

SDX_{HPLD}

High Performance Liquid Dilution System



AUTOMATION

An Innovative Spin on Proven Technology

The variety of sample matrices submitted for trace elemental analysis necessitates the need for complete mixing. The Teledyne CETAC SDX^{HPLD} System combines the proven ASX-560 Autosampler with a novel on-line dilution and vortex mixing accessory.

The SDX^{HPLD} uses a high precision syringe pump for both sample aliquot and diluent and then performs the important step of vortex mixing before diluted sample introduction to the host ICP-OES or ICP-MS instrument.

SDX^{HPLD} Benefits

- Automated on-line sample dilution and calibration standard prep for ICP-OES & ICP-MS
- Sample and standard homogenization via vortex mixing.
- Serial dilutions up to 2000x
- Intelligent dilution capability if analysis result is outside specified range



SDX_{HPLD} Technology Description

During normal operation the autosampler probe and host ICP peristaltic pump uptakes a sample which passes through the SDX module and then to the ICP nebulizer.

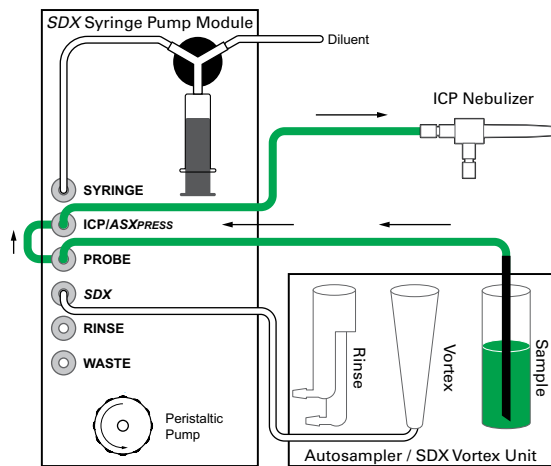
For a dilution, the autosampler probe is switched to a high precision syringe pump for sample aliquot and diluent addition to a dedicated vortex mixing vessel.

Following measurement, any remaining sample is drained to waste and the vortex vessel cleaned.

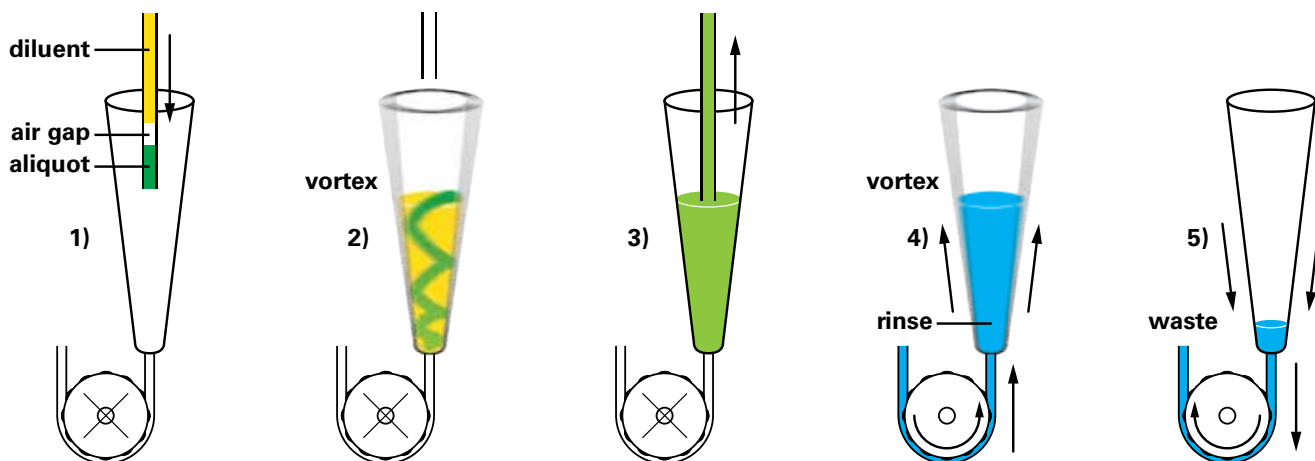
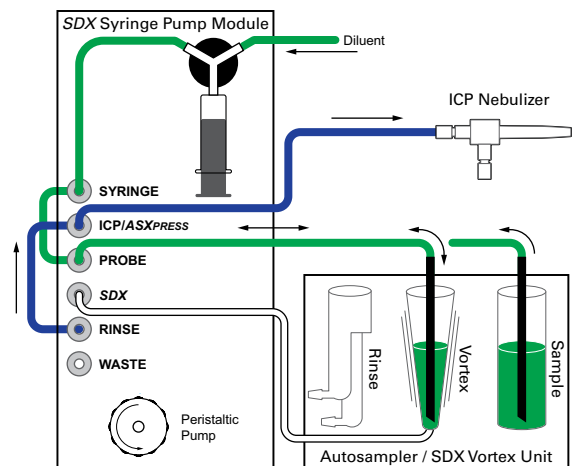
Dilution and Mixing Steps

1. The autosampler probe tubing is primed with diluent.
2. The autosampler probe moves into the sample and uptakes the prescribed aliquot
3. The syringe pump uptakes the prescribed volume of diluent.
4. The autosampler probe pulls up an air gap.
5. The autosampler probe moves to the vortex vessel and dispenses both aliquot and diluent; the combination is vortex mixed.
6. The autosampler probe switches to introduction mode and samples the homogeneous solution from the vortex vessel.

