FAQ: Frequently Asked Questions to Article 6020.EU.1m and 6020.OV.1m
ZDR 6020 Dynamic retroreflectometer $R_L$

Version 2.0 dated 05.03.2013

1. **What data is recorded with the ZDR 6020?**
   - $R_L$ average values, day contrast ratio, GPS coordinates, chainage (position in km/miles), ambient temperature ($^\circ$C/$^\circ$F), relative humidity (rH%), driven average speed, picture, voice recording as well as date and time.

2. **Which components does the customer have to provide?**
   - **Vehicle** *(Please consult Zehntner before providing/purchasing the vehicle)*
   - **Warning light** (if needed)

3. **Why does the customer have to provide the vehicle and warning light?**
   Due to customer- and country-specific peculiarities (warranty and other) the above mentioned components must be provided by the customer himself.

4. **What are the vehicle requirements?**
   - Hard suspension
   - More powerful alternator
   - Ground clearance of minimum 185 mm while fully loaded
   - Co-driver’s air bag must have the possibility to be switched off
   - Front screen without heat reflecting coating (affects the GPS connection)
   - Without front screen heating inside of the front screen (heating lines would be displayed on the pictures and hence the picture quality would be poor)
   - without automatic start-stop system

5. **Which car models do you recommend?**
   - Ford Transit
   - Fiat Cromo
   - Fiat Doblo
   - Mercedes Vito
   - Mercedes Sprinter
   - VW T5 with hard suspension
   However, there can be used many other models. Please contact us to check if your desired model can be used.
   *Please consult Zehntner before providing/purchasing the vehicle*

6. **Who is responsible for organizing the homologation?**
   As there are different regulations in every country, the customer is responsible for getting the local homologation. Zehntner will provide him with any necessary documents.
7. **Is the laptop provided by Zehntner?**
   Yes, Zehntner provides a special ruggedized touchscreen laptop with docking station and installs all necessary software packages required for operating the system.

8. **Is it possible to install software on the laptop after “RetroGrabber” installation?**
   All antivirus protection software and/or firewall software needs to be installed before installing the RetroGrabber software. Hence, you need to let us know if you wish to install antivirus protection and/or firewall software, so that Zehntner can send you the laptop for these installations. The additional shipping costs will be at your charge.

   Most other software like Microsoft Excel and other office programs can be installed later on.

9. **What is the warranty period?**
   Our ZDR 6020 Zehntner-Dynamic retroreflectometer $R_L$ has a warranty period of 2 years from the date of issue of the certificate of manufacturer (date of supply of mounted measuring vehicle and ZDR 6020).

   Transportation costs are excluded from the warranty and have to be covered by the customer. Warranty does not cover any damages caused by normal wear and tear, improper treatment by the customer or third persons as well as chemical or other unusual influences.

10. **How is the system operated?**
    The system is operated by the windows based "RetroGrabber" software, menu-guided in several languages. (Currently in English, French, German, Italian, Spanish). Please let us know if you are interested in providing an additional translation.

11. **What is the format of the data output?**
    The normal data output of our ZDR 6020 Zehntner-Dynamic retroreflectometer $R_L$ is a CSV-file that can be opened by Microsoft Excel. Since the Software is written by our own engineers, we are able to customize the data output to the customer needs. Feeding the data into a database is not a problem.

12. **Is Microsoft Excel mandatory for using the ZDR 6020?**
    Microsoft Excel is not mandatory for using the ZDR 6020. The data output can also be opened with e.g. normal text editor. However, we recommend Microsoft Excel for an easy and optimum analysis of the measuring results.

13. **What is the delivery time?**
    This system is available as from spring 2013. Afterwards, the equipment will be ready for pick up/shipment approx. 1-2 months after receipt of the first payment and "after providing the modified vehicle in our premises (* applies only for installation in CH-4450 Sissach). In case of mounting on site of the customer an appropriate date needs to be scheduled with Zehntner.

14. **What is the maximum measuring speed?**
    150 km/h (93.21 mph), please always observe speed limits.

15. **How many measurements can be taken with the system at a certain distance?**
    The number depends on the driven speed and the chosen average interval. The system has a measuring frequency of 170 Hz. Usually 680 measurements are used for calculating the average value if the driving speed is 90 km/h and the average interval is 100 m.

    We have built in software filters that will filter out values that are outside certain limits or that have had other disturbing influence. These filters may reduce the number of single measurements per meter depending on the signal quality. Nevertheless, we have made very good experiences with this system.

