EVALUATION OF MEASUREMENT UNCERTAINTY

1. COMPANY NAME : Super Auto Forge Private Limited **DATE :** 22-02-2024

2. DEVICE UNDER CALIBRATION : 6932

Range/Size (mm) : 85	**Least Count (mm) :** 62

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-01		12	12.3	52.3	Carbide

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 (±)
12	63	37.50	20	0.0047	0.0047	75

5. REPEATABILITY (mm)

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Standard Deviation	n
52	6	5	2	6	3	7	8	5	9	14.8028	10

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	12.3000	Normal	Type B	2	6.1500	1	6.1500	∞
U2	Uncertainty due to Calibration of Master 2 mentioned in the certificate		Normal	Type B	2		1		∞
U3	Uncertainty due to Calibration of Master 3 mentioned in the certificate		Rect	Type B	√3		1		∞
U4	Uncertainty due to accuracy of Master 2		Rect	Type B	√3		1		∞
U5	Uncertainty due to accuracy of Master 3		Rect	Type B	√3		1		∞
U6	Uncertainity due to Least count of Master 1	6.0000	Rect	Type B	√3	3.4641	1	3.4641	∞
U7	Uncertainity due to Least count of Master 3		Rect	Type B	√3		1		∞
U8	Uncertainity due to Least count of DUC	31.0000	Rect	Type B	√3	17.8979	1	17.8979	∞
U9	Standard Unc due to deviation from reference temperature	17.5000	Rect	Type B	√3	10.1036	0.0004	0.0040	∞
U10	Standard Unc due to temperature difference between DUC and Master	3.5000	Rect	Type B	√3	2.0207	0.0004	0.0008	∞
U11	Standard Unc due to difference in thermal expansion coefficient of Master (10%)	0.0005	Rect	Type B	√3	0.0003	1.4875	0.0004	∞
U12	Standard Unc due to difference in thermal expansion coefficient of DUC (10%)	0.0005	Rect	Type B	√3	0.0003	1.4875	0.0004	∞

U13	Standard Unc due to uncertainty of temperature monitoring System	75	Normal	Type B	2	37.5000	0.0004	0.0150	∞
U14	Standard Unc due to repeatability	14.8028	Normal	Type A	√10	4.6811	1	4.6811	9
U15	Uncertainty due to accuracy of Master 1	52.3000	Rect	Type B	√3	30.1954	1	30.1954	∞

Combined Uncertainty `(Uc) : 36.1086 mm` **Coverge Factor** `(k) : 2` **Degree of freedom** `(veff): 31864`

Expanded Uncertainty (U): `± 72.2172 mm`

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Prepared By