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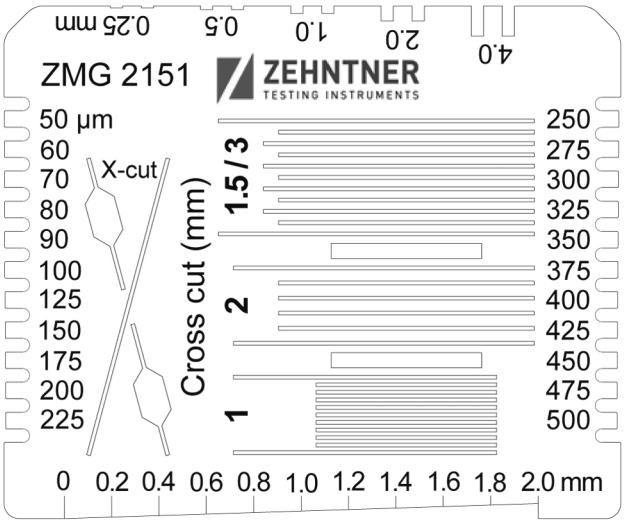
Instruction Manual

version 1.2 from 24.06.2011

ZMG 2151
Multi-purpose gauge



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Enclosures:

- Certificate of manufacturer

Exclusion of liability

Illustrations, descriptions as well as the technical specification conform to the instruction manual at hand at the time of printing. All changes resulting from technical progress, modified construction or similar are reserved.

The instruction manual has been drafted with the utmost care. Nevertheless, errors cannot be entirely excluded. The manufacturer will not be liable for errors in this instruction manual or for damages resulting from any errors.

The manufacturer will be grateful at any time for suggestions, proposals for improvement and references to errors.

1. Safety precautions and warnings

1.1 Dangers

Caution !

You will find this caution symbol throughout this instruction manual, where you may run the risk of minor or fatal injury caused by the inappropriate operation of this instrument.
Please observe these regulations and use caution in these cases. Pass on all safety precautions to other users. Besides the safety indications in this manual the user must have consideration for general safety precautions.

Note

This symbol marks instructions you should take notice of in order to follow directions, specifications and the correct working process as well as to avoid damage or destruction of the instrument.

1.2 Notes regarding safety at work

- The ZMG 2151 is exclusively designed to determine the thickness of liquid coatings by use of the comb gauge, for the determination of the evaluation of adhesion of single- or multi-coat systems by use of the cross-cut or X-cut tester, for determining the leveling properties, as well as for the preparation of wedge-shaped layers by use of the applicator. Any other application is not in accordance with the regulations. The manufacturer is not liable for damage resulting from inappropriate application. The user bears the full responsibility.
- Only spare parts and optional components provided by the manufacturer may be used in combination with the ZMG 2151. If components other than provided by ZEHNTNER are used with the ZMG 2151, there is no guarantee by ZEHNTNER for resulting damages, defects or malfunctions.
- Unauthorised modifications and changes of the ZMG 2151 are not allowed. These will invalidate the guarantee. The manufacturer is not liable for damages resulting from unauthorised modifications; the user bears the full responsibility.

2. Delivery of apparatus

2.1 Transportation damages

During carriage the ZMG 2151 is to be handled with the usual care. To ensure carriage without damages the device is to be transported in the original packaging and under normal freight conditions. Pushes during carriage are to be avoided.

At the receipt of the goods, you have to check if there are any visible damages at the outer packaging. If the packing is alright, you can sign the receipt documents. If you even suspect by your visual impression that damage has occurred, make a note of the suspected damage on the delivery receipt or freight papers and get the carrier to sign it. Moreover, the forwarding agent/courier service must be held responsible for the damage in writing.

If a hidden damage is discovered while unpacking, you have to inform and must held the forwarding agent / courier service immediately in the following way: “When opening the parcel we had to notice that …. etc. etc.“ This superficial checking of the goods has to be done before the time limit of the forwarding agent / courier service expires which is normally within 7 days. However, the period could be less. Hence, it is recommended checking the exact time limit when receiving the goods.

If there are any damages inform also immediately your authorized Zehntner trader or **Zehntner GmbH Testing Instruments** directly.

2.2 Extent of delivery

The following parts are included in the delivery:

Article No.: ZMG 2151.K:

- 1 multi-purpose gauge
- 1 NT-cutter with 9 mm width of edge
- 1 roll adhesive tape ACC753 (length: 50 m, width: 25 mm)
- 1 carrying case

