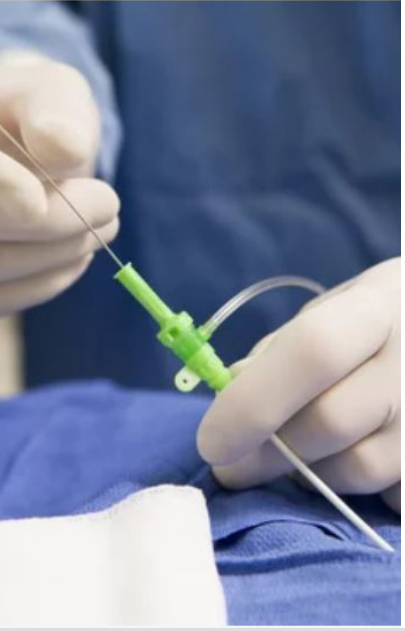

FLUID DISPENSING SOLUTIONS

for Medical Device Assembly

Nordson EFD

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Contents

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Fluid Dispensing Solutions for Efficient Catheter Bonding

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Overview

Catheter demand will greatly increase in all major categories over the next decade.

Catheter manufacturing is a globally significant industry. Catheters assist medical practitioners in various ways. They help with draining, giving fluids or gases, and allowing surgical instruments to enter.

Because of their utility, medical professionals commonly use catheters for a variety of applications and procedures. Consequently, billions of individual catheter products are necessary for good patient care outcomes. Experts predict that the demand for catheter products will increase by 4% - 5% every year for the next ten years and this growth will reach billions by 2025.

These products include Central Venous Catheters (CVC), Epidural Catheters, Hemodialysis Catheters, Pacemaker Lead Catheters, and Gastrostomy Tubes (G-Tubes). How catheter manufacturers will handle the expected rise in product demand is unclear. Smart manufacturers are preparing now to take advantage of future market opportunities.

Some are preparing by scrutinizing how they are leveraging fluid dispensing solutions. Fluid dispensing systems allow manufacturers to control the amount and placement of fluid on a substrate for catheter bonding. This technology allows for a smooth transition from manual to semi-automated to fully automated manufacturing processes. In this way, organizations can implement dispensing automation solutions in a stepwise manner as market conditions dictate.

What is Catheter Bonding?

Smart manufacturers are looking at fluid dispensing solutions to help prepare them to meet the increased demand.

Catheter design typically requires that manufacturers bond a tip, balloon, connector, and often a handle for the product. The main shaft of many catheter designs requires gluing a guide wire shaft to it. Quality control is important for catheter bonding because of FDA regulations and the costly validation process.

Every device must meet regulatory agency requirements. Additionally, it should have reliable parts, strong bonded components, and a smooth exterior. This is important for easy positioning inside the patient's body.

95% of catheters use a bonding process along the length of the catheter. Manufacturers must make important decisions about the volume of glue used to provide the appropriate amounts of bond strength. Bonding is a critical function, because a catheter failure inside the patient's body can adversely impact his health.

If a catheter product is faulty, it can lead to scrutiny, investigation by the FDA, lawsuits, and damage to reputation.

From patient's standpoint, poorly bonded catheter components can become detached, or leak. This can cause complications ranging from infection that require more surgical procedures to significant harm to internal organs. A catheter with compromised bonds increases risk for the patient. In the worst case, it can cause life threatening injuries.

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Application	Catheter Bonding
Fluids Used	• UV-cure adhesives
Application Requirements	Manufacturers need to apply a consistent amount of UV-cure adhesive to certain parts of the catheter and tube. This is vital for CVC, Epidural Catheters, Hemodialysis Catheters, Pacemaker Lead Catheters, and G-Tube applications. Fluid dispensing enables producers to reliably manufacture catheters within required specifications. The catheters need to pass FDA tests. Catheters must be strong, secure, and flexible. The devices must be able to withstand sterilization, and insertion into the patient's body. Lastly, catheters must pass rigorous internal and regulatory tests.
Dispensing Solutions	• UltimusPlus™ fluid dispensers • PICO® XP jetting systems

Manual Processes

Operator-based fluid dispensing systems provide a repeatable and reliable process for catheter manufacturing.

We recommend the UltimusPlus I or UltimusPlus II fluid dispenser for catheter manufacturers who use a manual/operator-based fluid dispensing process. This solution offers several advantages, principally that the solution is an entry point investment and is operator-based. The UltimusPlus products enable a more controlled dispensing solution that is easy to operate.

