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ZCC2087

Cross-Cut Tester

Instruction Manual

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1 Important Information

1.1 Exclusion of liability

The content of this document is intellectual property of Proceq SA.
Illustrations, descriptions as well as the technical specifications conform to the instruction manual on hand at the time of publishing or printing. However, Proceq SA is one of continuous product development. All changes resulting from technical progress, modified construction or similar are reserved without obligation for Zehntner to update.
Some of the images shown in this instruction manual may be of a pre-production model and/or are computer generated. Therefore, the design / features of the delivered product may differ in various aspects.
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.

1.2 Damages during transport

On receipt of the goods, check for any visible damages on the packaging. If it is undamaged you may sign the receipt of the goods. If you do suspect by visual inspection that damage has occurred, make a note of the visible damage on the delivery receipt and request the courier to countersign it. Moreover, the courier service must be held responsible for the damage in writing.

If a hidden damage is discovered while unpacking, you have to inform and hold the courier liable immediately in the following way: “When opening the parcel we had to notice that … etc.“ This superficial checking of the goods has to be done within the time limit set by the carrier, which is normally 7 days. However, the period could vary depending on the courier. Hence, it is recommended to check the exact time limit when receiving the goods.

If there are any damages also inform your authorized dealer or **Proceq SA** immediately.

1.3 Shipment

Should the device be transported again, it must be packaged properly. Preferably use the original packaging for later shipments. Additionally use filling material in the package to protect the device from any shock during carriage.

2 Safety information

2.1 Symbols used

This note comprises instructions needed to follow directions, specifications, proper working procedure and to avoid data loss, damage or destruction of the instrument.

This note signifies a warning about dangers to life and limb if the apparatus is handled improperly. Observe these notes and be particularly careful in these cases. Also inform other users on all safety notes. Besides the notes in this instruction manual the generally applicable safety instructions and regulations for prevention of accidents must be observed.

2.2 Safety notes and hints

- The ZCC 2087 is exclusively intended for the evaluation of adhesion of single- or multi-coat systems. Any other use is considered as being not in accordance with the intentions of the manufacturer and is conducted at the user's own risk. The manufacturer is not liable for any resulting damages.
- Unauthorized modifications and changes of the ZCC 2087 are not permitted.
- Reproduction of the ZCC 2087 without permission is not allowed.
- **Proceq SA** refuses all warranty and liability claims for damages caused by usage of the ZCC 2087 in combination with **non-original accessories**, or accessories from 3rd party suppliers.
- All local safety regulations apply for the operation of the ZCC 2087.

3 Product Description

The adhesion of a coating to a substrate is critical to both mechanical performance and corrosion protection. In practice there are several test procedures for the determination of the degree of adhesion.

The cross-cut test is a very rapid and simple method of the assessment for both single and multi-coat systems.

The ZCC 2087 is an ergonomically designed cross-cut tester with a special flexible cutting head with exchangeable cutting tool for evaluation of adhesion of single- or multi-coat systems, which allows easy testing and reproducible results.

3.1 Versions

Version	Number of blades	Spacing of blades	Standard
ZCC 2087.1	6	1 mm (0.04“)	DIN EN ISO 2409
ZCC 2087.15	11	1.5 mm (0.06“)	
ZCC 2087.2	6	2 mm (0.08“)	DIN EN ISO 2409
ZCC 2087.3	6	3 mm (0.12“)	DIN EN ISO 2409
ZCC 2087.4	6	1 mm (0.04”), 2 mm (0.08”) and 3 mm (0.12”), exchangeable	DIN EN ISO 2409
ZCC 2087.5	11	1 mm (0.04”)	ASTM D3359
ZCC 2087.6	6	2 mm (0.08”)	ASTM D3359

3.2 Standard delivery

The following parts are included in the delivery:

Cross-cut tester with flexible cutting head (to guarantee reproducible cross-cuts) and multiblade cutting tool according to version (see technical specifications)	
Allen key	
Brush (for versions ZCC 2087.1 to ZCC 2087.4)	
Roll of adhesive tape ACC753 (Length: 50 m, Width: 25 mm)	
Magnifier	
Certificate of manufacturer	
Carrying case	

3.3 Accessories

	Description	
ACC183	Adhesive tape (1 roll with 65 m, width 25 mm)	
ACC204	Adhesive tape (1 roll with 66 m, width 50 mm)	
ACC064 ACC094 ACC095	Multi-blade cutting tool with 6 blades according to DIN EN ISO 2409 spacing: 1 mm spacing: 2 mm spacing: 3 mm	
ACC096 ACC098	Multi-blade cutting tool according to ASTM D3359 with 11 blades, spacing: 1 mm with 6 blades, spacing: 2 mm	
ACC166	Multi-blade cutting tool with 11 blades, spacing: 1.5 mm	

