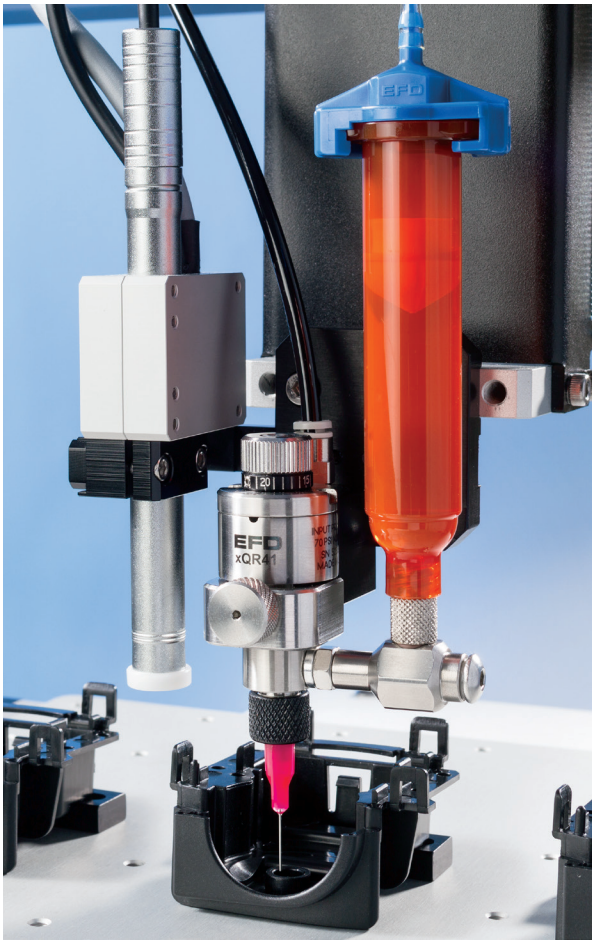
# Contact vs. Jet Dispensing

## Choosing the Optimal Micro-Dispensing Method for Your Application





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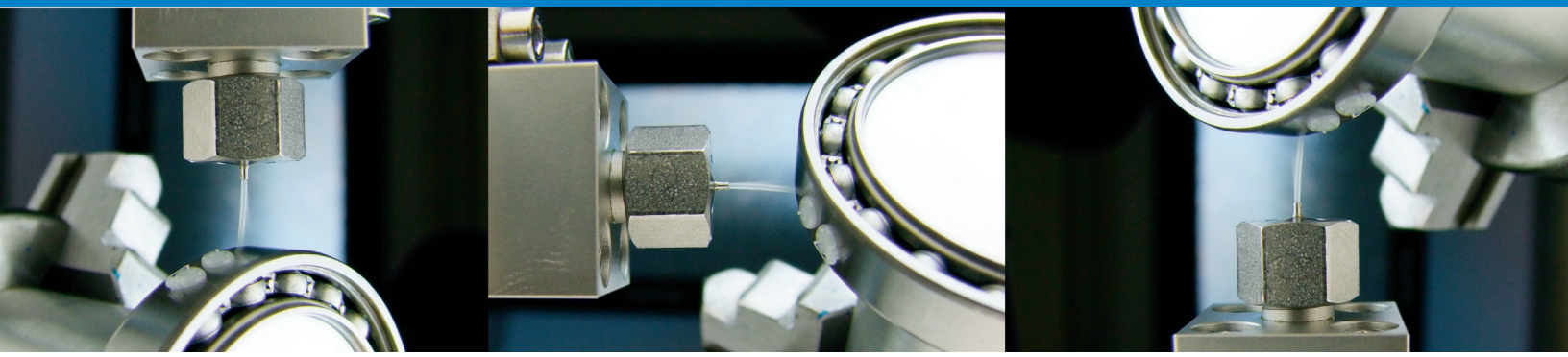


