

Shimadzu's Guide to Vial Selection

Not all vials are the same...



The perfect vial?

Struggling to find the “right” vial or microtiter plate?
You are not alone!



The main goals when choosing a vial or microtiter plate

- Hold the sample without allowing it to adsorb into the container
- Reduce the effects of extractables
- Prevent leaching of materials from the container into the sample

The key is low adsorption and leachables

What makes vials different?

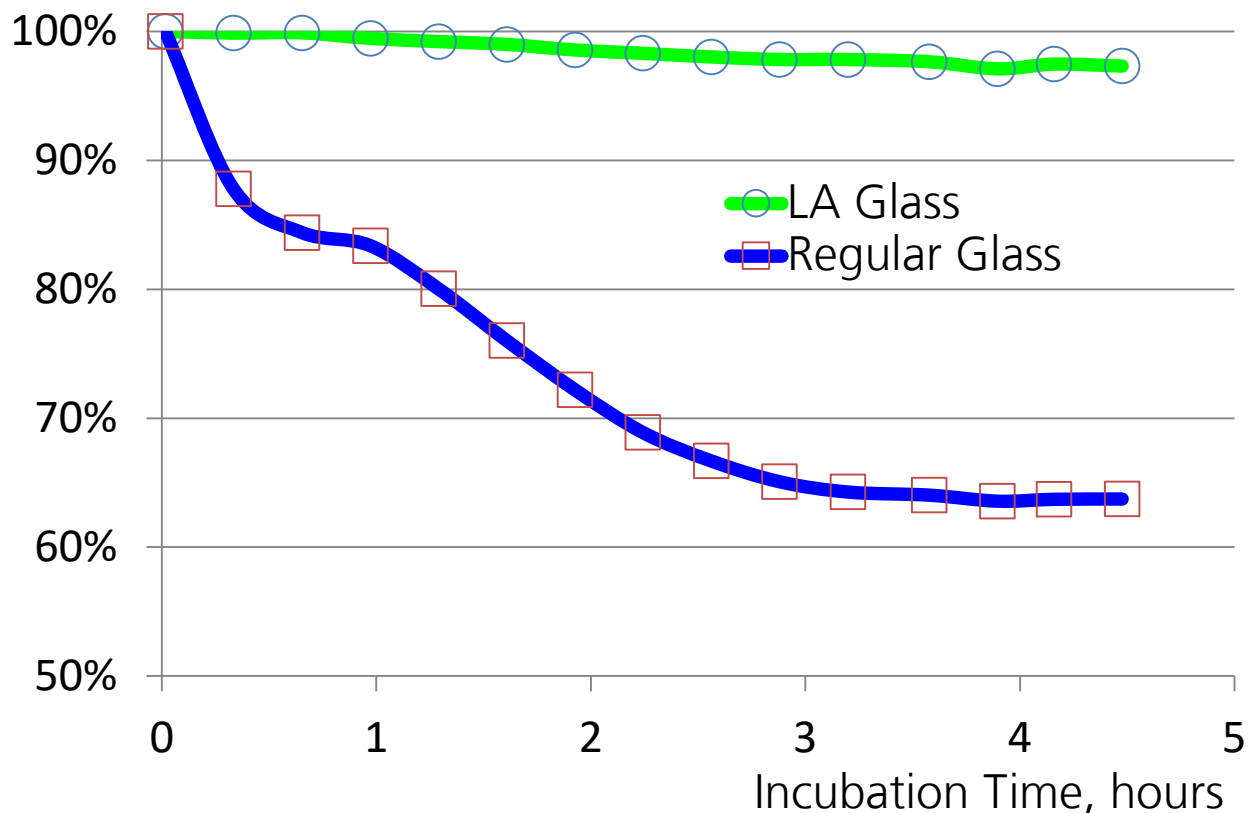
The glass vial...

A known fact in the glass industry is that not all glass is the same. Besides the compounds contained in the glass, the manufacturing process can widely change the properties of the final product. Sodium is a common element found in glass and is the major cause of surface adsorption on the glass. All adsorption in borosilicate glass is polar in nature causing sticking and bonding to the glass surfaces. Highly negatively charged hydroxyl sites in the glass matrix yield the perfect binding sites for positively charged compounds to stick to the glass surfaces.

