

Table 2
Volume and Density

Measurement	Instrument Type	Uncertainty Component		ITV (% rel., k=1)	Notes
		% rel., k=1			
		u(r)	u(s)		
Volume ^{1/}	ELTM (Accountability tanks)	0.05	0.1	0.12	<u>2/</u>
	ELTM (Process tanks; high concentration)	0.2	0.2	0.28	<u>3/</u>
	ELTM (Process tanks; low concentration)	1	1	1.4	<u>4/</u>
	ELTM (Accountability tanks)	0.3	0.2	0.36	<u>5/</u>
	ELTM for calibration conditions (Accountability tanks)				<u>7/</u>
Density	ELTM (Accountability tanks)	0.05	0.05	0.07	<u>6/</u>
	ELTM (Process tanks; high concentration)	0.1	0.1	0.14	
	ELTM (Process tanks; low concentration)	0.7	0.7	1	
	VTDM	0.05	0.05	0.07	
	Density for calibration conditions				<u>7/</u>

1/ Volume determinations are made on the basis of level pressure, density and temperature measurements. The volume measurement uncertainties are highly dependent on the homogeneity of the liquid, the quality of the density measurements and of the calibration equation determined in the calibration process. The volume measurements may also involve an absolute error component which has to be taken into consideration when determining the overall uncertainty of volume measurements.

2/ For accountability tanks in newly built large-throughput facilities, uncertainties of 0.05% for u(r) and 0.1% for u(s) at full volume are achievable if: i.) A carefully designed calibration procedure has been implemented under well-controlled environmental and stable temperature conditions; and ii.) Measurements, using high precision electro-manometers, are performed on a well-characterized and homogenized liquid.

3/ Process tanks for high Pu concentration solutions are generally also equipped with high precision electro-manometers, however, the calibration effort and tank design specifications may be lower.

4/ Equipped with standard electro-manometers, lower calibration effort.

5/ The values apply to older facilities where the tank design was not driven by optimized ELTM volume measurement capabilities.

6/ The same comments as given for the volume measurements apply; one additional important calibration parameter is the determination of the probe (dip tube) separation.

7/ Placeholder for ITV still under review.