Operating Instructions for the “Hamberger Plane”

General notes:

1 The Hamberger plane is a test instrument for the determination of quality characteristics. The instrument must be handled with care and used in strict compliance with the Operating Instructions.

2 The test method used by the plane is a destructive test. This means that the damage caused to the surface to be tested or to the selected test sample will be beyond repair.

3 The Hamberger plane is a test instrument for trade and industry.

4 All components of the Hamberger plane are made of metal and are suitable for scrap metal recycling.

5 Due to its size and weight, the Hamberger plane may cause injury if dropped. It is therefore recommended to wear suitable safety equipment (safety footwear) and to secure the plane against falling (e.g. by providing a sufficiently large worktop with a safe storage place for the plane).

Specific notes:

1 To establish reproducible test values, the Operating Instructions must be complied with.

2 The Hamberger plane is a hand-held test instrument for evaluating the scratch resistance of varnish coatings on wood and wood-based surfaces.
A correlation with results from other methods for determining this or similar characteristic(s) or on surfaces other than those specified has not been established. Therefore, transfer of or conclusions on the results from other sources are not possible.

3 The Hamberger plane is designed for film-forming coatings made of unfilled (e.g. corundum) finishing or varnishing materials on wood or wood-based surfaces. Usability on any other surface material or coating material has not been examined and may cause increased wear or even damage to the test instrument and/or the test blade/test edge.

4 The Hamberger plane is calibrated before delivery.
The Hamberger plane must be recalibrated depending on the scope of use and the abrasive properties of the tested materials. If there are any signs of irregularities in the measurement results, the instrument must be recalibrated immediately. A generally applicable calibration interval cannot be specified.

5 During calibration of the application of force, the Hamberger plane is checked as a complete functional unit. As a result, the scale will show a device-specific preset value between 5N and 7N, when the spring balance is not under load.
In case of deviation from this specific preset value, the instrument must be recalibrated immediately.

6 Recalibration is also required if defective or worn components of the Hamberger plane are replaced. This applies to the following components:

6.1 Spring balance,

6.2 Test blade/edge.
It is generally possible to insert other, similar test blades in the Hamberger plane. However, Hamberger recommends the exclusive use of test blades supplied by Hamberger. Hamberger provides no warranty for any other test blades and their use.

7 In addition, the following components must be checked regularly and before every use of the instrument:

7.1 Test edge/blade;
test edges/blades that are worn (which can be seen from an increased edge radius) or show damage must be replaced.

7.2 Moving parts (rocker, adjusting spindles and adjusting screws);
all parts must be able to move freely.

Measurement procedure:

1 Application area
These instructions describe the procedure for evaluating the scratch resistance of varnish coatings on wood and wood-based surfaces by using the Hamberger plane (behaviour under scratching load from a curved, moderately sharp edge). The determined values are given in newtons [N] as “scratch resistance according to Hamberger plane”.
Neither the Hamberger plane nor the described test method or the results obtained with it are defined in any national or international standard.

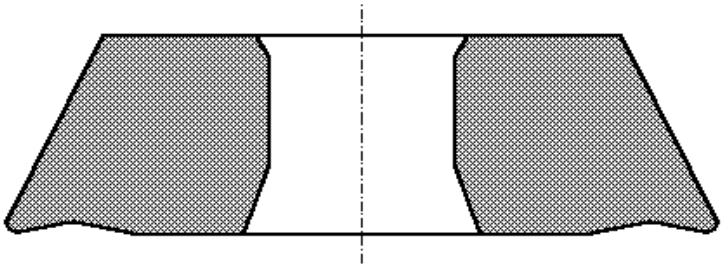
2 Brief description of the method
The resistance of a coating on wood or wood-based surfaces against abrasion by a narrow edge is determined by establishing the maximum weight force (= test force) that can be applied to an abrading edge (= test edge) without causing a noticeable change or damage to the coating.

3 Test instrument
The test instrument consists of the following components (see also Annex: Picture of scratch test instrument of type “Hamberger plane”):

3.1 Test blade / test edge

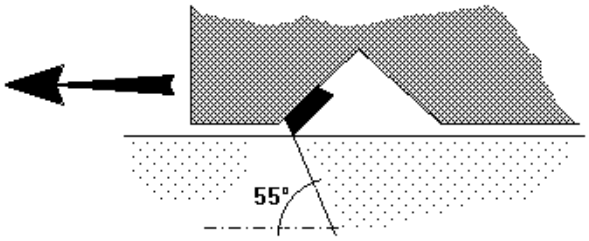
3.1.1 Test blade
Indexable insert (see drawing) made of carbide with a diameter of 12.75 mm at the cutting edge and a subsequently rounded cutting edge.

