

Nordson EFD Solutions:

Precision Fluid Dispensing for Compact Camera Module Assembly



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Introduction



As more and more consumers expect electronic devices to capture high-quality photos and videos — and increasingly care about pixel size and camera type — the compact camera module (CCM) market is experiencing exponential growth.

Consumer electronics are driving the most growth. This is largely due to the popularity of media sharing on social networks. New applications in the security and surveillance, and automotive sectors are also key drivers.

As camera module technology advances, some key manufacturing challenges come into focus. One is the miniaturization of image sensor chips. The other is the high cost of camera modules. Preventing fluid waste and rework is often a priority.

Nordson EFD can help. We provide precision fluid dispensing solutions that achieve highly repeatable micro-deposits within tight tolerances at fast speeds. This helps you produce more units per hour (UPH) with less rejects and material waste. Our capabilities in CCM assembly range from lens bonding to voice coil motor (VCM) bonding to anchoring flexible printed circuit boards (FPCs).

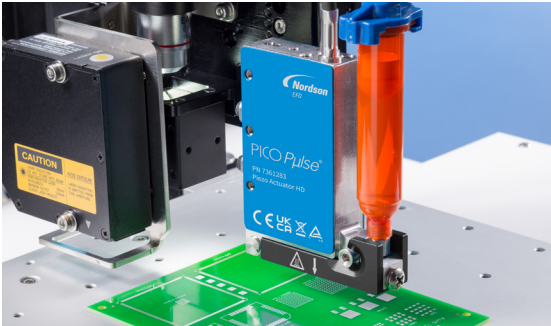
And, as the global leader in precision dispensing, we have multiple solutions for just about every CCM fluid. From low-volume to high-volume production, we have a precision dispensing solution that meets your requirements.



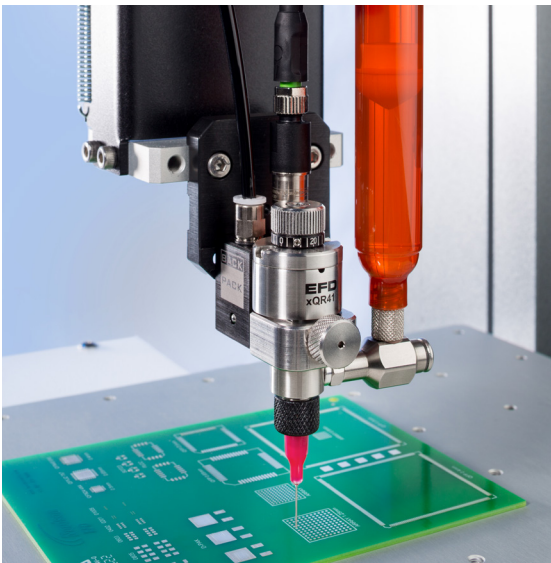
SEE IT IN ACTION

www.nordsonefd.com/CCMVideo

Valves vs. Dispensers



PICO *Pulse* jetting valves provide the greatest dispensing accuracy at the highest speed.



xQR41 MicroDot™ needle valves dispense precise fluid deposits as small as 150 µm wide.



Ultimus™ fluid dispensers provide precise fluid dispensing control for advanced applications.

Within each section of the CCM are multiple dispense points. For most dispense points you can choose between a fluid dispenser, dispense valve, or jet valve to apply precise amounts of fluid. Your production throughput and application requirements will dictate which is the best choice.

Here are some factors to consider.

Production throughput

Jet valves provide the fastest cycle rates at continuous dispensing speeds up to 1000Hz (cycles per second). They produce more units per hour for high-volume production requirements.

The PICO *Pulse*® XP jet valve self-adjusts to maintain the same micro-dispensing repeatability over long periods of time and with micron level stroke adjustment for fine-tuning jetting performance.

Deposit accuracy

Dispense and jet valves offer greater deposit accuracy and repeatability than dispensers, which make them the go-to solution when demanding deposit tolerances must be met.

Jet valves also allow dispensing at angles and onto uneven surfaces since no contact with the workpiece is required.

