SDXHPLD

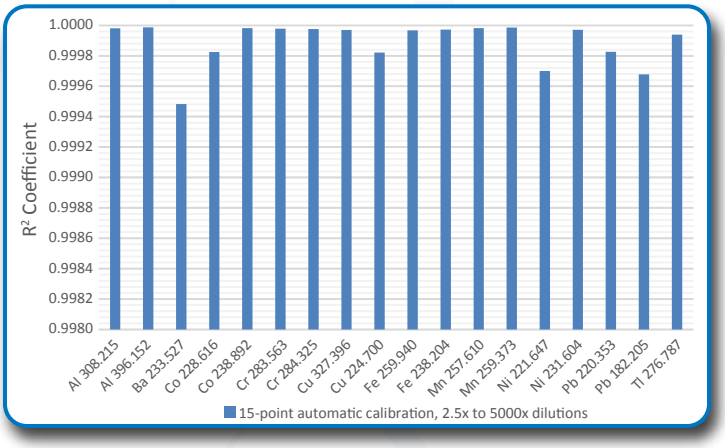
High Performance Liquid Dilution System

An innovative spin on proven technology

The SDXHPLD system combines the proven ASX-560 autosampler with a novel vortex mixing dilution accessory. The SDX uses a high precision syringe pump for both aliquot and diluent, but goes an additional step to vortex mix the resulting dilution prior to sample introduction to ICP and ICP-MS.

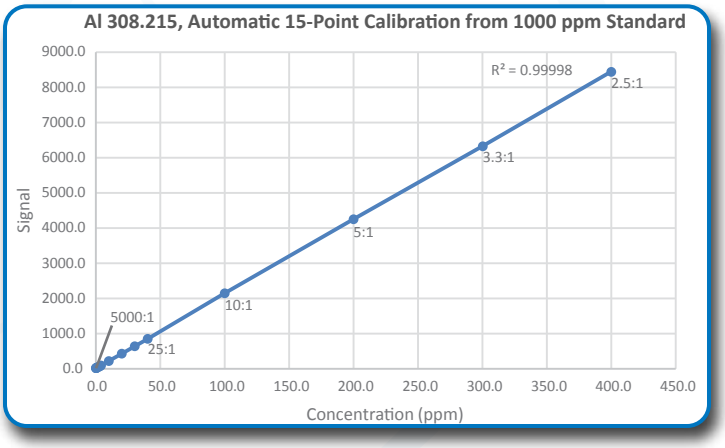
The SDX employs vortex mixing to promote homogenization of a sample to ensure accurate and precise analysis following dilution. The variety of sample matrices submitted for trace element analysis necessitates the need for mixing. This long overdue capability improves data quality by fully homogenizing a dilution mixture rather than performing in-line combination.

Automated Calibration



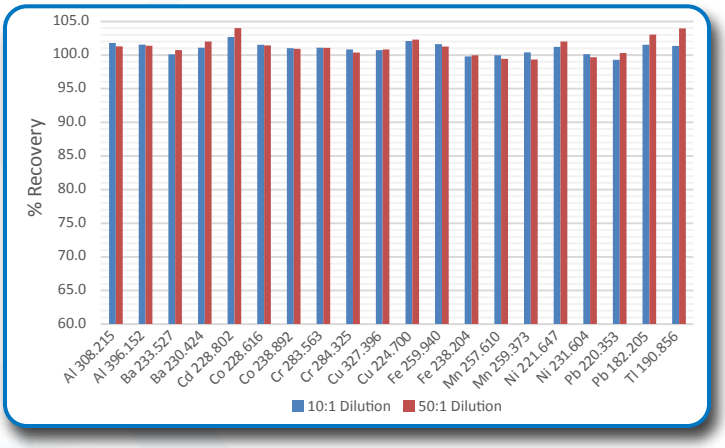
Automated calibrations on ICP using a 1000 ppm multi-element standard solution produced R^2 values greater than 0.999 for elements measured. Curves contained fifteen calibration points with dilutions between 2½:1 and 5000:1.

Linearity



Accuracy was measured on ICP to be better than ± 5% at a variety of dilution factors.