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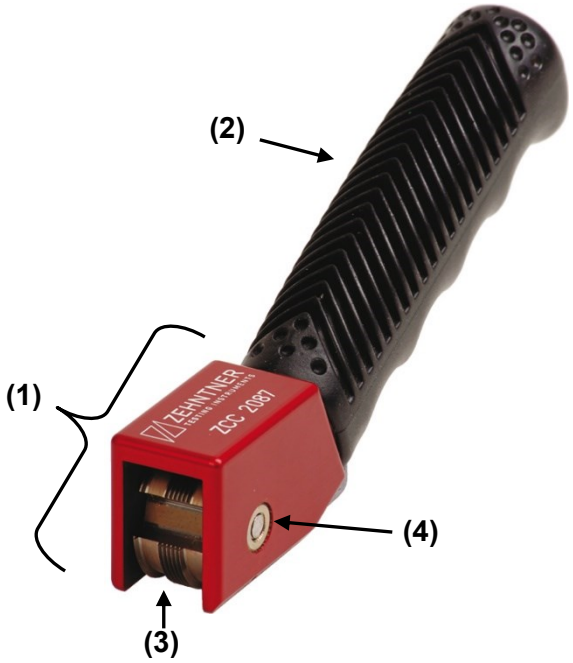
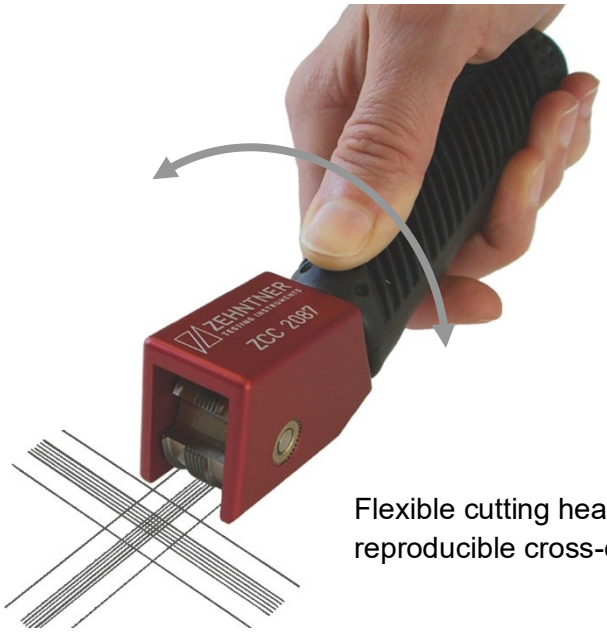
4 Device overview



1. Flexible cutting head
2. Ergonomic handle
3. Multi-blade cutting tool
4. Fixing screw

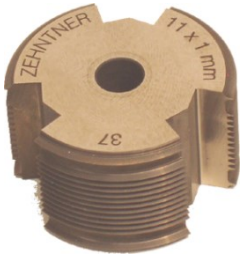
4.1 Flexible cutting head

The ZCC 2087 is equipped with a specially designed flexible cutting head which ensures reproducible cross cuts. It avoids unbalanced pressure by the operator and provides a uniform cutting depth over the complete width. Therefore it is also suitable for untrained users.



Flexible cutting head ensures reproducible cross-cuts.

4.2 Multi-blade cutting tool



Our multi-blade cutting tools (3) are equipped with the amount of blades required by the relevant standard. If one side is worn out, the multi-blade cutting tool (3) can be rotated onto an unused side. We suggest to mark the worn out side, e.g. with a water proof marker and with a black tip.

- Loosen the fixing screw (4) with the Allen key.
- Remove the fixing screw (4) and the multi-blade cutting tool (3).
- Rotate the multi-blade cutting tool (3) to the next unused blade and re-insert it-in this position.
- Insert the fixing screw (4) and push the multi-blade cutting tool (3) on the guiding pin.

Correct inserting of the cutting tool

- Refasten the fixing screw (4) with the Allen key.

When all three sides of the blades are worn out, the reverse side of the blade can also be used. Remove the multi-blade cutting tool turn and re-inserted it.

If all six blades are worn out, either a spare multi-blade cutting tool can be purchased at Proceq or at an authorized Proceq agent.

5 Executing a cross-cut test

5.1 Measurement principle and procedure

There are various standards that describe the execution of a cross-cut test in order to determine the adhesion of a coating.

In general a cross-cutting pattern is applied to the surface and visually evaluated.

