

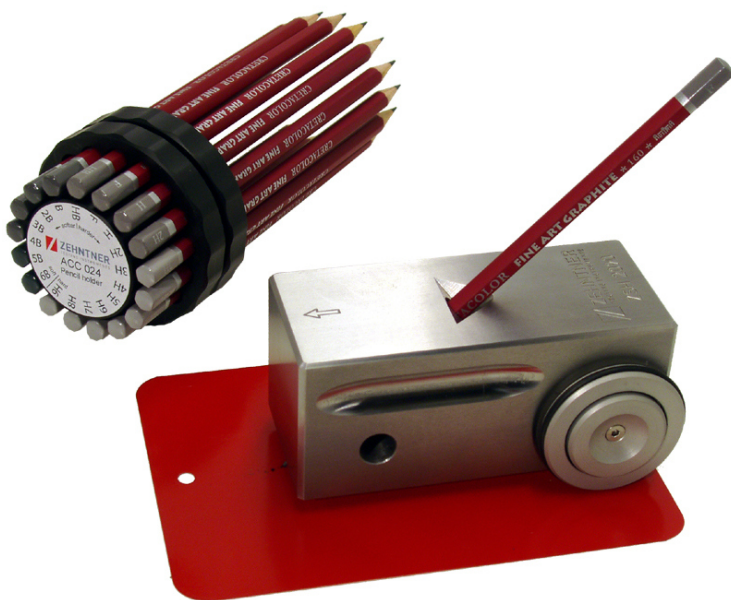
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Instruction manual

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ZSH 2090 Pencil hardness tester



Index

Exclusion of liability	3
1. Description of device	3
2. Safety precautions and warnings	4
2.1 Dangers	4
2.2 Notes regarding safety at work	4
3. Delivery of device.....	5
3.1 Damages during carriage	5
3.2 Standard delivery.....	6
3.3 Options.....	6
4. Preliminaries.....	7
4.1 Pencil preparation	7
4.2 Inserting the pencils.....	8
5. Handling	9
6. Determining the degree of hardness	10
7. Table with degree of hardness	10
8. Storage	11
9. Technical specification	11
Glossary	12

Annexe:

- Certificate of manufacturer

Exclusion of liability

The features described in this instruction manual represent the complete technology of this instrument. These features are either included in the standard delivery or available as options at additional costs.

Illustrations, descriptions as well as the technical specifications conform to the instruction manual in hand at the time of publishing or printing. However, Zehntner GmbH Testing Instruments policy is one of continuous product development. All changes resulting from technical progress, modified construction or similar are reserved without obligation for Zehntner to update this manual.

Some of the images shown in this instruction manual are of a pre-production model and/or are computer generated; therefore the design/features on the final version of this instrument may differ in various aspects.

This 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 damages resulting from any errors.

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

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1. Description of device

The ZSH 2090 is a hardness tester according to Wolff-Wilborn for determination of resistance of coatings to mechanical stress by pencils of different hardness.

The following features distinguish the ZSH 2090:

- Easy to handle
- Reliable results
- No maintenance required

2. Safety precautions and warnings

2.1 Dangers







Attention!

This note is included in this instruction manual wherever it is warned about dangers which will arise to life and limb of persons 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 these instruction manual the generally applicable safety instructions and regulations for prevention of accidents have to be taken into account.

Caution

This note comprises instructions to be observed in order to comply with guidelines, instructions, notes and the proper procedure of the work, and to avoid damaging or destruction of the apparatus.

2.2 Notes regarding safety at work

-  Every person working with the ZSH 2090 or maintaining the ZSH 2090 must read and understand the manual completely. In particular the safety precautions and warnings
-  The ZSH 2090 is exclusively designed for the determination of the scratch hardness. 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.
-  Avoid any mode of operation that could affect the safe working with the ZSH 2090. Especially the determination of the scratch hardness must take place as described in this instruction manual.
-  Only spare parts and optional components provided by the manufacturer may be used in combination with the ZSH 2090. If components other than provided by Zehntner are used with the ZSH 2090, there is no guarantee by Zehntner for resulting damages, defects or malfunctions.
-  Unauthorised reproduction, modifications and changes of the ZSH 2090 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.
-  For the operation of the ZSH 2090 apply all local safety regulations.

3. Delivery of device

3.1 Damages during carriage

During carriage the ZSH 2090 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. If the device was supplied in a carrying case or storage box, this original packaging needs to be used also for later shipments. 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 to check the exact time limit when receiving the goods.