Two manufacturing steps need to occur to produce a Low Adsorption (LA) vial that can be "Mass Spec Certified". Step one is to remove as much of the metals as possible with particular attention to sodium. The sodium as well as other metals can leach out of the glass into the liquid in the vial and chemically bond with certain common solvents. When this leaching occurs, the pH of the solution increases and can cause degradation to pH sensitive analytes. Shimadzu vials have been shown to contain 28 times less sodium than competitor vials which correlates to competitor vials having typical pH increases of up to 2.8 units or more. The second step in the process is to silanize or coat the glass in order to increase hydrophobicity.

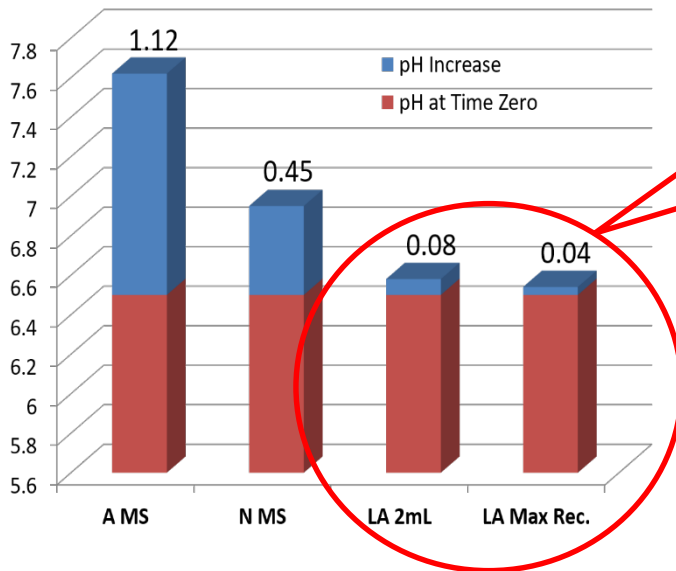
The table below shows the adsorption rate of the highly sticky positive molecule chlorhexidine in the average competitor's MS certified glass vial compared to the Shimadzu Low Adsorption vial. Rapid adsorption occurs within the first two hours with approximately 30% of the sample adsorbed into the surfaces of the vial. Then, saturation occurs within four hours of contact with the vial causing nearly 40% sample loss just by choosing the wrong glass vial.

Sample Adsorption Over Time



What makes vials different?

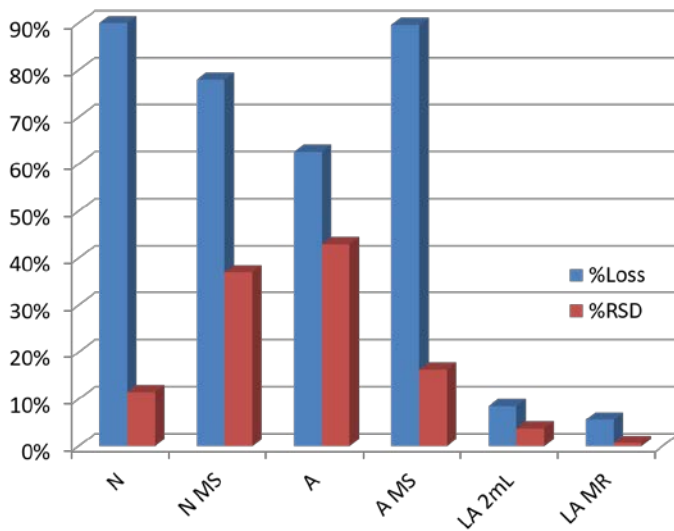
pH Shift in Different Vials



28x less sodium compared to competitor's vials

Less metals like sodium means that you have less leaching into your sample and less pH increase. Changes in pH causes degradation for pH sensitive compounds.

