Tástáil Ródacmhainneachta um Fheithiclí Tráchtála
Commercial Vehicle Roadworthiness Testing

Light Commercial Vehicle Roller Brake Tester (RBT)

Section 1

1.1 General overview

The roller brake tester must be capable of carrying out brake tests on all light commercial vehicles up to and including vehicles of 3,500kg design gross vehicle weight. It must connect to a PC running software capable of outputting test data to CoVIS via the agreed protocols as set out in Section 9 of this specification.

The Roller Brake Tester (RBT) shall;

(a) Consist of a pair of roller sets mounted at floor level (either separate or in a combined chassis is acceptable).
(b) Have the capability of accepting an axle load of up to 2,800kg.
(c) Be capable of weighing each axle of the vehicle in order to establish the total weight of the vehicle as presented (this will not be required where the axle weight is captured by the suspension tester).
(d) Have the capacity to drive the rollers and record a minimum peak value of 1200kgf.
(e) Have the Capacity to record Service Brake Performance and Parking Brake performance.
(f) Have the capacity to operate and produce a printout of test reports independent of CoVIS (for printout criteria see **Appendix 3**)
(g) Not be susceptible to any disturbance from radio frequencies and electromagnetic fields.
(h) Operate reliably in all conditions likely to be encountered within the vehicle testing environment.
(i) 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.
(j) Ignore a test measurement that is not part of the intended brake test e.g. when an axle is entering or exiting the RBT.
(k) Not commence a new test without clearing any existing measurements.
(l) Detect and ignore negative brake readings.
(m) Record the maximum valid brake value achieved.
(n) Meet current health and safety regulations and RECI standards on its installation.
(o) Be capable of measuring and recording brake performance simultaneously against pedal force values applied.
(p) Have a printout report capable of including the pedal force value applied for the purposes of evaluating the brake performance of the vehicle.
(q) When installed, must not inhibit overview of the CCTV camera or the reading of the number plate due to use of ANPR.

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

Section 2

2.1 Roller Set drive motor control system

LCV roller set drive motors may start under the following conditions.

(a) A means to detect if a brake is applied on start-up of the roller set and switch off drive motors to prevent sudden ejection of vehicle and/or possible tyre damage.
(b) A means of manually stopping both roller sets when correctly occupied by an axle i.e. if you press the stop button on the remote control for either roller then both rollers shall stop.
(c) An emergency stop function that cuts power to drive motors and that is triggered from any emergency stop device located within the LCV test lane – see **Appendix 1** for further detail.
(d) An automatic means of stopping either roller set individually when the tyre to roller slip reaches a pre-set limit in the range 20% to 30%.
(e) A means of preventing either roller set operating unless both left and right wheel sets are correctly located in the RBT, except following calibration in which case it shall be operated by the authorised RBT technician only.

A RBT may have automatic start up enabled when;

(f) The brake testing area prevents any access to the underside of vehicle when a brake test is in progress e.g. where a pit sharing the brake testing area with the inspection area allows access and in this situation, an automatic start up is not permitted.
(g) A delay on start up for a minimum of 3 seconds when condition (e) is met.

NOTE: If (f) and (g) conditions are not met the RBT **must not** have automatic start up enabled

2.2 SLIP CONDITIONS

(a) The slip value remains below the limit throughout the full range of brake force, and if variations occur in the power supply, the means of stopping the roller set shall include actual measurement of the speed of the sensing roller and the speed of the motor/drive roller train.
(b) A tyre to roller slip of 20% is when the surface speed of the vehicle wheel equals 80% of the surface speed of the RBT rollers.
(c) When both roller sets are running simultaneously and one wheel locks out, the RBT shall have the capability to;

(i) Allow the other wheel continue to rotate until maximum brake force is achieved and record the readings at that instance

AND

(ii) Stop the other wheel from rotating and record the readings at that instance.

NOTE; For the avoidance of doubt, the RBT should have the facility to operate both of the above options, as directed by the Authority.

Section 3

3.1 User Controls

The user controls / remote control shall be:

(a) Manually operated if conditions (f) and (g) in section 2 are not met for roller start up.
(b) Suitably identified in English or with acceptable intuitive symbols.
(c) Capable of starting the roller sets independently or simultaneously.
(d) Capable of stopping the RBT.
(e) Capable of being operated from the vehicle driving seat by remote control.
(f) Suitable secondary operating controls shall be available on the console, or equivalent

If the remote control unit is not hard-wired:

(g) The wireless remote control shall operate consistently and reliably at any stage of the test procedure. Where direct line of sight technology is used the remote control receiver shall be located within one meter of the furthest display and shall directly face the operator at each testing position. Should the distance between the receiver and the transmitter (remote control) exceed the useable range an additional receiver must be installed that is located at a closer range and mounted to the same standard.
(h) The unit shall be resistant to spurious signals from other sources.
(i) On installation of the RBT or its accessories, if it is found to be creating an interference with existing test equipment, where no issue was found prior to the introduction of the new equipment, the onus is on the new equipment to provide an alternative means of communication (channel/ frequency change etc.) that avoids such interference.
(j) A system shall be in place to ensure that each unit is dedicated to operate only one RBT when two or more are used in close proximity.
(k) Provision for safe and convenient storage shall be provided for the remote control unit when not in use.