# Contents



Nordson EFD

# Introduction

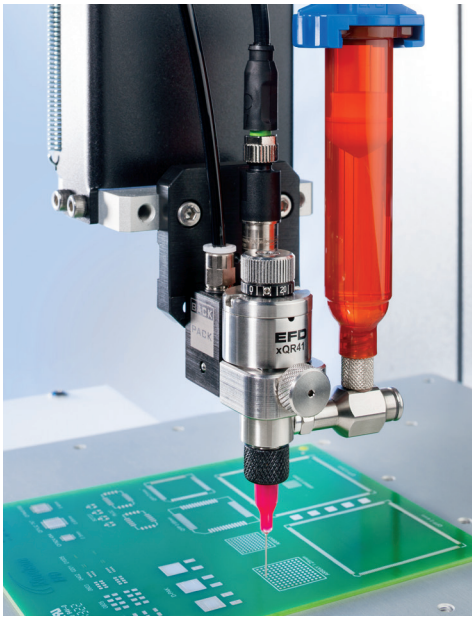
As products get smaller, components get smaller. This trend does not appear to be slowing as developments in the Internet of Things (IoT), wearables, and micro technology continue to rise.

When assembly processes require bonding micro-components or dispensing onto small, hard-to-reach, or uneven surfaces, there are a number of variables to consider before choosing the optimal dispensing method.

Simply comparing the technical data of each type of dispense valve will not help. You must also consider the process as a whole.

### IT'S IMPORTANT TO THINK ABOUT:

- **The properties of the fluid**
  If a fluid is very abrasive or cures quickly, it could affect your dispensing options.
- **Manufacturing environment**
  Do you have a cleanroom or industrial environment? How skilled are your operators?
- **Production process**
  Are you producing prototypes?
  Is your process semi-automated or fully automated?
- **How the fluid is stored**
  Is it kept in cold storage? How is it warmed?
  The properties of a fluid change as temperatures change or as it expires.




These factors will have an impact on the suitability of different dispensing methods for your application. This guide will help you understand the questions to ask now, and provide the pros and cons of contact vs. jet dispensing methods and technical details to help you make informed decisions about your process.


**WATCH THE VIDEO**
*Contact vs. Jet Dispensing*

# Questions to Consider

As you are thinking about a new or existing dispensing application, consider the following questions.

### 1. WHAT ARE THE PROPERTIES OF THE FLUID?

a. *What type of fluid is it?*
b. *What is the viscosity?*
c. *What is the density or weight?*
d. *How does it cure?*
e. *Are there any abrasive fillers in it?*
f. *Does it have liquefaction (thixotropy) or thickening (rheopexy) properties?*
g. *Is it safe to dispense or is it combustible?*
h. *How can it be cleaned? With what solvents or alcohol?*

### 2. WHAT DISPENSING PATTERN IS REQUIRED?

a. *Dot or line?*
b. *Fill or coating?*
c. *Does the deposit shape matter?*

### 3. WHAT DEPOSIT SIZE OR AMOUNT IS REQUIRED?

a. *Deposit diameter*
b. *Deposit volume*
c. *Deposit length and width*
d. *Deposit tolerances*

### 4. WHAT TYPE OF SURFACE OR SUBSTRATE ARE YOU DISPENSING ONTO?

*Does it require pre-treatment of any kind such as plasma etching, cleaning, etc.?*

### 5. WHAT ARE THE REQUIREMENTS OF YOUR DISPENSING PROCESS?

a. *How many parts per hour do you want to produce?*
b. *What is the cycle time of your production?*
c. *Will the process be automated, if it's currently manual?*
    i. *If so, will the valve be mounted on a robot or stationary as parts move beneath it?*
d. *If your process is fully automated, at what speed are parts fed to the dispensing valve? Are there any limitations due to the design of the machine?*

### 6. HOW CLOSE CAN THE DISPENSING HEAD BE TO THE PART?

*This will help determine if a contact or jet dispense valve can be used.*

### 7. IF THE APPLICATION EXISTS, WHAT ARE YOU HOPING TO IMPROVE?

a. *Throughput or cycle rate?*
b. *Deposit precision and repeatability?*
c. *Deposit placement precision and repeatability?*
d. *The degree of automation or flexibility of the current process?*