In addition, the UltimusPlus solution offers reduced guesswork and decreases fluid waste. Organizations benefit from less rework and rejects when they improve upon their existing manual methods.

The fluid dispensing system is lightweight and easy to operate, lessening operator fatigue. It is also versatile because it can be used for manual and automated applications. It scales with production requirements.

Also, these fluid dispensing solutions enable users to download dispense logs. The controller records information about the dispense cycle. This includes pressure, vacuum, time settings, and the start and end dates and times of these actions.

These features enable the medical device company the opportunity to record and download dispense data, such as dispense time, dispense pressure, and vacuum applied. Each dispense record identifies the dispense program used and is date/time stamped so the team can easily identify which production batch the dispense information is related to. You can save the information as a CSV file. This file can be used to find patterns in production and detect any problems that may affect quality.

Semi-Automated

The PROPlus dispensing automation solution provides repeatable fluid application in simple to complex patterns.

We recommend a semi-automated solution for organizations producing fewer than 300,000 catheter units. The primary benefit of semi-automated fluid dispensing technology is that it offers faster, higher yield operations. This mid-value investment is operator-based, but the machine offers improved control, accuracy and repeatability for higher volume, precision-oriented manufacturing.

We recommend using the UltimusPlus Series dispensers and the PICO *Pµlse* XP jet valve and PICO® *Toµch*™ XP controller for semi-automated fluid dispensing catheter bonding applications. Robots and gantry systems automate tasks and individuals can use them alone or add them to assembly lines with conveyors.

These dispensing automation solutions offer improved process control with reliable and repeatable fluid dispensing. True three-dimensional motion control allows easy programming of dots, lines, circles, arcs, and compound arcs.

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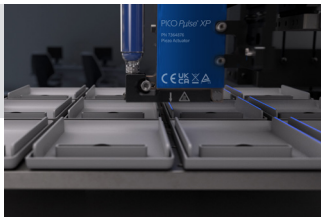
Custom Automation (Machine Builder Applications)

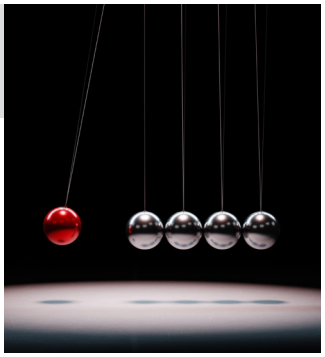


The PICO XP automated solution offers flexible automated fluid dispensing capabilities to medical device manufacturers.

Catheter manufacturers making 300,000-500,000 units per year at <$30 each should think about using custom automation. This high-value investment offers a turnkey solution that extends multi-process assembly capabilities to manufacturers. A customized, fully automated fluid dispensing solution enables catheter manufacturers to leverage quality assurance processes like pick and place, testing, pull testing, etc.

The principal benefit of a fully automated fluid dispensing solution is reduced process time for high production volume applications. The improved product quality, coupled with the rapid setup and programming capabilities enables catheter manufacturers to seek and fulfill new manufacturing opportunities.

Impact (Why Fluid Dispensing Matters)



Catheter manufacturing, and catheter bonding applications are on the precipice of a great opportunity. At the same time, the industry faces substantial challenges. On one hand, the market for catheter products is strong, and getting stronger. However, meeting the demand for CVC, Epidural Catheter, Hemodialysis Catheter, Pacemaker Lead Catheter, and G-Tube products is becoming increasingly difficult.

Choosing the right fluid for catheter bonding is important for efficiency and meeting market demands. Fluid dispensing, whether done by hand, partially automated, or fully automated, helps maintain catheter quality and consistency. The manufacturing efficiencies available reduce waste and improve uptime, while providing strong traceability features. In summary, finding the right way to dispense fluid can help protect your catheter manufacturing business in the future.

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UltimusPlus Fluid Dispensers Ease Setup and Operation for Efficient Catheter Development

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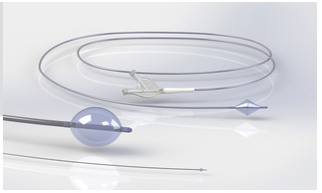
Application Success Story



Today, catheters are being used for a range of medical functions, from urethral to cerebral catheters.

Quality and precision play a significant role in medical device manufacturing around the world, and strict regulatory standards drive the need for devices to pass rigorous inspections. Catheters are no exception.