Percent Adsorption



In the Low Adsorption vials, less than 10% analyte loss was observed and it was highly reproducible as seen by the single digit %RSD's.

Competitor MS certified vials show no less than 60% sample loss via adsorption into the glassware. Consistency from vial to vial is also highly variable as shown by the inconsistent %RSD's.

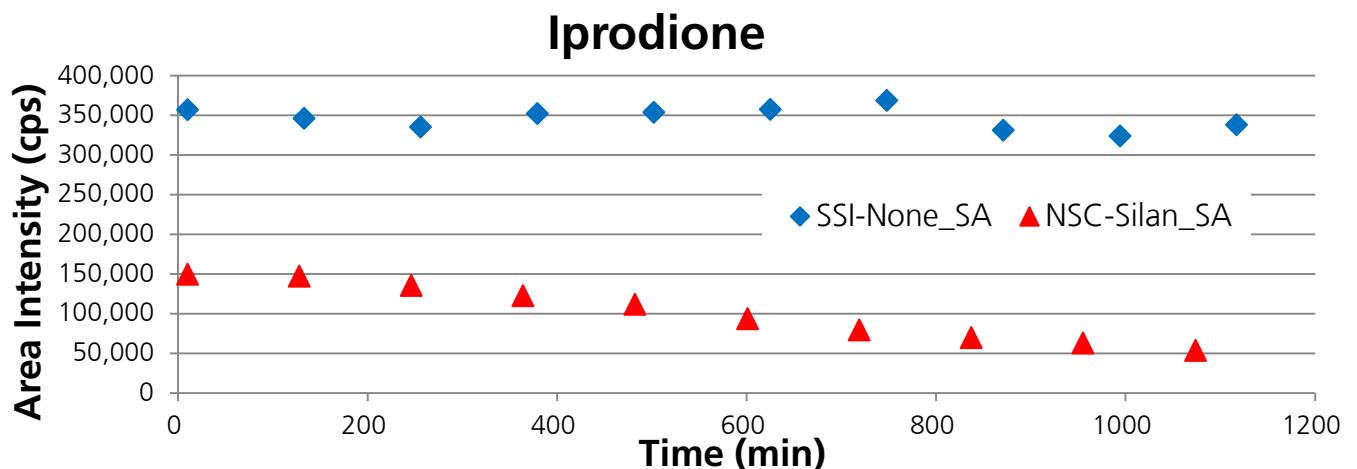
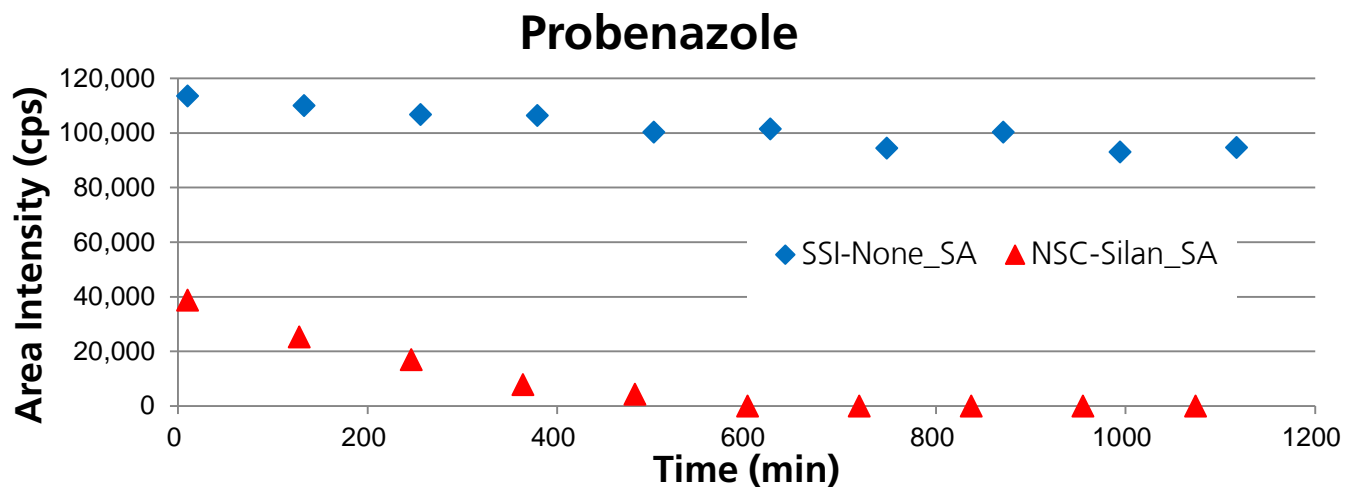
The Shimadzu LA vials provide ultra low adsorption with reproducible results