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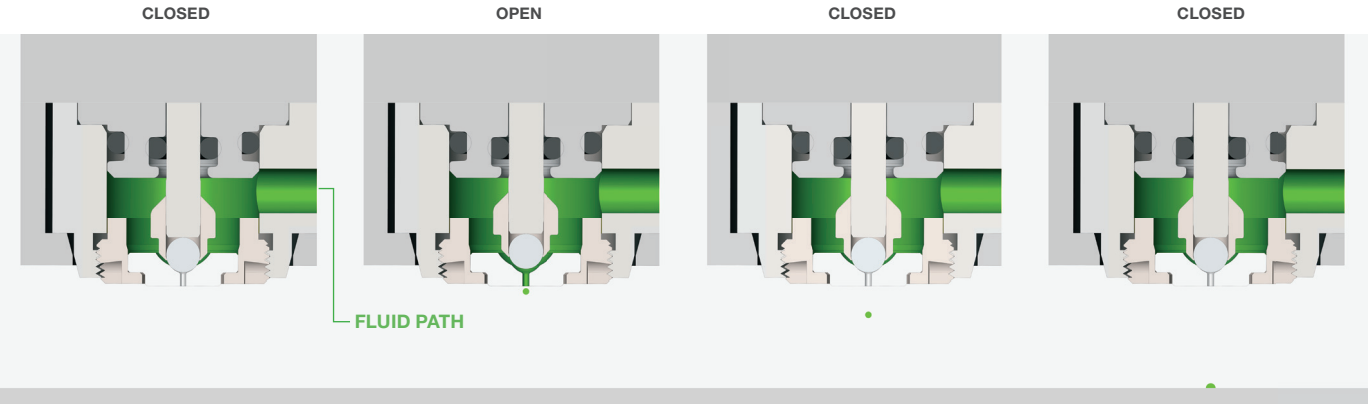
Even if you don't know all the answers, these are the types of questions a dispensing application specialist will ask to determine which type of dispensing method is optimal for a given application. It's never too early to start thinking about how your fluid should be dispensed. In fact, the earlier you start, the less production problems you'll have later on.

**Speaking with an experienced application specialist early in the process can save time and lower costs in the long run.**

# Contact vs. Jet Dispensing

To understand the benefits of contact dispensing vs. jet dispensing, it's important to understand the differences between the two dispensing methods.

## JET DISPENSING




*Typical jet (or non-contact) dispensing cycle showing the valve closed, then open, and then closed as the deposit makes contact with the surface.*

Jet dispensing often relies on a quasi-volumetric method to dispense assembly fluids. The amount of fluid dispensed depends greatly on the amount of fluid let into the nozzle chamber and the method at which the fluid is cut off so the exact same volume of material is dispensed each time.

This method of dispensing makes jetting an extremely accurate and repeatable solution because it takes many external variables, such as air pressure and suck-back, out of the equation.

