















TABLE 2. Error model with kinematic parameter-independence

	$\Delta X_r$	$\Delta Y_r$	$\Delta Z_r$	$\Delta I_r$	$\Delta J_r$	$\Delta K_r$
Error	Error Gain					
EXX	1	0	0	0	0	0
EYX	0	1	0	0	0	0
EZX	0	0	1	0	0	0
EAX	0	-Z <sub>m</sub>	0	0	-1	0
EBX	Z <sub>m</sub>	0	0	1	0	0
ECX	0	0	0	0	0	0
EXY	1	0	0	0	0	0
EYY	0	1	0	0	0	0
EZY	0	0	1	0	0	0
EAY	0	-Z <sub>m</sub>	0	0	-1	0
EBY	Z <sub>m</sub>	0	-X <sub>m</sub>	1	0	0
ECY	0	X <sub>m</sub>	0	0	0	0
EXZ	1	0	0	0	0	0
EYZ	0	1	0	0	0	0
EZZ	0	0	1	0	0	0
EAZ	0	0	0	0	-1	0
EBZ	0	0	0	1	0	0
ECZ	0	0	0	0	0	0
COX	0	X <sub>m</sub>	0	0	0	0
AOZ	0	-Z <sub>m</sub>	0	0	-1	0
BOZ	Z <sub>m</sub>	0	0	1	0	0

### V. Conclusion

Three-axis geometric error models derived using traditional methods all set the machine reference coordinate systems at a fixed point on the base of the machine and depend on the machine kinematic chain to derive a kinematic parameter-dependent model. For practical applications, this dependence makes accurate kinematic parameters impossible to obtain, the operation of measurement devices is inconvenient, and overall error is overvalued. For this reason, this paper created a measurement method integrating “modeling, measurement, and compensation for geometric error model of three-axis machine tools using a kinematic parameter-independent” technique. This technique, integrating simple measurement methods, was used to construct a corresponding three-axis geometric error model and compensation model. The geometric error model is machine kinematic parameter-independent, making it a practical, convenient, and accurate method of measurement.

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