Silanized vs Non-Silanized

Are Shimadzu non-silanized vials better than a competitors silanized vial?

Some applications require the use of silanized vials while other applications do not. Silanized glassware is not perfectly inert but it does offer an exceptional coating when needed. When conducting analyses that require non-silanized glassware and where plastics are not appropriate, how does the Shimadzu non-silanized vial compare to competitors silanized vials? The Shimadzu non-silanized vial exhibits ultra low adsorption characteristic as compared to competitors vials because they are manufactured using identical material to the Low Adsorption silanized vial except for the coating. Below is a comparison of the Shimadzu non-silanized vial to competitors silanized vials.

Compounds with a wide range of polarity and functional groups were studied to determine if silanized vials adsorbed less analytes than non-silanized vials. A comparison between a Shimadzu non-silanized vial and a competitor's silanized vial was performed using a 105 multi-residue pesticide mixture in a 95% aqueous tap water solution with sodium ascorbate to remove chlorine found in the tap water. The results showed that the pesticides were not significantly adsorbed into the Shimadzu vial but the competitor's vial showed significant adsorption of pesticides into the vial surfaces.



Seal the vial

Does the septa or mat really mater?

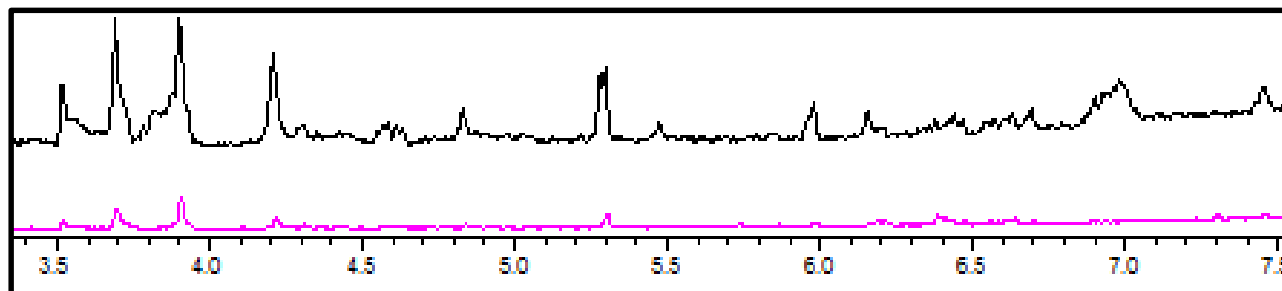
Shimadzu realizes that every application is different therefore multiple sealing options exist. For vials, two types of septa material are available. Modern septa are manufactured using a double layer design with the top layer for sealing and the bottom layer for sample protection.

Two Types of Septa

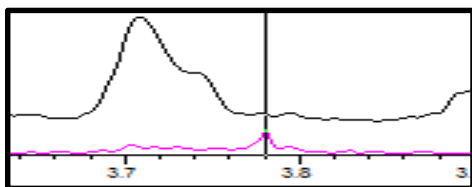
- The first and most common septum is one consisting of a silicone top layer and a PTFE bottom layer.
- The second septum is a silicone top layer with a polypropylene bottom layer.

Most applications utilize the PTFE version but if an application is sensitive to PTFE exposure, then the polypropylene option is recommended.