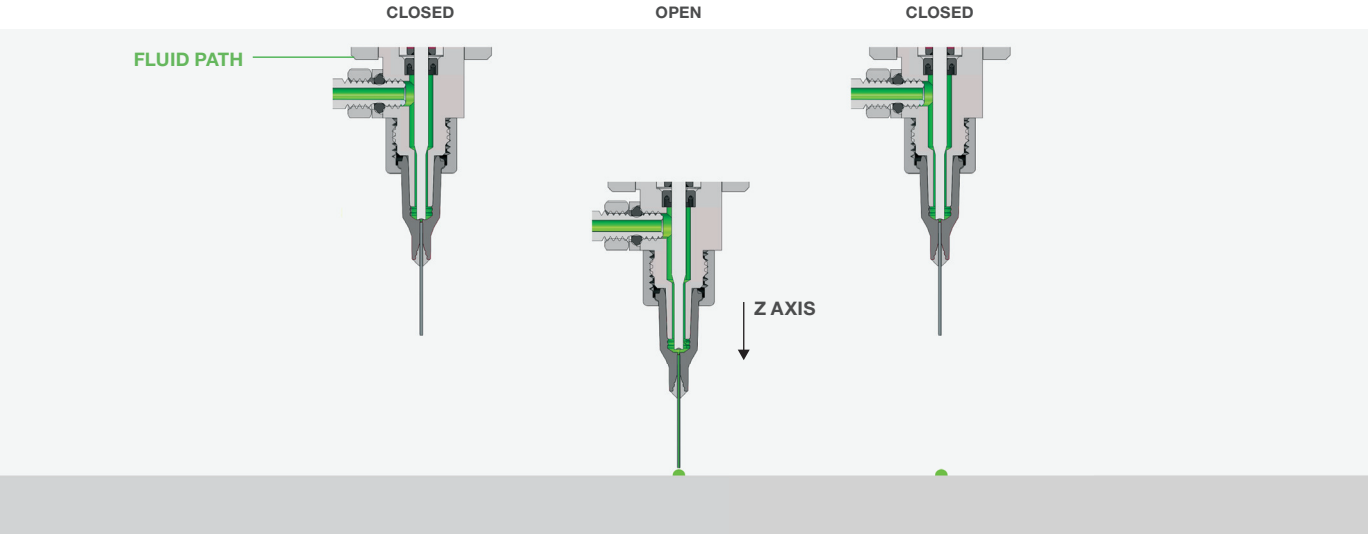
### PROS of JET DISPENSING

- Highly precise, repeatable deposits independent of part topography or tolerance
- Dispense at a continuous speed of up to 1,000 deposits per second
- Jet from any direction including horizontal and upside down
- Meets exact deposit tolerances as small as +/- 1%
- Eliminates substrate damage since there is no contact with the surface while dispensing
- Laser-based light barriers can count every deposit jetted — adding a level of process verification and quality control not possible with contact dispensing
- Eliminates dispense tip damage, since there is no contact with the surface

### CONS of JET DISPENSING

- Larger deposits when compared to needle contact dispensing — dots as small as 0.3 mm in diameter vs. 0.05 mm in diameter (with contact)
- Some fluids, such as particle-filled and highly-abrasive fluids, cannot be jetted
- Possibility for satellites or splashing can be greater — requiring time to adjust dispensing parameters
- Additional training of operators may be necessary due to more sophisticated programming requirements

## CONTACT DISPENSING




*Typical contact dispense valve cycle showing the valve closed, then open, and then closed again.*

Contact dispensing often relies on a time-pressure method to dispense assembly fluids. The amount of fluid dispensed depends greatly on the time the valve is open and amount of air pressure applied to the fluid reservoir. The amount of fluid dispensed may vary from deposit to deposit if, for example, shop air pressure fluctuates.

Contact dispensing can also rely on a volumetric method to dispense assembly fluids. In that case, the volume of fluid dispensed remains constant. However, there can be repeatability issues when fluid gets sucked back into the dispense tip and dispensed with the next deposit.

### PROS of CONTACT DISPENSING

- Dispense the smallest deposits possible at 0.05 mm in diameter
- Versatility to dispense nearly any kind of assembly fluid
- Ease of use in terms of setup and programming; shorter set-up time
- Reduced risk of deposit satellites splashing off the substrate, compromising the part

### CONS of CONTACT DISPENSING

- Slower cycle rates due to Z-axis movement — up to 80 deposits per second (with optional actuator)
- Possible part damage due to the fact that the surface must be touched
- Residual material sometimes adheres to the tip, which can affect repeatability
- Many variables that are difficult to control (ex: plant air pressure fluctuations)
- Dispense tips can become bent or break when contacting a surface, thus causing downtime

# Fluid Application Examples

The following examples illustrate how contact dispensing and jet dispensing meet different micro-dispensing application requirements. This will give you a better idea of which method might be more applicable to your dispensing needs.

## JET DISPENSING


### ADHESIVE

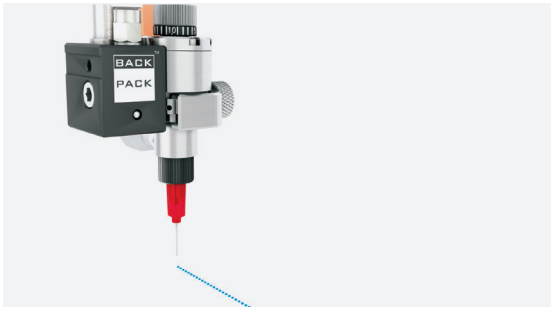
Applying UV-cure adhesive onto subassemblies of metal cutting lasers. The application required 500 µm deposits.