16. **How do I know to which place the $R_L$ values belong?**
    GPS coordinates and chainage is automatically recorded and stored to the $R_L$ average values. Furthermore, we provide the possibility that the co-driver is able to insert references (e.g. roundabout, bridge etc.) on the laptop which will also be stored. Additionally pictures can be taken every 10 m (32.81 ft) which will be stored to the $R_L$ value.
17. **What is the chainage and how it is working?**
The customer indicates that a measurement from point A to point B is carried out. So point A and B as well the distance between are known. Point A has the position 0.000 km. If the settings are that the \( R \) average values will be stored every 50 m, the 2\(^{nd} \) position is 0.050 km, the 3\(^{rd} \) position is 0.100 km and so on until you reach your destination point B. The system calculates the distance directly from the signal of the car odometer. On very curvy roads, the chainage system will sometimes show differences to the real world.

18. **Does the pressure of the tires influence the working of the chainage?**
The tire diameter does influence the chainage. This is why we have a built-in calibration wizard so the user can calibrate the chainage himself by driving a certain distance on a highway. It is also possible to store several calibrations, e.g. one for winter and one for summer tires.

19. **What happens in the hills and mountains when the car is in a different angle than the road marking 6 m in front of the car?**
Different angles will result in different measurements. The ZDR 6020 has two features that help avoiding wrong readings. One is the optical system which has overlapping light beams, the second one are software based filters that will treat the data in a way that such errors will be suppressed.

20. **If the car has one passenger more, or more load in the trunk, how will this affect the measurement? Is this corrected during calibration for example? If so, do you need to calibrate again when for example an extra passenger sits in the car during the measurements?**
Heavy load changes will affect the geometry and therefore the measurement. The ZDR 6020 measuring head contains two lasers to double check the geometry. If the geometry is misaligned, a new calibration needs to be done. Depending on the car’s suspension, one side passenger usually does not influence the measuring results.

21. **Can the lamp be replaced by the user itself?**
Yes, the provided spare lamp is mounted on a socket and optically adjusted by Zehntner. When the user replaces the lamp, no geometry adjusting is necessary.

22. **How frequent should the system be calibrated by the user?**
We recommend performing a calibration before each measurement cycle (e.g. before the measuring day).

23. **How frequent should the system have a maintenance and calibration by the manufacturer?**
The system should be sent/brought to the manufacturer every year for maintenance and calibration.

24. **Can the system be used for continuous wetting according to ASTM E 2176 (withdrawn in 2013) and EN 1436?**
Yes, the system can be used for continuous wetting while stationary.

25. **Is it possible to measure during rain?**
The standards EN 1436 and ASTM E 1710 respectively ASTM E 2176 do not describe measurements during rain because this would not be a standard condition and could not be compared with other measurements. So there is no reason to prepare the system for rain measurements and our system should not be exposed to it. Of course, the system is enough protected that it will not break down if during measurements it will start to rain. However, you will have to drive to the next exit in order to remove the head and store it in the trunk.

26. **Is it possible to measure road studs with the ZDR 6020 Zehntner-Dynamic retroreflectometer \( R \)?**
It is not possible to measure road studs with the ZDR 6020 Zehntner-Dynamic retroreflectometer \( R \). However, we are able to quote an optional software modification, so that the system is able to count the road studs. Please let us know if you are interested in this option. For measuring road studs, you will need our ZRP 6030 Zehntner-Retroreflectometer \( R \).
27. **Is it possible to measure the day contrast ratio with the ZDR 6020 Zehntner-Dynamic retroreflectometer R\textsubscript{d}?**
   Yes, it is.

28. **Is the system able to measure the day visibility (Qd)?**
   So far there is no dynamic system on the market which is able to measure the day visibility Qd. Please let us know should you be interested to be a partner in developing this feature.

29. **Is the system equipped with a CE-certification?**
   Yes, the ZDR 6020 is CE certified and is in conformity with the specification on the EC directive 89/336/EEC and the EC directive 73/23/EEC.

30. **Is the system officially approved?**
   The ZDR 6020 is approved by Prüf-, Überwachungs- und Zertifizierungsgemeinschaft der Straßenausstatter e.V., Germany, accredited under BauPG/DIBt 0913. A copy of the test report No.: 0913-2009-05 can be obtained from Zehntner.