

Volumetric Pump for Retrofit/Integration

Continuously Volumetric PCD Pump for Highly Repeatable Dispensing

Applications: Silicones, Conductive Ink, Underfill, LED Encapsulation, Solder Mask, Grease, Conformal Coatings, and more

Progressive Cavity Displacement (PCD) Technology is a true “continuous volumetric” dispense technology able to accommodate a wide range of fluid viscosities - from water to mid-viscosity pastes. With a completely sealed system, there is no chance for drip or drool, even with the lowest viscosity fluids. There are three models of PCD pumps - they vary in dispense rate and minimum volume capability. The smallest model can dispense volumes down to 0.5 µl while the largest can dispense at rates up to 16 ml/min. Without the need to recharge, as is common with other volumetric technologies, the pump can dispense continuously over the largest patterns. PCD dispense technology exhibits total fluid control; even the lowest viscosity fluids can be accurately controlled.

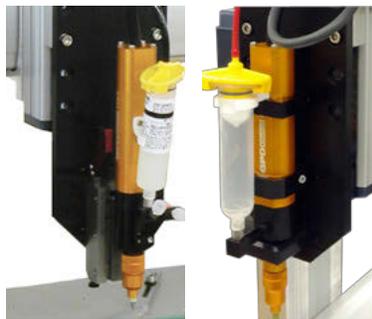


PCD Dispense technology is well suited for integration into systems with small or large volume requirements. Fluid may be fed from an external reservoir or from syringes (10 to 55 cc). For additional details about Volumetric PCD Pumps, refer to [Volumetric PCD Pumps](#) on our web site.

Volumetric Pump Integration Choices

Integrating any of the three PCD pump models into your existing process is easy with a choice of two ways to mount the pump and three methods of controlling it.

Simple mounting hardware that allows you to mount the pump to your system with a single bolt is included. Alternatively, Taper-Lock™ mounting hardware can be added for tool-less mounting.



Taper-Lock™ Mount Simple Mounting

Three control methods

are available: a stand-alone fully-programmable controller, a control interface, or a servo controller for high precision dispensing.

Programmable Controller

The Programmable Controller incorporates an easy-to-read LCD screen and a control wheel for programming the pump and monitoring its status. Programming modes include a specific volume, a specific time or a start/stop mode. These programming modes are executed either by pressing

the START button on the front of the controller, pressing a foot switch, or when an input is received from an external control source. For non-automated applications, a pump stand is available (Figure 1). The stand holds the pump in virtually any orientation for manual operations like syringe filling, coating, or applications that require the operator to move the product.



Figure 1: PCD Pump with optional Pump Stand, Programmable Controller, Interface Cable, and Support Kit

For automation applications, the programmable controller can be triggered with an external signal through a user-sourced cable. The signal may originate from a Programmable Logic Controller (PLC) or another automated system (Figure 2).

When the programmable controller receives an input, it executes the currently displayed program. The most common form of pump control for automation integration is the start/stop mode. In this mode, the pump on/off is controlled by the control signal and allows for varying volumes at different locations, including dots or complex patterns.

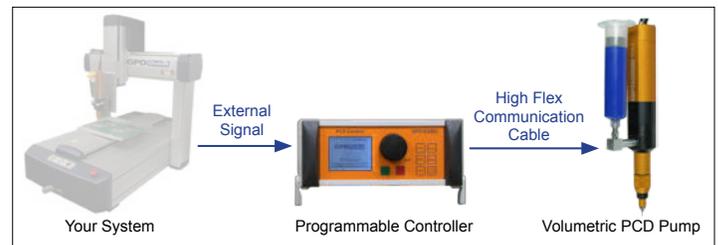


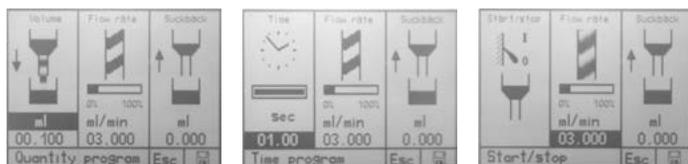
Figure 2: Standard Integration with automated machine

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Volumetric Pump Integration

The programmable controller has three programming modes:



Volume Dispense

Timed Dispense

Start/Stop

- **Quantity** - pump dispenses the programmed volume at the programmed speed.
- **Time** - pump dispenses for the programmed time at the programmed speed.
- **Start/Stop** - pump dispenses from the time the START button is pressed (an input signal is received) until the STOP button is pressed (the signal is removed). This is the most common mode for interfacing with a machine/robot.

