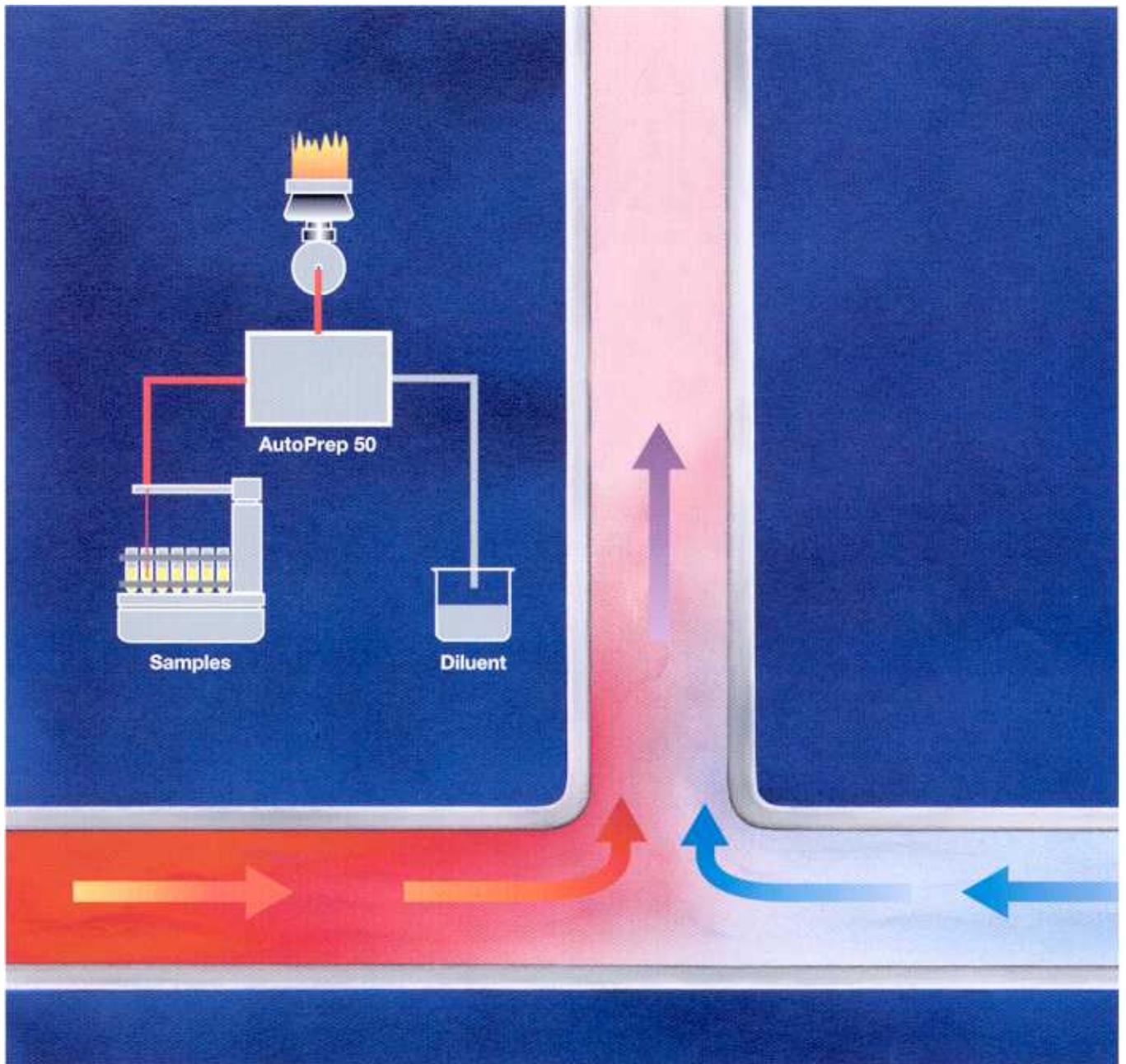


AutoPrep 50 Automatic Dilution System



The AutoPrep 50 provides you with an optimized tool for truly automated flame atomic absorption spectroscopy. With automatic, intelligent on-line dilution capabilities, the AutoPrep 50 takes away from you major time-consuming manual portions of your flame AA analyses, freeing you for more important tasks, enhancing productivity for your laboratory and reducing analysis costs.

Productivity, however, must go hand-in-hand with analytical quality. The AutoPrep 50 has been designed to provide analytical performance at least equal to that which you would expect with a skilled analyst. Rather than using peristaltic pumps, the performance of which can change with time, the AutoPrep 50 uses a digital stepper motor-driven, high precision piston pump and high performance switching valves to provide results that are fast, accurate, precise and reproducible. The AutoPrep 50 can also eliminate problems which are often associated with manual dilution, such as carry-over and contamination.

Key features of the AutoPrep 50 include:

• Fully Automatic Sample Introduction.

The AutoPrep 50 used in conjunction with the Perkin-Elmer AS-90 or AS-91 autosamplers provides fully automatic sample introduction capabilities, including dilution as programmed or intelligent dilution as required.