Type of fluid

Some materials can be so abrasive it would render a dispense valve obsolete within a shift or two. In this case, fluid dispensers may be a better option since they dispense from a disposable syringe barrel and tip that are thrown away after each use.

Benchtop dispensers such as the Ultimus V also provide full-to-empty compensation so that deposit consistency is the same from the beginning to the end of the syringe barrel.

The network-capable UltimusPlus dispenser allows dispensing control from a PLC or other manufacturing plant controller for added efficiency.

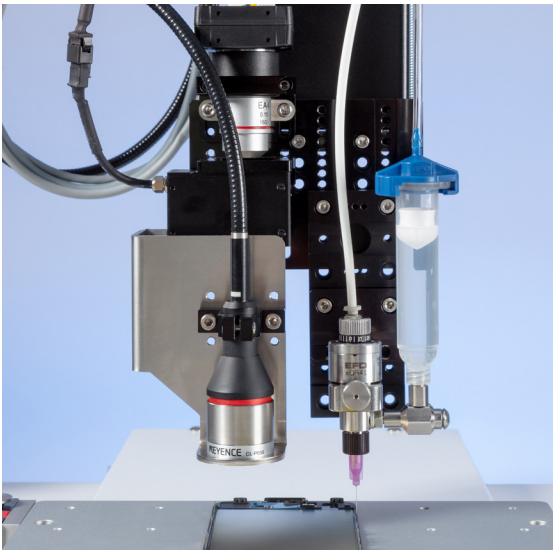
Nordson EFD valves and dispensers are designed to integrate seamlessly with tabletop dispensing robots and automated production lines. They can be configured to meet your quality and throughput requirements.

Getting a fluid application specialist involved early in new projects is essential to reducing development time and time to market.

Automated Dispensing Systems



PROPlus Series automated dispensing robots feature best-in-class positional repeatability of ± 0.003 mm ($3\text{ }\mu\text{m}$).



OptiSure improves quality control by providing optical assurance of fluid deposit dimensions and placement.

Dispensing advanced assembly fluids onto very tiny parts of a CCM requires extremely accurate deposit placement with little to no room for error. Nordson EFD developed the 3-axis PROPlus Series automated dispensing system with these types of applications in mind.

Specialized trigger mark commands allow the system's CCD camera to capture multiple fiducials with one snapshot. This speeds the VCM assembly process while increasing first pass yields.

With its dual linear guide, advanced servomotor, and ball screw actuation, the PROPlus can achieve industry-best speed and positional repeatability of ± 0.003 mm ($3\text{ }\mu\text{m}$).

Proprietary DispenseMotion™ software combined with integrated vision and laser height-sensing capabilities make it one of the easiest and fastest robots to set up and program for critical dispensing applications.

PROPlus integrates seamlessly with EFD jet valves, dispense valves, and dispensers to optimize dispensing performance for advanced applications.

It is available with OptiSure™ automated optical inspection (AOI) software and confocal laser to detect deposit measurements regardless of the transparency of the fluid or reflectivity of the deposit substrate, which can sometimes distort quality data.