***Recommended Solution:***
***PICO Pµlse jet valve and PICO Touch controller***

***Benefits:***

- *Faster cycle rates helped the customer meet an increase in demand*
- *Increased deposit accuracy and repeatability, minimized rework and rejects*
- *Met precise micro-deposit size requirement of 500 µm*

## CONTACT DISPENSING




### ADHESIVE

Applying 2 – 5 µl of UV-cure adhesive to bond small components of a medical device. The right amount of adhesive had to remain in place throughout the curing process in order to maintain part quality.

***Recommended Solution:***
***xQR41 MicroDot valve***

***Benefits:***

- *Met precise, repeatable micro-deposit requirements of the application*
- *Met required cycle time of 35 cycles per minute*
- *Easy to use and cost effective*

# Fluid Application Examples

## JET DISPENSING


### ADHESIVE

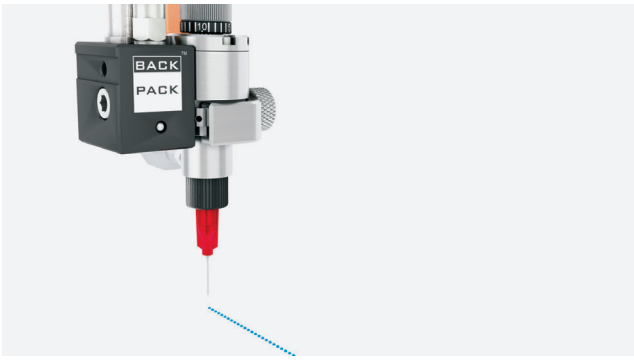
Applying a narrow bead of UV-cure adhesive to seal an automotive sensor. The application required a 2.8 mg deposit (+/- 0.2 mg).

***Recommended Solution:***
***PICO Pµlse jet valve and PICO Toµch controller***

***Benefits:***

- *Met a need to increase the speed of the process by 97%*
- *Increased deposit accuracy and repeatability*
- *Minimized rework and rejects*
- *Met tight deposit tolerance requirement*

## CONTACT DISPENSING




### ADHESIVE

Applying UV-cure adhesive to adhere a needle to a magnet in an electronic device. The application required precise micro-deposits. It did not require high-speed dispensing.

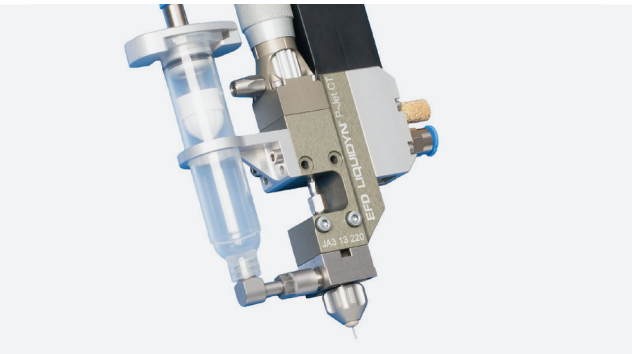
***Recommended Solution:***
***xQR41 MicroDot valve with BackPack actuator***

***Benefits:***

- *Small form factor allowed multiple valves to be mounted close together*
- *Precise, repeatable micro-deposits met application requirements*
- *Easy to use and cost effective*

# Fluid Application Examples

## JET DISPENSING




### GREASE

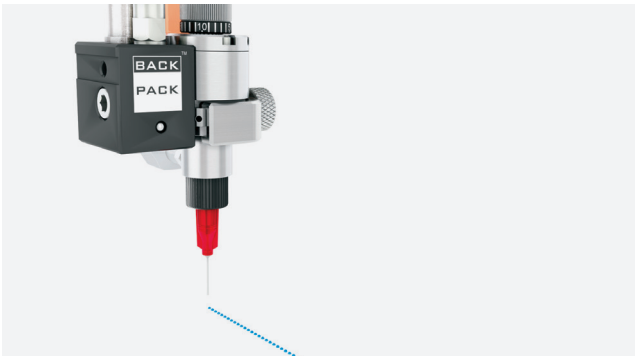
Applying high-viscosity grease onto multiple locations within the gearbox of an automobile. The application required deposit sizes ranging from 0.05 mg to 12 mg. Deposit volume had to be adjusted through a PLC.

