

Calibration Error Worksheet

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Uncertainty Analysis for Engineers and Scientists: A Practical Guide
(Cambridge University Press, 2020)

The error e_s is defined as the “best-case” standard error for a quantity as determined for a brand-new unit by a manufacturer or for a particular device by someone with authority to certify the value. For example, the technical specifications of a device may indicate that it is accurate to a value $\pm 2e_s$. Alternatively, a value of a constant (the viscometer constant α , for example) may be provided by the manufacturer with no specific uncertainty. In this case, the rule of thumb method of “least significant digit” is acceptable for evaluating the uncertainty. Finally, a user may take steps to calibrate a meter on site; this determination of error (likely to be greater than the “best case” error) has the advantage of reflecting issues associated with the particular unit in question.

Device name:			
Measured quantity:	Symbol:	Representative value: (include units)	
		<i>Estimate of e_s: (or Not Applicable)</i>	
Rule of Thumb Method: Least significant digit on provided value	Least significant digit varies by at least $\pm 1 = \pm 2e_s$		
Rigorous Method: Manufacturer maximum error allowable	$2 e_s \approx$		
Method 3: User calibration	$2e_s \approx$		
	Maximum of Methods 1 - 3	$e_s =$	95% level of confidence, Calibration error only: quantity $\pm 2e_s$ (units)
		$2e_s =$	

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Table 1: Tolerances for Volumetric Glassware (from Fritz and Schenk, *Quantitative Analytical Chemistry*, Allyn and Bacon, Inc, Boston, 1987 or www.thomassci.com)

Capacity, ml	Maximum error allowable, $2e_s$			
	Pycnometers (Thomas Scientific)	Volumetric flasks	Volumetric Pipets	Burets
5	0.03	-	0.01	0.01
10	0.04	-	0.02	0.02
25	0.05	0.03	0.03	0.03
50	0.08	0.05	0.05	0.05
100	-	0.08	0.08	0.10
500	-	0.15	-	-
1000	-	0.30	-	-

Table 2: Tolerances for Laboratory Meters

meter	Maximum error allowable, $2e_s$	reference
Thermocouple, type J or K, standard limits	$2.2^{\circ}C$	www.omega.com/techref/colorcodes.html
Thermocouple, type J or K, special limits	$1.1^{\circ}C$	www.omega.com/techref/colorcodes.html
RTD (Resistance Temperature Detectors)	Up to $0.001^{\circ}C$ with proper calibration	IEC751 Standard
Honeywell STD924 DP meter, 0-1000mbar	0.075% of calibrated span	ST 3000 Smart Pressure Transmitter Models Specifications 34-ST-03-65