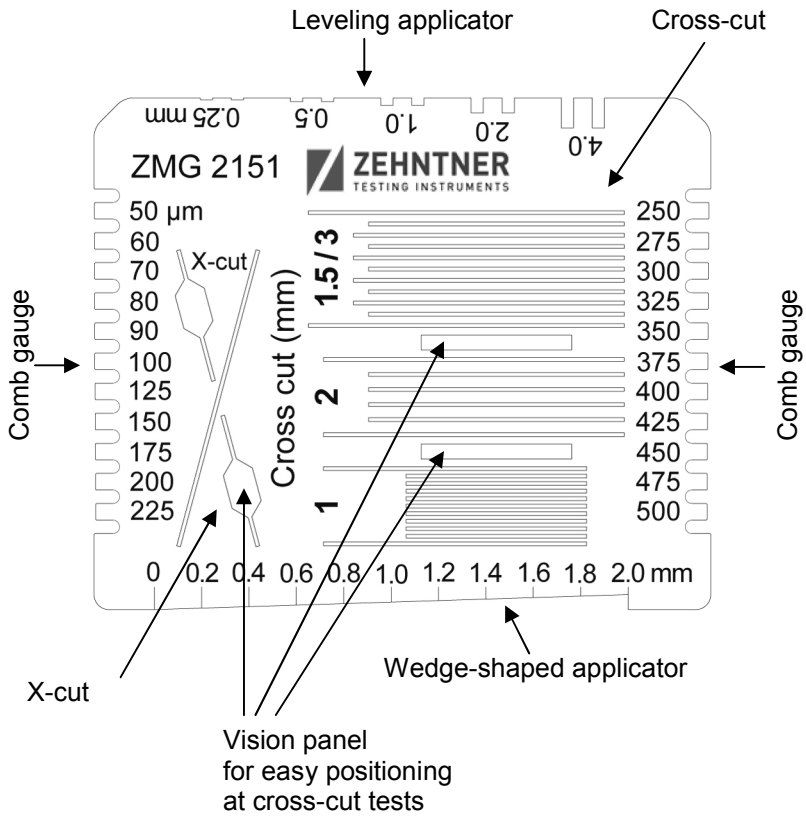
Article No.: ZMG 2151.G:

- 1 multi-purpose gauge
- 1 NT-cutter with 9 mm width of edge
- 1 roll adhesive tape ACC753 (length: 50 m, width: 25 mm)
- 1 magnifier
- 1 brush
- 1 carrying case

2.3 Options

- ZTC 2200 Test charts
- ACC163 adhesive tape (1 roll of 22 m, width 50 mm)
- ACC753 (length: 50 m, width: 25 mm)

3. Outline of the instrument

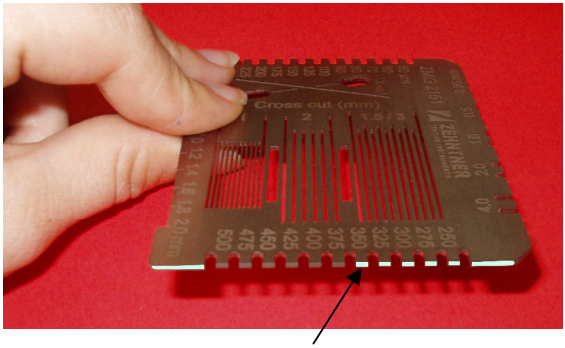


4. Handling wedge-shaped applicator

- Only using on solid substrates as e.g. test panels, test charts.
- Place the side with the wedge-shaped applicator on the substrate to be coated.
- Pour the product in front of the applicator in pulling direction, pull it at the right angle to the substrate at uniform speed (approx. 25 mm/s).
- Clean the applicator with solvent.

5. Handling wet-film thickness gauge

- The test hast to be carried out immediately after application.
- Choose the appropriate side before carrying out the test (50 µm – 225 µm or 250 µm – 500 µm).
- Place the comb gauge in a right angle firmly onto the substrate with the liquid coating so that the teeth are normal to the plane of the surface.
- Remove the comb gauge and examine which teeth have been wetted by the coating.
- The wet film thickness of the coating is between the last wetted tooth and first tooth which has not been wetted.
- Clean the comb gauge with solvent.



The picture shows that the tooth 350 µm is the last tooth which has been wetted by the coating and the tooth 375 µm is not wetted. The wet film thickness is between 350 µm and 375 µm.

6. Handling leveling applicator

In most cases the leveling property is a desired feature of paints so that the cured film shows a surface as plain as possible with brush marks, spray drops or other unevennesses occuring as little as possible.

- Only using on solid substrates as e.g. test panels, test charts.
- Place the sagging applicator onto the substrate.
- Pour the product in front of the applicator in pulling direction, pull it at uniform speed (approx. 25 mm/s), in this way at the same time five pairs of stripes with different film thicknesses will be obtained.
- Allow to dry in a horizontal position.
- Rate according to chapter 6.1 “Rating according to standard procedure” on page 8 or according to chapter 6.2 “Rating according to NYPC-method” on page 8.
- Clean the leveling applicator with solvent.

6.1 Rating according to standard procedure

- Generally, the gap depth of that pair of stripes is indicated, where the intervals between the stripes are just slightly visible.

6.2 Rating according to NYPC-method

- After the application each pair of stripes is numbered with 0, 2, 4, 6 and 8 from left to right:

NYPC: 0 2 4 6 8

- Ignore the leading and trailing edges and rate only the central. For easier handling there is a test chart available, where the rating area is marked in black.

