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ZEHNTNER
TESTING INSTRUMENTS

Instruction manual

Version 1.8 dated 09.02.2015

ZIT 2440
Impact Tester

Index

Enclosure:

- 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 at hand at the time of publishing or printing. However, Zehntner GmbH Testing Instruments policy is one of continuous product improvement. 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 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.

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 indications of errors.

1 Description of device

1.1 Summary

The ZIT 2440 Impact Tester is exclusively intended for the determination of impact resistance, deformability and elongation of coatings and substrates as well as adhesion of coatings.

In particular, this instrument has the following **features:**

- Suitable for single- and multiple-layer systems
- Massive and sturdy basic unit ZIT 2440.G can be equipped with different testing kits for tests according to ASTM D 2794, EN 12899-1, ISO 6272-1 and/or ISO 6272-2
- The module with a quick clamping device for ISO facilitates insertion and fixing of the sample
- The indenter on the ASTM module can easily be lifted after the test in order to facilitate removal of the sample
- No maintenance necessary
- Easy and safe to handle

2 Safety notes

2.1 Dangers

Caution!

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.

Note

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

2.2 Safety notes

- Never lift the ZIT 2440 on the guide tube! The guide tube could release and consequently the base plate would fall down.
- Every person working with the ZIT 2440 or maintaining the ZIT 2440 must read and understand the manual and in particular the safety precautions and warnings completely.
- The ZIT 2440 Impact Tester is exclusively intended for the determination of impact resistance, deformability and elongation of coatings and substrates as well as adhesion of coatings. Any other use is considered as not being in accordance with the intentions of the manufacturer. The manufacturer is not liable for damage resulting from inappropriate application. The user bears the full responsibility.
- **Zehntner GmbH Testing Instruments** refuses all warranty and liability claims for damages caused by usage of the ZIT 2440 in combination with **non-original accessories**, or accessories from 3rd party suppliers.
- Unauthorized modifications and changes of the ZIT 2440 are not permitted.
- Reproduction without permission is not allowed.
- All maintenance and repair work which is not explicitly allowed and described in this manual shall only be carried out by **Zehntner GmbH Testing Instruments** or your authorized Zehntner agent, otherwise all warranty expires.
- For the operation of the ZIT 2440 apply all local safety regulations.

3 Delivery of device

3.1 Damages during carriage

At the receipt of the goods, check for any visible damages at the outer packaging. If the packing is unharmed, you can sign the receipt of the documents. If you do suspect by your visual impression that damage has occurred, make a note of the visible damage on the delivery receipt or freight papers and get the carrier to countersign 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 hold the forwarding agent / courier service immediately liable 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 within the time limit set by the forwarding agent / courier service, 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 also immediately inform your authorized Zehntner agent or **Zehntner GmbH Testing Instruments** directly.

In case the device needs to be transported again at a later time, it has to be packaged properly. If the device was supplied in a carrying case or storage box, this original packaging needs to be used also for later shipments.

For the protection of persons and apparatus care is to be taken when the apparatus is lifted or carried Never lift the ZIT 2440 on the guide tube! The guide tube could release and consequently the base plate would fall down.

3.2 Standard delivery

The following parts are included in the delivery of the basic set ZIT 2440.G:

- 1 impact tester with base plate
- 1 guide tube
- 1 clamping sleeve
- 1 limitation unit
- 1 spirit level
- 1 allen key
- 1 certificate of manufacturer

An impact test can only be carried out with one of the following sets:

2440.I in accordance with ISO 6272-1:

- 1 falling weight 1 kg (2.20 lbs)
- 1 die
- 1 module

2440.I in accordance with ISO 6272-2:

- 1 modification guide tube of the basic set ZIT 2440.G (length 1.2 m (47.24"), graduation in mm)
- 1 falling weight 1 kg (2.20 lbs)
- 1 additional weight 1 kg (2.20 lbs)
- 1 die
- 1 module

2440.A in accordance with ASTM D 2794:

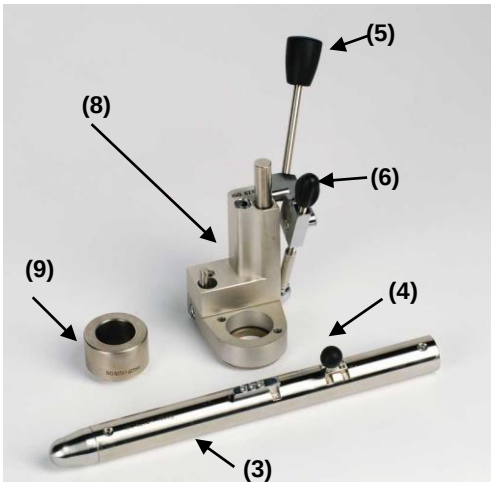
- 1 indenter Ø 0.625" (15.9 mm)
- 1 falling weight 2 lbs (0.91 kg)
- 1 die
- 1 module

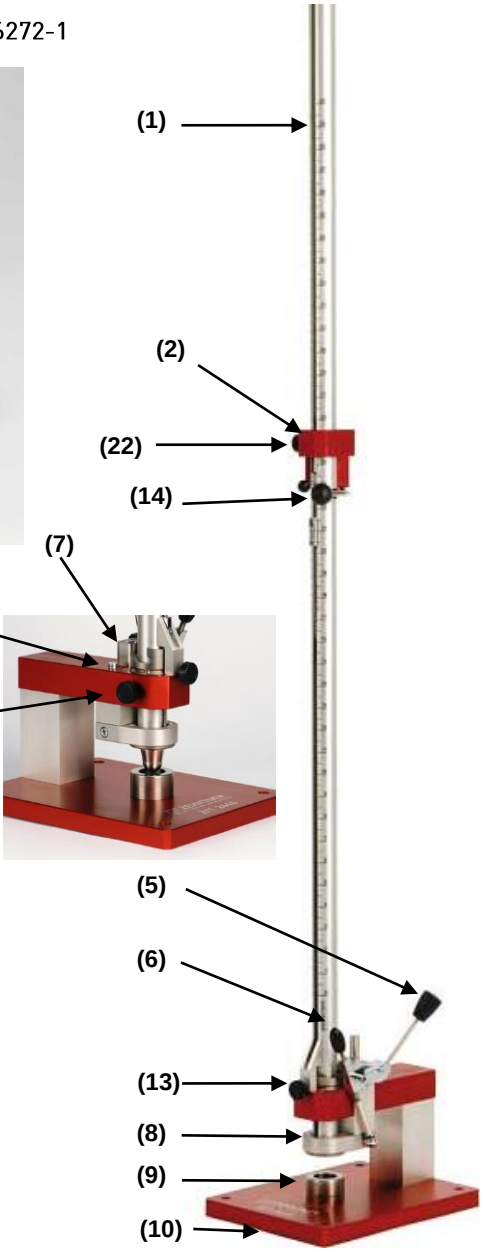
3.3 Options

- ACC813 set for impact tests according to EN 12899-1 for testing traffic signs. Following parts need to be ordered additionally: Basic set 2440.G and set 2440.I in accordance with ISO 6272-1.
- ACC483 indenter Ø 0.5" (12.7 mm) in acc. with ASTM D 2794 (ISO 6272-2)
- ACC493 additional weight 1 kg (2.20 lbs) in acc. with DIN EN ISO 6272-1
- Further additional weights on request

4 Operational elements

4.1 ZIT 2440.I in accordance with ISO 6272-1



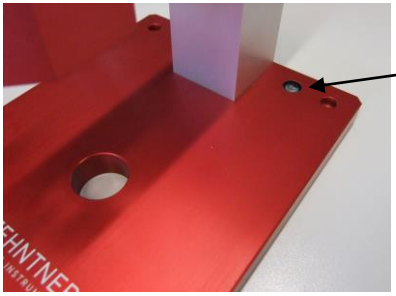


4.2 Key

(1) guide tube
(2) height stop
(3) falling weight
(4) falling weight lever
(5) clamping lever
(6) clamping force adjuster
(7) limitation unit
(8) module
(9) die
(10) base plate
(11) guide tube fixation
(12) module holding screw
(13) Fixation of the limitation unit(7)
(14) Weight release handle
(22) Fixation of height stop

5 First installation according to ISO 6272-1

- Place the base plate on a firm flat surface (e.g. concrete, steel or stone) Use the built-in spirit level in order to adjust the device horizontally.



