

ZVR 6000

Visual Retroreflectometer RL

Instruction Manual



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Exclusion of liability

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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.

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1 Description of device


The ZVR 6000 is a mobile, user-friendly retroreflectometer for visual determination of night visibility of road markings using comparison standards.


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

- Handy retroreflectometer with wheels for easy positioning and moving on the road
- Convenient one-hand operation
- Multifunctional, sturdy arm for operation with carrying handle
- Splash-proof for testing in wet condition
- Exchangeable comparison standards which can be ordered dependent on the planned application area
- Easy to handle
- Sturdy construction
- Alternatively operated by rechargeable battery cells type AA


2 Safety information


2.1 Symbols used


 This note comprises instructions to be observed in order 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 these instruction manual the generally applicable safety instructions and regulations for prevention of accidents have to be taken into account.


2.2 Safety notes and hints


 It is strictly forbidden to open the housing of the ZVR 6000. If not observed, all the guarantee and liability claims to Zehntner GmbH Testing Instruments will be void.


 The ZVR 6000 Visual Retroreflectometer RL is exclusively intended for the determination of night visibility of road markings using comparison standards. 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.

 Unauthorized modifications and changes of the ZGH 1024 are not permitted.

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 **Zehntner GmbH Testing Instruments** refuses all warranty and liability claims for damages caused by usage of the ZVR 6000 in combination with **non-original accessories**, or accessories from 3rd party suppliers.

 Avoid any mode of operation that could affect the safe working with the ZVR 6000.

 For the operation of the ZVR 6000 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 packing. If it 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 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 service immediately liable 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 courier service, which is normally 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 inform your authorized Zehntner agent or **Zehntner GmbH Testing Instruments** immediately.

3.2 Shipment


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. Additionally put filling material into a cardboard box in order to protect the device of shock during carriage.

3.3 Standard delivery

The following parts are included in the delivery:

1 ZVR 6000 Retroreflectometer	
4 batteries type AA	
2 comparison standards acc. to your choice	
1 certificate of manufacturer	

3.4 Options

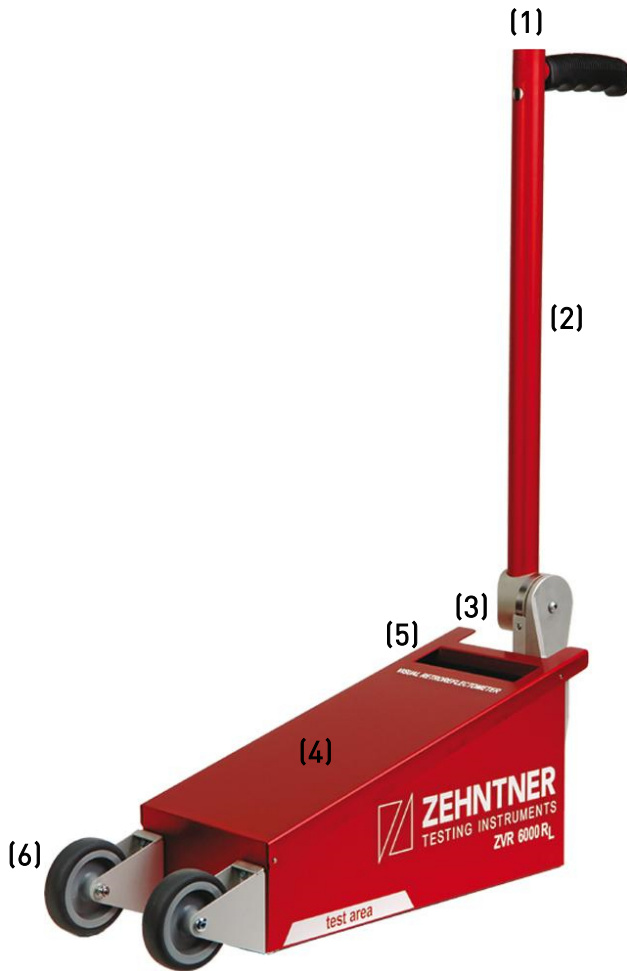
<ul style="list-style-type: none"> ACC1115 battery charger, incl. power cable for 4 accumulator cells type AA 	
<ul style="list-style-type: none"> Additional comparison standards 	