A reverse or suck back volume is available in each mode.

Up to 24 programs can be saved to an SD card for transfer to other controllers for programming consistency. The robot may select one of these programs with an optional program select module.

In addition, a single programmable controller can control up to two dispense pumps with an optional firmware update. When enabled, a single controller operates two PCD pumps in tandem using the same dispense parameters. This is ideal for doubling throughput for automation applications (Figure 3). To ensure volumetric consistency between the pumps, they can be individually calibrated. The controller records the calibration values and synchronizes the pumps to dispense the same volume.

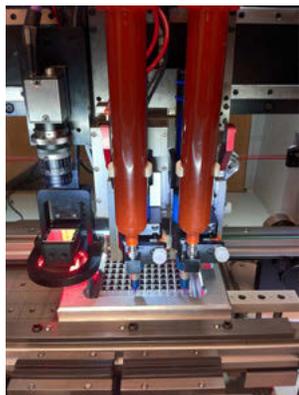


Figure 3: Tandem Pumps

To pressurize a syringe, the controller has a built-in regulator to moderate incoming pressure. The control unit displays the reservoir pressure but does not turn the air on/off. An incoming pressure of up to 6 bar (87 psi) can be connected to the control unit. When a large reservoir such as a pail is used, we recommend using an alternate pressurization device.

Interfacing the programmable controller and PCD pump is easily done with integration kits. These kits include everything needed for a simple integration (Figure 4): a PCD Series Volumetric Pump, a Programmable Controller, an Interface Cable between Controller and Pump, a Mounting Bracket, and a PCD Support Kit.



Figure 4: Integration Kit

(3D models of pump, controller, and mounting hardware are available for design purposes.)

Pump Mounting:

- Simple mounting is a clamp type that attaches to your system with a single bolt.
- Optional Tool-less Taper-Lock™ mounting provides a machine-side and pump-side interface where the pump can be mounted and removed with the push of a button.
- Optional Pump Stand for bench top use

Cabling:

- A 1.3 m high flex cable between the controller and pump is standard. Optional lengths up to 5 m are available.
- The control cable between the robot and controller is supplied by the customer. The programmable controller includes a connector to accept bare wire or wire with ferrules (Figure 5).

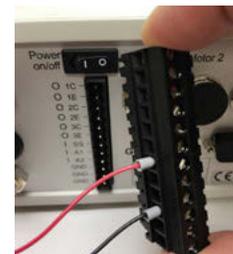


Figure 5: How connector wires attach

Control Signal:

- Through a user-supplied cable, a 24V signal from the robot initiates the selected program or starts/stops the pump when in the start/stop mode.
- For systems without the capability to send a 24V signal, we offer an optional interface to convert dry contacts to the required 24V.

Syringe Feed Pressure:

- When a regulated syringe pressure source is not available, the programmable controller has the ability to regulate an incoming air source and supply a constant syringe pressure.

Volumetric Pump Integration

Direct Control Integration

Direct Control Integration offers the greatest flexibility in pump control. This interface requires the user's control system to supply a forward or reverse enable signal with a concurrent 0-10V variable voltage for speed. With Control Interface, all programming and control must be set up by the user.



Figure 6: Two Control Interface units mounted on a machine

With this integration method, your system has full/dynamic control of the motor. The pump can dynamically change velocity when traveling through corners or when a larger volume is required in a particular area. One controller operates a single pump; tandem operations require two controllers and two pumps.