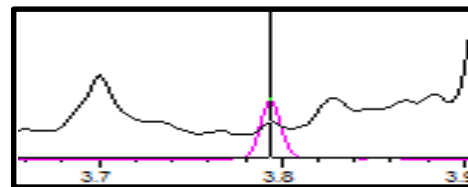
Not all PTFE or polypropylene material is the same as evidenced by the data below. A comparison of the Shimadzu septa versus the typical competitor's septa was conducted to see what leachables or bleed existed. Bleed most often occurs by lab practices such as leaning the vial or vortexing the vial so that sample liquid touches the septum and the solvent extracts material on the septum.



Null injection showing a clean system with no column contamination present



OFN Standard in competitor's vial, S/N = 10.81



OFN Standard in Shimadzu vial, S/N = 1616.08

Pre-slit or Not

Septa can be pre-slit or not and must be selected by evaluating a few method criteria. A pre-slit septa is ideal in applications requiring drawing 20% or more of the sample volume from the vial so that suction is avoided. The slit allows ambient gas to equalize the gas in the vial so that a vacuum is not created in the vial from the tight seal around the needle. If coring/clogging from a narrow needle or needle deflection from highly durable septa material is a concern, then choosing a pre-slit septa is ideal. The non pre-slit septa helps to reduce carryover from vial to vial because the resealing characteristics of the septum act as a squeegee to wipe solution from the outside of the needle. Typically, a non-slit septum exhibits resealing capabilities for a limited number of needle punctures but for long-term storage in the vial, using a new non-punctured septum is best practice.

Self adhering films and foils need to be avoided due to the adhesive residue buildup on the needle leading to excessive carryover.



For microtiter plates choosing a cover comes down to similar selection criteria as previously discussed. Mats that are not pre-punctured, mats that are pre-punctured, aluminum foil covers, and plastic film covers are available to seal 96 and 384 well plates as the application dictates.

Vials

Features of Shimadzu Vials and Septa

- 1st hydrolytic class and silanized glass
- Vials are packaged in a cleanroom
- Contamination-free septa production



■ 1.5mL screw vials, 100/pack



Part number	220-97331-25	220-91521-03	220-97331-26
Type	Clear, screw vial	Clear, screw vial with integrated 0.2mL micro-insert	Amber, screw vial
Write on spot	√	√	√
Min. Vol / uL	200	25	200
Max. Vol / mL	1.5	0.2	1.5
Dimension	32 x 12mm	32 x 12mm	32 x 12mm
Size	ND 9, wide opening	ND 9, wide opening	ND 9, wide opening

■ 1.5mL screw plastic micro-vials



Part number	220-91521-05	220-97331-00**	228-31600-91
Type	PP micro-vial, transparent	PP micro-vial	PP micro-vial
Write on spot	X	X	X
Min. Vol / uL	30	200	200
Max. Vol / uL	300	750	1 mL
Dimension	32 x 12mm	32 x 12mm	32 x 12mm
Size	ND 9, wide opening	ND 9, wide opening	ND 9, wide opening
Qty	100	100	200

**Must order 220-97331-01 (Caps & Silicone/PTFE Septa)

Vials

■ Caps/Septa for 1.5mL screw vials, 100/pack

Temperature limit for PTFE/Rubber septa: -40°C up to 110°C

Temperature limit for PTFE/Silicone septa: -60°C up to 200°C


Part number	Cap	Septa Material & Color	Septa Thickness	Septa Durometer	Size
220-97331-27	Red PP, Center hole	Silicone (White)/PTFE (Red)	1.3 mm	45° shore A	ND 9 (9mm)
220-97331-28	Red PP, Center hole	PTFE (Red)/Silicone (White)/PTFE (Red), Slit	1.0 mm	45° shore A	ND 9 (9mm)
220-97331-29	Red PP, Center hole	Red Rubber/PTFE (Beige)	1.0 mm	45° shore A	ND 9 (9mm)
220-91521-12	Polyethylene	Septumless Cap	-	-	ND 9 (9mm)
220-91521-13	Polyethylene Plug Cap	-	-	-	8 x 40 (1mL)

* UltraBond seal, cap & septa form an inseparable unit, so that septa cannot fall out.