Overview

Final Assembly

- VCM to sensor bonding
- FPC grounding
- FPC anchoring
- Enclosure bonding

Lens Module

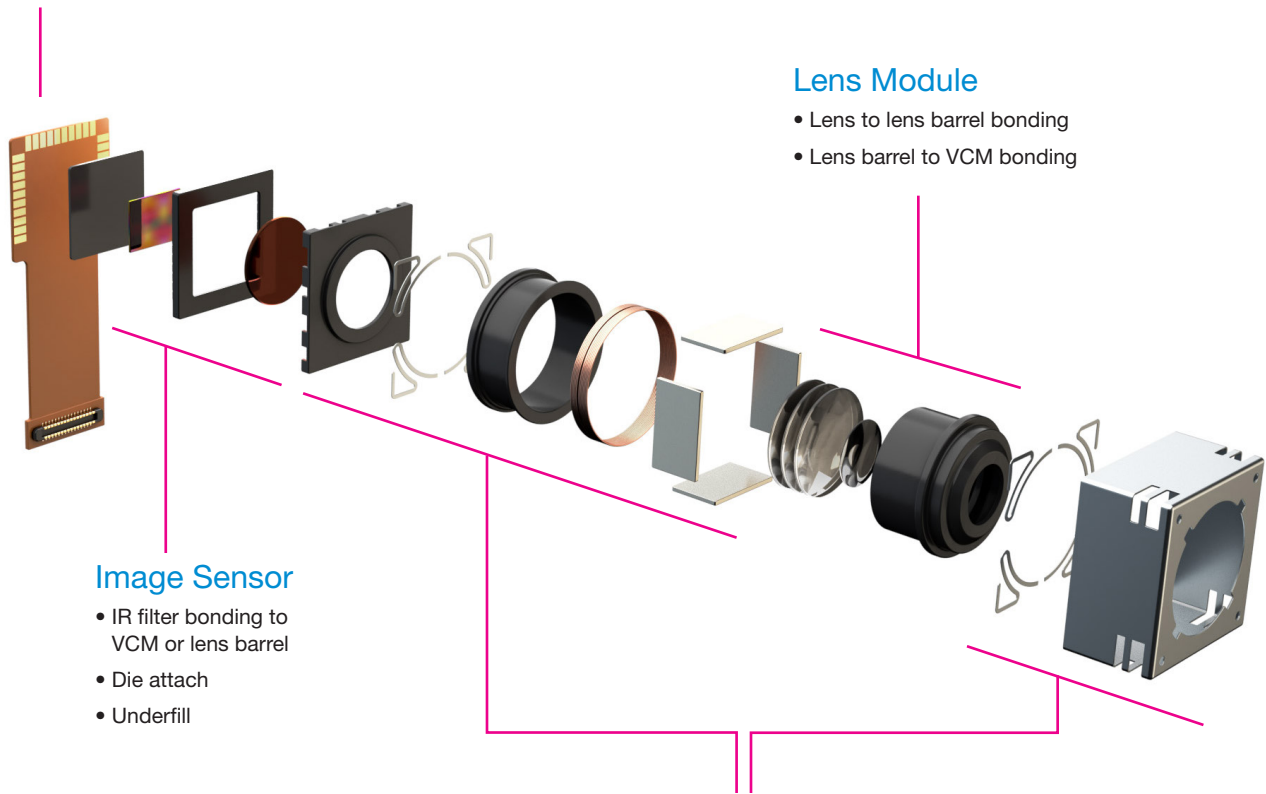
- Lens to lens barrel bonding
- Lens barrel to VCM bonding

Image Sensor

- IR filter bonding to VCM or lens barrel
- Die attach
- Underfill

Voice Coil Motor (VCM) Actuator

- Coil to carrier bonding
- F spring to carrier bonding
- B spring to carrier bonding
- Magnet to yoke bonding



Lens Module



The lens module has very unique dispensing requirements. The main application involves bonding the lens to the lens barrel, which holds multiple lenses. Some key requirements must be met to achieve a controlled process.

Exceptional deposit uniformity

Since the amount of light filtered through the lens impacts image quality, each deposit must be uniform so that it does not migrate onto the surface of the lens.

Precise deposit placement

The design of the lens barrel requires exact deposit placement around the edge of the barrel wall to hold the lens in place.

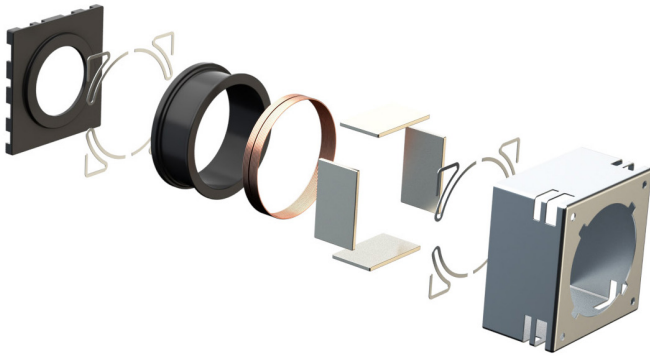
Typically, a jet valve is used to dispense precise amounts of adhesive at the edge of the barrel wall. EFD's *PICO Pulse* jetting system provides the most accurate deposits at the highest speed.

