GPD Global Precision Dispensing Systems **Dispense Technology**

PCD Series Volumetric Dispensing

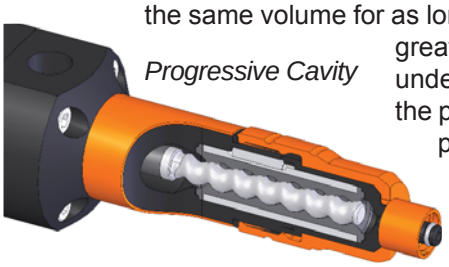
Continuous Volumetric Dispensing

Progressive Cavity Displacement (PCD) is an innovation in volumetric dispensing for a wide range of fluids. PCD technology can dispense fluids ranging in viscosity from water up to thick pastes without a configuration change.

The principle of fluid movement is to transmit uniform, sealed cavities of fluid through the displacement mechanism. Exceptionally high dispense rates can be achieved due to the movement of the individual cavities through the displacement chambers. Abrasive materials are pushed rather than sheared or impacted, maximizing the life of the displacement components. The fluid transfer mechanism consists of a chrome plated surface (rotor) that mates with a high durometer rubber (stator).

PCD3L *PCD4L* *PCD6*

PCD volumetric dispensing has a great advantage with materials that change viscosity over time or with a change in temperature. Since the fluid is transferred continuously in constant cavities, you will always get the same volume for as long as you need to dispense. This is of great interest when using materials such as underfill or encapsulants; no recharging of the pump is needed. Also, since the fluid is pushed without the chance of material separation, material can be ejected from the nozzle up to 2 mm above the work surface. This height is key during the underfill process to position the flow of fluid close to sensitive components, as well as to avoid the potential for contact.



Progressive Cavity

The PCD Pump Series is available in 3 different sizes, each specific to a volume range, and more importantly, a minimum volume. In addition to the volume ranges, configurations suited for bulk and syringe feed are available. *All specifications available at end of brochure*. Large areas can be dispensed in a fraction of the time required by other methods and small volumes can be dispensed with an unmatched repeatability. Fluid can be presented to the pump with standard hardware in reservoirs between 10 cc and 70 cc. Bulk feeding is also possible by connecting directly to the material chamber. Variations in incoming fluid pressure do not affect the dispense quality; this means consistent results from full-to-nearly empty reservoirs. Other dispense methods will have volumetric variation under these conditions.

PCD dispense technology yields excellent benefits over existing dispense technology:

1) Continuously volumetric
2) No drip with any viscosity of material
3) Not subject to wear from abrasive materials
4) Does not damage or break fillers
5) Adjustable flow rates up to 6 ml/min
6) Low maintenance

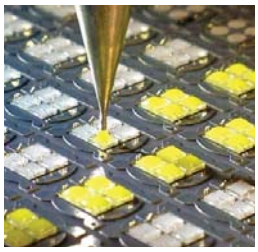
Materials to Dispense

The PCD achieves unparalleled levels of repeatability over the full pot-life of a wide range of fluids without calibration.

PCD is ideally suited to low viscosity liquids such as fluxes, encapsulants, and underfills. Thicker fluids up to 60,000 cps such as greases, gasketing, and damming materials do not affect the performance of the valve. The motion of filled fluids through the stator does not damage or smash silver flake or phosphor found in some LED encapsulants.