- Fasten the base plate (10) with 4 appropriate screws on the flat surface firmly.
- Insert the module (8) and tighten it with the module holding screw (12). (Allen key is enclosed.)
- Insert the guide tube (1) in a way that the trench and the labelling face in the front, and the „0" is to the ground. Insert the guide tube into the device until it juts out about 1 cm, then tighten it with the guide tube fixation (11).

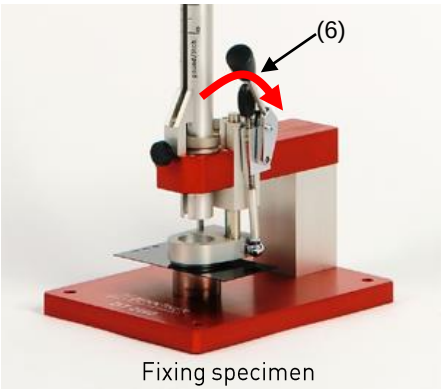
- Insert the die (9) into the base plate.
- Insert the falling weight (3) into the guide tube (1) top down, head and labelling facing to the ground and handle to the front. Place the falling weight (3) on the limitation unit (7).
- Insert the height stop (2) into the guide trench so that the weight release handle (14) faces to the ground on the right, and tighten it with its fixation (22).
- Hook the falling weight (3) into the height stop (2).

6 Test preparation in accordance with ISO 6272-1

6.1 Zero-adjusting the guide tube

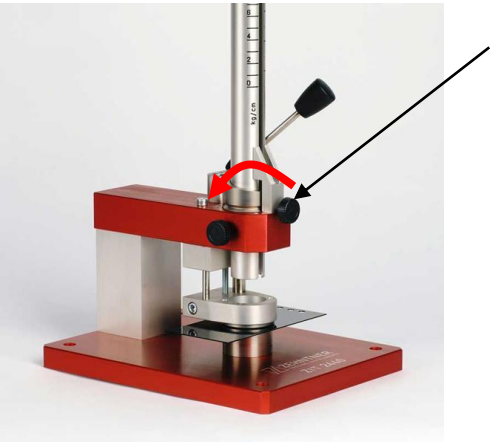
- Place the specimen to be tested on the die (9). Pull ahead the clamping lever (5) until latching. Tighten the clamping force adjuster (6) clockwise until the specimen is clamped firmly. (Tip: In case the specimen does not clamp properly, release the clamping lever (5) and half turn the clamping force adjuster (6) clockwise, subsequently pull ahead the clamping lever (5) again until latching.)

Clamping specimen



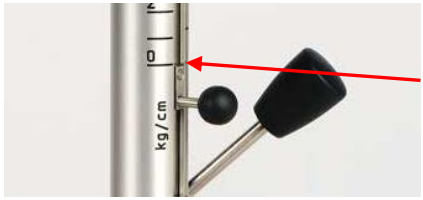
Fixing specimen

- Lift the falling weight (3) with left hand, pull the weight release handle (14) with right hand (outwards) to the right.
- Lower the falling weight gently until it rests on the specimen, afterwards adjust the limitation unit as follows:



- Unscrew the fixation of the limitation unit (13).

- Turn the limitation unit clockwise to 15.
- Tighten the fixation (13).



- Unscrew the guide tube fixation (11) while holding the guide tube (1).
- Shift the falling weight (3) until its marking is aligned with the 0 (zero) engraved line on the guide tube scale (1), and tighten it slightly.

Tighten the guide tube fixation (11) only slightly otherwise the guide tube (1) could be deformed.

- Adjust the height stop (2) on the kg/cm guide tube scale. Its black marking should be aligned with the requested falling height.
- Tighten the height stop (2) with its fixation (22) on the guide tube (1).

- Lift the falling weight (3) until it latches in its place audible.

The indentation depth of the falling weight (3) can be adjusted with the limitation unit (7).

7 Test procedure with ISO module

For the test procedure follow the instructions of the standard to be applied.

The falling weight as well as the inspection side of the specimen needs to be defined previously. Before starting the test procedure proceed as indicated in previous chapters.