When integrated with our PROPlus Series dispensing robot, this valve meets the exacting deposit placement requirements of lens module assembly.

Recommended Solutions

- PICO *Pulse* jet valve:
www.nordsonefd.com/PICOPulseValves
- PICO *Pulse* XP jet valve:
www.nordsonefd.com/PICOXP
- PROPlus Series automated dispensing system:
www.nordsonefd.com/PROSeries
- OptiSure AOI software and confocal laser:
www.nordsonefd.com/AOI

Voice Coil Motor (VCM) Module



The VCM module provides the auto-focus and image stabilization capability of the CCM. As such, it has a complex structure with multiple pieces that flex and move. Some VCM modules require more than 12 dispense points.

Fluid must be placed in specific locations and in specific amounts. Too little material will not adequately bond the pieces, causing the assembly to fail. Too much material will impede movement, also causing the assembly to fail.

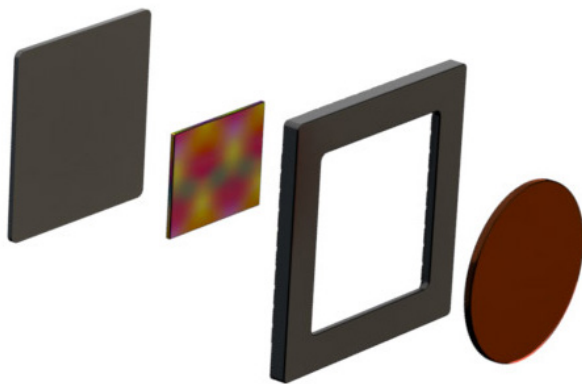
It's not surprising that needle valves such as the xQR41 and jet valves such as the PICO *Pulse* are often used to dispense fluids that hold the VCM module together. Needle valves provide the precise, repeatable micro-deposits required. Jet valves achieve consistent micro-deposits with greater accuracy at higher speeds.

Fluid dispensers provide reliable, repeatable dispensing for VCM applications that don't require strict deposit tolerances. Ultimus and UltimusPlus can apply fluids that valves simply cannot due to the abrasive or filled nature of the fluid. Dispensers are also easy to maintain. They only require discarding the syringe barrel and dispense tip after use.

Recommended Solutions

- PICO *Pulse* jet valve:
www.nordsonefd.com/PICOPulseValves
- PICO *Pulse* XP jet valve:
www.nordsonefd.com/PICOXP
- xQR41 Series needle valve:
www.nordsonefd.com/xQR41
- Ultimus or UltimusPlus fluid dispenser:
www.nordsonefd.com/Dispensers
- PROPlus Series automated dispensing system:
www.nordsonefd.com/PROSeries
- SolderPlus solder paste:
www.nordsonefd.com/SolderPlusPaste

Image Sensor



Tight tolerances and advances in chip design make image sensor applications very dynamic and complex. The applications generally fall into three categories: die attach, underfill, and IR filter bonding.

Die attach

This process is just like any other die bonding process where a heat-cure adhesive is dispensed onto the substrate to accept the die. In this case, the image sensor die is bonded to the substrate.

Valves are generally not recommended due to the abrasive nature of the material, which would deteriorate the fluid-carrying parts of the valve. Dispensers such as the Ultimus V provide the controlled dispensing required.

Underfill

This process involves filling the voids under the sensor chip to improve cooling and temperature dissipation. It typically requires non-contact dispensing with a jet valve such as PICO *Pulse* because of the speed and accuracy required.

