WHITE PAPER

Straightness /Flatness Parameter and Actuator Carrier LOM

This information furnished by:
Brett Holker
Senior Mfg. Engineer
Tolomatic, Inc.
3800 County Road 116
Hamel, MN 55340
PHONE: 763-478-8000
www.tolomatic.com

Tolomatic
EXCELLENCE IN MOTION

This white paper describes the testing parameters for the published values contained in the Tolomatic Product Catalog for TruTrack linear actuators regarding straightness and flatness specifications as they apply to the line of motion (LOM) of an actuator's carrier.

DEFINITIONS

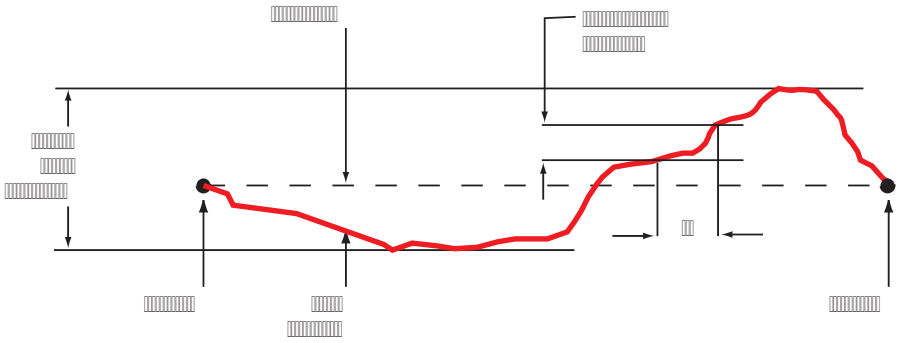
The definitions below are related to the parameter of straightness with respect to GDT principles:

Straightness: A condition where an element of a surface or an axis is a straight line.
Straightness Tolerance: A straightness tolerance specifies a tolerance zone within which the considered element must lie.

STRAIGHTNESS TOLERANCE AS IT APPLIES TO CARRIER LOM:

In the definition of *straightness tolerance*, above, the 'considered element' is the carrier's LOM between ends-of-stroke. The desired path of that LOM is a perfectly straight line between the ends-of-stroke. This 'desired path' becomes the reference datum. Any deviation from this datum must fall within the specified tolerance zone.

Since actuators come in all different lengths, that tolerance zone is ultimately defined by applying a unit length basis. This unit length basis is 1-inch of carrier travel. The amount of deviation within any 1-inch of carrier travel is limited by the straightness tolerance on a per inch basis. Reference the diagram



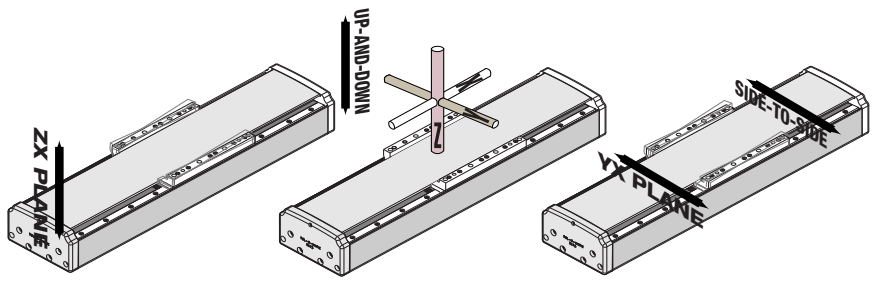
below.

TOLOMATIC METHOD OF MEASUREMENT

Tolomatic utilizes a laser measurement system in order to quantify the line of motion of an actuator's carrier. The actuator is constrained with appropriate fasteners at all mounting holes, to a Class 2 surface plate. The retro-reflector is then mounted rigid to the carrier and centered on the carrier's width, approximately 1.5 inches above the top of the carrier's surface. The carrier is then actuated thoughout its full stroke and data points are collected at 1-inch intervals. The maximum deviation between any two consecutive data points is then compared to the appropriate specification defined previously.

STRAIGHTNESS QUANTIFIED IN 2 PLANES:

To be consistent with the characteristics of the actuator and manner in which an actuator is typically mounted, this tolerance is applied in 2 planes. The ZX plane (flatness), where the straightness tolerance



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is quantifying the 'up and down' deviation of the carrier; and YX plane (straightness) , where the straightness tolerance is quantifying the 'side to side' deviation of the carrier.

STATE OF THE ACTUATOR:

A final consideration is the state of the actuator when quantifying the carrier's LOM. Depending on the application, the actuator may be mounted using any number of methods, orientations, or configurations. In addition, the actuator may be carrying any load up to the maximum allowable for that particular actuator. These variables make it difficult to predict the carrier LOM as experienced in the application. Therefore, there are two 'conditions' of the actuator that we define as a straightness tolerance: free state and constrained.

Free State: The actuator is simply supported at 3 points of contact. Two points are side by side— one on each mounting pad and both positioned at 1/3 stroke. The remaining point is at 2/3 stroke, and is centered on the width of the actuator with no load on the carrier.

Constrained: The actuator is physically attached to a Class 2 certified surface, utilizing all mounting holes in the base and no load on the carrier.