Uncertainity for Laser Positioning measurement under average industrial conditions (*k* =2)

Reference ISO230-2 Annex A

MD CALIBRATIONS, LLC
Machine Tool Calibration at the Speed of Light™

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ACCREDITED
Calibration Laboratory
CERT #3335.01

Machine SN:	**1234**
Date of Test:	**x/x/xxxx**
Customer Name:	**ABC Company**
Address:	**1234 Road**
	City, State Zip
Contact:	**###-###-####**
Machine Model:	**123456**
Machine Location	**TBA**

X **Axis**

$R_{DEVICE=\ XL80\ laser\ error\ in\ PPM}$		0.5	ppm	
$L_{length=\ Distance\ measured\ in\ millimetes}$		700	mm	
$R_{misalignment\ of\ laser}$		1	mm	
$\alpha_{Exp\ Cooefficient}$		11.7	ppm/°C	
R(ø)= (A_{temp}-M_{temp})		-0.1	°C	
ΔT=T-20°C		1.5	°C	
T=Machine Temp		21.5	°C	
A=Air Temp		21.4	°C	
R(α)=Uncertainty of exp cooefecient		1	µm/m*°C	
EVE, Enviromental variation (Drift Test)		1.6	µm	
U_{DEVICE} =0.6 * R_{DEVICE} * L	A3	0.2	µm	
$U_{MISALIGNMENT}$=0.3*R*R/L/1000	A4	0.4	µm	
U(M, Machine Tool) = 0.6 * α * L/1000 * R(ø)	A5	-0.5	µm	
U(M, Device)= Zero, included in U(Device)		0.0		
U(E,MACHINE TOOL)=0.6*ΔT*L*R(α)	A7	0.6	µm	
U(E,DEVICE) = Zero, included in U(Device)		0.0		
U(EVE)=0.6*EVE	A9	1.0	µm	
U(R+, R-)=2*U(EVE)	A11	1.9	µm	

= Constant (Do not Change)
=Requires input from Inspector
= Calculated

For axes up to 2000mm in length — 700.0 — Axis length in mm

U(B)=0.9*U_{EVE}	A12	± 0.9	µm	±	0.000035	Inches
U(R)=2.2*U_{EVE}	A14	± 2.1	µm	±	0.000084	Inches
U(E,E↑, E↓)=	A15	± 1.0	µm	±	0.000041	Inches
U(M)=	A16	± 1.0	µm	±	0.000039	Inches
U(A,A↑, A↓)	A19	± 2.2	µm	±	0.000089	Inches

For axes exceeding 2000mm in length — 0 — Axis Length is Less then 2000

U(B)=2.0*U_{EVE}	A12	± 0.0	µm	±	0.000000	Inches
U(R)=2.2*U_{EVE}	A14	± 0.0	µm	±	0.000000	Inches
U(E,E↑, E↓)=	A15	± 0.0	µm	±	0.000000	Inches
U(M)=	A16	± 0.0	µm	±	0.000000	Inches
U(A,A↑, A↓)=	A19	± 0.0	µm	±	0.000000	Inches

Form#: F94