Micro-Metrics Company
OG232 Tooke Paint Inspection Gauge III (discontinued)
Technical Data Sheet

Description and uses

Since its introduction in 1963, the Tooke Paint Inspection Gage has become an essential tool for coatings application quality control in both field maintenance painting and product finishing, Because it performs a direct measurement of total film thickness as well as thickness of individual coats (of contrasting colors), the Paint Inspection Gage often finds use as a "referee" instrument and a calibration tool for other instruments. In addition to measurement of film thickness, the Tooke Gage can be used to measure adhesion of films, and to observe microscopic checking and cracking, tendency for brittleness, blistering, cratering, and other microscopic film symptoms.

The Model III instrument the result of years of manufacture and use ro provide reliability, precision, ruggedness, comfort and convenience for all users in the lab and in the field.

The Tooke Gage has been used to assess sandblast cleaning work, to measure plating thickness on ceramics, metal, and plastics. and to measure thickness of protective backing films on mirrors. It is virtually the only tool for measuring paint on plastics. Surface contamination and wettability can be effectively visualized with the illuminated microscope.

Specifications

Material and size:	Machined aluminum cylinder 2.5" diameter x 4.5" length; 50X illuminated, reticle 0-100 mils, 1-mil div.
Power:	Four AA dry cell batteries
Lamps:	Three GE No. 222
Cutting Tips:	Tungsten carbide 0.620 x 0.132 x 0.072 in.
Carrying Case:	Suede-finished polyurethane cushioning
Shipping Weight:	2 lbs, 3 oz

Ordering information

The Tooke Paint Inspection Gage III, OG232, is **no longer available**. The OG232 originally came complete with illuminated microscope, three mounted cutting tips, felt tip marker, Allen wrench, carrying case and instructions.

Micro-Metrics Company
4450 Ansley Lane
CUMMING, GA 30040-5252
www.micro-metrics.com

(Revised: 2013)

Principle

A small V-groove precision cut through the paint film and into the substrate is observed vertically with an illuminated microscope bearing a measuring reticle. A schematic view of a cut is shown in Figure 1, below, and the appearance under the microscope is shown in Figure 2 (next page). For the 45-degree cut illustrated, film thickness is equal to the horizontally measured length of the layer of film. For any angle of cut:

Tooke Gauge Geometry

As shown in Figure 1 the observed horizontal projection of the film in the groove wall is related to the film thickness by the equation:

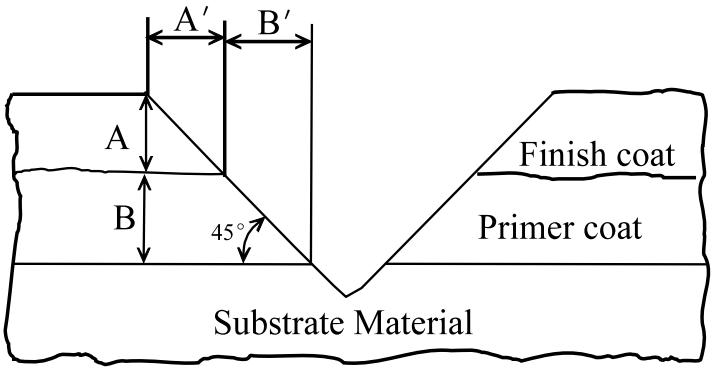
$$A = A' \tan\theta$$

At a 45-degree groove angle:

$$\tan\theta = 1$$

And:

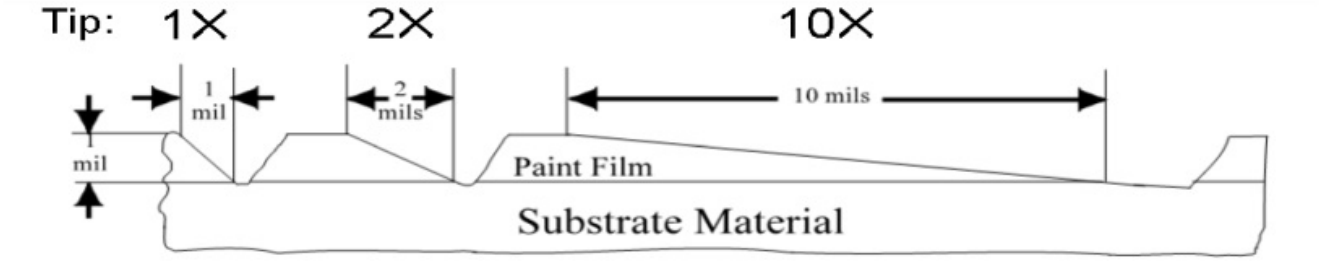
$$A = A'$$



(A – A′) Finish coat thickness
(B – B′) Primer coat thickness

Figure 1 Geometry of Thickness Measurement

Similarly, other groove angles may be cut for convenience and precision-of-measurement of coating films over a wide range of thicknesses.



