A resist-saving photoresist dispensing systems

Wasteful use of resist, variation of application amount, contamination, accumulation of bubbles, and so forth—these are problems experienced in the photoresist coating process.

Now, all of them can be solved by the PDS series.

Saving of resist will lead to remarkable cost reduction and improvement of production efficiency.
Substantial Saving of Resist
The use of a high-torque stepper motor as the drive source results in a consistent discharge volume, unimpeded by filter clogging or viscosity change. A repeatable accuracy (0.3%) of discharge is maintained.
- Repeated precision: ±0.3% (F.S.)
- Linearity: ±0.5% (F.S.)
- Resolution: 0.01 ml or below

Contamination-free
The pump portion is of tubephragm structure wetted internals are flat and smooth, with a small dead volume. Because the system hardly has a place that allows liquid resist to dwell, production of particles is prevented.

Usable for a Variety of Coating Processes
Since the discharge velocity can be changed freely in a shot, the system is capable of dealing with a variety of resist coating processes including application of a very small amount or in a very short period of time.

Reduction of Downtime
A discharge amount and a discharge time can be set only by entering values in the controller. It can save operator’s time and labor and reduce downtime.

Mountable on Existing Equipment
Mountable on existing equipment (a coater, for example). In case the SB pump is mounted on the PDS as a replacement, the use of the pulse controller PDS-230 offered as an option can eliminate the need for changing software and the signal system which are being used.

An Example of Cost Curtailment
- Amount of saved resist: 1.5 ml/shot
- Number of resist applications: 20 times
- Number of produced wafers: 30,000/month
- Price of resist: $500/gallon

In the above case, the amount of resist saved annually is:
1.5 (ml/shot) x 20 (times) x 30,000 x 12 (months) = 10,800 (liters) = 2.851 (gallons)
2.851 (gallons) x 500 ($) = $1.4 million
### Construction and materials

- Valve guide: PTFE
- Valve seat: PCTFE
- O-ring: EPDM/Karifrez
- Pump head unit: (Pump body/tubephragm) PTFE/PFA

### Operating principle of pump

**STEP 1.** The bellows stretch and shrink following the reciprocating movement of the motor shaft of the linear stepping motor.

**STEP 2.** Stretch and shrink of bellows cause, via incompressible fluid, the tubephragm to become deformed.

**STEP 3.** A change of capacity due to deformation of the tubephragm and the chucking function of the pump cause pumping.
Pump specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PDS-105H / 105V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. discharge capacity</td>
<td>ml/shot 5 (Note 1)</td>
</tr>
<tr>
<td>Max. discharge pressure</td>
<td>MPa 0.15</td>
</tr>
<tr>
<td>Discharge speed</td>
<td>ml/sec 0.1 - 4.0</td>
</tr>
<tr>
<td>Suction speed</td>
<td>ml/sec 0.1 - 3.0</td>
</tr>
<tr>
<td>Viscosity limit</td>
<td>mPa-S 100 (Note 2)</td>
</tr>
<tr>
<td>Power supply</td>
<td>V DC24 2.4</td>
</tr>
<tr>
<td>Mass</td>
<td>kg 2.3</td>
</tr>
</tbody>
</table>

Note 1: The 10 ml/shot type (PDS-110) is also available. For details, please call us.
Note 2: Viscosity limit depends on piping conditions, suction conditions, etc. For details, please contact us.

Requirements for Use
Range of liquid temperatures: 15 to 25°C, Ambient temperature: 20 to 25°C, Ambient humidity: 30 to 40%

Identification

**PDS - 1 05 H A - E P W2 - S01**

1. Code of product 1: Pump
2. Max. discharge capacity 05: 5ml/shot
3. Form H: Horizontal
   V: Vertical
4. Driving unit A: With home sensor and up sensor and without encoder
   B: With home sensor and encoder and without up sensor
5. Material of O-ring E: EPDM
   K: Kalrez®
6. Pressure sensor P: With pressure sensor
   L: Without pressure sensor
7. Connection size M6: ø6 x ø4 mm PFA tube
   W2: 1/4" PFA tube
   Y1: Others
8. Special specification S01, S02, S03 ...

Dimensions in mm

<table>
<thead>
<tr>
<th>Model</th>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDS-105HA</td>
<td>277</td>
<td>198</td>
</tr>
<tr>
<td>PDS-105VA</td>
<td>165</td>
<td>249</td>
</tr>
</tbody>
</table>
System flow

An example of a system where the start-up signal is an external pulse from the equipment (coater)

Only the pump start signal is given by the equipment (coater). All other pump parameters (discharge volume, speed, etc.) are preset via the pump controller.

Note: Both systems need a separate power supply of DC 24 V and DC 5 V.

An example of a system where the start-up signal is a solenoid signal (Example: PDS replaces an existing SB pump)

This is an example of a PDS pump installed into equipment with pump controlled by means of a solenoid signal (for example, an SB pump). In principal, the PDS operates correspondingly with the ON and OFF signal from the equipment. Both discharge and suction speed (set in pulses/second) can be set via the pulse controller. The timing operation is preset by a programmable pump controller.

Note: Both systems need a separate power supply of DC 24 V and DC 5 V.

Automatic air vent
Component apparatus

Pumps
PDS-105H/105V
A horizontal type (PDS-105H) and a vertical type (PDS-105V) are available as standard products. You may choose either one as both are suitable for a planned installation space. Further, each has Types A and B:
- Type A: With built-in home sensor and up sensor
- Type B: With built-in encoder and home sensor

Programmable controller
PDS-310
This controller is used as an interface with the PDS-230 and is capable of controlling a maximum of two PDS pumps.
- Input variables:
  - Pump start/stop, timing of valve opening/closing (sec.), filter pressure (MPa)
- Standard accessory: Setting device 10D1
- Power supply: AC100-240V
- Dimensions in mm: W203xD93xH90

Driver
CSD5807N-P
This driver converts a pulse signal output from a controller into a power signal to drive the pump.
- Power supply: DC5V, DC24V
- Dimensions in mm: W72xD63x(H31)
Note: If you prefer a higher resolution, please contact us.

Automatic suck back unit
TQASO
A unit to prevent liquid resist from dripping out of the discharge end of the pump. The amount of suck-back liquid and the suck-back time are both electronically controlled. Unlike in the case of using a conventional speed controller, it never requires complicated adjustments.
- TQASO-6US-5: 6mm dia tube connection
- TQASO-8BUS-5: 1/4” dia tube connection

Automatic vent unit
PDS-410
An air elimination unit comprised of a vacuum-purge system. Air in the system can be extracted in a short period of time without any action required by the operator.
Thorough quality-control measures and constant pursuit of efficiency have helped Iwaki establish a superior production system.