Normal Operation



Dilution and Mixing



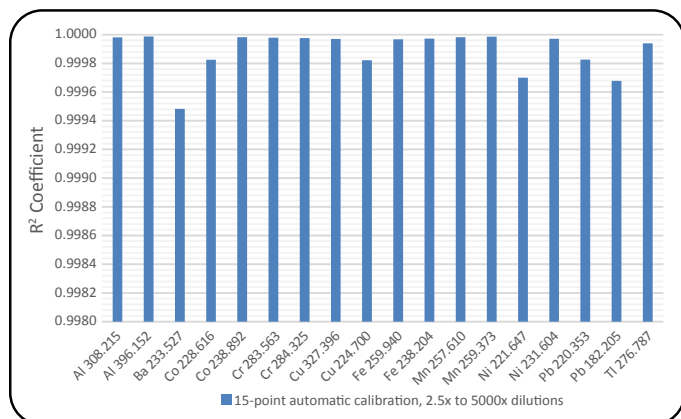
(1) aliquot and diluent are delivered to the mixing vessel (2) vessel is vortexed (3) dilution is sampled (4) fresh rinse is added and vortexed (5) waste is pumped away

The SDX_{HPLD} sample flow path and vortex mixing vessel are composed of inert, metal-free materials. The vortex vessel may be set for multiple rinse steps (up to 4) to ensure lowest sample carryover.

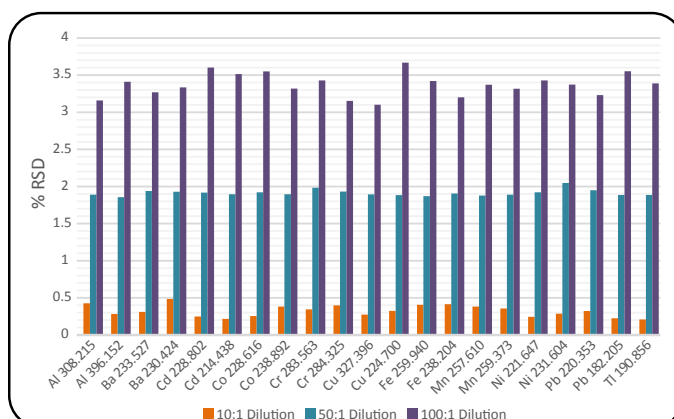
The SDX_{HPLD} uses a separate rinse solution reservoir from the ASX-560 Autosampler reservoir, ensuring an adequate supply of rinse solution.

Automated Calibration Curve Preparation Precision

Automated calibration curve preparation using a 1000 ppm multi-element standard produced R values > 0.999 for 10 elements using ICP-OES with 18 selected wavelengths.

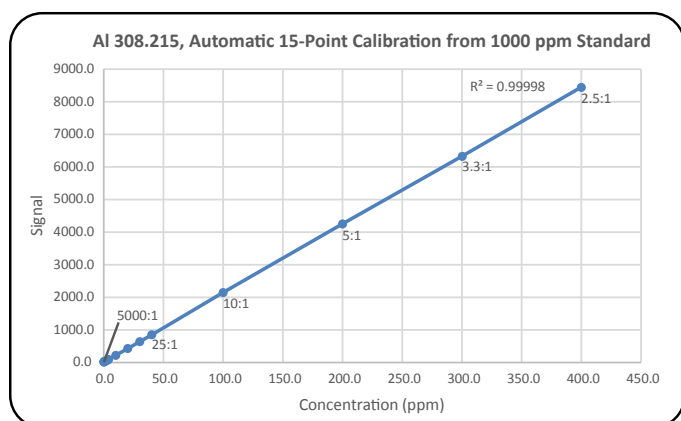


Precision (7 repetitions) was measured using ICP-OES for 10:1, 50:1 and 100:1 dilutions; results were < 5% relative standard deviation.



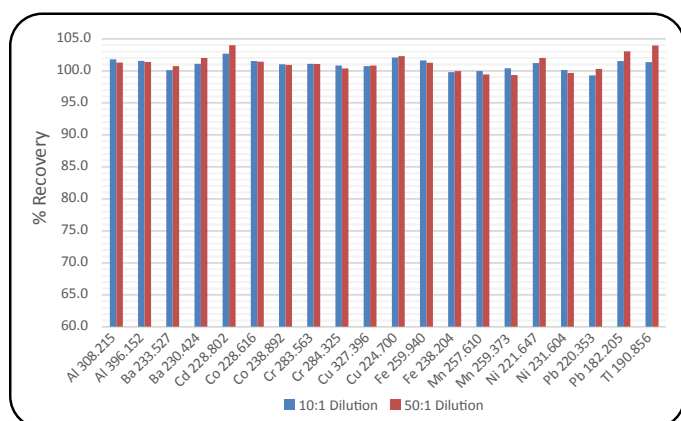
Linearity

Calibration curves contained 15 calibration points with dilutions between 2.5:1 and 5000:1.