Originally catheters had a single function, to drain out urine from urinary tracts. Today, because of many advances in materials, design techniques, fabrication technology, and manufacturing capability, catheters are being used for a range of medical functions, which span from urethral to cerebral catheters.

Depending on the function in which the catheter will be used, designers must take many characteristics into consideration when developing these devices, including flexibility, steerability, and the ability to handle greater torque or pressure forces.

Catheter bonding and assembly processes can be exceptionally difficult and cumbersome to execute due to the small form factor of these devices, and the need to dispense microdots of adhesive repeatedly and reproducibly onto an area not much bigger than the tip of a pen.

Nordson EFD's UltimusPlus benchtop fluid dispensers helped one medical device company significantly improve efficiency and accuracy to elevate catheter manufacturing to a world-class standard, while meeting necessary regulatory standards.

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Application	Catheter Bonding
Fluids Used	• Cyanoacrylate
Application Requirements	• Apply consistent and precise quantities of material onto catheters • Handle and dispense material quickly before it cures • Dispense into tight tolerance locations
Previous Process	Prior to purchasing the UltimusPlus, the cyanoacrylate was applied by hand using a squeeze bottle. This involved holding the squeeze bottle over the desired area on the catheter, and literally squeezing the adhesive onto the relevant catheter components. This was a new application for the development team. In the beginning phases the team had planned to continue using a squeeze bottle to bond the catheter parts.
Issues with Previous Process	As they started implementing this process, the development team quickly realized that they were facing many challenges. First, the material handling of the cyanoacrylate was cumbersome. Using a squeeze bottle to apply the adhesive was an inconsistent and very inaccurate process. Since cyanoacrylate is a moisture-cure adhesive, it has a very short potting life. Therefore, it would start to cure before the team could fully empty the squeeze bottle. This provided a very small timeframe to handle the material and apply it onto the substrate. The second challenge was not being able to apply the correct dose of material to bond the necessary catheter components together. The team could not accurately measure the amount of fluid that was applied by the squeeze bottle. They also could not ensure repeatability of the fluid dose each time. The inconsistent fluid application process led to significant waste, higher cost of materials, and an out-of-control manufacturing process. Lastly, using the squeeze bottle to apply the material into the tight tolerance dispense area proved to be a significant challenge. This specific catheter system had a shaft diameter smaller than 0.052” (1.33 mm). The development team needed a more precise method for applying the quick-curing adhesive to these precision components.
Dispensing Solutions	• UltimusPlus fluid dispensers • Optimum syringe barrels • Optimum 27 ga SmoothFlow tapered tips

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Results

When the team was introduced to the UltimusPlus fluid dispenser they experienced an immediate, and positive improvement to their production process. With touchscreen control of its intuitive interface, the UltimusPlus provided simplified setup.

The team was able to set and adjust the dispensing parameters with ease and speed and could focus more on applying the fluid in the correct location.

The 27 ga SmoothFlow tapered tip attached to a syringe barrel allowed the precise application of highly controlled fluid deposits. Filling the syringes with cyanoacrylate became much easier than the previous handheld squeeze bottle method.

The dispensing process was no longer messy or unmeasured, and the fluid didn't cure as quickly once it was filled into the syringe. The small gauge dispensing tip allowed for effortless dispensing onto the precision components of the balloon catheter. The UltimusPlus dispenser provided an exact amount of fluid each time to reduce waste and cost.

The dispenser was able to solve all the development team's challenges. They also benefited from many other features the unit had to offer, such as:

Full Operator Lockout

This feature was important because many operators used the dispenser throughout the day. Full operator lockout gave the development team the ability to set the validated dispensing parameters required without any potential for the parameters to be changed. This made every deposit the same as the previous deposit, and within the validated settings.

Dispense Log

This feature gave the medical device company the opportunity to record and download dispense data, such as dispense time, dispense pressure, and vacuum applied. Each dispense record also identified the dispense program used and was date/time stamped so the team could easily identify which production batch the dispense information was related to. This data could then be downloaded onto a CSV file, which could be used to identify trends in the production process and help uncover any anomalies that could lead to quality issues that may affect the functionality of the device.