Conductive Adhesive

LED Encapsulation



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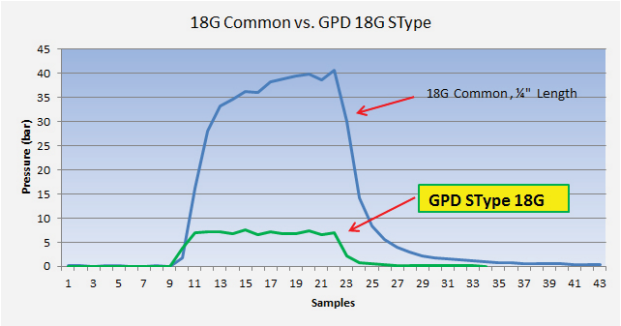
High Flow Rate, Low Pressure Nozzles

S Type nozzles are single piece, seamless tips designed to impart minimum pressure on the fluid during the dispense process. The interior of the tips is completely smooth with no seams or insertion points to hinder fluid flow. The taper has been designed to minimize pressure on the fluid and improve flow rate. For optimal results the wall has a thickness of 0.050mm (0.002”). For an equivalent OD of a thick wall, common nozzle, the S Type will deliver a significantly greater flow rate.

The chart at the right illustrates pressure buildup in a common 18G, 6mm length nozzle compared to an equivalent ID S Type tip. With the common nozzle the pressure continues to build and is not stable which results in uneven flow rate. The SType tip illustrates a significantly lower pressure that reaches a peak and remains constant over through the dispense cycle. End result is a more uniform and controlled dispense.

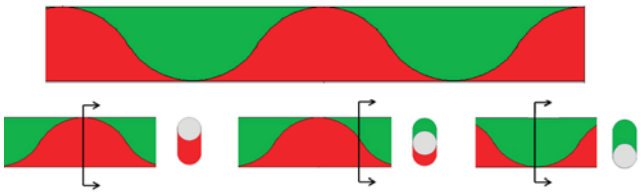


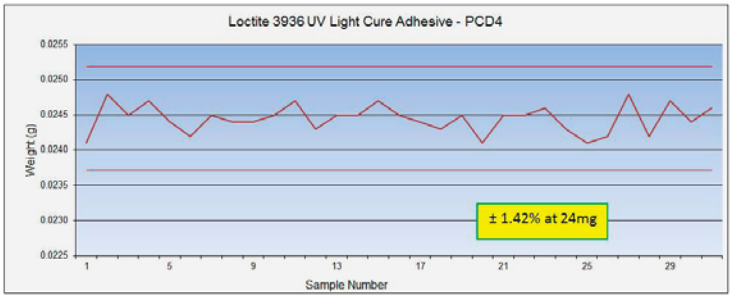
The connection to the pump is via a luer connector. Luer connectors will interface numerous pumps and easily interchanged.

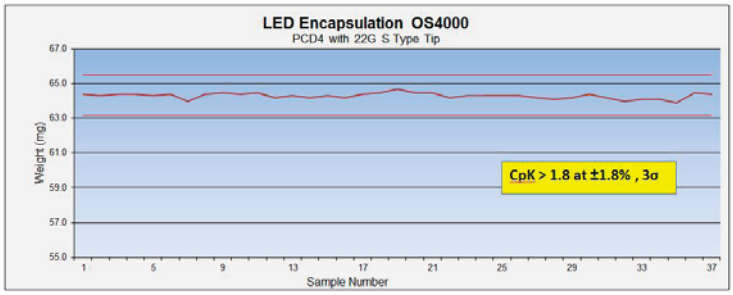
PCD Repeatability

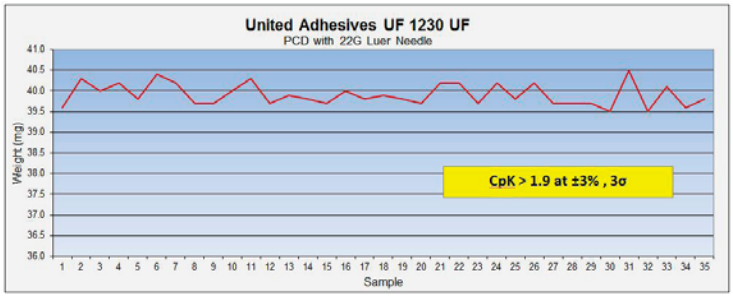
PCD pump repeatability is exceptional over a wide range of fluids. PCD Pump technology is a sealed system that utilizes two opposing cavities that are 180 degrees out of phase. Through the pump cycle fluid is being fed to the dispense tip by a combination of both cavities or a single cavity. At any point in time the cross section of fluid is constant, resulting in a continuous, volumetric dispense. The cavities are a known volume making it easy to measure the volume through a portion of the dispense cycle. Since the pump is a volumetric pump it is not greatly affected by changes in viscosity due to pot life change or environmental temperature fluctuation.