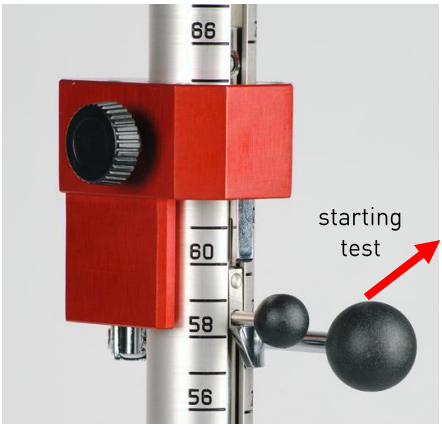
If a different falling height is indicated in the standard, please refer to the chapter 12 “Energy units and falling height” on page 16.

- In case it is indicated in the standard, adjust the limitation unit as follows: Unscrew the fixation of the limitation unit (13) and turn it counterclockwise until you feel a resistance. The number seen on the limitation unit (7) shows the thickness of the specimen. Add the requested indentation depth of the falling weight (3) to this number. Tighten the fixation (13).

For specimens with different thickness, the zero-adjusting of the guide tube and the clamping have to be carried out again.

- By moving the weight release handle (14) to the right the falling weight (3) drops onto the specimen.

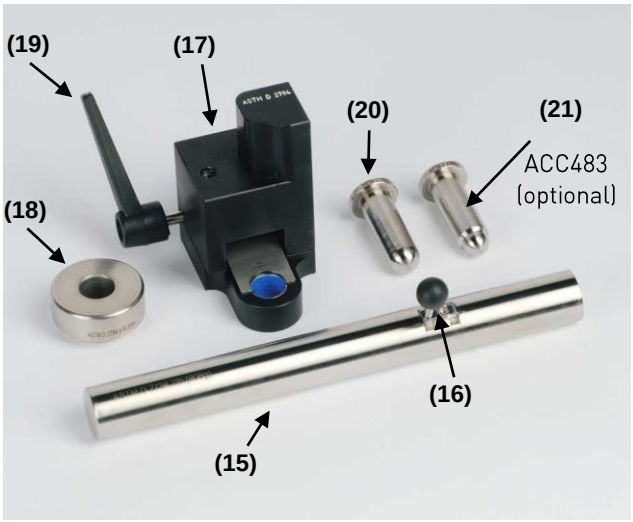
Please take care that no body parts are in the test area!

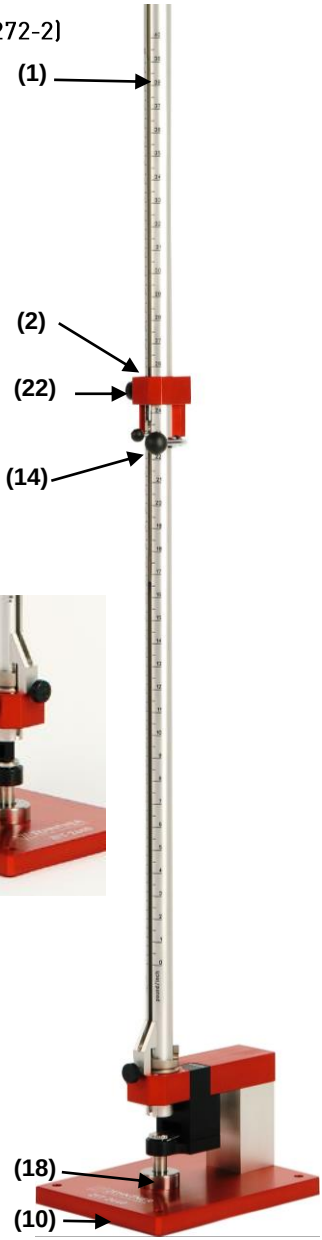


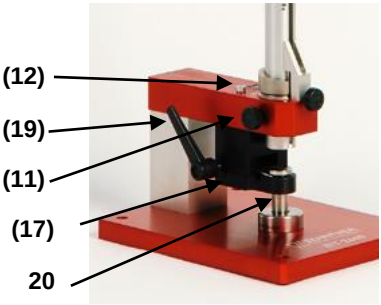
- Repeat the test as agreed or as indicated in the standard.
- Loosen the clamping lever (5), lift the falling weight (3) slightly, and remove the specimen.
- Prepare the evaluation and the test report as indicated in the standard or as agreed.