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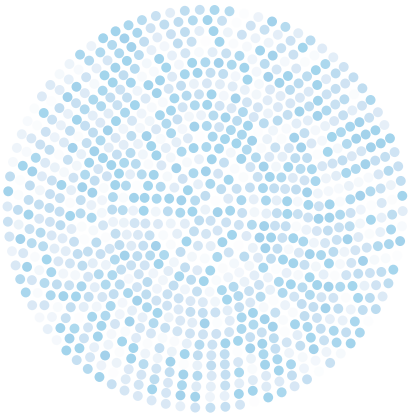
Self-Calibration



Traditionally, dispensers use solenoids and regulators, mostly mechanical hardware, that requires calibration to ensure displayed settings on the dispenser are true against the internal performance of the solenoid and regulator. The UltimusPlus is different in that it features proprietary technology that calibrates each dispense. This technology ensures if, for example, the operator sets air pressure to 10 psi, it is 10 psi of pressure being generated and supplied to the syringe barrel.

This feature reduced setup time for the medical device manufacturer by eliminating the need to experience downtime while the dispenser was calibrated by a third party. It also eliminated costs associated with getting the dispenser calibrated. This self-calibrating feature also ensured first-shot accuracy that helped the team create higher-quality catheters with less rework and scrap. First-shot accuracy means each dispensed deposit from the first to the last is validated and calibrated for the best possible process control.

The development team had so much success with the UltimusPlus, they plan to purchase the optional barcode scanner that is compatible with the unit. This will allow a part to be scanned as it comes through the assembly line and its dispensing parameters will automatically load into the dispenser.

The barcode scanner takes the guesswork out of programming the dispenser, while ensuring dispenser setup to the validated parameters each time. It also allows the operator to apply a more precise, repeatable amount of fluid required for the application, every time.

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Meeting High-Demand Production for Blood Glucose Meters

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Overview

Fluid dispensing solutions apply reagents to test strips and adhesives to bond CGM components.

Blood glucose meters are an important and growing industry worldwide. This category of products includes blood glucose monitoring test strips and readers, and continuous glucose monitors (CGMs). Wearable glucose monitors, also known as CGMs, are essential to patients and medical professionals. They assist patients in tracking their health instantly and aid doctors in diagnosing and treating complex medical issues.

Industry insiders predict that in the next decade, the demand for glucose meters will grow over 10% annually for the next seven years. Trends also indicate that the worldwide revenue associated with CGMs will grow from $13 billion dollars in 2024 to $32 billion in 2030.

As more people get older and testing improves, it will be challenging for manufacturers to handle the higher demand. Forward thinking manufacturers are already analyzing current market forces and strategizing about how they can successfully meet the CGM opportunity.

Of the many technologies used to produce CGMs, fluid dispensing is pivotal and deserves focus. Dispensing applications include applying reagents to test strips and adhesives to bond components for CGM readers.

Fluid dispensing technologies help manufacturers apply precise amounts of fluids at the correct positions on CGM substrates and test strips. This increases throughput yields, while reducing fluid waste and part rejects. Plus, many of these solutions provide a smooth transition from manual to semi-automated to fully automated manufacturing processes. In this way, organizations can implement dispensing automation solutions in a stepwise manner as market conditions require.

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Application	Blood Glucose Meters	Blood Glucose Strip
Fluids Used	• Cyanoacrylates • UV-cure adhesives • Silicone oils • Conductive petroleum jelly	• Reagents • Tetrahydrofuran • PHF • Isobutanol
Application Requirements	Both CGM and traditional blood glucose strips are heavily regulated medical devices. Both products must pass stringent quality standards and provide accurate readings under adverse conditions. In order to meet the quality standards on CGM and Blood Glucose Technologies, manufacturers require extremely precise and repeatable fluid dispensing solutions. Application requirements include micro-dispensing at specific locations on the substrates consistently. The deposit size tolerances for these applications are generally very tight, sometimes as small as ± 1%. Applying the same amount of fluid at the correct location every time is paramount to generating high-quality CGMs because the potential consequences for faulty CGMs or test strips is very high. Another application requirement is fast cycle times to meet demand for high throughput. Fluid dispensing systems must be capable of keeping up with high-volume production requirements.	
Dispensing Solutions	Manual • UltimusPlus fluid dispensers • Ultimus I-II fluid dispensers Semi-Automated • 3-Axis EV Series • 3-Axis PROPlus Series Dispense Valves • PICO XP Jetting System • xQR41 MicroDot™ Valves • 752V Diaphragm Valves • 781 Spray Valves	

Manual Fluid Dispensing

Operator-based fluid dispensing systems provide a scalable, efficient tool for CGM manufacturing.