Continuous volume cavities with constant volume at any point in the dispensing motion.









The system is a sealed environment so there is no chance for very low viscosity fluids to drip or drool even when under pressure. The charts shown here illustrate PCD4 with S Type tip repeatability tests conducted with various fluids at different viscosities. An excellent combination for accuracy, repeatability and optimal throughput.

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Specifications

Volumetric PCD Pumps

VOLUMETRIC PUMPS	PCD3H	PCD3L	PCD3	PCD4H	PCD4L	PCD4	PCD6	PCD7
Dimensions† (height, diameter)	220.73 mm, Ø 34.80 mm	208.28 mm, Ø 34.80 mm	207.56 mm, Ø 34.80 mm	240.2 mm, Ø 35 mm	230.35 mm, Ø 35 mm	230.28 mm, Ø 35 mm	274 mm, Ø 34 mm	
Weight (approx.)	451 g (1.0 lb)	556 g (1.2 lb)	380 g (0.8 lb)	689 g (1.52 lb)	671 g (1.48 lb)	420 g (0.9 lb)	753 g (1.66 lb)	
Dispensing volume	≈ 0.012 ml/rotation			≈ 0.05 ml/rotation			≈ 0.14 ml/rotation	≈ 0.53 ml/rotation
Theoretical flow rate*	0.12 to 1.48 ml/min			0.2-6.0 ml/min	0.5-6.0 ml/min		1.4-16.0 ml/min	5.3-60.0 ml/min
Minimum dispensing amount**	0.0005 ml	0.001 ml			0.004 ml		0.015 ml	0.06 ml
Priming volume	≈ 1.5 cc		≈ 3 cc	≈ 1.5 cc		≈ 3 cc	≈ 4 cc	
Dispense precision ml, absolute**	±1%							
Maximum input pressure	6 bar (87 psi)							
Maximum dispensing pressure*	20 bar (290 psi)							
Parts touched by medium	HD-POM, Stainless Steel, Anodized Aluminum							
Motor rotating speed	0-120 rpm							
Operating ambient conditions°C	+10 to +40 non-condensing, air pressure 1 bar (14.5 psi)							
Medium temperature°C	+10 to +40							
Storage conditions°C	Dry and dust free, -10 to +40							
Pump cable length	250 mm (10”), Extension cable available							
Stator material	Inert Elastomer							
Maximum viscosity***	60,000 cps							
Nozzle type	Luer or Precision		Luer	Luer or Precision		Luer		
Thread used - medium input	Standard luer lock or 1/4-32		1/8” cylindrical Whitworth pipe thread	Standard luer lock or 1/4-32		1/8” cylindrical Whitworth pipe thread	1/4” cylindrical Whitworth pipe thread DIN/ISO 228	
Material reservoir	Up to 55 cc w/standard mount.		Up to 55 cc w/ standard mount. Bulk feed possible.	Up to 55 cc w/standard mount.		Up to 55 cc w/standard mount. Bulk feed possible.		
Air free reservoir exchange	Yes		No	Yes		No		
Drip & drool free	Yes							

† Contact GPD Global for 3D models for integration layout purposes.
* Depending on viscosity & primary pressure of medium. All pressure details are maximum values for low-to-medium viscosity media (20,000 mPas).
** Reference medium approx. 1.000 mPas at 20° C.
*** Higher viscosity may be possible based on nozzle size and flow rate.

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