To execute a cross-cut test the following procedure is followed:

1. Apply the cross-cutting pattern: Intersecting cuts (6 cuts with the appropriate spacing, depending on the method and the film thickness) are performed. With Method A the intersecting cuts are at an angle of 30° (X-cut) and with method B the intersecting cuts are at an angle of 90° (lattice pattern).
2. In order to produce these cuts a dedicated cross-cut tester as the ZCC2087 can be used, or alternatively a sharp blade with the appropriate cross-cut templet (ZCT2160). The cross-cut tester is specifically designed to produce a reproducible pattern. Note: Always pull the cross-cut tester.
3. Clean the cut pattern with a soft brush (included in the cross-cut tester).
4. Place an adhesive tape over the lattice parallel to one set of cuts. Ensure good contact with the coating.
5. Evaluate the pattern according to the selected standard.

5.2 Choosing the cross-cutting pattern

There are two different methods of applying the cross-cut patterns. The pattern has to chosen depending on the standards used and the thickness of the film.

5.2.1 Method A - X-cut

In Method A the intersecting cuts are at an angle of 30° (X-cut).

Method A is suitable for tests in accordance with

ASTM D3359	for film with thicknesses of >125µm
DIN EN ISO16276-2	for all films

5.2.2 Method B - Lattice pattern

In Method B the intersecting cuts are at an angle of 90° (lattice pattern).

Method B is suitable for tests in accordance with

ASTM D3359	for film with thicknesses of >125µm
DIN EN ISO16276-2	for film with thicknesses of 0µm - 250µm

5.3 Choice of the appropriate spacing of cuts

The spacing of the cross-cutting pattern is dependent on the thickness of the film and the selected standard (Method A - X-cut or Method B - Lattice).

Select the appropriate spacing of cuts:

5.3.1 Spacing according to DIN EN ISO2409

Film thickness	Substrate	Spacing of cuts
0 µm - 60 µm	hard	1 mm
0 µm - 60 µm	soft	2 mm
Above 60 µm to 120 µm	hard and soft	2 mm
Above 120 µm to 250 µm	hard and soft	3 mm

The cross-cut test is not suitable for substrates with a film thickness over 250 µm.

5.3.2 Spacing according to ASTM D3359

Film thickness		Spacing of cuts
0 µm - 50 µm	0 mil – 2 mil	1 mm
50 µm - 125 µm	2 mil – 5 mil	2 mm

To test film thickness over 125 µm use test method A, as described in the standard.

6 Handling of the ZCC2087

6.1 Handling according to DIN EN ISO2409

- Hold the cross-cut tester only at the handle.
- The flexible cutting head should always move freely.
- Never use your other hand or finger of the leading hand to add additional pressure to the cutting head during testing.
- Always pull the cross-cut tester, never push it.
- If the panel is made of wood or a similar material, apply the cuts with an angle of 45° to the direction of the grain.

Procedure

- Place the conditioned test panels on a rigid, flat surface to prevent any deformation of the panel during the test.
- Carry out the test at a temperature 23 ± 2 °C and relative humidity of 50 ± 5 %.
- Hold the ZCC 2087 with the blade vertical to the test panel surface.
- Make two successive cuts, the second cut crossing the original one at 90°, generating a lattice pattern. All cuts shall penetrate the coating completely down to the substrate surface. The indentation depth into the substrate should be as low as possible.

- Remove any loose particles from the area of cutting. For suitable methods refer to chapter 6.1.1.
- Carefully examine the cross-cut area and compare it with the classification table in order to determine the cross-cut value.
- Test at least on three areas on the panel.
- Issue a test report.

6.1.1 Removing loose particles

According to the informative Annex A of the DIN EN ISO 2409 the following three methods are suitable for removing loose particles:

Brushing

- Brush the panel lightly using a soft brush several times backwards and forwards along the diagonals of the lattice pattern.

Adhesive tape

- Remove two complete laps of tape and discard.
- Remove an additional length at a steady (that is not jerked) rate and cut a piece of about 75 mm long. Place the center of the tape over the lattice in a direction parallel to one set of cuts and smooth into place over the area of the lattice.
- To ensure good contact with the coating, rub the tape firmly with a fingertip or the nail.
- Remove the tape within 5 minutes after applying. Grasp the free end of the tape and pull it off steadily in 0.5 s to 1.0 s at an angle which is as close as possible to 60°.

Since using an adhesive tape is no longer a normative reference, it is possible to use any adhesive tape. However, we suggest to use a tape with an adhesive strength on steel between 6N and 10 N. The adhesive strength of coatings can differ significantly from the manufacturer's specifications on steel. Therefore it is important to always use the same adhesive tape in order to get reproducible results.

Compressed air or Nitrogen

- Remove all loose particles with compressed air or nitrogen.

6.2 Handling according to ASTM D3359

Hold the cross-cut tester only at the handle.
The flexible cutting head should always move freely.
Never use your other hand or finger of the leading hand to add additional pressure to the cutting head during testing.
Always pull the cross-cut tester, never push it.