For CGM manufacturers, Nordson EFD's manual fluid dispensing solutions provide an entry-point investment.

The Ultimus I fluid dispenser is used by CGM producers to dispense conductive petroleum jelly onto sensors inside the reader devices. CGM manufacturers also use the Ultimus II dispenser with PTFE-lined dispense tips and blue pistons to dispense cyanoacrylate fluids. Fast cure times of the cyano make it appealing but also tricky to dispense. This is why a disposable syringe is often better to use than a valve with mechanical parts.

These manually operated solutions offer these advantages for CGM producers:

- Reduces operator fatigue
- Serves manual and automated applications
- Scales with production requirements
- Decreases fluid waste
- Enables users to download dispense logs
- Obtain actionable information about the dispense cycle
- Find patterns in production and detect problems that may impact quality

Semi-Automated Fluid Dispensing

Small form factor makes it easy to mount multiple controllers on a DIN rail.

As CGM production needs increase, semi-automated fluid dispensing solutions are advantageous. Semi-automated solutions are operator based. They offer better control, greater accuracy, and improved repeatability. These systems provide improved control for higher volume, precision manufacturing.

CGM manufacturers can configure their semi-automated fluid dispensing solution based on their manufacturing needs. A proven CGM manufacturing setup features a tabletop automated dispensing system and a dispensing head such as the PICO *Pulse* XP jet valve, xQR41 Series MicroDot needle valve, or 752V series diaphragm valve. CGM manufacturers choose this combination of Nordson EFD fluid dispensing solutions because it enables them to improve efficiency and save production time.

For example, the PICO XP jet valve is used to dispense UV-cure adhesives for bonding an implantable device's chassis or body together. Jet valves eliminate the need for Z-axis movement, therefore increasing the speed at which a fluid can be applied. This makes it a great option for high-volume production.

Recently, a CGM manufacturer selected a Nordson EFD automated fluid dispensing solution to manufacture a blood glucose reader. The design required joining two injection molded sides of the blood glucose reader. In addition, the design specified encapsulating the device's circuit board to secure and protect it.

The manufacturer used UV-cure fluids for these applications.

Joining the two sides of the blood glucose reader is a complex operation. The device is joined at a molded ledge on both sides of the injection molded parts. The robot dispenses fluids onto the narrow ledge, following the outline of the injected molded part.

The CGM manufacturer used a 3-Axis PROPlus Series automated fluid dispensing robot to meet its objectives. The system provided excellent X, Y, and Z-axis repeatability, and the speed needed to meet higher production output needs. The constant closed-loop feedback provided actionable data for improving throughput.

The 3-axis robot was fitted with a PICO XP jetting system because of the precision and repeatability needed to apply fluids on the injection molded parts. The micro- level dispensing capability of 0.5 nL enabled the CGM manufacturer to apply fluids in compound arcs and lines on the blood glucose reader at high speeds for high volume production demands.

The 4-axis PROPlus series fluid automation solution includes a rotating table. This table is used for dispensing on the perimeter, inner diameter, and outer diameter of small parts.

Spray valves are also commonly used in CGM production to lubricate small parts with silicone oil. Nordson EFD's 781 spray valve is a common tool for this application. It is typically mounted onto a 3-axis semi-automatic dispensing robot for batch production.

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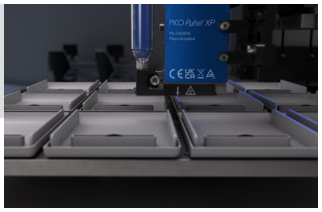
Custom Automation (Machine Builder Applications)



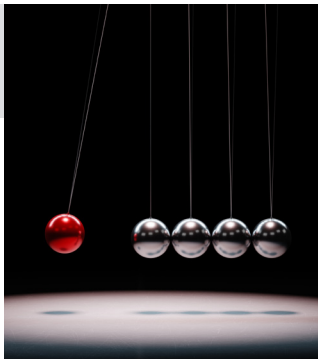
The PICO XP automated solution offers flexible automated fluid dispensing capabilities to medical device manufacturers.

Manufacturers making 300,000-500,000 units per year at <$50 each should think about using custom automation. This high-value investment offers a turnkey solution that extends multi-process assembly capabilities to manufacturers. A customized, fully automated fluid dispensing solution enables CGMs manufacturers to leverage quality assurance processes like pick and place, testing, pull testing, etc.