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


3.2 Standard delivery

The following parts are included in the delivery:

- 1 pencil-hardness-tester
- 1 set pencils of 17 hardness degrees (6B to 9H)
- 1 sharpener for releasing cylindrically the lead
- 1 pencil holder
- 1 set emery paper No. 400
- 1 certificate of manufacturer
- 1 carrying case

3.3 Options

- ACC601 calibration and certification (incl. certificate)

 **Zehntner GmbH Testing Instruments** refuses all warranty and liability claims for damages caused by usage of the ZSH 2090 in combination with **non-original accessories**, or accessories from 3rd party suppliers.

4. Preliminaries

4.1 Pencil preparation

- Remove the wood on a length of approximately 5-6 mm from the pencil, make sure not to damage the lead.
- Rub the lead against the emery paper (No. 400) maintaining an exact angle of 90° to the paper until a flat circular surface is obtained.
- Repeat this procedure with the pencil after each test.

By aid of the sharpener for releasing cylindrically the lead, the wood can be removed from the pencil and by doing that take care of not damaging the lead:

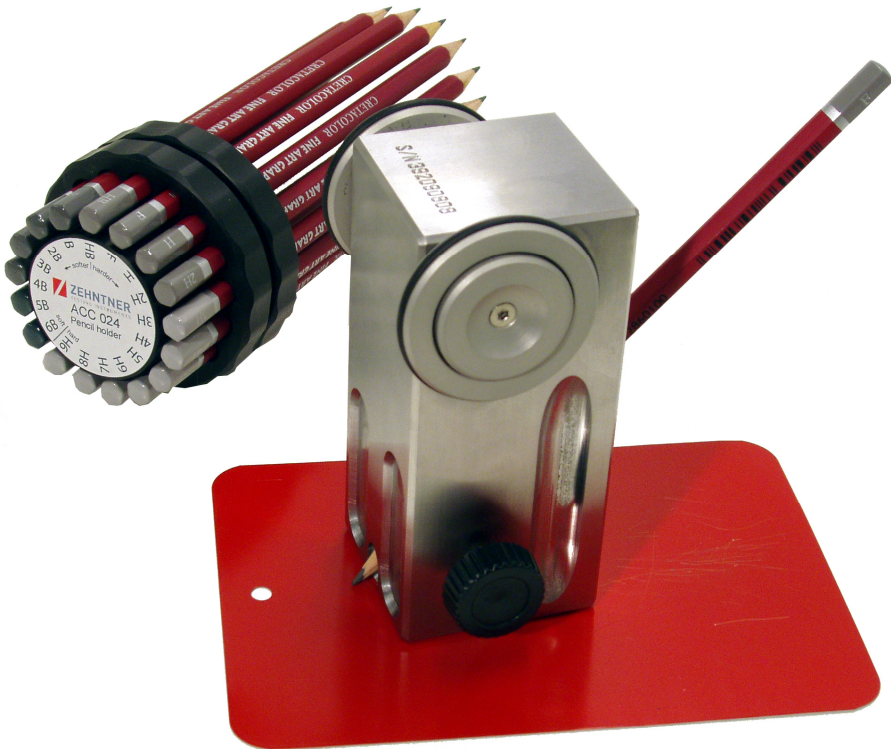
- Sharpen the pencil carefully (as with a normal sharpener).
- The remaining wood can be removed by a fingernail.
- Rub the lead against emery paper (as described above)



4.2 Inserting the pencils

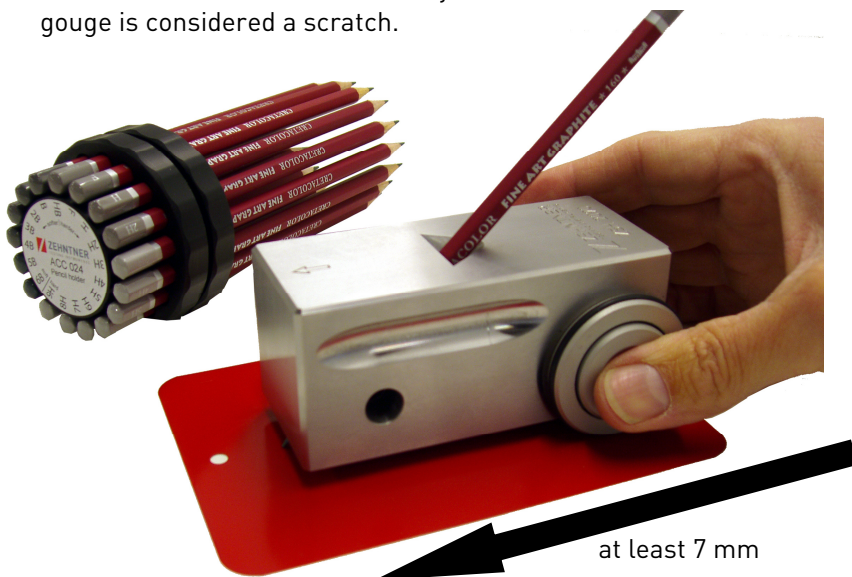
Insert the pencils in the hardness tester as follows:

- Place the instrument with the wheels upwards onto its front end.
- Insert the pencil in this way, that the lead touches the surface.
- Fasten the pencil with the clamping knob.



5. Handling

- ! The test needs to be carried out under laboratory conditions.
- ! In the different standards, the test is carried out differently. Hereunder, the procedure is described when starting with a hard pencil or lead. Please note that the procedure might have to be carried out in the reverse order of succession!
 - If necessary prepare the pencil ZSH 2090 as described in chapter 4.1 “Pencil preparation” on page 7.
 - Insert the first pencil into the as described in chapter 4.2 “Inserting the pencils” on page 8.
 - Place the ZSH 2090 on the coating under test.
- ! The test surface needs to be flat.
 - Hold the instrument by the wheel hubs and push forward at a speed of 5-10 cm/s for a distance of at least 7 mm (cf. arrow).
 - Examine the test surface with the naked eye for indentation or scratching.
 - Repeat the process down the hardness scale until a pencil is found that will not cut the film to the substrate (either metal or a previous coat) for a distance of at least 3 mm.
 - Continue the process until a pencil is found that will neither cut nor scratch the surface of the film (any defacement other than a cut or gouge is considered a scratch).



6. Determining the degree of hardness

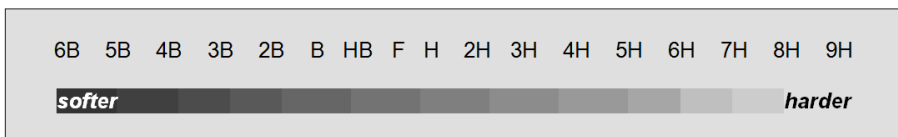
Record each end point for gouge and scratch hardness. With some films, the two end points will be identical.

gouge hardness:	The degree of hardness of the hardest pencil that will leave the film uncut for a stroke length of at least 3 mm.
scratch hardness: (pencil hardness)	The hardest pencil that will not rupture or scratch the film.
Wolff-Wilborn hardness:	The degree of hardness of the softest pencil which damages the surface.


! Please mention in your test report which standard the measurement results refer to.

7. Table with degree of hardness

The following degrees of hardness are available:



8. Storage

-  Please store the ZSH 2090 and any accessories in its carrying case in order to avoid damages.

9. Technical specification

Material hardness tester:	steel
Material pencils:	wood and graphite
Dimensions (LxWxH):	110 mm x 80 mm x 58 mm (4.33" x 3.15" x 2.28")
Weight, net:	approx. 1.8 kg (3.9 lbs)
Weight, gross incl. accessories:	approx. 2.4 kg (5.2 lbs)
Standards:	ISO 15184, EN 13523-4, ASTM D 3363, NEN 5350, SIS 184187, SNV 37113, ECCA-T 4, MIL C 27 227
Warranty:	2 years

Glossary

D

Damages during carriage	5
Degree of hardness.....	10
Delivery of device	5
Description of device.....	3
Determining the hardness degree..	10

E

Exclusion of liability	3
Extent of delivery.....	6

H

Handling	9
Hardness determination	10

I

Inserting the pencils	8
Instrument	
<i>Description</i>	3
<i>Extent of delivery</i>	6

L

Liability.....	3
----------------	---

O

Options	6
---------------	---

P

Pencil preparation	7
Preliminaries	7
<i>Inserting the pencils</i>	8
<i>Pencils</i>	7
Preparation	
<i>Pencil</i>	7

S

Safety precautions and warnings	4
Standard delivery.....	6
Storage	11

T

Technical specification	11
Test procedure.....	9