dispense volumes in the range of 10 µl and the pipetting speed can be adjusted to dispense up to 10 ml/s.

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The master mix is prepared, placed in the microtiter plate and then the samples are added. The disposable tip pierces the Fast MDx's Pathtube® cap, and aspirates and pipettes each patient sample into the master mix in one of the microtiter plate wells. Piercing the Pathtube® cap saves a lot of time and money, as no conventional opening and closing systems are needed, and eliminates the human handling errors that so often occur when manually pipetting hundreds of samples into tubes.

A separate Festo handling system uses an EHPS-16 electric gripper to pick up the filled microtiter plate and place it in the heat sealer. The sealed plate is then placed in the RT block, which triggers the conversion of the RNA, if present, into complementary DNA (cDNA). Finally, the plate is placed in the NGX2 qPCR thermal cycler, where the PCR reaction takes place and the cDNA is amplified. The NGX2 uses an ultrafast fluorescence detection system to determine whether the cDNA sequence of the pathogen of interest is present in any of the patient samples. The Biosero software used on the platform integrates and controls all the modules and makes operating it very easy.

To avoid having to use an external pneumatic supply, the Fast MDx test platform uses Festo's PGVA pressure and vacuum generator, which produces a pressure or vacuum of +/-0.5 bar using a 24-volt power supply. The PGVA integrates a mini compressor, air filter unit, reservoir and electronic pressure and vacuum control in a very small space, providing a totally self-contained solution for liquid handling in laboratory automation.

Special machine manufacturer, Applied Automation, is responsible for assembling the complete test system including safety, risk analysis and CE marking.

"Thanks to the close cooperation between Fast MDx and Festo, we were able to build the first prototypes quickly and efficiently, despite the extremely high degree of complexity," says Richard Lewis. "We were able to combine Fast MDx's extensive expertise in qPCR thermal cycling with Festo's proven 3D gantries, controllers and pipetting systems." Tamara Seivwright-Blake, Project

Engineer at Festo GB says 'I've enjoyed working on such a socially conscious project bringing together and coordinating the different parties involved and continuously developing and refining the platform'.

About Fast MDx:

Fast MDx is a social enterprise that aims to make cost-effective, ultra-fast, high-throughput molecular diagnostic testing available to everyone, worldwide.

Fast MDx will provide clinicians with quicker and more reliable results, enabling them in turn to give each patient a faster, personalised treatment plan. The company is a spin-off of BJS Company, which has been in the PCR thermal cycler business since 1991 and today supplies

most of the Tier 1 thermal cycler manufacturers with fast, accurate, silver heat exchange blocks.

Press Images



Fast MDx 1

Richard Lewis, founder and CEO of Fast MDx.



Fast MDx 2

High throughput: two Festo 3D gantries with pipetting and transport units ensure a fully automated sequence of molecular diagnostic tests in the Fast MDx.



Fast MDx 3

The automated pipetting system, consisting of the DHOE pipetting head and the DHAO disposable syringe ejector from Festo, can accurately dispense volumes in the range of 10 µl.



Fast MDx 4

Fully automated tests: a separate Festo handling system uses the EHPS-16 electric gripper to transport and position the microwell plate between the individual processing steps.

Festo GB & IE

About Festo

Festo is a leading international supplier of automation technology with a turnover in 2024 of around €3.45 billion. Festo employs over 20,000 people worldwide and is a proven innovator and problem solver in pneumatic and electrical automation, where it is the performance leader. Festo offers around 36,000 pneumatic and electric products in hundreds of thousands of variants for factory and process automation technology, many of which can be tailored to specific customer needs. Sustainability, reducing its CO₂ footprint, digital learning, innovation, performance and speed are the key drivers for the company's future. Festo GB operates as a carbon neutral organisation and uses the PAS 2060 standard externally audited by NQA to validate this claim to customers, employees and other stakeholders.

Festo Industrial Automation's innovative strength is demonstrated through the launch of around 100 new products every year. The company invests over 8.5% of its turnover in R&D, resulting in over 2,600 patents held worldwide. For more information about the company's products and UK / Irish services, please visit: www.festo.com/gb and www.festo.com/ie

Festo and Industry 4.0 - Festo has engaged with the Industry 4.0 initiative from its inception: as a user, manufacturer and trainer. As a member of the steering group, the company has taken an active role in defining the core standards such as the RAMI model and the Administration Shell. Festo Didactic has installed Industry 4.0 Cyber-Physical Factory training hardware systems in many leading universities and training centres. It also provides Industry 4.0 training courses for change managers and practical workshops for employees. Industry 4.0 technologies such as OPC-UA communications are embedded in the latest generation products. For more information, go to www.festo.com/digitalisation

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