

## Suspension Tester Specification

### **IMPORTANT NOTICE**

At present, all suspension performance test equipment in the CVRT network is based on one or other of two different measuring principles, namely the Boge principle or the Eusama principle. In the interest of uniformity and to improve consistency, it is the intention of the Authority to introduce a uniform measuring principle for all suspension testers, based on the **Damping Ratio According To Lehr** (commonly known as the Theta method) principle. The introduction of this new principle will be dependent on further successful testing of the principle and on suspension testers using this new principle being widely available. At that stage, it will become a requirement for all newly installed suspension testers. Existing test equipment may also be required to be modified to adopt the new principle.

Whilst the Suspension Tester Specification, as set out below, can be met using either the Boge or Eusama principles, it would be preferable that any new suspension testers, purchased from now on, should also be capable of being adapted to use the Lehr principle. It is the Authority's understanding that such adaptation should only require a minor hardware / software change and should not require a significant or complete change of components. However, the impact of such a change should be discussed with your equipment supplier.

### **Section 1**

#### **1.1 General overview**

The Suspension Tester must be capable of carrying out suspension tests on all light commercial vehicles up to and including vehicles of 3,500kg DGWV. It must connect to a PC running software capable of outputting test data to CoVIS via the agreed protocols as set out in **Section 2**.

It is expected that the manufacturer of the Suspension Tester is the same manufacturer of the corresponding brake tester and they are integrated with the same host PC and controlled by the same test equipment software. This is for the purposes of calculating the brake performance based on the static weight recorded by the suspension tester.

The Suspension Test Unit shall;

- (a) Be based on the resonance principle with vertical oscillating base excitation.
- (b) Be capable of measuring overall suspension performance of each wheel and the imbalance of each axle.
- (c) Be capable of measuring the static weight of each axle
- (d) Have the capability of measuring the weight of an axle load up to 2,800kg and testing the suspension performance of a wheelset weighing up to 1400kg.
- (e) Prevent the excitation of a plate until both plates are occupied correctly by the wheel sets on an axle
- (f) Delay automatic start up by a minimum 3 seconds after correct occupation (if applicable)
- (g) Have the capacity to operate and produce a printout of test results independent of CoVIS. (for printout criteria see **Appendix 1**)
- (h) Not be susceptible to any disturbance from Radio Frequencies and Electromagnetic fields
- (i) Operate reliably in all conditions likely to be encountered within the vehicle testing environment. It shall meet a weather proof rating of IP42 or above.
- (j) Consist of a pair of test plates mounted in one unit at floor level – the vehicle shall be predominantly level when any axle is on the suspension tester.
- (k) Have marker bars located on the front and rear of both the left and right test plates for the purpose of assisting in locating the wheel correctly.
- (l) Be suitably located in the floor to avoid the requirement of retaining the brake on the vehicle for the purposes of preventing it from rolling off the suspension tester or keeping it centered on the plate. This must accommodate all LCV Wheel base lengths.
- (m) Have the display and a user interface positioned on the driver's side (right side in the driving direction) and ensure the vehicle tester, for all axles being tested, has an unobstructed line of sight and a clear view when in the driving position. The display must have adequate visibility of the readings during the test procedure, particularly in poor light conditions or bright sun light.
- (n) Not commence a new vehicle test without clearing any existing measurements.
- (o) Meet current health and safety regulations and RECI standards on its installation.
- (p) When installed, the unit must not inhibit the view of the CCTV camera or the reading of the number plate as required by the ANPR camera.

**NOTE;** Detail on the equipment layout is found in the test lane guidelines section of the premises guidelines.

## **Section 2**

### **2.1 Connection to CoVIS**

- (a) The suspension tester host PC must be capable of connecting to the CoVIS network via the internal test centre network.
- (b) This PC shall be capable of communicating to CoVIS via ASANetwork Standard on a network i.e. requires a network card dedicated to communicate with CoVIS or the centre's LAN.
- (c) The host PC date and time format shall be set to a standard Irish date/time format and time zone. These must be set to the correct time.
- (d) There shall be no firewalls or firewall rules preventing data from transferring to\from ASANetwork.