Ordering scheme for additional comparison standards

ZZS . [colour] . [glass beads] . [retroreflection value] . [type]

<u>colour</u>	W G F_Spez	white yellow with material of customer
<u>glass beads</u>	600 2000 G_Spez	mostly used glass beads (200-600 µm) special glass beads up to 2000 µm with material of customer
<u>retroreflection value</u>	70 ... 500	70 to 500 (in steps of 10, will say 70, 80, 90, 100, 110 etc.) $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$
<u>type</u>	flat structured	flat, without structure with structure

4 Device overview



- (1) light switch
- (2) handle
- (3) opening overlap
- (4) device cover
- (5) observation window
- (6) wheels

light and handy,
easy to carry



carrying handle, lift to
open



battery case cover



opened battery case cover



5 Inserting comparison standards

After opening the device cover (4) you will see the accessory drawer, where the comparison standards can be stored. By default, 4 comparison standards can be stored. If needed, the storage capacity can be enlarged by Zehntner. The accessory drawer is removable.



To insert the comparison standards, follow these steps:

- Remove the accessory drawer.
- Lift the holding clip for comparison standards, push the required standard underneath and clamp it carefully.



Please observe the measuring direction shown by an arrow on the backside of the comparison standards.



holding clip for
comparison
standard



Align the comparison standard with this edge. It must not be positioned behind or on top of the edge.

6 Measuring procedure



Measuring direction
(observation direction)

Choose two comparison standards whose values are close to the expected retroreflection of the marking to be tested. Insert them into the device aligned on the left and right edge as described above.

Press the light switch (1) during the whole visual testing procedure and observe the road markings to be tested and the comparison standards through the observation window (5).

View through the observation window (3)



Compare the retroreflection of the marking with the retroreflection of the comparison standards and decide if the sample has a higher or lower retroreflection. Choose further comparison standards and repeat the testing in order to receive more precise results.

In the example at hand, the retroreflection of the marking is higher than of both comparison standards. In this case, two standards with values over $150 \text{ mcd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$, could be chosen, e.g. $175 \text{ mcd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$ and $200 \text{ mcd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$, for a second comparison to get preciser results.

7 Maintenance and cleaning

7.1 Maintenance which can be carried out by the user

Only the following maintenance and cleaning work can be carried out by the user:

- Outer cleaning of the device (see chapter 7.2)
- Changing of the batteries (see chapter 7.3)

! All other maintenance and repair work shall only be carried out by **Zehntner GmbH Testing Instruments** or your authorized Zehntner agent, otherwise all warranty is void.

7.2 Cleaning of the device

The ZVR 6000 does not need any special maintenance. The mirrors can be cleaned with window cleaner and a soft cloth if needed.

For cleaning of the housing use a clean soft cloth. Use only soft cleaning agents.

! Do not use strong acidic or alkaline liquids.

7.3 Changing of the batteries

After opening the battery case cover, the provided 4 AA batteries will be seen. Empty batteries can be replaced either by commercially available new batteries or by rechargeable batteries cell type AA. Remove the batteries from the battery holder and insert the new ones according to the pole marking.

! Never store the batteries inside the device if it will not be used for a longer period or is exposed to direct sunlight for a longer time. Batteries have to be recycled, respectively disposed separately from household garbage.

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7.4 Comparison standards

Always handle the comparison standards with care and protect them from soiling and scratches. They should be stored in the accessory drawer.