Accuracy

Accuracy for 10:1 and 50:1 sample dilutions were measured using ICP-OES at +/- 5% of target value.



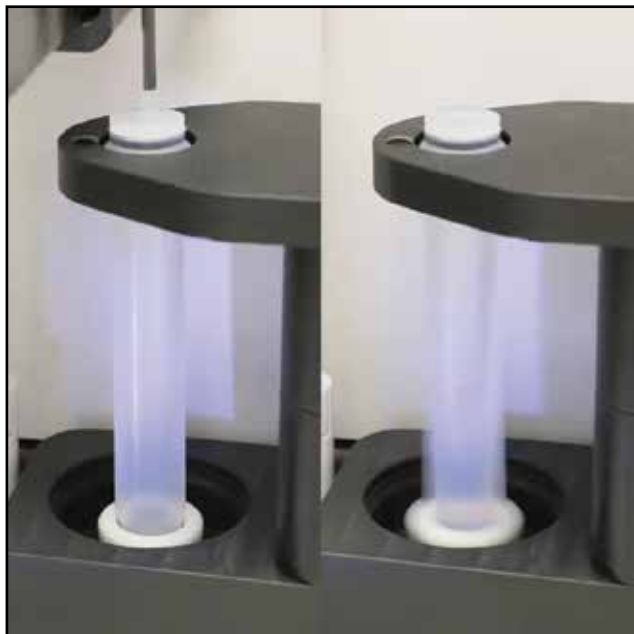
Carryover

Carryover was measured using ICP-MS detection for 10:1 dilutions of a 2ppm multielement standard. An average was calculated after 50 cycles of diluted sample / blank analysis. Consistently low % carryover results were obtained for 34 elements, with 6 elements not detected.

Element	Avg. % Carryover, 50 Reps.
⁹ Be	0.005
²⁴ Mg	<DL
²⁷ Al	<DL
³⁹ K	<DL
⁴⁴ Ca	0.002
⁵¹ V	0.002
⁵² Cr	0.000
⁵⁷ Fe	<DL
⁵⁹ Co	0.004
⁶⁰ Ni	0.002
⁶⁵ Cu	0.003
⁶⁶ Zn	<DL
⁷¹ Ga	0.003
⁷⁴ Ge	<DL
⁸² Se	0.001
⁸⁵ Rb	0.006
¹³³ Cs	0.005
¹³⁷ Ba	0.004
¹³⁹ La	0.003
¹⁴⁰ Ce	0.003

Element	Avg. % Carryover, 50 Reps.
¹⁴¹ Pr	0.003
¹⁴⁶ Nd	0.003
¹⁴⁷ Sm	0.003
¹⁵³ Eu	0.003
¹⁵⁷ Gd	0.003
¹⁶³ Dy	0.003
¹⁶⁵ Ho	0.003
¹⁶⁶ Er	0.003
¹⁶⁹ Tm	0.003
¹⁷² Yb	0.003
¹⁷⁵ Lu	0.004
²⁰⁵ Tl	0.005
²⁰⁶ Pb	0.002
²⁰⁷ Pb	0.002
²³⁸ U	0.003

SDX_{HPLD} High Performance Liquid Dilution System



The sample and diluent are dispensed into the vortex chamber and mixed.

Intelligent Dilution

The Teledyne CETAC SDX_{HPLD} system redefines "intelligent dilution" with the ability to re-analyze a sample in a single step to fall within a user-specified range.

On recognition that a measured sample falls outside a specified range, the sample is re-diluted at a new dilution factor which has been calculated to target a user-specified concentration. A reanalysis is only performed once rather than through an incremental dilution process.

Additional Features and Benefits

- Save time and labor incurred with sample dilutions and calibration standards preparation
- Minimal laboratory footprint
- Syringe pump equipped with internal leak detector
- Liquid flow paths and electronics separated with the syringe pump unit
- Flexible control of vortexing, washout, and analysis speed

Technical Specifications

ASX-560 Dimensions:

Height*	62 cm	(24.4")
Width	58 cm	(22.8")
Depth†	60 cm	(23.5")
Weight‡	13.6 kg	(29.9 lbs)

* with sample probe

† allow additional space for cables

‡ with vortex module

SDX Module Dimensions:

Height	25.4 cm	(10")
Width	13.2 cm	(5.2")
Depth	21.6 cm	(8.5")
Weight	4.4 kg	(9.7 lbs)

Autosampler Control Utilities

Firmware Updater Utility

Communication Interface

USB or Serial (RS-232) ports

Power Requirements

100-240 VAC, 47-63 Hz, 3.33A

Expansion Options

ENC-560 DC Enclosure for ASX-560 Autosampler

ASXPRESS® PLUS Rapid Sample Introduction System

Teledyne LABS enhances the visibility for our brands, products, and services, aiding customers in finding solutions that meet their current and future needs. The existing Teledyne brands will remain, providing ongoing value to customers.