### **2.2 Communication with CoVIS**

- (a) The suspension tester and its host must have the capability to receive test orders transmitted by CoVIS and return test results to CoVIS using the ASANetwork secure common industry standard interface (see example in **Appendix 4** below).
- (b) The Suspension Tester shall have the capacity to electronically transmit test measurement values for both left and right wheels i.e. it must transmit the actual measurement values and not just a calculated result. See **Appendix 4** where there is a sample of the output required – ref the highlighted content only.
- (c) The unit of measurement will return a dampening value for the left and right of each wheel.
- (d) The suspension tester must be capable of providing separate values for each axle on a vehicle and labelling each measurement with the axle number
- (e) The suspension tester must provide a Start date & time for each test
- (f) The suspension tester must provide an End date & time for each test
- (g) The suspension tester must provide the Serial Number of the equipment used for each test

### **2.3 Input Test order detail from COVIS**

The input data shall comply with ASANetwork input data requirements.

It shall include;

- (a) Order type id
- (b) Order Description
- (c) Vehicle Registration Number
- (d) EU Vehicle Category
- (e) Date of first registration
- (f) Number of Axles

## **Section 3**

### **3.1 Documentation/Identification**

- (a) The Suspension Tester shall have a durable identification mark on its exterior or its control unit showing the make, model and serial number.
- (b) The manufacturer of the Suspension Tester shall provide a clear and easy to understand user manual, written in English and available at any time to the test centre, which shall explain how it operates, including the function of each aspect of the Suspension Tester.
- (c) The manufacturer of the Suspension Tester shall provide a recommended "Maintenance Procedure".

## **Section 4**

### **4.1 Variables and Settings**

- (a) Pass / fail limits set in the Suspension Tester must correspond to the limits applied by the RSA and stored within CoVIS, for suspension performance and imbalance on each axle as per the relevant Vehicle Tester's Manual.
- (b) Local Settings and variables that affect the outcome of the readings shall be uniform for each make/ model type.

### **4.2 Calibration of the Suspension Tester**

**The Calibration service provider, as part of their quality programme, shall adhere to the CITA 9B Quality Requirements (see Appendix 3 below).**

- (a) The manufacturer of the Suspension Tester shall, on request, provide a technical handbook in English describing the calibration technology for review by the RSA.
- (b) A person with recognised training from the manufacturer of the Suspension Tester shall calibrate the equipment every 12 months, or more frequently if required, using calibration equipment as specified by the manufacturer guidelines.
- (c) A condition report shall be completed by a person with recognised training from the manufacturer of the Suspension Tester.
- (d) A condition report on the Suspension Test shall be carried out at 12 month intervals or if the Suspension Test is potentially damaged in any way e.g. exiting of Test Plate when vibration motor has not come to a complete stop.
- (e) The calibration procedure shall match the manufacturer's recommendation.
- (f) For an initial set up, the installer shall provide a calibration certificate.

**Note 1:** All component parts of the calibration device kit, including any venire calliper, shall be individually marked with an identity number to enable all parts to be kept together as a set. The certificate shall relate to the set and each calibration device produced shall require its own certificate.

**Note 2:** If the certificate or any other relevant document produced for the calibration device is not in English, the applicant shall make available a translation into English.

**Note 3:** When the static calibration has been completed, to assess the linearity and stability of deviation, including any unexpected cause of increased friction such as a failing bearing or loose spring, the final check procedure – dynamic observation shall be carried out – please see **Appendix 2** of the condition report

## 4.2 Weight; Calibration Equipment

**The Calibration service provider, as part of their quality programme, shall adhere to the CITA 9B Quality Requirements (see Appendix 3 below).**

Where the weight is determined from the integrated suspension tester the following applies.

The calibration equipment shall be capable of checking mass axle weight up to minimum 35% of the end range value of the suspension tester e.g.35% of 2,800kg = 980kg. If the weight measurement is displayed on a VDU, the accuracy of the weight measurement shall be judged against the digital values. Traditional dials shall indicate the same values (if applicable)

- (a) All component parts of the calibration device, including any mobile weight scale handset, shall be individually marked with an identity number to enable all parts to be kept together as a set. The certificate shall relate to the set and each calibration device produced shall require its own certificate.
- (b) If the certificate or any other relevant document produced for the calibration device is not in English, the applicant shall make available a translation into English.
- (c) When the static calibration has been completed, a drive-on of the target weight axle used in calibration in normal operating mode shall verify the weight readings.
- (d) The method of obtaining the target weight shall ensure the vehicle weight distribution is retained for the actual weight calibration.

### Accuracy

- (e) The weighing scales readings shall be accurate to within:
  - (i) +/-3 kg of the true value from zero up to and including 100 kg.
  - (ii) +/-3 per cent of the true value for all readings between 200-2000 kg.
- (f) The weighing scales calibration device shall be accurate to within:
  - (i) +/-0.3 kg of the true value from zero up to and including 100 kg.
  - (ii) +/-0.3 per cent of the true value for all readings above 100 up to 600 kg.