- **Automatic intelligent selection of dilution range.**

System software will automatically recognize over-range samples and implement an appropriate dilution ratio, up to 200-fold. Samples which fall within the normal working range are analyzed directly without dilution. Sensitivity and detection limits remain essentially unchanged, and the dynamic working range is significantly enhanced.

- **Stable, even with higher viscosities.**

The digital stepper motor-driven piston pump system used in the AutoPrep 50 ensures that selected flow rates will be maintained, even with higher viscosity solutions. In addition to providing exceptional analytical precision and reliability, this unique system also has minimal maintenance requirements.

- **Automatic preparation of multiple standards from a single stock solution.**

Automatic standard preparation ensures proper calibrations and analytical accuracy and reproducibility by eliminating the potential for operator errors.

- **Integrated software control.**

Control of the AutoPrep 50 is included with the AA WinLab™ software used for instrument control and data handling, simplifying use and minimizing operator training requirements.





Figure 1. The AutoPrep 50 Automatic Dilution System.

Flame atomic absorption spectroscopy (flame AA) is still the most frequently used instrumental technique for quantitative trace metal determination. Flame AA combines short analysis times, high sample throughput, exceptional precision and accuracy, good detection limits and unmatched ease-of-use. One limitation, however, is its limited working range. Even with the use of nonlinear calibration algorithms, the dynamic working range for flame AA at a specific analytical wavelength is only about three orders of magnitude. Since many laboratories have to deal with samples that have analyte concentrations which can vary from detection

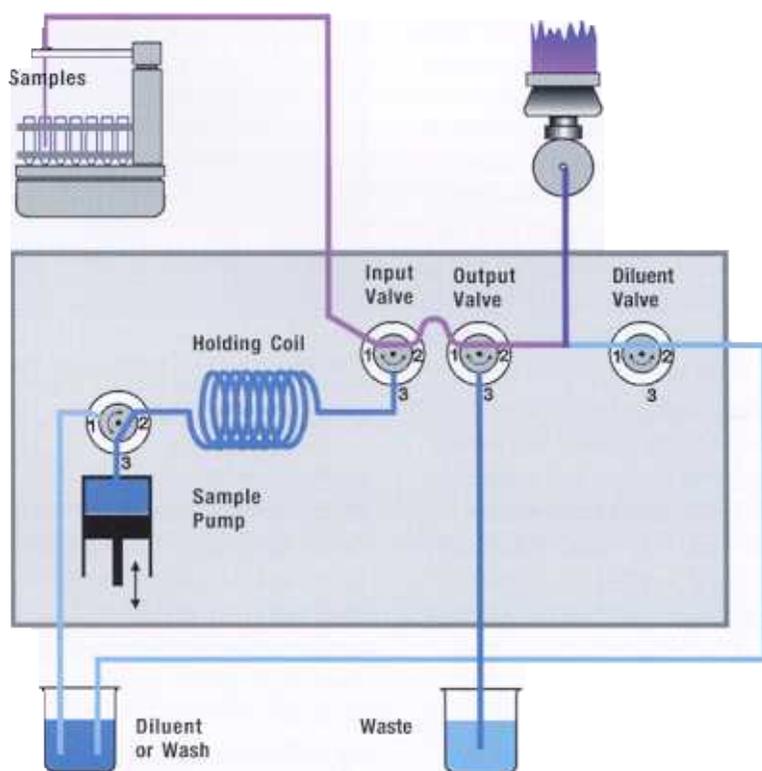


Figure 2. Schematic diagram of the AutoPrep 50.

limit to percentage levels, a limited working range translates to a large number of time-consuming dilutions. The AutoPrep 50 Automatic Dilution System eliminates this problem by performing dilutions automatically—and intelligently.

The AutoPrep 50 is a compact computer-controlled system that you can easily place in front of your flame AA. It is fully software-controlled. The method in use determines the dilution mode and sets the appropriate parameters automatically. The AutoPrep 50 provides fully automated operation when directly connected to an AS-90 or AS-91 auto-sampler, and can also provide fully automated calibration and

dilution capabilities when used with manual sample introduction.

The principle of operation of the AutoPrep 50 is elegantly simple, as illustrated in Figure 2. The key components in the AutoPrep 50 are a high precision stepper motor-driven piston pump (for controlling sample or reference solution flows), four high performance switching valves (Sample Pump, Input, Output and Diluent) and a holding coil.

With the Diluent Valve open and the Output Valve closed, the nebulizer continuously draws up diluent or wash solution to clean the burner/nebulizer system and maintain stable flame performance.

On-line Dilution.

To measure a sample (or reference) solution, the Sample Pump and Input Valves are switched to allow the sample pump to draw sample solution from the autosampler into the Holding Coil. For flame AA the sample volume withdrawn typically will be about 5 mL.

Then the Sample Pump, Input and Output Valves are switched to deliver the sample solution toward the nebulizer, injecting it into the diluent stream. The sample solution is diluted by the ratio of the pump rate—set via the AA WinLab software—to the natural nebulizer uptake rate.