***Recommended Solution:***
***Liquidyn P-Jet jet valve***

***Benefits:***

- *One P-Jet valve replaced 30 contact dispense valves, lowering cost-of-ownership*
- *More accurate, repeatable deposits created higher-quality parts and a cleaner workstation*
- *Programming through the PLC streamlined programming, saving time*
- *Faster cycle rates generated higher throughput*

## CONTACT DISPENSING




### GREASE

Applying a small dot of medium-viscosity grease onto the gears of a dental device.

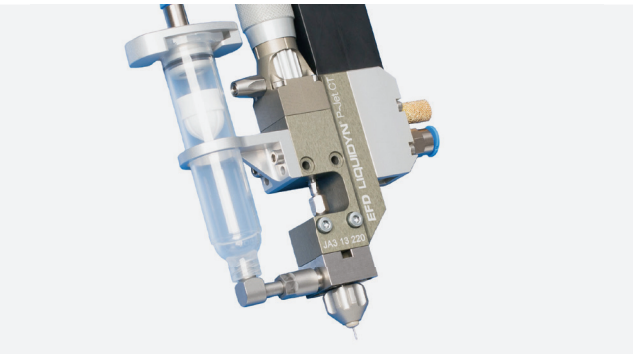
***Recommended Solution:***
***xQR41 MicroDot valve***

***Benefits:***

- *Met deposit size and accuracy requirements*
- *Quick Release clasp reduced maintenance time*
- *Easy to use and cost effective*

# Fluid Application Examples

## JET DISPENSING




### LUBRICANT

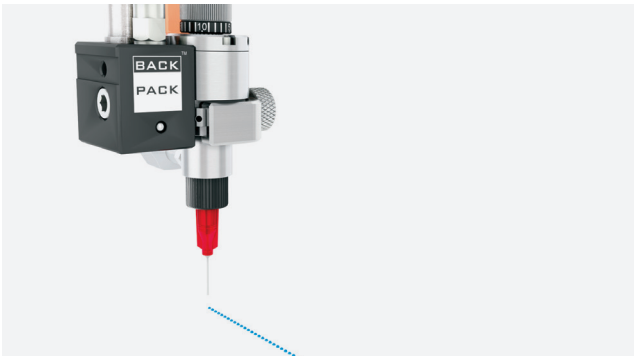
Lubricating moving parts in electrical circuit breakers. The application required a precise deposit volume with small tolerances and minimal waste since the lubricant used was very expensive.

***Recommended Solution:***
***Liquidyn P-Jet and P-Dot jet valves***

***Benefits:***

- *Precise, repeatable deposits met tight tolerances*
- *Decreased material waste cut costs significantly*
- *Shorter cycle times increased throughput*
- *Increased production quality*

## CONTACT DISPENSING




### LUBRICANT

Applying a tiny dot of lubricant into a narrow space of a medical connector. The application required deposit weight of 0.5 grams +/- 0.05 grams.