**Note;** Valid and current calibration certificates shall be scanned and uploaded to CoVIS. An original hard copy shall be stored securely and made accessible for inspection.

## **Appendix 1**

### **Printout Report**

The Suspension Tester shall have the capability to operate independent of CoVIS and produce a printed report that must include at minimum the following details on the report. The test values on the print out report must match the data values returned to ASANetwork for CoVIS i.e. where a value is calculated and presented with no decimal places, the value will be rounded down to no decimal place.

### **The Printout must include at minimum the following details on the report**

- Test centre details – Name / Address / Centre number
- Completion date and time of test – dd/mm/yyyy - hh/mm
- Vehicle registration number
- Vehicle odometer reading
- Detail requirements for each axle.
  - Damping value left wheel.
  - Damping value right wheel.
  - Axle Imbalance. - %
  - Static wheel weight left - Kg
  - Static wheel weight right -Kg
  - Total Axle Static Weight.- Kg
- Total Vehicle Weight.
- Test limits applied and presentation of performance results for each wheel.
- Test limits applied and presentation of imbalance calculated for each axle -%
- Outcome of the test – Pass / Fail / Void / Aborted
- Provision for CVRT testers' signature and tester number as issued by the RSA.

## **Appendix 2**

### **Condition Report**

Recommended minimum key points for compilation of a condition report on a Suspension Tester

Particular attention shall be made to the following and noted;

- The effect of corrosion or excessive wear on the Suspension Tester.
- Vertical travel mechanism for each test plate operates smoothly with no detectable play or mechanical vibration that may affect the accuracy of the readings.
- All moving joints/bearings are sufficiently lubricated.
- No detectable rocking present in the chassis.
- Cover plates/guards are not damaged or missing and all bolts retaining them are present and tight.
- Test plates are secured to vertical travel mechanism. Travel mechanism has no abnormal noise or vibration for each plate when in normal operation.
- Cables are neatly strapped and clear of moving mechanical parts
- All junction boxes are clean and dry, in good condition and lids closed with adequate screws
- Cable ducting/conduit in good condition and mounted correctly
- Cable glands are tight
- Correct time and date (EU format) is noted on measurement device controller
- Automatic summer time adjustment is set and configured for local Irish time and settings

Final check - dynamic observation

With the Suspension Tester in normal operating mode carry out the following process.

1. Drive the front axle onto the test unit. Allow test to run and note measurement values. Note the values for left and right.
2. Repeat three times and note the consistency in the results.
3. If it is safe to do so (e.g. it may not be safe in the case of an inspection pit) reverse the vehicle onto the suspension tester and again using the front axle, repeat step 1 & 2.
4. Compare that the results taken the forward driving direction test for left and right have swapped around when the reverse direction tests are carried out.

These are minimum key points for compilation of a condition report. Any other check recommended by the equipment manufacturer should be included.

## **Appendix 3**

### **CITA 9B Quality Requirements Covering Calibration**

#### **6.3. Calibration**

**6.3.1** The inspection body shall ensure that there are proper arrangements to adequately control and calibrate vehicle inspection equipment before and during use, in order to ensure its accuracy, its conformity to the relevant requirements and its continued suitability and to provide confidence in decisions based on measurements.

**6.3.2** The calibration procedures, sometimes known as calibration programmes, shall define the calibration processes, their environmental conditions, their frequency, the acceptance criteria and the action to be taken when the results are found unsatisfactory and / or inadequate.

**6.3.3** Quality relevant vehicle inspection equipment shall be calibrated before first use and at least at the following frequencies during in-service use **or at other frequencies as prescribed in national regulations:**

***NOTE; All calibration frequencies mentioned in the CITA requirements have been omitted from this Appendix as they are superseded by the prescribed calibration frequencies outlined in the Premises & Equipment Guidelines.***

**6.3.4** Calibration shall be done, where appropriate, against certified equipment having a known and traceable relationship to internationally or nationally recognised standards. Where no such standards exist, the basis used for calibration shall be fully documented, according to the equipment manufacturer's recommendation, if any.

**6.3.5** If vehicle inspection equipment is found to be out of calibration or there are any other systematic errors, the validity of the vehicle inspection results since the date of last calibration shall be re-assessed. If there was any relevant non-conformity, the vehicle inspection body shall, as soon as practicable inform the owners / keepers of the affected vehicles and invite them immediately for re-inspection, making it clear that there will be no charge for the inspection.

**6.3.6** The calibration status shall be shown clearly on relevant vehicle inspection equipment, preferably by means of suitable markers or labels, indicating at least the date of the last calibration and the date the next calibration is due.

