prep3
Automated Inline Dilution System for PerkinElmer Optima

prep3 is an inline peristaltic pump system that performs precise and accurate inline dilution of samples and standards. Three independent microperistaltic pumps under the control of the Optima Syngistix software deliver sample, diluent, and internal standard to an inline, low-volume mixing device. Automatic, inline dilution is performed by varying the ratio of sample to diluent while the total liquid flow to the nebulizer remains constant.

Features
- Triple low-pulsing microperistaltic pump
- Variable flow rates from 5µL/min to > 5000 µL/min
- Full computer control
- Low-volume mixing device

Benefits
- Automatically calibrate from a single stock standard solution
- Automatically perform sample dilution
- Automatically dilute over-range or internal standard out-of-range samples
- Analyze samples undiluted or up to 50x diluted
- Fully supported by PerkinElmer Syngistix software

Figure 1. prep3 autocalibration from 1 ppm stock standard (10x, 5x, and 2x dilutions).
Figure 2. 10x, 5x, and 2x dilutions from the 1 ppm stock std and 10x, 5x, 2x and 1x from the 10 ppm stock std.

### 7 Replicates of 10x Dilutions of 10 ppm Stock Standard with % Recoveries

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Al</th>
<th>Ca</th>
<th>Cr</th>
<th>Mg</th>
<th>Ni</th>
<th>K</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Recovery</td>
<td>98.3</td>
<td>100.7</td>
<td>101.9</td>
<td>102.0</td>
<td>100.4</td>
<td>98.8</td>
<td>100.1</td>
</tr>
</tbody>
</table>

Figure 3. Seven 10x dilutions were performed from the 10 ppm stock standard. Average % recovery is shown. All analytes average out to 100.4%.

**prep3 Washout**

Figure 4. 25 second wash time between every analysis.
Washout Factor After 200 ppm Sample Was Run

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Al</th>
<th>Ca</th>
<th>Cr</th>
<th>Mg</th>
<th>Ni</th>
<th>K</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Blank</td>
<td>19000</td>
<td>22000</td>
<td>21000</td>
<td>11000</td>
<td>15000</td>
<td>24000</td>
<td>21000</td>
</tr>
</tbody>
</table>

*Figure 5.* Washout factor for calibration blank after 200 ppm sample was run.

## Automatic Dilution of Low Internal Standard Recovery

**Figure 6.** Method setup for autodilution if internal standard is below a certain limit. System will reanalyze sample at 10x dilution.

**Figure 7.** The internal standard recovery was below the limits set in Figure 6. Instrument software automatically repeats the sample at a 10x dilution, bringing the internal standard recovery within limits. A 10% seawater lowered the internal standard recovery.

## Dilution of Over-range Samples

**Figure 8.** Sample limits tab allows users to set a limit for their samples. If over the limit, samples can be rerun at factor determined by the user.

**Figure 9.** Over-range sample comes in above the limit determined in Figure 8. Instrument software automatically sends a dilution command and sample is rerun, bringing the sample within the determined limits.
prep3 Syngistix Integration

Figure 10. Defining stock standard concentration and autosampler position in the Syngistix software. In this example, autocalibration from two stock standards creates a calibration curve from 0.1 ppm to 10 ppm.

![Calibration Curve](image1.png)

Figure 11. Prescriptive dilution factors may be specified sample-by-sample. prep3 makes offline manual sample dilution unnecessary. Dilute all samples by the same factor, or specify a unique dilution factor for each sample. If the autodilution factor is left blank, the sample will be analyzed undiluted.

![Sample Dilution Table](image2.png)

Figure 12. Auto-QC dilution for over-range samples. Set the upper limit and choose the desired dilution factor if over the limit. Autodilution when internal standard recovery is above or below user-specified limits is also configurable.

![Auto-QC Dilution](image3.png)