8 Operational elements

8.1 ZIT 2440.A in acordance with ASTM D2794 (ISO 6272-2)





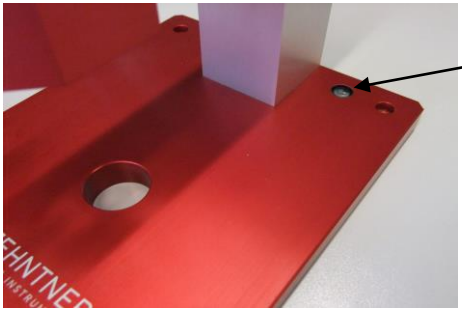


8.2 Key

(1) guide tube
(2) height stop
(10) base plate
(11) guide tube fixation
(12) module holding screw
(14) weight release handle
(15) falling weight
(16) falling weight lever (15)
(17) module
(18) die
(19) clamping lever
(20) indenter Ø 0.625“ (15.9 mm)
(21) optional ACC483 small area indenter Ø 0.5“ (12.7 mm)
(22) Fixation of height stop

9 First installation according to ASTM D2794

- Place the base plate on a firm flat surface (e.g. concrete, steel or stone) Use the built-in spirit level in order to adjust the device horizontally.

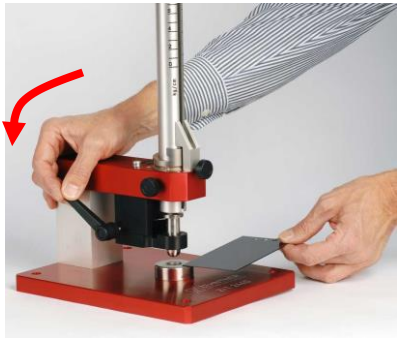


- Screw the base plate (10).

- Insert the die (18) into the base plate.
- Insert the module (8) and tighten it with the module holding screw (12). (Allen key is enclosed.)
- Insert the indenter (19) Ø 0.5" (12.7 mm) or the optional ACC483 indenter (20) Ø 0.5" (12.7 mm) into the module (17).
- Insert the guide tube (1) so that the trench and the labelling are facing to the front, and the „0" is at the lower end. Insert the guide tube into the device until it protrudes about 1 cm, then tighten it with the guide tube fixation (11).
- Insert the falling weight (15) into the guide tube (1) top down, labelling facing downwards and falling weight lever (16) to the front. Lower the falling weight (15) gently until it rests on the limit stop.
- Insert the height stop (2) into the guide trench so that the weight release handle (14) faces downwards on the right, and tighten it with its fixation (22).
- Hook the falling weight (15) into the height stop (2).

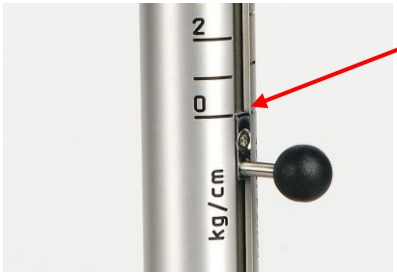
10 Test preparation in accordance with ASTM D2794

10.1 Zero-adjusting the guide tube



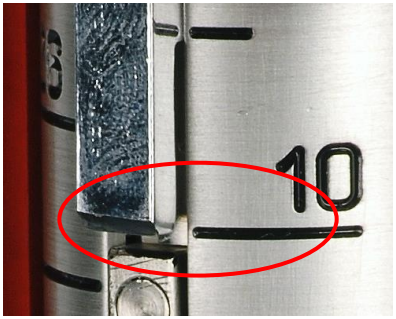
- Place the specimen to be tested on the die (18), by pushing backwards the clamping lever (19).

- Lift the falling weight (15) with left hand, pull the weight release handle (14) with right hand (outwards) to the right.
- Lower the falling weight (15) gently until it rests on the specimen.
- Unscrew the guide tube fixation (11) while holding the guide tube (1).



- Shift the falling weight (15) until its marking is aligned with the 0 (zero) engraved line on the guide tube scale (1), and tighten it slightly.

Tighten the guide tube fixation (11) only slightly otherwise the guide tube (1) could be deformed.



- Adjust the height stop (2) on the lbs/inch guide tube scale. Its black marking should be aligned with the requested falling height).
- Tighten the height stop (2) with its fixation (22) on the guide tube (1).

- Lift the falling weight (15) until it latches in its place audible.