The principal benefit of a fully automated fluid dispensing solution is reduced process time for high production volume applications. The improved product quality, coupled with the rapid setup and programming capabilities enables CGM manufacturers to seek and fulfill new manufacturing opportunities.

Common Nordson EFD dispensing solutions used in custom automation include jetting valves (non-contact dispensing), needle valves (contact dispensing), and even syringe barrel dispensing controlled by benchtop fluid dispensers, which are also used in the manual application of fluids.

Impact (Why Fluid Dispensing Matters)



Using innovative fluid dispensing solutions helps CGM manufacturers take advantage of the growing market and increase their production capacity. The technology enables both manual and automated processes, ensuring high-quality CGMs on the market.

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Precision Fluid Dispensing Systems for Point-of-Care Diagnostic Applications

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Overview

Point-of-care (POC) diagnostics is a crucial field of research in the medical industry since these POC devices help doctors make critical decisions and help patients monitor their health. These devices can range from HIV tests to blood tests and, more recently, COVID-19 tests.

Nordson EFD provides fluid dispensing equipment that helps manufacturers meet and exceed requirements for quality and product consistency that is essential in life sciences. In this blog post, we will share details about several diagnostic applications where our fluid dispensing products increased production, improved accuracy, and more.

Blood Gas Analyzers

Application	Adhering Parts of Blood Gas Analyzers
Fluids Used	• UV-cure adhesives
Application Requirements	A medical manufacturer needed greater accuracy when dispensing a UV-cure adhesive to assemble blood gas analyzers. They were also looking for an automated solution, having previously used benchtop dispensers to assemble the readers by hand.
Dispensing Solutions	• PICO XP jetting systems

The production of most diagnostic analyzers is meticulous and requires precise dispensing operations to ensure correct functioning of the end product. With this in mind, we recommended the PICO XP jetting system because of the extreme accuracy and reliability it offers.

This jetting system allowed the manufacturer to accurately dispense lines of UV-cure adhesives along two parts to bond them together. As the next generation product to our standard PICO *Pμlse*, the PICO XP provides better, more repeatable deposit tolerances. It self-adjusts to maintain micron-level stroke of the jetted volume over time, staying closer to the initial dispensing parameters and making this our most accurate jetting valve.

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Diagnostic Readers

Application	Adhering Parts of Covid-19 Diagnostic Readers
Fluids Used	• UV-cure adhesive • Cyanoacrylate mix
Application Requirements	A healthcare technology company needed a solution for accurately dispensing a mix of UV-cure adhesive and cyanoacrylates to assemble a new COVID-19 diagnostic reader. The parts needed to be bonded together properly in order for the reader to accurately read the inserted test strips.
Dispensing Solutions	• 752V diaphragm valves • EV Series robots • RV Series robots

The 752V diaphragm valve features an open/close stroke adjustable from 0.13 mm to 0.64 mm to produce a fast response and positive shutoff. This helped the manufacturer reduce fluid waste when dispensing. Its wetted parts are made from an inert ultra-high molecular weight (UHMW) polyethylene which made the valve suitable for dispensing the fast-curing cyanoacrylate mix.

Due to the geometries of the COVID-19 diagnostic reader, we recommended both our EV Series and RV Series automated dispensing systems. While our EV robot could dispense the UV-cure adhesive and cyanoacrylate mix along X, Y, and Z coordinates of the substrate, a fourth axis was needed to rotate 360° around the part and dispense in hard-to-reach places such as where the test strip would be inserted.

Both robots include vision, meaning they have either a pencil or CCD camera that displays an on-screen preview of the dispensing path to make programming complex patterns easier. For this medical application where reliability was essential, the vision system was able to provide assurance of correct part alignment using fiducial recognition.

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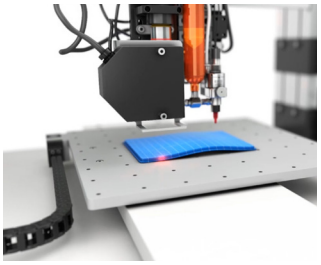
Test Strips