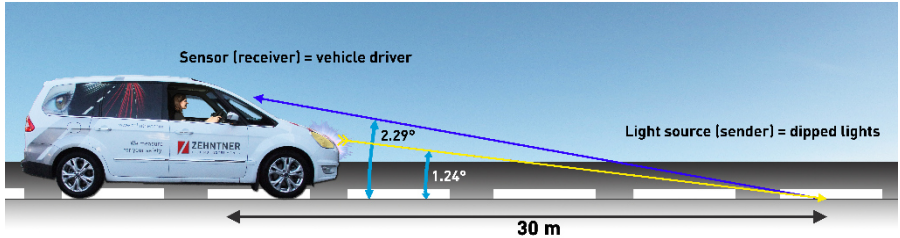
! Never clean the comparison standards, as the values cannot be guaranteed afterwards. In case of soiling-they have to be replaced.

We recommend replacing the standards every 2 years.

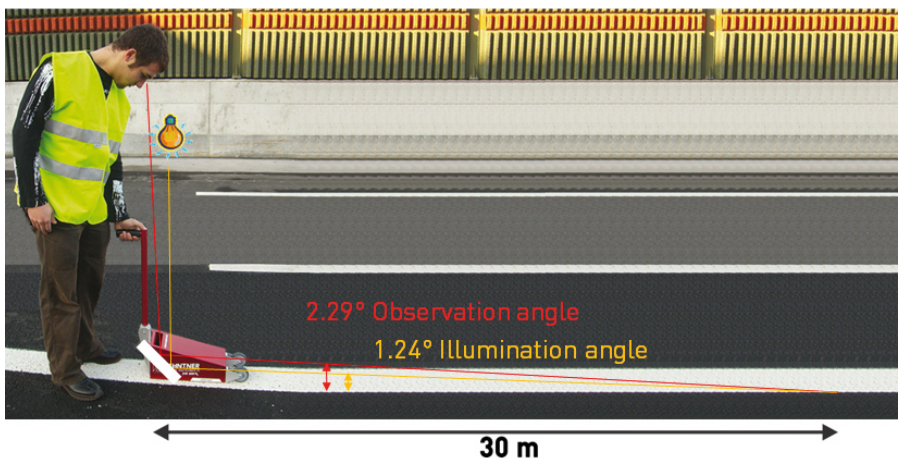
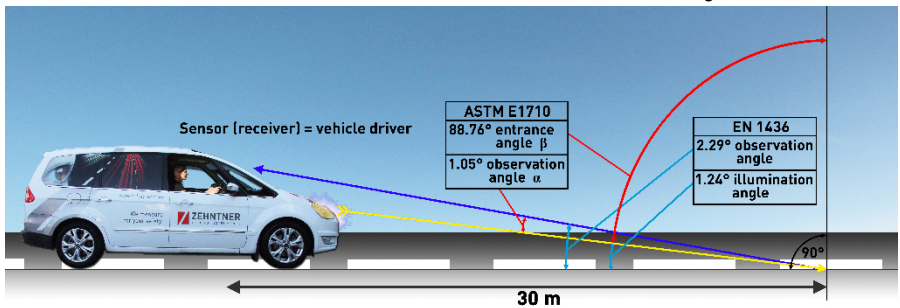
8 Graphical illustration of the measuring principles

8.1 Night visibility R_L

R_L is the coefficient of retroreflected luminance (night visibility) of road markings. The observation angle of 2.29° corresponds to the viewing distance of a vehicle driver of 30 m under normal conditions. The illumination angle is 1.24° .



The angle definitions above are valid for EN 1436. It is important to understand that EN 1436 and ASTM E1710 use different illustration of the same angles.



9 Technical specification

Observation distance:	Equivalent to 30 m, according to CEN geometry
Observation angle:	EN 1436: 2,29° ASTM E1710: 1.05°
Illumination angle:	RL: EN 1436: 1,24° RL: ASTM E1710: 88,76°
Test area (WxL):	50 mm x 160 mm (2" x 6.3")
Comparison standards:	50 mm x 150 mm (2" x 5.9")
Testing principle:	according to Muench
Battery:	4 Alkaline type AA
Dimensions (LxWxH):	550 mm x 165 mm x 730 mm (21.7" x 6.5" x 28.8")
Weight:	3,6 kg (7.9 lbs)
Standards:	EN 1436, ASTM E1710
Warranty:	2 years

10 Glossary

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