***Recommended Solution:***
***xQR41 MicroDot valve with BackPack actuator and ValveMate 8000 controller***

***Benefits:***

- *Compact size allowed multiple valves to be mounted close together*
- *BackPack actuator increased the speed of the dispense cycle to meet production requirements*
- *Met deposit tolerance of 10%*

# Fluid Application Examples

## JET DISPENSING


### PAINT

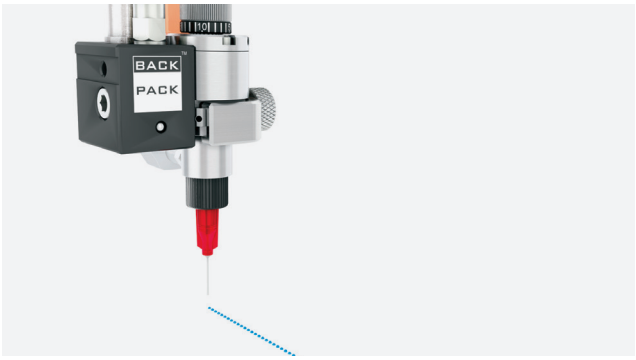
Applying paint into engravings on watches. The application required applying the exact amount of material precisely into the grooves without spilling over onto the surface.

***Recommended Solution:***
***PICO Pμlse jet valve and PICO Touch controller or Liquidyn P-Dot jet valve***

***Benefits:***

- *Increased production capacity by eliminating the previous method of applying paint to the entire surface and cleaning it off so paint remained only in the grooves*
- *Reduced fluid waste and production costs*
- *Improved part and production quality*

## CONTACT DISPENSING




### PAINT

Applying paint to color fill frames and other metal decorations in elaborate patterns.

***Recommended Solution:***
***xQR41 MicroDot valve and ValveMate 8000 controller***

***Benefits:***

- *Much more accurate, repeatable results than the previous manual method*
- *Semi-automated dispensing led to higher throughput and increased profit margins*
- *Easy to use and cost effective*

# Fluid Application Examples

## JET DISPENSING


### SILICONE

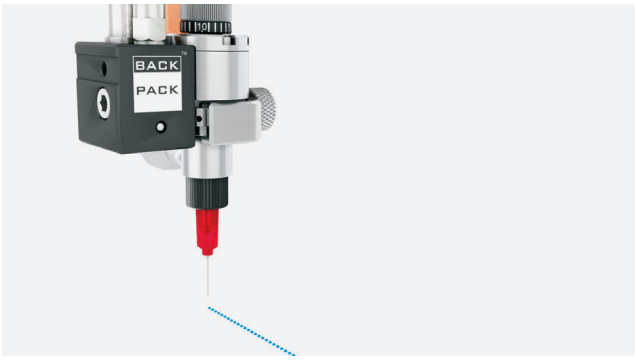
Applying a precise amount of silicone to lubricate a needle within a medical part. The application required a deposit weight of 50 µg (+/- 30 µg) and a cycle time of less than 0.5 seconds.

***Recommended Solution:***
***PICO Pµlse jet valve and PICO Toµch controller***

***Benefits:***

- *Increased speed and accuracy of the deposit for higher throughput*
- *Added flexibility to the process due to eliminating Z-axis movement*
- *Met precise micro-deposit size requirement of 50 µg*

## CONTACT DISPENSING




### SILICONE

Applying small dots of silicone grease onto heater housing of an electronics assembly.

***Recommended Solution:***
***xQR41 MicroDot valve***

***Benefits:***

- *Reduced rework and rejects that were formerly an issue with the process*
- *More accurate deposit control allows for higher part quality*
- *Easy to use and cost effective*

# Valve Comparison

The following tables outline the differences between Nordson EFD micro-dispensing valves in relation to industry and application requirements. For example, because life sciences applications often require a higher level of precision than automotive applications, which often require higher volume, the recommended valve type will be different.

## VALVE COMPARISON GUIDE / BY INDUSTRY

| INDUSTRY | JET DISPENSING | | | CONTACT DISPENSING |
|---|---|---|---|---|
| | PICO *Pulse* | Liquidyn P-Jet | Liquidyn P-Dot | xQR41 |
| Aerospace | ••• | •• | ••• | •• |
| Automotive | •• | ••• | ••• | ••• |
| Cosmetics | • | ••• | • | • |
| Defense | • | ••• | ••• | •• |
| Electronics | ••• | •• | •• | •• |
| Food Industry | • | ••• | • | •• |
| Furniture | • | ••• | •• | • |
| Life Science | ••• | • | • | •• |
| Machine Builders/ Integrators | ••• | ••• | ••• | ••• |
| Mobile Devices/ Wearables | ••• | •• | •• | • |
| Packaging | • | ••• | • | • |
| Pharmaceutical | •• | ••• | • | • |
| Photovoltaic | ••• | •• | •• | •• |