3.1.2 Test edge
Segment of the cutting edge that is in contact with the test sample's surface during the test.



The following types meet the requirements and can be used for the production of test blades:
Garant indexable insert Item No. 21458 RPMM 1204 type P25,
Garant indexable insert Item No. 214640 RPMM/RPMT 1204 TIN-P35

3.2 Rocker: Metal block for holding and fastening the test blade described in section 3.1. It is designed to allow moving the test blade at the specified angle (see drawing) and with the required test force over the surface to be tested.



3.3 Loading device that allows the application of the test force to the test edge perpendicularly to the surface to be tested; the test force acting at the test edge is adjustable in increments of 1 N.

3.4 Housing that encloses the rocker and loading device described in sections 3.2 and 3.3. It is designed so that:
a) the test edge can move freely during the test and in the direction of the test force, and
b) the test edge can travel smoothly and in a straight line over the surface to be tested, and
c) only the test edge can come into contact with the surface to be tested in the area of the test path and up to a distance of at least 5 mm on both sides of the test path.

4 Sampling, preparation of the test samples
From the material to be tested, representative samples of suitable size and quantity must be selected to allow testing according to the procedure described in section 6 Procedure. It is important to ensure that the surface is clean, smooth, even and without defects. It may be necessary to clean the sample surface

several times during the test, e.g. by wiping it with a soft, dry cloth.

5 Conditioning

Unless otherwise agreed or specified, the coating on the selected test samples should be fully cured and conditioned in test climate under standard test room conditions.

6 Procedure

Note:
Before performing the test, the state of the test edge must be visually inspected. If signs of damage or wear have occurred, the test blade must be rotated until reaching a fresh, visually intact segment of the test edge that can be used for the subsequent test.
If the test blade has already been rotated several times so that no segment of the test edge is available in a perfect working order, the test blade must be replaced and the Hamberger plane must be recalibrated.

6.1 It is recommended to perform the test under standard test room conditions.

6.2 From the test samples, select areas or sections that
a) have a regular and knot-free texture, and
b) have no joints that run across or diagonally to the test path, and
c) are large enough to ensure that the entire surface of the Hamberger plane rests on the test sample along the full length of travel (see section 6.5).

6.3 The test sample is placed on a sufficiently large and stable support so that it is horizontal and level; the sample is then firmly fixed in place to prevent it from shifting during the test.

6.4 The Hamberger plane is placed on the sample, the test edge is lowered onto the surface and the loading device is set to the lowest force to be expected, e.g. 10 N.
Depending on the design of the instrument and/or the test force to be set, it may be necessary to hold the instrument down with moderate force so that it cannot be lifted off the sample's surface by the exerted spring force.

6.5 The test instrument is then pushed in the direction of travel (see picture), without tilting, in a straight line, with the grain and in a single smooth and continuous pass across the surface for a distance of approx. 200 - 300 mm (test path).
It is important to ensure that the test instrument is not lifted off the sample's surface by the exerted spring force.
Note:
A straightedge can be used as a guide.

6.6 Immediately after the test, the test path is visually inspected for damage.

In this context, damage includes visible or noticeable deviations in colour, e.g. milky white (“stress whitening”), as well as a partial or complete abrasion of the coating in the area of the test path over a continuous length of at least 2 mm and/or in clusters.
Indentation traces or shiny traces that do not deviate in colour are not rated as damage.

6.7 The test force is then increased by 5 N and another test path is added in parallel to and at a distance of at least 5 mm from the previous test path.

The procedure described in sections 6.4 to 6.7 is repeated until damage to the coating is observed.

6.8 When damage to the coating has been observed, the procedure is continued in reverse order: starting from the last set value, the test force is reduced in increments of 1 N until no damage can be detected.

6.9 The last set value is recorded as the test value for the tested surface.

Note:
If the test value of a material is roughly known or if a specific limit value is to be checked, the procedure can be shortened accordingly.

7 Result and evaluation

The “scratch resistance according to Hamberger plane” is calculated accurate to 1 N as a mean value from at least 3 test values for each material/surface to be tested.

Annex: Picture of scratch test instrument of type "*Hamberger plane*":