Accuracy



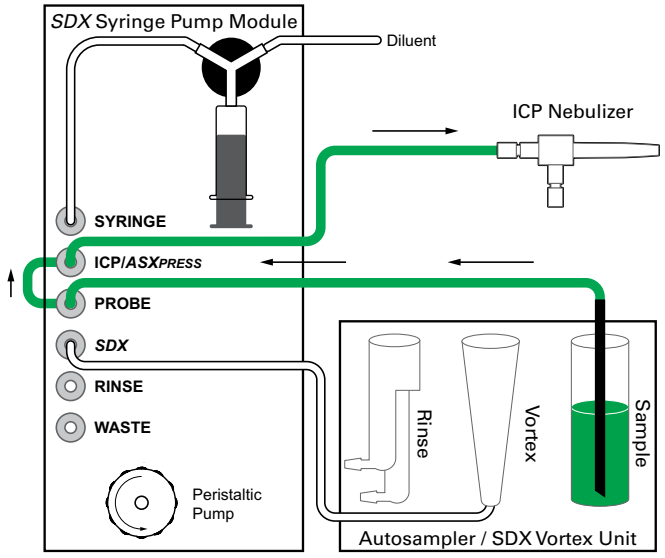
SDXHPLD Technology Description

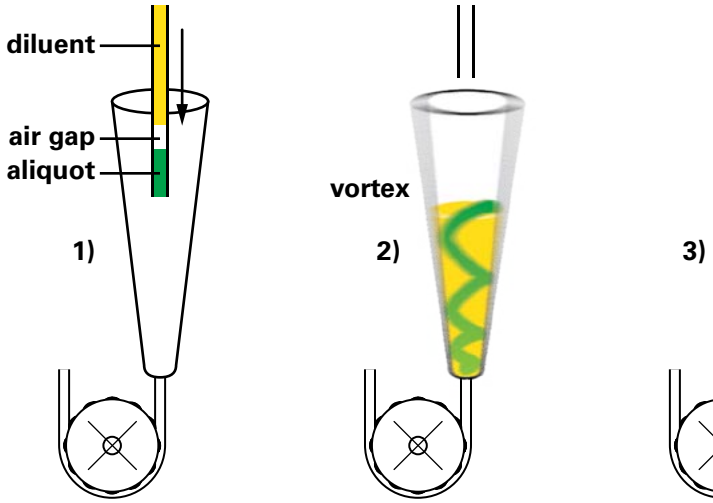
During normal operation the autosampler probe draws a sample which passes through the SDX module and continues to the ICP.

For a dilution, the same probe is connected to a high resolution syringe pump for aliquot and diluent addition to the vortex mixing vessel.

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

Normal Operation



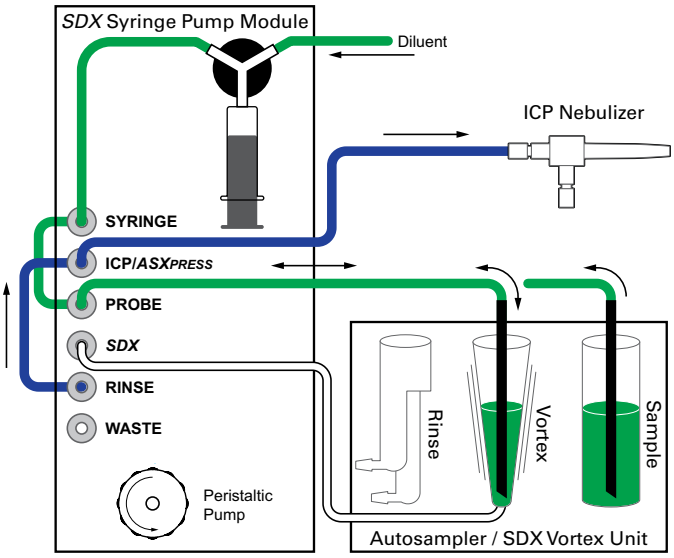


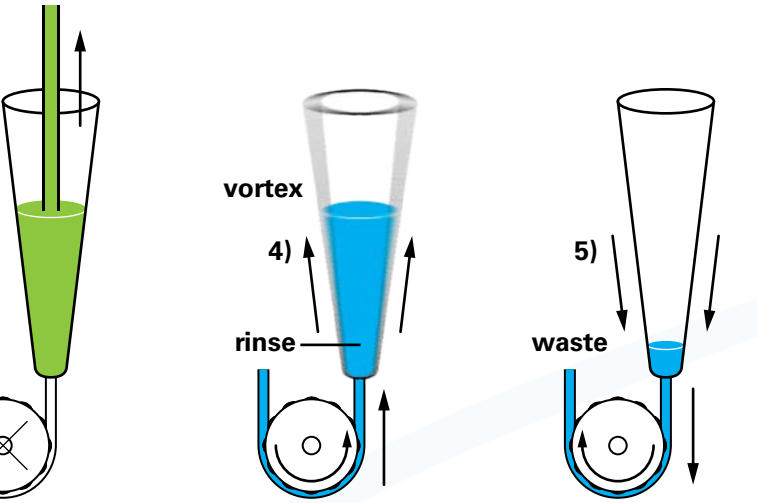
(1) aliquot and diluent are delivered to the vessel (2) vessel is mixed (3) dilut

The SDXHPLD system can be set to rinse the vortex mixing vessel multiple times as desired to reduce carryover. The sample flow path and vortex mixing vessel are comprised completely of inert materials that are free of trace metals and easy to clean.