**KEY** ••• Most Suitable •• Suitable • Less Suitable — Not Suitable

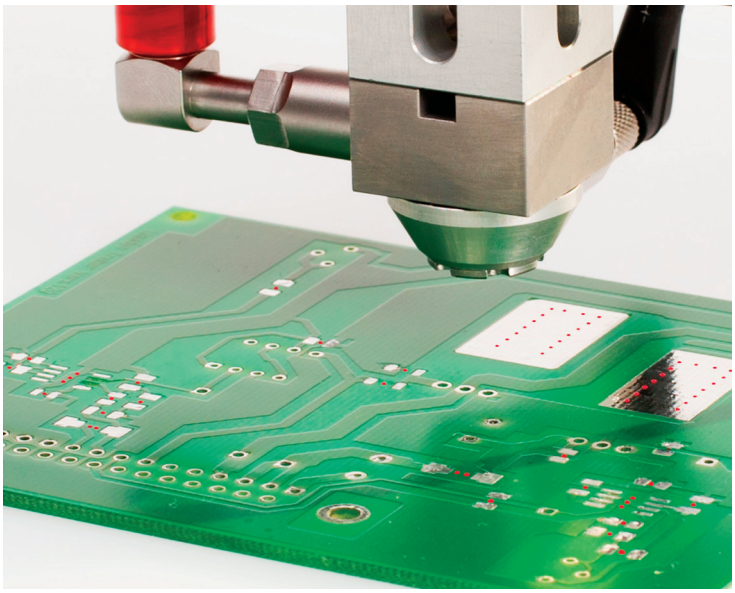
## VALVE COMPARISON GUIDE / BY APPLICATION REQUIREMENTS

| REQUIREMENT | JET DISPENSING | | | CONTACT DISPENSING |
|---|---|---|---|---|
| | PICO *Pulse* | Liquidyn P-Jet | Liquidyn P-Dot | xQR41 |
| ≥150Hz Frequency | ••• up to 1500Hz | ••• up to 280Hz | ••• up to 150Hz | — up to 80Hz w/BackPack |
| Volume < 1 nL | ••• as small as 0.5 nL | — as small as 3 nL | — as small as 3 nL | ••• as small as 0.5 nL* |
| High Accuracy | ••• | •• | ••• | •• |
| High Repeatability | ••• | •• | ••• | •• |
| Ease of Maintenance | ••• | ••• | ••• | ••• |
| Versatility | ••• | ••• | • | ••• |
| Dots | •• | •• | ••• | ••• |
| Encapsulating | ••• | •• | •• | •• |
| Filling | • | ••• | • | •• |
| Lines | ••• | ••• | •• | ••• |
| Microdots | ••• | • | ••• | ••• |
| Potting | • | ••• | — | ••• |

**Depending on the gauge of the dispensing tip. You need a very small gauge to get this volume.*

**KEY** ••• Most Suitable •• Suitable • Less Suitable — Not Suitable

# Why Nordson EFD?

Because so many factors can impact your dispensing process, it's important to consult an experienced fluid application specialist who knows what questions to ask to guide you to find the right solution for your dispensing application.

In fact, getting an EFD application specialist involved early in a project will help you not only choose the right micro-dispensing valve, but also help you develop the right process so you'll have fewer problems later in production.

Most EFD application specialists have 10+ years of experience helping customers find the right dispensing solutions for their fluid and application requirements. And with more than 15 global application labs, it's easy to test your fluid and parts with EFD dispensing solutions to validate an application prior to purchase.

Our global support team can provide on-site technical assistance and trusted recommendations — even for the most challenging dispensing applications — from offices in more than 40 countries worldwide.

**Contact EFD at info@nordsonefd.com to request more information.**

## Request More Information

Nordson EFD's worldwide network of experienced fluid 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/recommendations

## Connect with us

Nordson EFD

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