Uncertainty Calculation For Linear Measurement

Uncertainty Equation   Y = Corrected value

$Y = X + SC_i$ X = Measured value

C_i = Corrections

Uncertainty Budget for 25.4mm Micrometer

	Source	Estimate	Degrees of Freedom	Type	Distribution	Divisor	Std Uncertainty (µm)	Variance (µm)^2
C_1	Uncertainty of Master	0.08	∞	B	U	e2	0.05	0.0029
C_2	Repeatability	0.51	29	A	Normal	1	0.51	0.2611
C_2	Resolution	0.64	∞	B	Rectangular	e3	0.37	
C_3	Uncertainty of Thermometer	0.07	∞	B	Rectangular	e3	0.04	0.0018
C_4	Uncertainty in CTE	0.03	∞	B	Rectangular	e3	0.02	0.0004
C_5	Temperature Differential	0.02	∞	B	Rectangular	e3	0.01	0.0001
C_6								
C_7								
C_8								

Sum of the Variances	0.2663
Combined Standard Uncertainty (u_c equals the square root of the sum of the variances	0.5160
Expanded Uncertainty (min) $U=ku_c$ (k=2.00)	1.0321

Tool Name: Micrometer   Max measurement: 25.4

Standard Name: Grade 2 Gage Block Length   25.4000   See sheet 2 for supporting data and assumptions:

Tool Description: 1.27 mm (0.00127 mm/0.00005 in) resolution U_{SI} 1.04 µm

Determination by: Henry L.Alexander U_{USC} 40.95 µin   Date: 21-Mar-08

coverage Factor "k" = 2.00   Based on Rule 3