Setting the maximum pump rate to the natural nebulizer uptake rate would provide no sample dilution. Setting it to half the natural rate would provide a twofold dilution, while setting it to 10% of the natural rate you would get a tenfold dilution, and so forth. And because the digital micro-stepper motor-driven piston pump delivers accurate flows even at low pumping rates (unlike peristaltic pumps), dilution accuracy is maintained even at high dilution factors.

During an automatic run, the AA WinLab software controls the complete analysis. If a sample absorbance is above that of the highest standard, the pump speed will automatically be decreased (performing a higher dilution) and another measurement will be taken. This procedure is repeated

Concentration (mg/L)	Dilution Factor	measured Concentration (mg/L)	RSD %
1,0	1	0,97	0,2
2,0	2	2,08	0,3
3,0	3	3,12	0,7
4,0	2	4,06	0,8
5,0	2,5	5,08	1,1
10,0	2,5	10,00	0,2
20,0	5	19,80	0,9
50,0	10	50,40	0,6
100,0	20	103,20	0,6
200,0	50	205,00	2,0
200,0	200	208,00	1,2

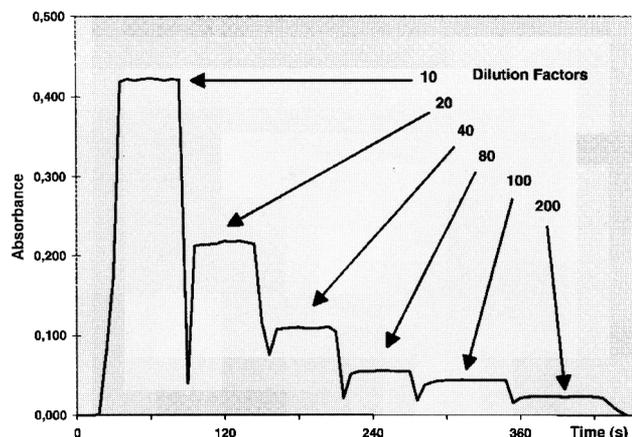


Figure 3. Precision and accuracy of on-line dilution with the AutoPrep 50. The table and the diagram show excellent values for the relative standard deviation as function of the dilution factor and the analyte concentration (Element: Cu; Measurement Time: 3 s; Replicates: 3).

until the sample is within the range of the calibration curve or the maximum dilution ratio of the system has been reached, at which point the final measurement will be made. Analytical results are automatically corrected for the final dilution used.

Automatic Rinsing.

At the end of a determination the automatic rinse function can be activated. The Sample Pump valve is switched so that diluent fills the sample pump. Then the Sample Pump, Input and Output Valves are switched so that diluent or wash liquid is pumped through the Holding Coil to clean it in preparation for the next sample. By thoroughly flushing the coil, the tubing, and the valves automatically after each sample, the system is continuously free of contamination and carryover.

Corrosion Resistance.

The only solution that comes into contact with the sample pump is the pure diluent. The holding coil prevents sample or

reference solution from contacting the sample pump, eliminating the possibility of pump contamination and minimizing pump maintenance. Of course, all parts which do contact sample, reference or diluent solutions are made from chemically inert materials to ensure system corrosion resistance as well.

System Bypass.

The AutoPrep 50 valves can be set quickly and easily so that the dilution system is ignored and your system is operating in the normal flame AA mode.

In short, AutoPrep 50 is the best automatic AA dilution system you can buy.

Today's analytical laboratories need instrumentation that combines outstanding analytical performance with exceptional cost efficiency, ease of use and reliability. AutoPrep 50 easily meets all of those goals and enhances laboratory productivity by fully automating time-consuming dilutions for samples and reference solutions.

Specifications

System Design:	Compact computer-controlled system for automatic and intelligent sample and reference dilution for flame atomic absorption spectroscopy, providing fully automated calibration and dilution capabilities when directly connected to an AS-90 or AS-91 autosampler or when used with manual sample introduction. For maximum analytical precision the AutoPrep 50 works with a high precision stepper motor-driven piston pump (for controlling sample or reference solution flows), four high performance switching valves (Sample Pump, Input, Output and Diluent) and a holding coil.
Chemical Resistance:	All parts which do contact sample, reference or diluent solutions are made from chemically inert materials. The only solution that comes into contact with the sample pump is the pure diluent.
System Control:	Included with the AA WinLab™ software used for instrument control and data handling.
Dilution Factors:	Continuously selectable up to a factor of 200 by setting the pump dispense rate or automatically selected via the AA WinLab software according to the sample concentration.
System Bypass:	The AutoPrep 50 valves can be set so that the dilution system is ignored and the AA system is operating in the normal flame AA mode.
Automatic Rinsing:	At the end of a determination the automatic rinse function can be activated.
Interfaces:	Built-in RS232C and IEEE-488 interfaces.
Power Requirements:	Built-in wide-range power supply 90 to 230 V AC; 50/60 Hz; 60 W.
	340 mm x 390 mm x 200 mm (H x D x W).
Weight:	7.5 kg.

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