- Note the lower numbered pair of stripes that has failed to merge completely. The leveling value ist hat number plus 1 if merger is about half. If all pair of stripes have merged completely, the leveling value is 10.

7. Handling cross-cut

- Place the templet on the coating under test and hold the templet in such way that the cuts always are executed away from the body and from the hand holding the templet! Never hold the templet at the sides of the slits!
- Make six/eleven (depending on standard) parallel cuts with the desired spacing by cutting through the film to the substrate in one steady motion using just sufficient pressure on the cutting tool to have the cutting edge reach the substrate.
- Turn the templet for 90° and make the same number of cuts with the same spacing again.
- Apply the adhesive tape on the cutted place and remove it carefully and evenly and check the results with the table “Classification of test results of method B” on page 10.

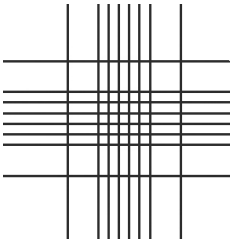
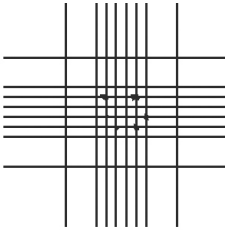
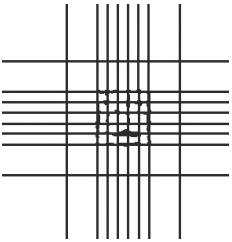
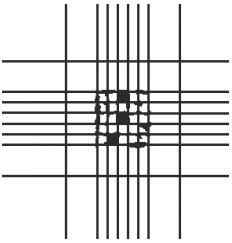
7.1 Choice of the appropriate spacing of cuts acc. to ISO 2409

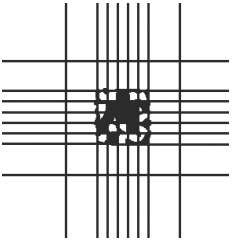
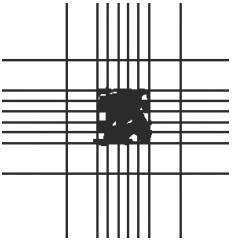
film thickness in µm	substrate	spacing of cuts in mm
0 to 60	hard	1
0 to 0	soft	2
above 60 to 120	hard and soft	2
above 120 to 250	hard and soft	3

7.2 Choice of the appropriate spacing of cuts acc. to ASTM D 3359

film thickness in µm	film thickness in mils	spacing of cuts in mm
0 to 50	0 to 2.0	1
50 to 125	2.0 to 5	2

7.3 Classification of test results of method B

Cross-cut	according to EN ISO 2409	according to ASTM D 3359
	0: The edges of the cuts are completely smooth, none of the squares of the lattice is detached.	5B: The edges of the cuts are completely smooth; none of the squares of the lattice is detached.
	1: Detachment of small flakes of the coating at the intersections of the cuts. A cross-cut area not greater than 4% is affected.	4B: Small flakes of the coating are detached at intersections; less than 5% of the area is affected.
	2: The coating has flaked along the edges and/or at the intersections of the cuts. A cross-cut area greater than 4% but not greater than 30% is affected.	3B: Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.
	3: The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross-cut area greater than 30% but not greater than 50% is affected.	2B: The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.

Cross-cut	according to EN ISO 2409	according to ASTM D 3359
	4: The coating has flaked along the edges of the cuts in large ribbons and/or some squares have detached partly or wholly. A cross-cut area greater than 50%, but not greater than 60% is affected.	1B: The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.
	5: Any degree of flaking that cannot even be classified by classification 4.	0B: Flaking and detachment worse than grade 1B.

8. Handling X-cut

- Place the templet on the coating under test and fix it with tape.
- Carry out the first incision of the X-cut.
- Turn the templet for 90°, the vision panel enables an easy positioning for the X-cut, carry out the X-cut.
- Apply the adhesive tape analogous the cross-cut test.
- Classification of the test results.

8.4 Classification of test results of method A

X-cut classification	description
5A	No peeling or removal.
4A	Trace peeling or removal along incisions or at their intersection.
3A	Jagged removal along incisions up to 1.6 mm (1/16 in.) on either side.
2A	Jagged removal along most of incisions up to 3.2 mm (1/8 in.) on either side.
1A	Removal from most of the area of the X under the tape.
0A	Removal beyond the area of the X.

9. Technical specification

Material:	stainless steel
Standards:	ASTM D 3359, ISO 2409, ISO 2808
Testing ranges:	wet film thickness: 50 µm to 500 µm, cross-cut: for dry film thickness up to 250 µm, leveling: 0.25 to 4.0 mm, gap heights applicator: 0 to 2 mm
Dimensions (LxWxH):	81 mm x 68 mm x 1 mm
Weight:	36 g (0.079 lbs)
Warranty:	none