

APPLICATION NOTE

PISTON WRIST PIN ODs

Customer: Chrysler Corporation,
Newcastle

Application: Wrist pin ODs

Measurements: Flexible Marposs Quick-Set fixture gage measures ODs at three locations on pin. Measurements are displayed on marposs E4N digital light columns.

Compensation Approach: Albion's GageComp M3 (three channel) Temperature Compensation System uses 2 sensors to monitor temperatures of a) workpiece and master and b) gage fixture. GageComp computes and transmits correction via analog signal to light columns, where correction amounts are mixed with gaged dimensions to give resulting net compensated measurements for each feature.

Gage Modification: A bracket was added to the gage fixture to hold the 3/8" diameter IS-1 workpiece/master temperature sensor. The sensor was positioned so that it came in contact with the workpiece or master when either was in the gage. A GS-1 gage temperature sensor was also housed inside the same bracket. It was located so that it could pick up a representative gage temperature.

Characterization: To determine effective coefficients of expansion (COEs), empirical testing was performed on the master, sample workpiece and gage fixture (the "elements" of the measurement system). The uncompensated gage was first used to make measurements for these tests with compensation turned off, so that true changes in dimension could be noted. Compensation was then turned on, to verify the results of the thermal correction applied.

Characterization studies were conducted for each element. In each case, one element was varied in temperature while the remaining elements were maintained at stable temperature. Any variation in dimension could then be attributed to the element that had been subjected to varying temperature. From the recorded data a linear coefficient of expansion was determined (see Fig. 1), and its effectivity demonstrated (Figs. 2 and 3).

Fig. 1 Effective COEs found for each element.
($\mu\text{m}/\text{m}/^\circ\text{F}$ = parts per million per degree F)

Part $\mu\text{m}/\text{m}/^\circ\text{F}$	Gage $\mu\text{m}/\text{m}/^\circ\text{F}$	Master $\mu\text{m}/\text{m}/^\circ\text{F}$
10.5	7.5	12.0



A L B I O N

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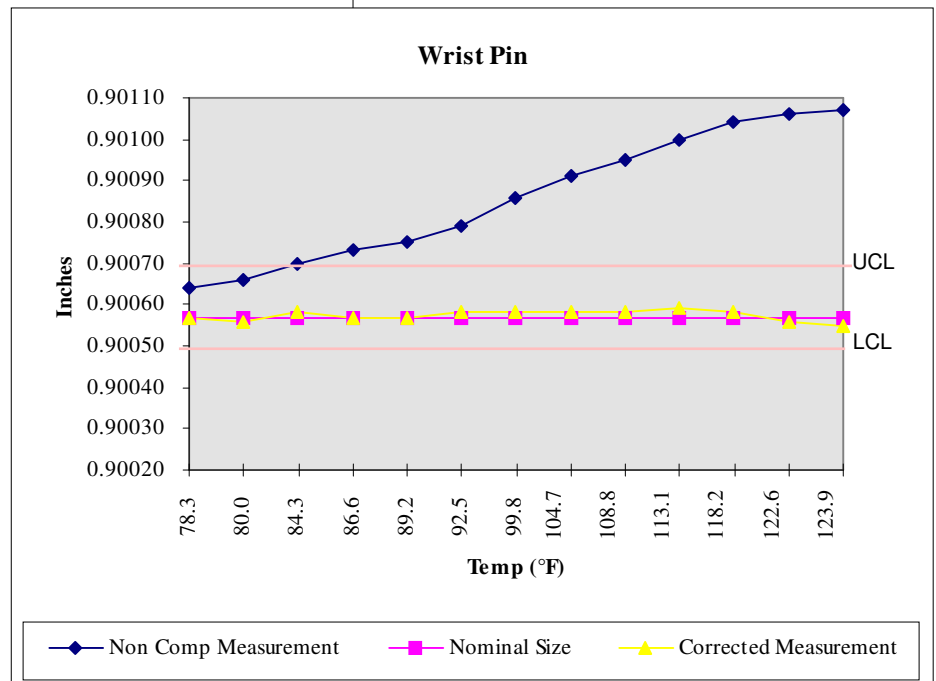
One in a series of temperature compensation application notes. Just call us for the one most relevant to your application. Here are some other titles:

Con rods
Piston skirt ODs
Piston pin bores
Engine cylinder bores
Engine crank bores
Hub/bearing IDs
Throttle body IDs
Differential carrier bores
Wrist pin ODs
Brake drums
Transmission pump ODs
Transmission housing IDs
CrankShaft
Cylinder head

Fig. 2 Sample actual (non-compensated) and corrected (compensated) readings from gage fitted with GageComp temperature compensation system while temperatures varied by approx. 45F. Total tolerance on the pins is .0002 inch.

Part		Gage		Master	
Actual (inch)	Corrected (inch)	Actual (inch)	Corrected (inch)	Actual (inch)	Corrected (inch)
.00043	.00002	.00028	.00001	.00044	.00001

Fig. 3 Pin OD data taken from gage while wrist pin was heated and gage was held at stable temperature. Note blue line shows uncompensated growth caused by increasing temperature. Red line indicates nominal size, and yellow line shows compensated dimension.



Implementation: After being proven on the shop floor it is intended that this system will be reconfigured to interface to a host computer. This will in turn be integrated into a feedback loop, to control the machining process.