Modification of Moore Measuring Machine/Leitz Microscope

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Quality Assurance Mechanical Inspection, anticipating the need for improved measuring techniques for the various Laboratory programs, has perfected a modification of the Leitz Microscope for the Moore Measuring Machine that has the capability of significantly reducing inspection time with increased reliability.

I. Introduction

To inspect hardware requiring high accuracies, some hardware even too delicate to handle or touch, a microscope with a measuring stage was needed. Up to now the only available instrument was the projection comparator, which does not give a true image of the part, only a shadow or a reflection from the part. Too much of the required accuracy is lost in this method.

II. Innovation From Existing Equipment

The Mechanical Inspection Department has adapted or modified a Leitz microscope capable of attaching directly to the spindle of the Moore Measuring Machine. The precision that is built into the Leitz microscope and the attaching of it to the Moore has given us accuracies to 0.5 micron (20 millionths of an inch) (100% more accurate than a projection comparator). In essence, we now have a tool maker's microscope, but on a 30-cm × 45-cm (12-in. × 18-in.) table. Also, the Leitz microscope provides six different magnifications from 10× to 150×, an internal 360-deg optical protractor, as well as built-in master charts of 30 thread profiles, 28 circles, and 32 radii, all usable in different magnifications. Also, a removable magazine is provided for special charts and templates.

Shown below are some applications of this instrument and a few of the services the Metrology Laboratory is called upon to do for Flight, DSN, and R&D programs.

(1) Measuring the form, angle, pitch, and diameter of threads.

(2) Checking form tools, milling cutters, gears, shapes, gages, templates, cross-sections, fittings, and various small parts and contours.

(3) Surface inspection of machined work, holes, pits, scratches, and fractures.

(4) Accurate determination of center distances between drilled holes, threaded holes, or pins.

(5) Dimensions of impressions and ball diameters.

(6) Laying out and spotting of precision parts.

(7) Measuring from edges to holes or radii, slots, lengths, widths, tensile specimens, glass-enclosed electrodes, filaments, coils, and items too delicate to handle or touch.

III. Summary

Modifying the Leitz Microscope and adapting it to the Moore Measuring Machine with its various accessories has provided one of the most versatile instruments for precision measurements, and has greatly increased the measurement accuracies of parts that are too delicate to stage and handle.