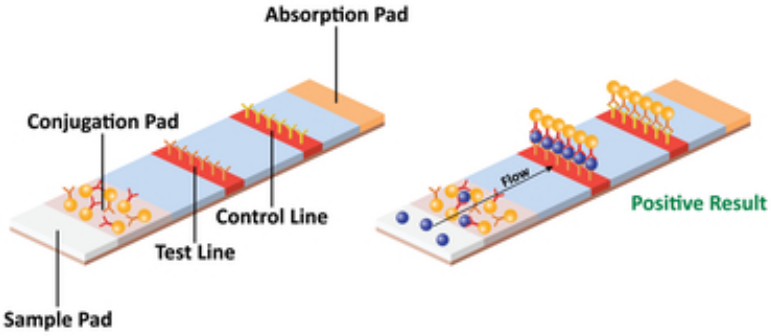
Application	Dispensing Various Reagents onto Test Strips
Fluids Used	• Various reagents
Application Requirements	This medical manufacturer needed a different robot from what had been used prior to provide easier setup and better software. The dispensing of reagents onto test strips needed to be accurate to avoid any false positive/negative test results.
Dispensing Solutions	• PROPlus Series robots



For this application, we recommended our PROPlus Series robot. This is our most sophisticated and advanced automated dispensing system that is designed for simplified usability. It features our unique DispenseMotion™ software that seamlessly integrates with the camera. The high-definition CCD smart camera features a global shutter to eliminate any blurriness or distortions when the robot is operating. It also features laser height detection (see image below) to identify height variations and self-adjust accordingly for superior accuracy.

This provided a high level of accuracy when dispensing sub-microliters of fluid onto each conjugate pad of the test strip. It was crucial that deposits were accurate so that each fluid was dispensed onto the correct pad to avoid overflow and provide an accurate test result.

As we can see in the lateral flow of a test strip below, the chemistries must be dispensed only on certain sections of the test strip. This manufacturer had separate test strips for COVID-19, glucose, blood, and more. It was vitally important that the fluid volume be controlled and applied only to particular sections. That way, when the blood or test sample is added to the sample pad, the right antibodies and antigens are latching onto the sample to provide an accurate test result.



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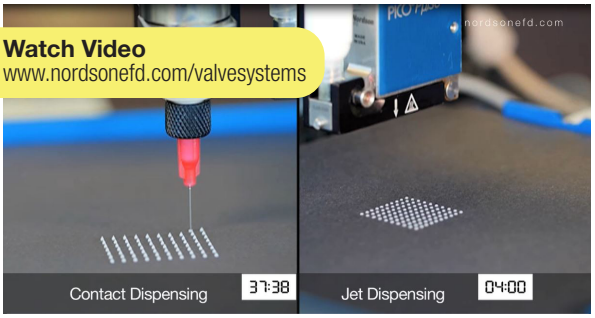
Blood Test Strips

Application	Dispensing Various Reagents onto Test Strips
Fluids Used	• UV-cure adhesives • Reagents
Application Requirements	This medical technology manufacturer needed a faster solution to keep up with an increase in production and market demands.
Dispensing Solutions	• PICO *Pµlse* jetting systems

Although their previous process included our 754V aseptic valves, xQR41 MicroDot valves, and Ultimus™ V fluid dispensers, an exponential increase in demand required them to switch to a jetting solution. We can see in the video below how eliminating the Z-axis greatly speeds up the dispensing process up to 1000Hz (deposits per second) continuously. Jetting is also quicker to set up since it doesn't require programming where a tip would be coming down onto a substrate, eliminating the risk of bending tips and damaging substrates.

Watch Video
www.nordsonefd.com/valvesystems



See the difference between contact and jet dispensing for higher throughput.

Our PICO *Pµlse* jetting system was able to increase their blood test strip production with its ability to dispense micro-deposits in a fast and repeatable manner, vastly improving throughput. In the future, we will recommend our new PICO XP jetting system, which provides superior repeatability for longer periods regardless of valve stack temperature changes.

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Progressive Cavity Pumps More than Double Capsule Filling Production in Pharmaceutical Processing

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Overview

The pharmaceutical industry has seen a growing need for personalized medication. Modern medicine and treatments have improved. However, there are some patients who cannot take over-the-counter drugs. This is due to organ restrictions, allergies, stomach problems, personal preferences, more precise dosing, or limited access to medicines.

While one drug works for one person, it may not be as effective for someone else. Taking each person's individual uniqueness into account, many doctors are writing personalized prescriptions to best treat their patients.

When a compounding pharmacy receives these requests, they formulate the individual prescriptions from scratch, ensuring consistency between drug formulations. These recipes are usually a mixture of medicine and oil, the latter serving as a fat source for better absorption. This blog will show how a compounding pharmacy upgraded to an automated capsule filling solution (robot and a progressive cavity pump) that enabled them to increase production and improve accuracy.