**6.3.7** Reference measurement standards held by the inspection body shall be used for calibration only and not for other purposes. Only competent bodies who can provide traceability to international or national measurement standards shall calibrate reference measurement standards.

**6.3.8** The inspection body shall keep records of all calibrations performed.



## Appendix 4

### Sample XML Stream sent to CoVIS from ASANetwork

#### Important Note

- **The highlighted content in the sample below shows the minimum fields required** The data must be returned to ASANetwork in the correct format
- All XML must be valid or will be rejected
- The sample file contains results for a 2 axle vehicle
- The XML should output all raw data including decimal values
- The results must relate to the test Order ID received from CoVIS. The registration number is not read when processing the results

#### SAMPLE ONLY

```
<?xml version="1.0" encoding="ISO-8859-1" standalone="no" ?>  
<!DOCTYPE RESULTS SYSTEM "awnres.dtd">  
<!-- Created 24.10.2014 15:16:26 with AWNX32.dll Version 2.0.0 Build 50 -->
```

```
<RESULTS>  
  <RESULTSHEADER>  
    <COUNTRY>  
      <REGULATION>GERMAN</REGULATION>  
      <LANGUAGE>GERMAN</LANGUAGE>  
    </COUNTRY>  
    <CUSTOMER>  
      <NAME> </NAME>  
      <ADDRESS>DOWNINGS NTH  
PROSPEROUS</ADDRESS>  
      <ZIP>N1</ZIP>  
      <CITY>NAAS</CITY>  
      <ORDER>1170001494/10</ORDER>  
    </CUSTOMER>  
    <VEHICLE>  
      <IDENT>  
        <REGISTRATION>95-KX-2149</REGISTRATION>  
        <MANUFACTURER>Toxota</MANUFACTURER>  
        <MODEL>HILU</MODEL>  
        <VIN>JT131LXXA409037921</VIN>  
      </IDENT>  
      <DATA>  
        <ODOMETER>173202</ODOMETER>  
      </DATA>  
    </VEHICLE>  
  </RESULTSHEADER>  
  <RESULT OBJECT="SUSPENSION">  
    <TITLE>Fahrwerktest</TITLE>  
    <HEADER>  
      <EQUIPMENT TYPE="SUSPENSION">  
        <TITLE>Fahrwerktest</TITLE>
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```

    <MANUFACTURER>SAXON</MANUFACTURER>
    <MODEL>FW67/70</MODEL>
    <SERIAL_NO>2014003</SERIAL_NO>
    <VERSION>2.0.1.5</VERSION>
  </EQUIPMENT>
  <START_TEST>24.10.2014 15:15:22</START_TEST>
  <END_TEST>24.10.2014 15:16:26</END_TEST>
</HEADER>
<SECTION OBJECT="SUSPENSION" AXLE="1">
  <TITLE>Achse 1</TITLE>
  <MEAS OBJECT="ROAD_HOLDING" LOC="LEFT">
    <TITLE>Bodenhaftung links</TITLE>
    <VALUE UNIT="%" FORMAT="NUM">32</VALUE>
  </MEAS>
  <MEAS OBJECT="WHEEL_WEIGHT_DYN" LOC="LEFT">
    <TITLE>Radlast links</TITLE>
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  </MEAS>
  <MEAS OBJECT="RESONANCE_FREQUENCY" LOC="LEFT">
    <TITLE>Resonanzfrequenz links</TITLE>
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  </MEAS>
  <MEAS OBJECT="ROAD_HOLDING" LOC="RIGHT">
    <TITLE>Bodenhaftung rechts</TITLE>
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  </MEAS>
  <MEAS OBJECT="WHEEL_WEIGHT_DYN" LOC="RIGHT">
    <TITLE>Radlast rechts</TITLE>
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  </MEAS>
  <MEAS OBJECT="RESONANCE_FREQUENCY" LOC="RIGHT">
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  </MEAS>
  <MEAS OBJECT="ROAD_HOLDING">
    <TITLE>Bodenhaftung, Differenz</TITLE>
    <VALUE UNIT="%" FORMAT="NUM" TYPE="DELTA">3</VALUE>
  </MEAS>
  <MEAS OBJECT="AXLE_WEIGHT">
    <TITLE>Achsgewicht</TITLE>
    <VALUE UNIT="kg">1013</VALUE>
  </MEAS>
</SECTION>
<SECTION OBJECT="SUSPENSION" AXLE="2">
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```

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</MEAS>
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</SECTION>
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