Procedure

- Place the test panel on a firm base.
- Successively make two cuts about 20 mm (0.79 in.) long, the second cut crossing the first one at 90°, generating a lattice pattern. Cut 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. (For coatings having a dry film thickness up to and including 50 µm (2 mils) – eleven cuts, for coatings having a dry film thickness between 50 µm (2 mils) and 125 µm (5 mils) – six cuts).
- Brush the film lightly with a soft brush or tissue to remove any detached flakes or ribbons of coatings.
- Remove two complete laps of tape and discard.
- Remove an additional length at a steady (that is not jerked) rate and cut a piece about 75 mm (2.95 in.) long.
- Place the center of the tape over the grid and in the area of grid smooth into place by a finger.
- To ensure good contact with the film rub the tape firmly with the eraser on the end of a pencil.
- Within 90 ± 30 s of application, remove the tape by seizing the free end and rapidly (not jerked) back upon itself at as close to an angle of 180° as possible.
- Inspect the grid area for removal of coating using a magnifier and rate the adhesion in accordance with the cross-cut scale.
- Repeat the test in two other locations on each test panel.
- Issue a test report.

7 Evaluation – Cross-cut classification

When a cross-cut test is performed the results are visually evaluated after the cross-cut pattern has been applied, cleaned and a tape has been attached and removed.

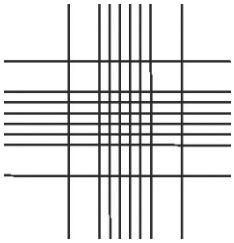
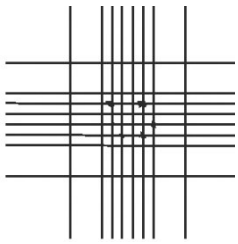
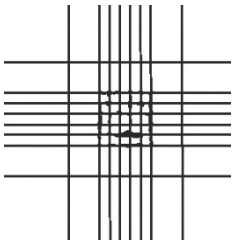
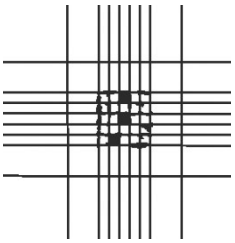
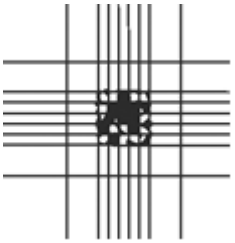
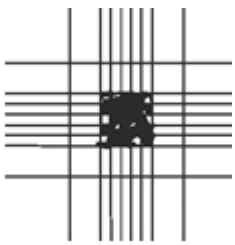
The evaluation criteria are depending on the test method (X-cut or lattice) and the standard chosen:

Classification of the test results of

Method A (X-cut)

ASTM D3359		DIN EN ISO 16276-2	
5A	No peeling or removal	**0**	No peeling or removal of coating
4A	Trace peeling or removal along incisions on their intersections	**1**	Trace peeling or removal along cuts on their intersections
3A	Jagged removal along incisions up to 1.6mm (1/16") on either side	**2**	Jagged removal along cuts, extending up to 1.5mm (0.06") on either side
2A	Jagged removal along most of incisions up to 3.2mm (1/8") on either side	**3**	Jagged removal along most of the length of the cuts up to 3mm (0.12") out on either side
1A	Removal from most of the area of the X under the tape	**4**	Removal from most of the area of the X under the tape
0A	Removal beyond the area of the X	**5**	removal of coating beyond the area o

Method B (Lattice)

Cross-cut	DIN EN ISO 2409		ASTM D3359	
	**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. Percent area removed: 0 % - none
	**1**	Detachment of small flakes of the coating at the intersections of the cuts. A cross-cut area not greater than 5 % 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 5 %, but not greater than 15 % 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 15 % but not greater than 35 % 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.
	**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 65 % 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 classification 1B.

8 Maintenance and cleaning

8.1 Maintenance which can be carried out by the user

The user is only allowed to carry out the following maintenance and cleaning work:

- Outer cleaning of the device as described below

All other maintenance and repair work shall only be carried out by **Proceq SA** or your authorized Zehntner agent, otherwise all the guarantee and liability claims will be void.

8.2 Cleaning of the device

For cleaning of the aluminium housing use a proper, soft cloth. Only use soft cleaning agents.

Do not use aggressive solvents or cleaning agents.

If the device has to be disinfected, do not use disinfectants that contain sodium hydroxide.

9 Technical Specification

Material	Housing Multi-Blade Cutting tool	Red anodized Aluminum Hardened Steel
Dimensions (LxWxH)	160 x 26 x 80 mm (6.30 x 1.02 x 3.15“)	
Weight	245 g (0.54 lbs))	
Protection class	1 (according to EN 61140)	

SWISS MADE

For safety and liability information, please download www.screeningeagle.com/en/legal

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