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Previous Process

The compounding pharmacy filled the smaller capsule halves with medicine and then covered and secured the capsule with the larger half.

The pharmacy used a machine to pour a thin mixture of hormone, vitamin, and olive oil into small capsule parts. These parts would be sealed with the bigger capsule part later on.

While this process was effective, their 30cc syringe barrels would only yield 60 capsules before having to swap out for a new syringe and reset the dispenser. This was the only size of syringe barrel compatible with the fluid dispenser they were using; it created unnecessary downtime and slowed production.

Application	Capsule Filling
Fluids Used	• Low-viscosity mixture of hormone, vitamin, and olive oil
Application Requirements	• Capsules must have a filled weight of 0.4 g and can only deviate by ±5% • Faster production with less downtime • Ability to fill more capsules per fluid reservoir (syringe barrel) • Must be compatible with varying viscosities between recipes
Dispensing Solutions	• EV Series robots • 797PCP progressive cavity pumps • 70cc Optimum syringe barrels • Beige Optimum syringe barrel pistons • 14ga SmoothFlow tapered dispense tips

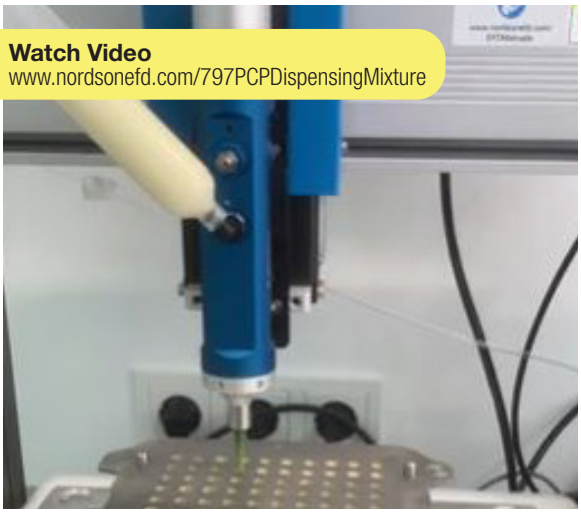
Results

Nordson EFD's stainless steel progressive cavity pump offers a corrosion resistant dispensing solution for manufacturers looking to maximize the longevity of their capital equipment investments.

When organizations want to improve production and accuracy, automation offers a path forward. After evaluating their current production method, Nordson EFD determined that the compounding pharmacy's process could be easily configured with a robot. Technical services recommended the EV series automated dispensing system, which was an upgrade from benchtop dispensing. The advantage a fully automated system had over the existing manual process was that it eliminated human error, which can result in inconsistent batches. And, with the requirements to have a filled weight of 0.4 g that could only deviate by ±5%, having a robot monitoring everything on the backend when precisely filling each capsule half proved extremely beneficial.

The next key technology recommendation was the Nordson EFD 797PCP progressive cavity pump, which accurately dispensed the mixture within the ±5% accuracy requirements. The progressive cavity pump provides continuous volumetric dispensing independent of fluid viscosity or changes in viscosity over time. That ensures reliable, repeatable control, which is essential for medical applications. The pump could also be easily cleaned with pure olive oil in between medicine recipes as well.

Watch Video
www.nordsonefd.com/797PCPDispensingMixture



In this 797PCP video you can see how Nordson EFD products dispense the mixture into each capsule half.

In addition, the Nordson EFD Optimum line provided some useful components that complemented the automated setup. The 70cc Optimum syringe barrel allowed the 797PCP progressive cavity pump to dispense into 200 capsule halves before requiring a swap for a new syringe barrel. This was a huge jump from the maximum 60 capsule halves they were dispensing into prior with this setup. The larger syringe size helped more than double their production and reduced downtime.

Nordson EFD's beige SmoothFlow pistons are loose-fitting pistons used with air-entrapped fluids. These worked well since air bubbles are common in the mixture and the air has a place to escape with this piston. The piston also features a wiper design that reduces the amount of fluid waste in a syringe, which is vital when working with expensive fluids. Lastly, our 14ga olive tapered dispensing tip was beneficial in this application because its larger gauge allowed particles to easily flow through without clogging the tip.

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Request More Information

Nordson EFD's worldwide network of experienced Application Specialists are available to discuss your needs and recommend a solution that meets your requirements and budget.

Call or email us for a consultation.

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