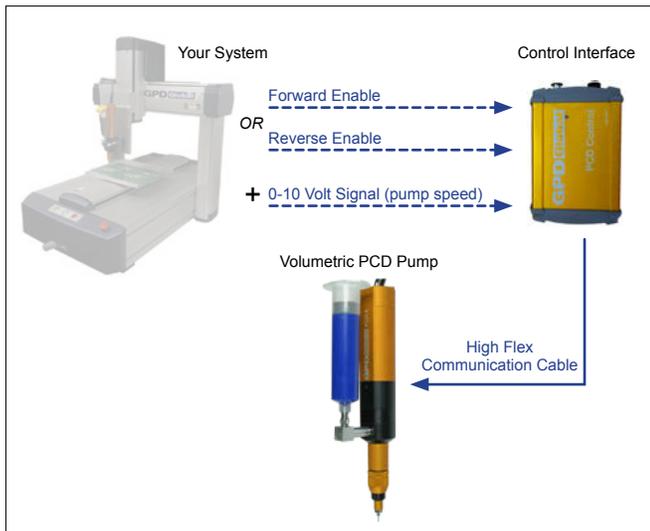


Figure 7: Direct Control Integration

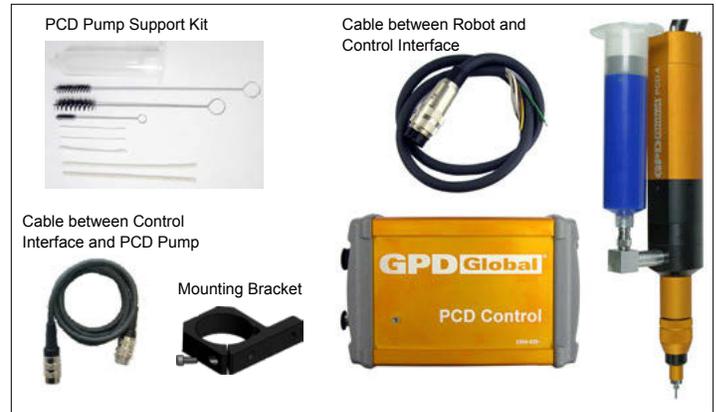


Figure 8: Direct Control Integration Kit

The Direct Control Integration Kit (Figure 8) includes all hardware needed for easy integration into your system: a PCD Series Volumetric Pump, a Control Interface, a Cable between controller and pump, a Cable between controller and robot, a Pump Mounting Bracket, and a PCD Support Kit.

(3D models of pump, controller and mounting hardware are available for design purposes)

Pump Mounting:

- Simple mounting is a clamp type that attaches to your system with a single bolt.
- Optional Tool-less Taper-Lock™ mounting provides a machine-side and pump-side interface where the pump can be mounted and removed with the push of a button.

Cabling:

- A 1.3 m high flex cable between the controller and pump is standard. Optional lengths up to 2.5 m are available.
- 0.6 m cable between the robot and controller

Control Signal:

- A 24V signal through the supplied cable enables forward/reverse motion while a concurrent 0-10V signal controls the speed.

Syringe feed pressure:

- Customer-supplied regulated pressure line is required.

Volumetric Pump Integration

Servo Controller

For applications requiring volumes at the lower limits of pump specification (volume or flow rate), a high resolution controller and pump configuration is available. The Volumetric PCD H Series pump uses the programmable servo controller for successful integration.

A servo motor and high-resolution precision encoder control the pump. The closed-loop motion control system ensures repeatable operation and uniform speed when fluid viscosity changes.

The programmable servo controller is a full featured controller (Figure 9). It controls all motion aspects of the PCD H Series pump for dot and continuous dispense. Programming is done using an intuitive touch screen that uses no text - just symbols.



Figure 9: Front and Rear View of Servo Controller

Pump Parameters available to the operator are acceleration, deceleration, speed, and in the case of dots, an exact amount of rotation. The touch screen interface is intuitive and is programmed for universal recognition with symbols and numbers. The programmable controller can also be connected to a computer for remote programming, making this a comprehensive controller for all PCD H Series pump needs. The operator may set up separate program profiles that can be referenced by inputs from your system. Figure 10 illustrates how a PCD H Series pump integrates into a third party dispensing system.

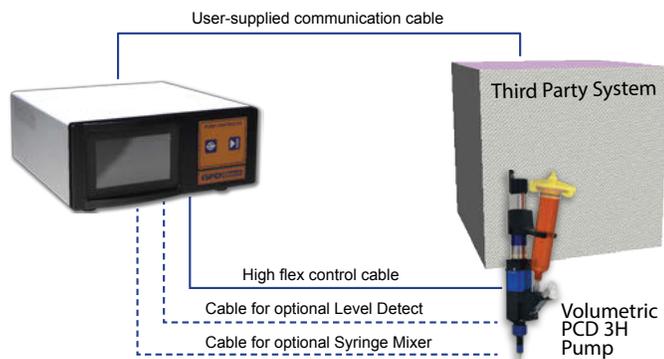


Figure 10: PCD H Series Integration into Third Party Machine

Easily interface a Volumetric PCD H Series Pump with your existing robot or control systems using the Volumetric PCD H Series Integration Kit (Figure 11). This kit includes a PCD Pump, Toolless Taper-Lock™ Mounting Hardware, a programmable Servo Controller, a 2 meter interface cable between the controller and pump, and a Support Kit.

