

PENCIL HARDNESS GAUGE OPERATING PROCEDURE

This manual complies with ASTM D3363-929. The Pencil Hardness Gauge is used to determine the hardness of an organic coating. The results are recorded as the hardest pencil that does not scratch or mar the surface of the coating (this is the scratch hardness interpretation not the gouge hardness interpretation).

The gauge can be used on both liquid painted and powder coated surfaces. The procedure and assessment of the results are the same for both.

The gauge is equipped with 8 leads located in the following standard positions (Extra leads are stored in the middle tube of the gauge):

Position	1	2	3	4	5	6	7	8
Hardness	2B	B	HB	F	H	2H	3H	4H
	Softest ←—————→						Hardest	

The difference between two adjacent leads is considered one unit of hardness.

Testing is to proceed from the hardest lead to the softest lead.

Equipment Required

1. Pencil Leads

Due to the variability of the manufacturing of leads (both batch to batch and different manufacturers); only 2 types of leads are permitted:

- a) Eberhard Faber - Microtomic
- b) Eagle Turquoise - T2375

These leads are mechanical pencil types, not wood pencils. Wood pencils may be used if absolutely necessary.

2. Pencil Holder

- a) Single mechanical pencil or
- b) 8 pencil holder (Pencil hardness Gauge). This manual explains the proper operation of this holder; but the same process applies to a single lead pencil.

3. Dressing Disc

This is used to keep the pencil leads flat and smooth. If there is no dressing disc available, a flat block with 400 grit sandpaper will work.

Procedure

The test must be conducted in an environment of $77 \pm 3.5^{\circ}\text{F}$ ($25 \pm 2^{\circ}\text{C}$) and $50 \pm 5\%$ relative humidity.

1. Lead tips must be smooth and flat.
 - a) Position the leads so that the flat end of the lead is exposed and they are even with the other 3 leads on that end of the gauge.
 - b) Position the dressing disc so that the 400 grit paper is flush at a 90° angle with the leads. The 90° angle must be maintained throughout step C.
 - c) Rotate the pencils (or disc) until a flat, smooth circular cross section is obtained. The lead surface must be free of all nicks and chips on the edges.
2. Place the coated panel to be tested on a level, firm horizontal surface.
3. Position the gauge on the coated test panel with the desired test lead pointed downward. The middle tube must be rested against the panel.
4. Rotate the gauge until the desired test lead is pointed toward the operator. Begin testing with a lead of sufficient hardness that will scratch or mar the painted surface.
5. Position gauge at a 45° angle to the test panel. The lead and the middle tube should both be touching the panel.
6. Push the gauge away from yourself exerting enough force to either crush the lead edge (start over using a harder lead), or scratch/mar the paint surface (proceed to a softer lead). Length of the strokes should be $1/4$ " minimum.
7. Repeat the process of selecting and testing the leads (going from harder to softer) until a lead is tested that will not mar or scratch the coated surface.

Note: Watch closely for the "scratched" surface - it may be necessary to use your fingernail to determine whether or not a scratch was made.

If the sharp edge of the lead is slightly chipped or crumbled the lead must be resharpened prior to being used for testing again.

8. Record the coating hardness as the hardest lead that will not scratch or deface the painted surface.
9. Repeat the process twice to make an accurate conclusion as to the hardness of the coating.
10. Report any deviance from the standard method used such as
 - type and brand of leads used.
 - roughness/profile of coating surface.