■ 1.5mL screw vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-30	Clear with write on spot	220-97331-25	PTFE/Silicone, ultra-clean	220-97331-27
228-45451-91	Clear Silanized	-	PTFE/Silicone, ultra-clean	-
220-97331-31	Amber with write on spot	220-97331-26	PTFE/Silicone, ultra-clean	220-97331-27
228-45453-91	Amber Silanized	-	PTFE/Silicone, ultra-clean	-

■ Micro-insert for 1.5mL screw vials, 100/pack

Part number	Min. sample vol	Max. sample vol	Usage	Assembled plastic spring	Type	
220-91521-04	30 uL	200 ul	ND9 wide opening vials	√	Conical	



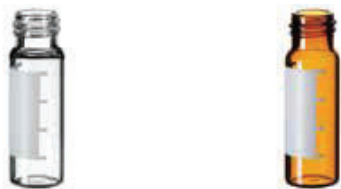
1.5 mL amber screw vial kit



1.5 mL clear screw vial kit

Vials

■ 4mL screw vials, 100/pack



Part number	220-97331-17	220-97331-18
Type	Clear, screw	Amber, screw
Write on spot	X	√
Min. Vol / uL	800	800
Max. Vol / mL	4.1	4.1
Dimension	45 x 15mm	45 x 15mm
Size	ND 13	ND 13

■ Caps/Septa for 4mL vials, 100/pack

Temperature limit for Silicone/PTFE septa: -60°C up to 200°C

Part number	Cap	Septa Material & Color	Septa Thickness	Septa Durometer	Size
220-97331-19	Black PP, Solid Cap	Silicone (Cream)/PTFE (Red)	1.5 mm	55° shore A	ND 13 (13mm)
220-97331-20	Black PP, Center hole	Silicone (Cream)/PTFE (Red)	1.5 mm	55° shore A	ND 13 (13mm)
220-97331-21	Black PP, Center hole	Silicone (White)/PTFE (Blue), Cross Slit	1.5 mm	55° shore A	ND 13 (13mm)

■ 4mL screw vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa Material	Cap/Septa part number
220-91521-10	Clear - Low Volume	-	PTFE/Silicone, ultra-clean	-
220-97331-23	Clear with write on spot	220-97331-17	PTFE/Silicone, ultra-clean	220-97331-20
220-97331-23	Amber with write on spot	220-97331-18	PTFE/Silicone, ultra-clean	220-97331-20
228-45453-24	Amber with write on spot	220-97331-18	Solid Cap, PTFE/Silicone	220-97331-19

Vials

■ 10mL and 20mL Headspace screw vials, 100/pack



Part number	220-97331-09	220-97331-10	220-97331-11	220-97331-12
Volume / mL	10	20	10	20
Type	Round bottom	Round bottom	Flat bottom	Flat bottom
Dimension	46 x 22.5mm	75.5 x 22.5mm	46 x 22.5mm	75.5 x 22.5mm
For use on instrument	HS-10, HS-20, AOC-5000, AOC-6000	HS-10, HS-20, AOC-5000, AOC-6000	AOC-5000, AOC-6000	AOC-5000, AOC-6000

For TurboMatrix™ 16, 40 and 110, produced after 01.09.2006

■ Cap/septa for 10mL and 20mL screw vials

Temperature limit for PTFE/Silicone septa: -60°C up to 200°C

Temperature limit for Butyl/PTFE septa: -40°C up to 120°C

Part number	Cap	Septa Material	Septa Thickness	Septa Durometer	Picture
220-97331-04	Magnetic Screw	Silicone/PTFE	1.3 mm	45° shore A	

■ 10mL and 20mL screw vial kits, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-14	Clear, Round Bottom	220-97331-09	Magnetic Cap, Silicone (Transparent Blue)/PTFE (White)	220-97331-04
220-97331-16	Clear, Round Bottom	220-97331-10	Magnetic Cap, Silicone (Transparent Blue)/PTFE (White)	220-97331-04