(A more-detailed explanation of Tooke Gauge geometry is available here: ww.micro-metrics.com/TDS-index.htm)

Cutting tip determination

Determine the cutting tip to be used in accordance with the following table:

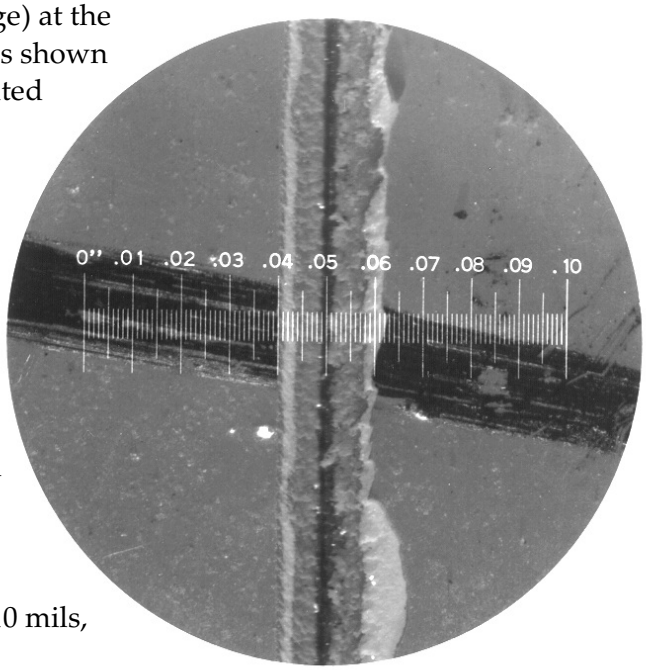
Cutting tip designations and appropriate film thickness ranges

Cutting tip Designation	Maximum coating thickness in mils	Precision of thickness determinations in mils	1 division on reticle represents in mils
1×	100	± 0.25	1.0
2×	20	± 0.13	0.5
10×	3	± 0.025	0.1

If undecided use the 2× cutting tip.

Measurement procedure

Figure 2



Make a small mark with a marker (supplied with gage) at the measurement location. Grasp the Paint Inspection Gage as shown in Figure 3 with the selected cutting tip down on the painted surface to form a "tripod" with its pair of guide studs. Maintain moderate but continuous 3-point contact. and draw the gage toward the body at a comfortable speed directly across the marker "benchmark."

Turn the microscope and view the inter-section of the scribe and "benchmark. " A momentary contact (normally off) lamp switch prevents excessive battery drain, but provides continuous illumination while the gage is held for viewing. Line up a convenient long line on the reticle directly over the left edge of the groove and count small scale divisions (1 mil) inward toward the central groove in the substrate. This count divided by the tip designation (1×, 2×, or 10×) is the film thickness.

If the result should be less than 2 mils or more than 10 mils, you may wish to use the 10× or 1× tips respectively.

Calibration

Original factory calibration is accomplished by setting the guide studs in precise alignment with the cutting tips. Checks are also made with precision applied film standards. For highest precision work, the user is advised to maintain painted panels of known thickness. and to check and calibrate the instrument measurements periodically. After an extended service period, if replacement of old tips fails to restore a "zero" calibration, the instrument should be realigned.

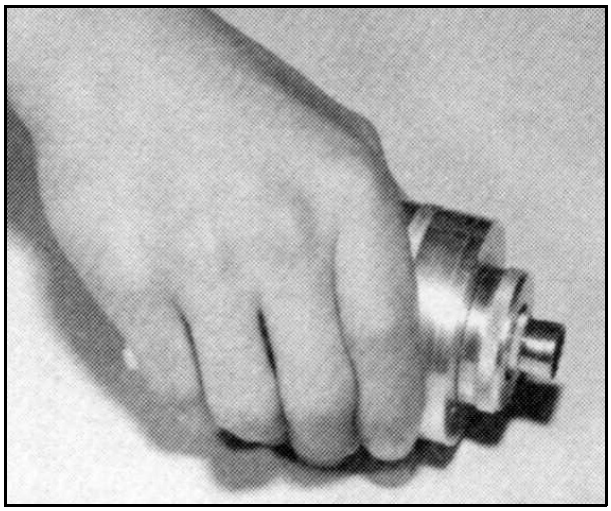


Figure 3

Suggestions to users:

1. On wood or other directional material make incisions in the grain or "machine" direction to avoid ragged cuts.
2. Soft or elastic materials can sometimes be cooled or frozen with ice or dry ice to obtain good cutting characteristics.
3. Dyes or indicator solutions such as phenolphthalein are sometimes helpful to develop appearance contrast between metals (iron-galvanizing) or paint coats.
4. "Wite-out®"-type fluid may be useful as a benchmarker on dark surfaces.
5. With some coatings, improved cuts can be achieved by wetting the surface, or by speeding or slowing the cutting rate.
6. Coatings with poor adhesion will exhibit a ragged line at the substrate interface. Read thickness from the left incision edge in the substrate in these cases. (Note reference 2 below.)

References

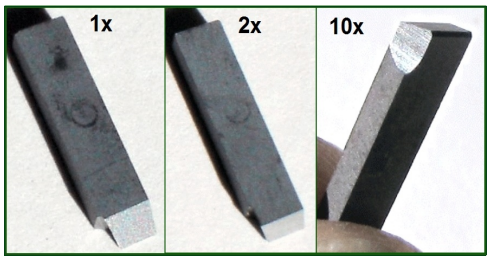
1. "A Paint Inspection Gage" by Raymond Tooke, Jr. *Official Digest*, July 1963, 691–698.
2. "Coatings Adherence Measurement By An Angular Scribe-Stripping Technique" by W. R Tooke, Jr. and J. Montalvo, *Journal of Paint Technology*, January 1966, 38, pp. 18–28.

Gage Construction

The gage body, cap, and focusing ring are manufactured of machined aluminum. The lamp base is epoxy plastic. The cylindrical body houses four AA bulbs in the annular space between the central (axial) microscope barrel and the cylinder wall. Three cutting tips are mounted radially in slots in the cylinder near the upper (eyepiece) end. These are tightened by set screws tapped vertically into the cylinder and accessible through holes in the cap. The slots positioned at 11, 12, and 1 o'clock positions, when viewed from above, contain the 1×, 2×, and 10× cutting tips respectively. Each tip cooperates with one pair of four guide studs mounted radially in the cylinder wall about 2 inches below the tips. The guide studs are tapped into the cylinder wall and locked with hex nuts.

The three bulbs are arrayed on the lamp base to point inward from positions 120 degrees apart and downward at approximate 45-degree angles to commonly illuminate on all sides a small area directly beneath the microscope objective. The resultant intense illumination is adequate and comfortable even under most adverse viewing conditions indoors or out.

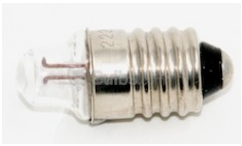
Optional accessories



Replacement tungsten-carbide cutting tips:

Available in 1× (45°, OG200-1X), 2× (26.6°, OG200-2X), 5× (10.2°, OG200-5X), and 10× (5.7°, OG200-10X) configurations. (5× cutting tip not shown.)

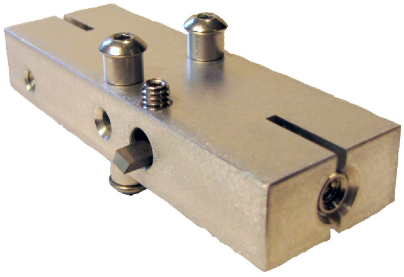
OG200-LED LED replacement bulb



The manufacturer says they should have a "Long life, 50,000 hours."

CTH01 (single) Cutting Tip Holder

The CTH01 Cutting Tip Holder, at a little under two inches (4.1cm) long, allows easy use of a carbide cutting tip without having to manipulate the Tooke Gauge to make the incision and then manipulate the gauge again to view the incision through the microscope. Make multiple incisions with your most-used tip without having to return the gauge to viewing position multiple times.



CTH02 (double) Cutting Tip Holder

This Cutting Tip Holder allows easy use of two cutting tip(s). Both cutting tip holders include a carrying compartment that carries two extra tips (tips not included).

MG402 Microgroover:

The Microgroover is a major accessory tool for creating coating incisions for film thickness measurements with the Tooke Paint Inspection Gauge. This tool greatly extends the range of the measuring technique to include almost any coating on any substrate. The Microgroover is especially effective on hard and brittle (concrete) materials, as well as soft or elastomeric (rubber) substances. In addition, fibrous composites are incised easily and cleanly. This device eliminates the deformations of coating and substrate that may occur when conventional gage cutting tips are used.