EVALUATION OF MEASUREMENT UNCERTAINTY

1. COMPANY NAME : Super Auto Forge Private Limited **DATE :** 29-02-2024

2. DEVICE UNDER CALIBRATION : Dial Gauge

Range/Size (mm) : 50	**Least Count (mm) :** 0.001

3. STANDARDS / EQUIPMENT USED FOR CALIBRATION :

Sr.No	Master Name	Range/Size (mm)	L.C. (mm)	Uncertainty (mm)	Accuracy (mm)	Material
Master 1	CMM - I-CMM-1	500X400X200	0.0001	0.002	0.0006	Steel

4. ENVIRONMENTAL PARAMETERS

Start Temp T1 (°C)	End Temp T2 (°C)	Mean Temp (TA= (T1+T2)/2)	Ref. Temp (TR)	Thermal Expansion of master (mm/m°C)(αM)	Thermal Expansion of DUC (mm/m°C)(αD)	Uncertainty of Temperature Indicator (°C) UT (±)
21.6	21.9	21.75	20	0.0115	0.0115	0.2

5. REPEATABILITY (mm)

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Standard Deviation	n
50.001	50.002	50.003	50.001	50.002	-	-	-	-	-	0.0008	5

6. UNCERTAINTY BUDGET

Source of uncertainty Xi		Estimates (Xi)	Probability Distribution	Type	Factor (x)	Standard Uncertainty u = (Xi / x)	Sensitivity Coefficient (y)	Uncertainty contribution ui = (x * y)	Degree of freedom vi = (n - 1)
U1	Uncertainty due to Calibration of Master 1 mentioned in the certificate	0.0020	Normal	Type B	2	0.0010	1	0.0010	∞
U2	Uncertainty due to accuracy of Master 1	0.0006	Rect	Type B	√3	0.0003	1	0.0003	∞
U3	Uncertainty due to Lease Count of DUC (1/10th of Least Count)	0.0001	Rect	Type B	√3	0.0001	1	0.0001	∞
U4	Uncertainty due to deviation from reference temperature	1.7500	Rect	Type B	√3	1.0104	0.0006	0.0006	∞
U5	Uncertainty due to difference in thermal expansion coefficient of Master (10%)	0.0011	Rect	Type B	√3	0.0006	0.0875	0.0001	∞
U6	Uncertainty due to difference in thermal expansion coefficient of DUC (10%)	0.0011	Rect	Type B	√3	0.0006	0.0875	0.0001	∞
U7	Uncertainty due to uncertainty of temperature monitoring System	0.2	Normal	Type B	2	0.1000	0.0006	0.0001	∞
U8	Uncertainty due to repeatability	0.0008	Normal	Type A	√5	0.0004	1	0.0004	4

Combined Uncertainty (Uc) : 0.0013 mm **Coverge Factor** (k) : 2 **Degree of freedom** (veff): 447

Expanded Uncertainty (U): ± 0.0026 mm

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Prepared By