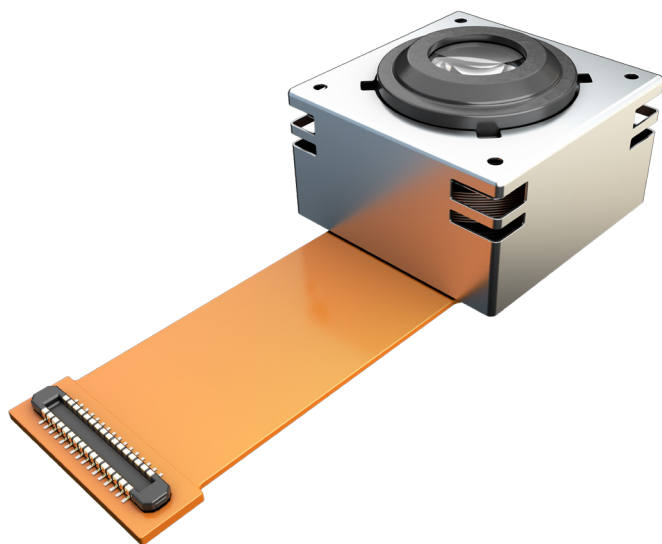
IR filter bonding

A special IR filter is attached to the VCM module in auto-focus CCMs or to the lens holder in fixed-focus CCMs. This prevents unintentional light penetration from impairing sensor image quality. It can be done with a needle valve or dispenser depending on production throughput and other requirements.

Recommended Solutions

- PICO *Pulse* jet valve:
www.nordsonefd.com/PICOPulseValves
- PICO *Pulse* XP jet valve:
www.nordsonefd.com/PICOXP
- xQR41 Series needle valve:
www.nordsonefd.com/xQR41
- Ultimus or UltimusPlus fluid dispenser:
www.nordsonefd.com/Dispenser
- PROPlus Series automated dispensing system:
www.nordsonefd.com/PROSeries
- OptiSure AOI software and confocal laser:
www.nordsonefd.com/AOI

Final Assembly



Final assembly fluid applications are critical to increasing first pass yields for CCMs. They generally involve three key steps — bonding the VCM module to the image sensor, grounding the flexible printed circuit board (FPC), and anchoring the FPC to the camera. Failure in any of these steps results in rejects.

Bonding the VCM to the image sensor is the most demanding since alignment of the image sensor and lens barrel is crucial to camera functionality. Misalignment of a few degrees can, depending on the design, mean the difference between a quality CCM and scrap. Therefore, highly accurate dispensing is essential.

Grounding and anchoring the FPC also require consistent, repeatable dispensing results, as does bonding the enclosure to the VCM. Each of these applications can be achieved with a dispenser, dispense valve, or jet valve. However, one method may be better than the others depending on production volume and other requirements.

It's important to consult an experienced fluid application specialist to determine the ideal solution.

Recommended Solutions

- PICO *Pulse* jet valve:
www.nordsonefd.com/PICOPulseValves
- PICO *Pulse* XP jet valve:
www.nordsonefd.com/PICOXP
- 794 Series auger valve:
www.nordsonefd.com/794
- 797PCP progressive cavity pump:
www.nordsonefd.com/PCP
- Ultimus or UltimusPlus fluid dispenser:
www.nordsonefd.com/Dispenser
- PROPlus Series automated dispensing system:
www.nordsonefd.com/PROSeries

Why Nordson EFD?

Dedicated to providing the highest quality dispensing solutions and customer support since 1963, Nordson EFD leverages a depth of application knowledge with every precision dispensing product we develop.

For CCM assembly, that knowledge results in exceptional dispensing repeatability, accuracy, and speed required by the market.

Advanced dispensing technology improves your manufacturing processes, providing greater control and cost effectiveness, while increasing overall part quality and throughput.