Dilution and Mixing
1. The probe line is primed with diluent
2. The probe moves into the sample and takes the prescribed aliquot
3. The syringe pulls the prescribed amount of diluent
4. The probe pulls up an air gap
5. The probe moves to the vortex vessel and dispenses both aliquot and diluent and the mixture is vortex mixed
6. The probe switches to normal operation then samples the homogenous solution from the vortex vessel

Dilution and Mixing

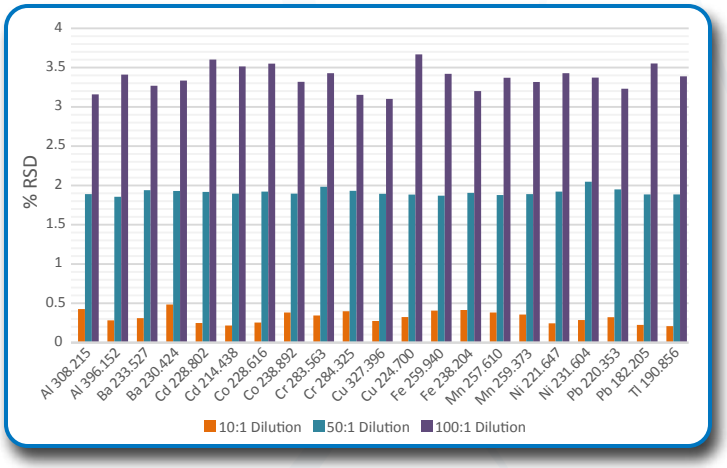




tion is sampled (4) fresh rinse is added and mixed (5) waste is pumped away

The SDXHPLD uses an independent rinse source from the ASX-560 Autosampler so that, if needed, a different rinse solution can be used for the autosampler probe versus the SDXHPLD vortex mixing vessel.

Precision



Precision was measured by ICP to be better than 5% RSDs at 10:1, 50:1 and 100:1 dilutions, running 7 repetitions.

Carryover was measured by ICP-MS at 10:1 dilutions. An average was taken after 50 cycles of dilution/ blank analyses. Consistently low carryover values were measured for all elements <10,000x, often below the limit of detection.

Carryover

Element (ICP-MS)	50x Avg. Carryover %
^{9}Be (KEDS)	0.005
^{24}Mg (KEDS)	<DL
^{27}Al (KEDS)	<DL
^{39}K (KEDS)	<DL
^{44}Ca (KEDS)	0.002
^{51}V (KEDS)	0.002
^{52}Cr (KEDS)	0.000
^{57}Fe (KEDS)	<DL
^{59}Co (KEDS)	0.004
^{60}Ni (KEDS)	0.002
^{65}Cu (KEDS)	0.003
^{66}Zn (KEDS)	<DL
^{71}Ga (KEDS)	0.003
^{74}Ge (KEDS)	<DL
^{82}Se (KEDS)	0.001
^{85}Rb (KEDS)	0.006
^{133}Cs (KEDS)	0.005
^{137}Ba (KEDS)	0.004

Element (ICP-MS)	50x Avg. Carryover %
^{139}La (KEDS)	0.003
^{140}Ce (KEDS)	0.003
^{141}Pr (KEDS)	0.003
^{146}Nd (KEDS)	0.003
^{147}Sm (KEDS)	0.003
^{153}Eu (KEDS)	0.003
^{157}Gd (KEDS)	0.003
^{163}Dy (KEDS)	0.003
^{165}Ho (KEDS)	0.003
^{166}Er (KEDS)	0.003
^{169}Tm (KEDS)	0.003
^{172}Yb (KEDS)	0.003
^{175}Lu (KEDS)	0.004
^{205}Tl (KEDS)	0.005
^{206}Pb (KEDS)	0.002
^{207}Pb (KEDS)	0.002
^{238}U (KEDS)	0.003

SDX High Performance Liquid Dilution System

- Intelligent Dilution – Re-analysis in one step to fall within range
- Diluted sample homogenization through vortex mixing
- Serial dilution capable up to 2000x
- *ASXPRESS PLUS* compatible
- Modular – can be added to an existing ASX-560
- Automated consistency of sample and calibration standard dilution

Technical Specifications

ASX-560 Dimensions:

Height*	62 cm	(24")
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 Integrated Clean Enclosure
ASXPRESS® PLUS Rapid Sample Introduction System

Intelligent Dilution

The Teledyne CETAC SDXHPLD 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 an analyzed sample falls outside of a specified range, the sample is re-diluted at a new dilution factor which has been calculated by the system to target a user-specified concentration. Reanalysis is only performed once rather than through an incremental dilution process.

Additional Features and Benefits

- Save time and reduce labor costs
- Minimal laboratory footprint
- Known, proven and reliable technology
- Syringe pump unit internal leak sensor
- Liquid flow paths and electronics separated within the syringe pump unit
- Promotion of diluted sample homogenization through vortex mixing with high accuracy and precision
- Flexible control of analysis speed, carryover and memory effects
- Attractive price

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