Measurement Uncertainty Estimation

Measurement: Ethanol vapor: Solutions analyzed range from approximately 0.020 g/210L to 0.360 g/210L by Perkin Elmer HS-GC/FID

Procedure name and revision: TOX_P~~100~~ 500 JSD 10/15/21

Estimation prepared by: JSD **Date Prepared:** 9/14/2021 JSD 10/15/21

Analyte	Analyte Standard Uncertainty (%)		Degrees of Freedom (n-1)	Combined Standard Uncertainty	Coverage Factor (k)*	Expanded Uncertainty	Reported Uncertainty
	Reproducibility	Calibration Material					
Ethanol	1.13	0.181	179	1.22	3.077	3.75	**3.8**

*Coverage factor reflects a confidence interval of 99.73%

Note: Regardless of the number of digits shown above, Excel carries the maximum number of digits in the background and will use the entire number for calculations. Only final results are rounded.

Basis for estimated uncertainties:		Standard Uncertainty (%)	Distribution	Type	Divisor
1	Reproducibility - Pooled %CV from control charts	see above	Student t	A	1.00
2	Cal. materials - Avg. standard uncertainty from Cerilliant COAs	see above	Normal	B	1.00
3	Pipetting calibrators - 250 µL pipette tolerance	0.19	Normal	B	1.00
4	Pipetting internal standard - 500 µL pipette tolerance	0.09	Normal	B	1.00
5	Pipetting sim. solution - 250 µL pipette tolerance	0.19	Normal	B	1.00
6	Homogeneity - pooled between bottle % CV from validation	0.288	Normal	B	1.00
7	Stability - average uncertainty of the two capping methods due to instability of the reference material over a 24 month period	0.000931	Normal	B	1.00

Reviewed 9/15/21 AP

See Sharepoint: Forensic Lab - Documents\Section Folders\Alcohol\Traceability Documents\Cerilliant

Cerilliant Calibrators *from COAs

Lot #	Conc.	± mg/dL	Relative Standard Uncertainty
Cerilliant FN02231604	10.00	0.04	0.175%
Cerilliant FN10241403	10.00	0.04	0.175%
Cerilliant FN08031803	10.00	0.04	0.194%
Cerilliant FN03241604	20.00	0.07	0.175%
Cerilliant FN10051909	20.00	0.08	0.194%
Cerilliant FN04271601	50.00	0.18	0.175%
Cerilliant FN05211804	50.00	0.18	0.175%
Cerilliant FN06171903	50.00	0.19	0.194%
Cerilliant FN04171701	80.00	0.28	0.175%
Cerilliant FN06231704	200.0	0.8	0.181%
Cerilliant FN05101903	200.0	0.8	0.194%
Cerilliant FN07031402	500.0	1.8	0.175%
Cerilliant FN08031602	500.0	1.8	0.175%

See Sharepoint: Forensic Lab - Documents\Section Folders\Alcohol\Traceability Documents\Pipettes

Pipettes **from Calibration Certificates Updated: 7/23/2021

S/N	Volume (µL)	Uncertainty	Uncertainty/k	%
JJ03213	250	1.50	0.471	0.19%
HH94382	500	1.50	0.471	0.09%
LH79841	500	1.50	0.471	0.09%

k= 3.182

Precision Data from QC charts (09/24/2019 - 09/14/2021)

	AQ QC ***	0.050 CCS	0.200 CCS
Precision %CV	0.99%	1.13%	1.26%
n	53	71	56
Pooled % CV	**1.134%**		
Average % CV	**1.127%**		
Worst % CV	**1.260%**		
n	**180**		

Homogeneity Study

	Batch 1	Batch 2	Batch 3
Mean	0.1013	0.0999	0.1005
Between bottle SD	0.0003610	0.0003316	0.0001076
Between bottle % CV	0.356%	0.332%	0.107%
n	30	30	30
Pooled % CV	**0.288%**		
Average % CV	**0.265%**		
Worst % CV	**0.356%**		

Reviewed AP 9/15/21

Stability

	Induction	Parafilm
n	10	10
Mean	0.1005	0.1006
Slope	-0.0001	-0.0001
Intercept	0.1013	0.1013
u_{slope}	0.00004	0.00004
$u_{stability}$	0.00087	0.00099
Average $U_{stability}$	**0.00093**	
Worst $U_{stability}$	**0.00099**	

*Traceability of the measurement is established through NIST traceable calibrators from an accredited reference material producer used to calibrate the instrument during each run and use of pipettes that are maintained with NIST traceable calibration from an accredited calibration laboratory.

** Largest "As Left" reported MU during the time frame these pipettes were used

***AQ QC lot numbers: Cerilliant FN02221601 & & FN01212001