(3D models of pump, controller, and mounting hardware are available for design purposes.)

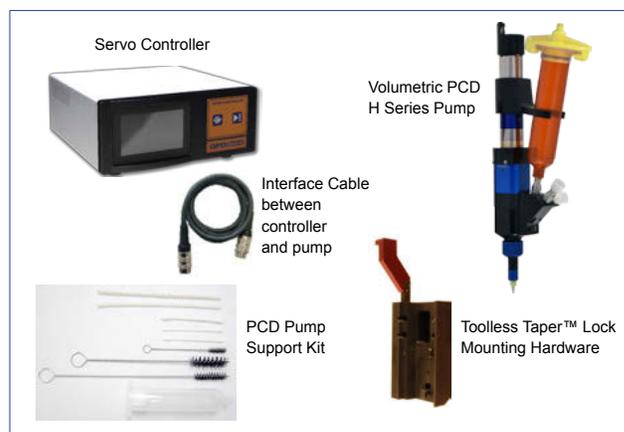


Figure 11: Volumetric PCD H Series Integration Kit

Pump Mounting:

- Tool-less Taper-Lock™ Mounting interface - single push button allows operator to mount or remove the pump.

Cabling:

- Standard 2 m high flex cable between controller & pump.
- Optional cable lengths: 1 m, 3 m, or 5 m

Control Signal:

- Through a user-supplied cable, a 24V signal or dry contact from the robot initiates the pump start/stop or executes the currently displayed program.
- Pump ready signal from controller may also be monitored by the robot.
- Programming via RS232 or Ethernet is available.

Syringe Feed Pressure:

- On/Off control
- Programmable air pressure

Volumetric Pump Integration

Specifications

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.

CONTROLLERS	PROGRAMMABLE CONTROLLER	DIRECT CONTROL INTERFACE	SERVO CONTROLLER
Dimensions (W x D x H)	240 mm x 260 mm x 100 mm (9.45" x 10.24" x 3.94")	85 mm x 50 mm x 142 mm (3.35" x 1.97" x 5.59")	247.65 mm x 279.4 mm x 101.6 mm (9.75" x 11" x 4")
Weight	approx. 1.3 kg (2.9 lb)	260 g (9 oz)	4.27 kg (9.42 lb)
Power Supply Voltage	Input: 120/240 V, 50/60 Hz Output: 24 V DC	24 V DC	Input: 120/240 V, 50/60 Hz, Single Phase
Consumption/Rating	100 VA / 2.7 A	100 VA / 2.7 A	150 VA / 2.0 A
Speed Control Voltage	0-10 VDC / 4-20 mA	0.3 Volts to 10 Volts (maximum pump speed is 10 V)	N/A
User Interface	Touch Screen & Control Buttons	Controlling Computer	Touch Screen with Servo Pump Controller Software
Communication Cables	Controller to Pump: up to 3 m (118") Robot to Controller: User-supplied. 18 gauge recommended.	Controller to Pump: up to 2.5 m (98") Robot to Controller: 0.6 m (24") standard. One end is bare wire.	Controller to Pump (standard): 2 meter, high flex. Other lengths available.
External Trigger Signal	24 V (see User Manual for greater detail)	• 24V signal to enable forward motion • 24V signal to enable reverse motion and • Variable 0 to 10V signal to control speed in forward or reverse.	+5 to 24V / Dry Contact
Air Pressure	Input: 0 to 6 bar (0 to 87 psi)	N/A	Input: 0 to 6.9 bar (0 to 100 psi) Output: 0 to 4.1 bar (0 to 60 psi)
Pressure Regulation	Manual: 0 to incoming air pressure	N/A	Digital Precision: 0 to 60 psi (0 to 415 kPa)
Operating Temperatures	+10° C to +40° C (50° F to 104° F)	+10° C to +40° C (50° F to 104° F)	+10° C to +40° C (50° F to 104° F)
(not shown to scale)	 Programmable Controller	 Direct Control Interface	 Servo Controller

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