Vials

■ 10mL and 20mL Headspace crimp vials, 100/pack



Part number	220-97331-50	220-97331-51	220-97331-07	220-97331-08
Volume / mL	10	20	10	20
Type	Round bottom	Round bottom	Flat bottom	Flat bottom
Dimension	46 x 22.5mm	75.5 x 22.5mm	46 x 22.5mm	75.5 x 22.5mm
For use on instrument	HS-10, HS-20, AOC-5000, AOC-6000	HS-10, HS-20, AOC-5000, AOC-6000	AOC-5000, AOC-6000	AOC-5000, AOC-6000

** not suitable for Thermo Scientific HS250/HS500

■ Cap/septa for 10mL and 20mL crimp vials

Part number	Cap	Septa Material	Septa Thickness	Septa Durometer	Temperature limit	Picture
220-97331-05	Silver magnetic	Silicone/PTFE, ultra-clean	3.0 mm	45° shore A	-60°C up to 200°C	
220-97331-06	Aluminum silver	Silicone/PTFE	3.2 mm	45° shore A	-60°C up to 200°C	
220-94906-32	-	Silicone/PTFE, ultra-clean	3.0 mm	45° shore A	Up to 300°C	
220-94906-33	Aluminum silver	-	-	-	-	

Vials

■ 10mL and 20mL crimp vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-13	Clear, Flat Bottom	220-97331-07	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-15	Clear, Flat Bottom	220-97331-08	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-52	Clear, Round Bottom	220-97331-50	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-53	Clear, Round Bottom	220-97331-51	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06

■ Crimper/Decapper for 10mL and 20mL crimp vials

Part number	Description
REST-23398	20mm Crimper
REST-23399	20mm Decapper
REST-23396	11mm Crimper
REST-23397	11mm Decapper



■ EPA screw vials, 72/pack

Part number	Volume	Vial	Size
220-90613-01	40 mL	Clear	ND 24
220-90613-02	40 mL	Amber	ND 24



Vials

Shimadzu LabTotal Vial MS Certified Kit

- Reduces the Adsorption of Basic Compounds on the Surface of the Glass Vial.
 - This improves quantitative accuracy in the analysis of trace basic compounds.

- Quality certificate proving suitability to LCMS / GCMS
 - This product can be used as a vial for high-sensitivity analysis in GCMS and LCMS

- Wide Mouth with Preset Cap and Septum Improves Ease of Use
 - This shortens the time needed for sample preparation and reduces human error.

Part number	Description
227-34001-01	LabTotal Vial Certified Kit for LCMS, 100/pk
227-34001-02	Blue PP cap, Silicone white/PTFE red for LabTotal vial LCMS, 50/pk
226-84340-01	Black PP cap, Silicone white/PTFE red for LabTotal vial LCMS, 100/pk
227-34002-01	LabTotal Vial Certified Kit for GCMS, 100/pk



■ Mass Spec Quality Certificate Provided

This confirms that there was an absence of elution components from the vial in random inspections using LC/MS and GC/MS. Therefore, this product can be used with confidence, with no concern for ghost peaks originating from the vial.



Shimadzu Corporation
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Certification of Inspection
Shimadzu LabTotal Vial

LabTotal Vial Certified Kit
Part: 227-34001-01
Lot: 1206000

Description: 1.0oz Short Throat Vial, clear glass, hydrolytic stop 1, wide-mouth, blue/white stop, clear, 100 Short Throat Cap, 5000, white/red, silicone white/PTFE, 100

Batch lot of LabTotal Vial Certified Kit is tested by a 20th ISO 9001:2008 certified laboratory according to parameters to fulfill with any certified customer for use in mass spectrometry.