Productivity Gains

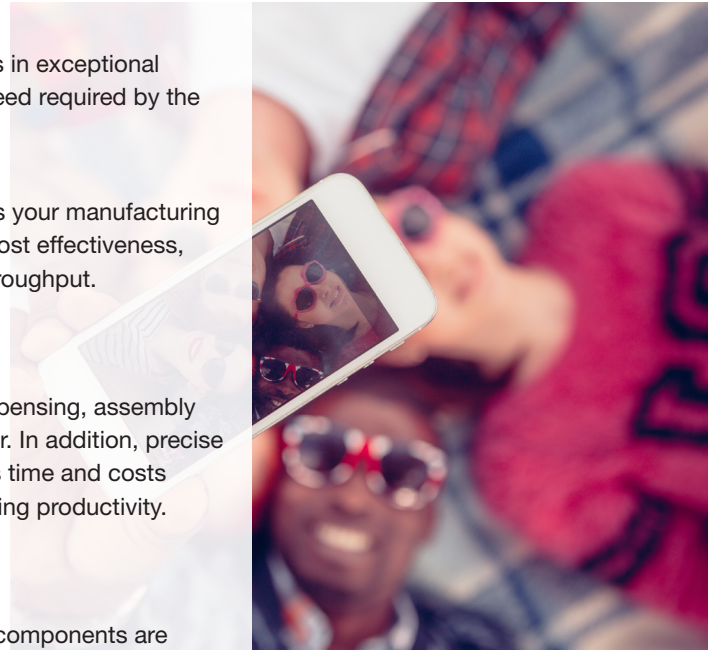
Due to faster, more consistent material dispensing, assembly machines can produce more parts per hour. In addition, precise application with EFD systems leads to less time and costs associated with clean up — further improving productivity.

Material Savings

Many of the materials used to bond CCM components are expensive, making fluid waste reduction critical to lowering operating costs. Nordson EFD dispensing systems are engineered to reduce fluid waste, contributing considerable savings to manufacturers.

Customer Support

Our team of experienced application specialists continually help customers improve manufacturing processes. With more than 15 testing labs worldwide, customers can send materials to test with EFD systems prior to purchase. With offices in more than 40 countries, EFD also provides global on-site technical support.



Useful Resources



Application Videos

Visit our Video Gallery to access 150+ application, how-to, and product videos. See EFD dispensing solutions in action.

Watch Videos: www.nordsonefd.com/VideoGallery



Expert Recommendations

Knowledgeable Nordson EFD fluid application specialists have, on average, more than 10 years of experience helping customers find the right dispensing solutions.

Request Expert Advice: www.nordsonefd.com/Advice



Easy Part Number Search

It's easy to search our digital catalog to find products by part number or keywords. Plus, get links to product specs, videos, and more. With our app, you can even access the catalog from your smartphone.

Find Part Numbers: www.nordsonefd.com/Digital-Catalog



CAD Models

When you partner with Nordson EFD, you benefit from a wide range of reliable, best-in-class precision fluid dispensing solutions.

Download CAD models: www.nordsonefd.com/CAD



Valve Selection Guide

Quickly find valves by application and fluid type to get an idea of the breadth of dispensing solutions provided by Nordson EFD.

Download Valve Guide: www.nordsonefd.com/ValveGuide

CCM Dispensing Solutions

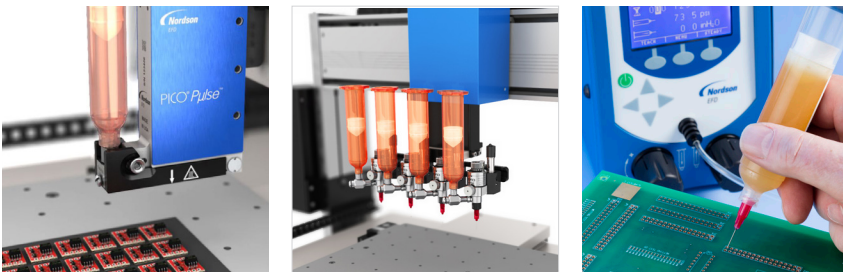
Request More Information

Nordson EFD's worldwide network of experienced product application specialists are available to discuss your dispensing project and recommend a system that meets your technical requirements and budget.

Call or email us for a consultation.

800.556.3484 info@nordsonefd.com

www.nordsonefd.com/Advice



Connect with us



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