

GUM Workbench Version 2.4 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 $t_0=20$
δl_D	mm	Change of the length of the reference gauge block since its last calibration
δl	mm	observed difference in length between the unknown and the reference gauge
δl_C	mm	correction for non-linearity and offset of the comparator
L	mm	nominal length of the gauge blocks under consideration

Model view - quantity data

length of the reference gauge block at the reference temperature of $t_0=20$ °C according to its calibration certificate

Type: Type B

Distribution: Normal

Value: 50.000020 mm

Expanded Uncertainty: 30E-6 mm

Coverage Factor: 2.0

Description: Picture 1

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).

Model view - partial derivatives

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Model Observation Correlation Budget Last Result Diagram ?

Title Model Equation Quantity Data **Partial Derivatives**

Partial Derivatives:

$$\frac{\partial l_x}{\partial L} = -(\alpha_{av} \cdot \delta t + \delta \alpha \cdot \Delta t_{av} + u_{at});$$

$$\frac{\partial l_x}{\partial \alpha_{av}} = -L \cdot \delta t;$$

$$\frac{\partial l_x}{\partial \delta t} = -L \cdot \alpha_{av};$$

$$\frac{\partial l_x}{\partial \delta \alpha} = -L \cdot \Delta t_{av};$$

$$\frac{\partial l_x}{\partial \Delta t_{av}} = -L \cdot \delta \alpha;$$

$$\frac{\partial l_x}{\partial u_{at}} = -L;$$

Observation view

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Model **Observation** Correlation Budget Last Result Diagram ?

dl

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: Arithmetic Mean: -94.00·10⁻⁶ mm

Experimental Standard Deviation: 6.5·10⁻⁶ mm

Standard Uncertainty: 4.75·10⁻⁶ mm

Correlation view

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Model Observation **Correlation** Budget Last Result Diagram

Row: δl_p Col: l_s Coefficient:

Correlation Matrix:

	l_s	δl_D	δl	δl_C	α_{zv}	δt	$\delta \alpha$	Δt_{zv}
l_s	1							
δl_D		1						
δl			1					
δl_C				1				
α_{zv}					1			
δt						1		
$\delta \alpha$							1	
Δt_{zv}								1

Description:

Budget view

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Model Observation Correlation **Budget** Last Result Diagram

l_x

length of the gauge block to be calibrated

Uncertainty Budget:

Quantity	Value	Standard Uncertainty	Distribution	Sensitivity Coefficient	Uncertainty Contribution	Index
l_s	50.0000200 mm	$15.0 \cdot 10^{-6}$ mm	normal	1.0	$15 \cdot 10^{-6}$ mm	19.3 %
δl_D	0.0 mm	$12.2 \cdot 10^{-6}$ mm	triangular	1.0	$12 \cdot 10^{-6}$ mm	12.8 %
δl	$-94.00 \cdot 10^{-6}$ mm	$4.75 \cdot 10^{-6}$ mm	normal	1.0	$4.7 \cdot 10^{-6}$ mm	1.9 %
l_x	49.9999260 mm	$34.2 \cdot 10^{-6}$ mm				

Attention: Some sensivity coefficients are zero or not valid!

Result:

Value: Expanded Uncertainty: Coverage Factor: Coverage:

Result of a Monte Carlo simulation

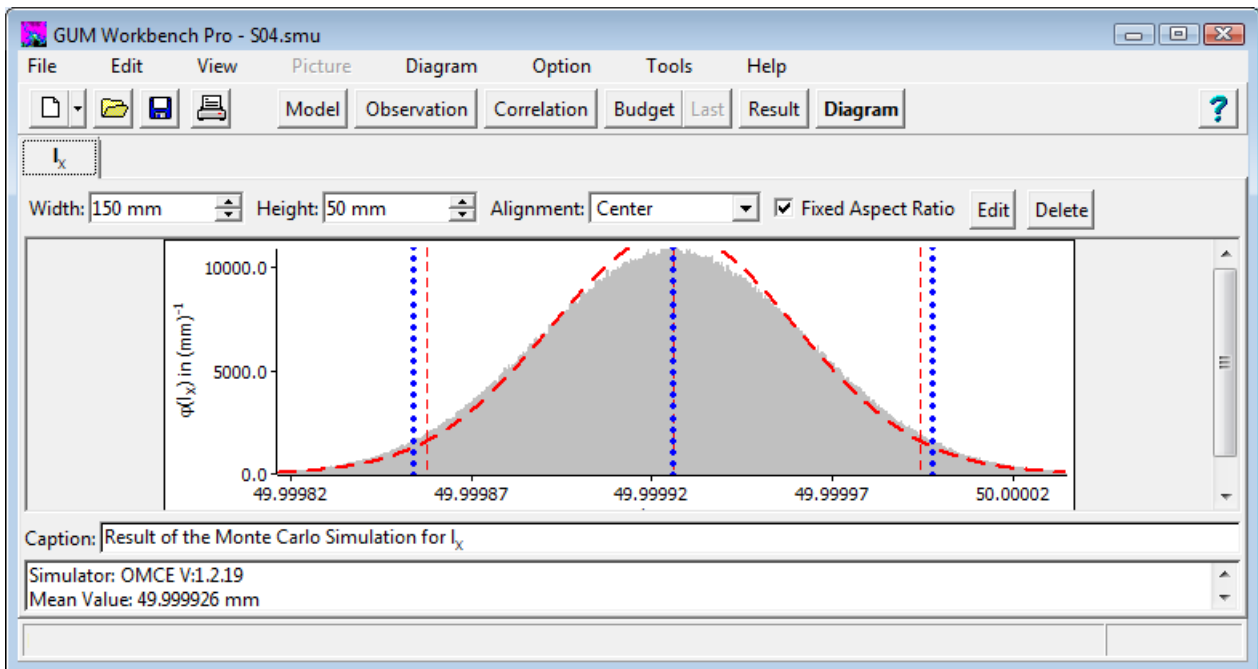


Diagram with multiple results