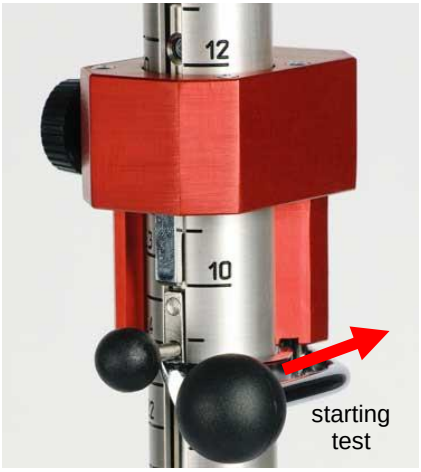
11 Test procedure with ASTM module

For the test procedure follow the instructions of the standard to be applied.

The falling weight as well as the inspection side of the specimen needs to be defined previously. Before starting the test procedure proceed as indicated in previous chapters.

If a different falling height is indicated in the standard, please refer to the chapter 12 “Energy units and falling height” on page 16.

For specimens with different thickness, the zero-adjusting of the guide tube and the clamping have to be carried out again.



- Move the weight release handle (14) to the right in order to start the test.
- Repeat the test as indicated in the standard or as agreed.

Please take care that no body parts are in the test area!

- Push backwards the clamping lever (19) and remove the specimen.

- Prepare the evaluation and the test report as indicated in the standard or as agreed.

12 Energy units and falling height

In the various standards and regulations there are different indications of the drop energy. Normally (ISO, DIN), the falling height and the falling weight to be used are indicated. Other impact standards describe the absolute energy units:

- kg m (ISO 6272, ASTM D 2794)
- Joule (ASTM D3029, ECCA T5)
- inch pound (ASTM D 2794)
- lbs inch (ASTM D 3029)

These energy units can be converted as follows:

1 J (Joule) = 0,1 kg m = 8.8 lbs inch (= inch pound)

The falling weight is calculated as follows:

$$h = \frac{E}{m \cdot g}$$

h: *falling height [m]*

m: *falling weight [kg]*

E: *energy [J =* $kg \cdot m^2 \cdot s^{-2}$ *]*

g: *gravity acceleration [* $m \cdot s^{-2}$ *]*

Example: If a drop energy of 5 Joule and a falling height of 1 kg is indicated, the following falling height needs to be adjusted at the guide tube:

$$h = \frac{5\,J}{1\,kg \cdot 9.81 m \cdot s^{-2}} = 0.5097\,m = 50.97\,cm$$

13 Maintenance and cleaning

13.1 Maintenance and cleaning which can be carried out by the user

By the user himself only the following maintenance and cleaning work can be carried out:

- Outer cleaning of the device with a soft cloth or with compressed air.

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

14 Storage

If the ZIT 2440 is not used, we recommend dissembling it. Should you not dissemble the device, please carry out the needed safety precautions.

If the ZIT 2440 with ASTM module is not dissembled and stored, we suggest to rest the falling weight on the indenter for safety reasons to avoid an unintended falling of the weight.

If the ZIT 2440 with ISO module is not dissembled and stored, we suggest to rest the falling weight on the limitation unit for safety reasons to avoid an unintended falling of the weight.

15 Technical specification

version	description	standards
ZIT 2440.G	falling height: max. 101.6 cm (40") set weight: 4.9 kg (10.80 lbs)	
ZIT 2440.A	falling weight: 2.0 lbs (0.91 kg) indenter Ø: 0.63" (15.9 mm) die inside Ø: 0.64" (16.3 mm) outer Ø: 1.73" (44 mm) thickness of test panel: max. 0.04" (1 mm) set weight: 3.74 lbs (1.7 kg) total weight: 14.55 lbs (6.6 kg)	ASTM D2794
ZIT 2440.I	falling weight: 1.0 kg (2.20 lbs) hemispherical head Ø: 20 mm (0.79") die: inside Ø: 27 mm (1.06") outer Ø: 44 mm (1.73") thickness of test panel: 4 mm (0.16") set weight: 1.95 kg (4.30 lbs) total weight: 6.85 kg (15.10 lbs)	ISO 6272-1

Dimensions (LxWxH): 19.8 cm x 25.8 cm x 145.4 cm (7.8" x 10.16" x 57.24")

Warranty: 2 years

Index