

GUM Workbench Version 1.3 screen views

Model view - model equation

Equation:

$$l_x = l_s + \delta l_D + \delta l + \delta l_C - L * (\alpha_{av} * \delta t + \delta \alpha * \Delta t_{av} + u_{at}) - \delta l_v$$

Quantity	Unit	Definition
l_x	mm	length of the gauge block to be calibrated
l_s	mm	length of the reference gauge block at the reference temperature of $t_0=20$ °C according to its calibration
δl_D	mm	Change of the length of the reference gauge block since its last calibration due to drift
δl	mm	observed difference in length between the unknown and the reference gauge block
δl_C	mm	correction for non-linearity and offset of the comparator

C:\Programme\GUM Workbench 1.3\Budgets\Examples\EA\504.smu

Model view - quantity data

Quantity Data:

- l_x : length of the reference gauge block at the reference temperature of $t_0=20$ °C according to its calibration
- l_s : Type: Type B
- δl_D : Distribution: Normal
- δl : Value: 50.000020 mm
- δl_C : Expanded Uncertainty: 30E-6 mm
- L : Coverage Factor: 2.0
- α_{av}
- δt
- $\delta \alpha$
- Δt_{av}
- u_{at}
- δl_v

Description:
 REFERENCE STANDARD: The length of the reference gauge block together with the associated expanded uncertainty of measurement is given in the calibration certificate of a set of gauge blocks as 50,000 02 mm ±30 nm (coverage factor k=2).

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Observation view

GUM Workbench - S04.smu

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Model **Observation** Correlation Budget Last

δl

observed difference in length between the unknown and the reference gauge block

Observation:

No.	Observation
1	-100E-6
2	-90E-6
3	-85E-6
4	-95E-6
5	-100E-6

Method: Direct

Unit: mm

Arithmetic Mean: $-94.00 \cdot 10^{-6}$ mm

Experimental Standard Deviation: $6.5 \cdot 10^{-6}$ mm

Standard Uncertainty: $4.75 \cdot 10^{-6}$ mm

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Correlation view

GUM Workbench - S04.smu

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Model Observation **Correlation** Budget Last

Row: l_S Col: l_S Coefficient: 1

Correlation Matrix:

	l_S	δ_D	δl	δ_C	α_{av}	δt	$\delta \alpha$	Δt_{av}	u
l_S	1								
δ_D		1							
δl			1						
δ_C				1					
α_{av}					1				
δt						1			

Description:

C:\Programme\GUM Workbench 1.3\Budgets\Examples\EA\S04.smu

Budget view

GUM Workbench - S04.smu

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Model Observation Correlation **Budget** Last

l_S

length of the gauge block to be calibrated

Uncertainty Budget:

Quantity	Value	Standard Uncertainty	Degrees of Freedom	Sensitivity Coefficient	Uncertainty Contribution	Index
l_S	50.0000200 mm	$15.0 \cdot 10^{-6}$ mm	50	1.0	$15 \cdot 10^{-6}$ mm	17.1 %
δ_D	0.0 mm	$17.3 \cdot 10^{-6}$ mm	∞	1.0	$17 \cdot 10^{-6}$ mm	22.8 %
δl	$-94.00 \cdot 10^{-6}$ mm	$4.75 \cdot 10^{-6}$ mm	13	1.0	$4.7 \cdot 10^{-6}$ mm	1.7 %
l_X	49.9999260 mm	$36.3 \cdot 10^{-6}$ mm	1200			

Attention: Some sensitivity coefficients are zero or not valid!

Result:

Value: 49.999926 mm Expanded Uncertainty: $\pm 73 \cdot 10^{-6}$ mm Coverage Factor: 2.00 Coverage: 95% (t-table 95.45%)

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