Item	Result
Vial Parameters	
Hydrolytic Class V, 11 compliance (Shimadzu, meets all requirements of Pharm. USP, EU, JP, etc. class 10-100 cleanroom)	Passed
Weight	Passed
Dimension	Passed
Bottom Thickness	Passed
Neck Length	Passed
Throat Profile	Passed
Appearance	Passed
Cap / Septum	
Test Parameter	Result
Dimension	Passed
Height	Passed
Thread Integrity	Passed
Seal Thickness	Passed
Seal Size Compliance (per specification)	Passed
Thread Profile (per specification)	Passed
Examination	Passed

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Chemical Test

Test Parameter	Result
GC/MS, Non-polar solvent	Passed
GC/MS, Polar solvent	Passed

GC/MS Chromatogram
Vial with attached Closure, filled with non-polar solvent

LC/MS Chromatogram
Vial with attached Closure, filled with polar solvent

QC Certification: Date of QC Certification: 25.09.2013

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Dedicated Pretreatment Vials for CLAM-2000

CLAM-2000 is compatible with dedicated disposable pretreatment vials from Shimadzu. Filtration and Collection vials are used as a pair.

Part number	Description		
241-16531-41	Vial set	Set of 100	* Sold as a set
241-16531-42	Vial set	Set of 500	* Sold as a set



Dedicated Filtration Vial



Dedicated Collection Vial

■ Specifications of Applicable Sample and Reagent Vials

Sample Containers	13 mm body diameter × 75 mm tall Examples: BD brand Vacutainer blood collection tubes Terumo brand Venoject II blood collection tubes Nipro brand Neotube blood collection tubes, etc.	
	2 mL cup P/N 038-00180 Sample Cup, 1270016HIT	
	X Micro-volume cup P/N 241-94045-01 Sample Cup, Micro	
Reagent Vials	2 mL vial P/N 038-00083-01 Vial, 2.0mL Glass Shell Vial	
	6 mL vial P/N 038-00199-04 Vial, SCREW NO.2-C	
	12 mL vial P/N 038-00199-06 Vial, SCREW NO.4-C	

Microtiter Plates

■ Deep Well Plates - PCR Clean

	EPPE-951031801	EPPE-951032204	EPPE-951032603	EPPE-951033006	EPPE-951033405	EPPE-951033600	EPPE-951031003	EPPE-951031402
# of wells	96		96		96		384	
Working Volume	30-550uL		30-1000uL		50-2000uL		20-225uL	
Total Volume	700ul		1200uL		2400uL		240uL	
Nominal Volume	500uL		1000uL		2000uL		200uL	
Material	Polypropylene							
Bottom Shape	V Well (Conical)							
Dimensions (W x D x H) mm	127.8 x 85.5 x 27.1		127.8 x 85.5 x 44.1		127.8 x 85.5 x 44.1		127.8 x 85.5 x 25.1	
# of Plates/box	40	120	20	80	20	80	40	120

■ Microplates

	EPPE-951040005	EPPE-951040021	EPPE-951040188	EPPE-951040227	EPPE-951040048	EPPE-951040081
# of wells	96		96		96	
Working Volume	50-350uL		20-320uL		20-320uL	
Total Volume	400ul		360uL		350uL	
Material	Polypropylene					
Bottom Shape	Flat Well		V Well (Conical)		U Well	
Dimensions (W x D x H) mm	127.8 x 85.5 x 14.4					
Type	PCR	Sterile	PCR	Sterile	PCR	Sterile
# of Plates/box	80		80		80	

	EPPE-951040341	EPPE-951040383	EPPE-951040421	EPPE-951040464
# of wells	384		384	
Working Volume	10-120uL		5-120uL	
Total Volume	150uL		140ul	
Material	Polypropylene			
Bottom Shape	V Well (Conical)			
Dimensions (W x D x H) mm	127.8 x 85.5 x 14.4			
Type	PCR	Sterile	PCR	Sterile
# of Plates/box	80		80	

Microtiter Plates

■ Deep Well Plate Covers

Item Number	Description
EPPE-0030127838	Deepwell Plate Storage Film - Heat Sealed, 100pcs
EPPE-0030127854	Deepwell Plate Storage Foil - Heat Sealed, 100pcs
EPPE-0030127960	Deepwell Plate Sealing Mat for 96DWP 2000uL, 50pcs
EPPE-0030127978	Deepwell Plate Sealing Mat for 96DWP 1000uL & 500uL, 50pcs





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URL: www.shimadzu.com/an/

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