In addition, there shall be:

(l) A visual indication for the user on the display console showing:
    (i) When each roller set is in operation, and
    (ii) If the RBT has a bi-directional facility, whether the roller sets are operating in 'forward' or 'reverse' direction.
(m) Where there is a restriction on automatic operation of the RBT, a durable notice stating 'RBT shall NOT be used in automatic mode for vehicle testing' should be displayed.

Section 4

4.1 Roller specification

The rollers shall have;

(a) A surface coating, such as a plastic corundum, that is durable and not likely to cause undue tyre damage i.e. a metal mesh or metal weld splatter is not acceptable.
(b) A roller to tyre co-efficient of friction of not less than 60% in wet conditions.
(c) The following dimensions:
    (i) Minimum outer diameter 180mm
    (ii) Minimum length of 890mm (of the cylinder)
    (iii) Not greater than 500mm between roller centres
    (iv) Not greater than 880mm between inner ends of the high friction surfaces of the left and right rollers.
    (v) Not less than 2600mm between outer ends of the high friction surfaces of the left and right rollers.
    (vi) When running a constant surface speed in the range 2 to 5.5 km/h.

NOTE: The speed of the rollers shall remain within the specified range throughout the full range of brake force.

Section 5

5.1 Roller Set specification - Mechanical and Floor installation

The Roller set shall be securely installed in the ground flush to the finish floor. The outer top edge of the RBT perimeter shall not be lower than the finished floor or protrude more than 15mm. No part of the RBT shall protrude more than 50mm of the surrounding finished floor. In the case where the weight of the axle is not determined by the suspension tester the RBT shall float freely within the floor frame suspended by a load cell mechanism. Its mechanical design shall have;

(a) A drive system capable of a 150% of the max torque applied.
(b) A slip bar mechanism that monitors wheel rotation speed and occupation of roller set. The slip bar must have a sufficient range to ensure it can operate from all tyres usually fitted to a vehicles tested in the LCV test lane.
(c) CE approved guards, in particular chain and sprocket guards

Section 6

6.1 Roller set Specification - features

The roller set shall have the following features;

(a) A drive out assistance in the form of a speed limiting or a locking mechanism of the roller.
(b) Soft start control of the drive motors.
(c) Permanent four wheel drive capability using the single wheel counter rotation method – automatic start up is not permitted when using this facility

Section 7

7.1 Brake Force Display Unit

The brake force display shall;

(a) Indicate in units of kilogram force (kgf).
(b) Indicate the brake force individually for each wheel on an axle.
(c) Be analogue and sufficiently sensitive to show the variations in brake force caused by excessive drum ovality or disc run out.
(d) Include a digital display of brake force which shall be of a size that is readable from the vehicle driving position.
(e) Have the means to display max brake force value not less than 1200kgf
(f) Have:
    (i) 10kgf dial graduations from zero up to and including 240kgf.
    (ii) 20kgf dial graduations from 240kgf up to and including 800kgf.
    (iii) 50kgf dial graduations from 800kgf and above.

(g) Indicate individually for each roller set when a wheel lock occurs.
(h) Retain the maximum brake force values until either the indication is manually reset or the rollers are restarted.
(i) Have a provision for the brake force unit to be displayed in Kilo Newton (KN) by a software setting if a TV/Computer monitor is used to display the values.

Section 8

8.1 Brake Efficiency, Imbalance, Evaluation

The RBT shall calculate and display the value of:

(a) Brake efficiency, calculated from the total brake force and expressed as a percentage of the static vehicle weight presented.

(b) If the RBT is equipped with a device for indicating maximum brake imbalance it shall;

  (i) be inhibited when both left and right brake forces are 25kgf or less,

  (ii) function when one or both brake forces exceed 25kgf and display the numerical difference between left and right brake forces as a percentage of the higher brake force, i.e.

$$\text{Imbalance (\%)} = \frac{\text{high force} - \text{low force}}{\text{high force}} \times 100.$$

(c) Pass / fail limits must correspond to the limits applied by the Authority and stored within CoVIS for brake performance and imbalance on each axle for each category and for overall performance.

Section 9

9.1 Connection to CoVIS

(a) The host PC must be capable of connecting to the CoVIS network via the internal test centre network or directly to the CoVIS LAN.

(b) The RBT and its host must have the capability to receive test orders transmitted by CoVIS and return test results to CoVIS using the ASA network secure common industry standard interface (see example in **Appendix 5** below).

9.2 Outputs required for CoVIS

(a) The RBT shall have the capacity to electronically transmit maximum test measurement values for the following

  (i) Left and right service brakes on each axle

  (ii) Left and right parking brakes on the applicable axle/s

  (iii) Static presented weight of each axle

  (iv) Left and right ovality of disk / drum on each axle

  (v) Pedal force applied on each axle test

(b) It must transmit specific measurement values i.e. a calculated result is not acceptable

(c) The unit of brake force and pedal force measurement returned will contain the value in kgf or as otherwise agreed.

(d) The unit of static weight in Kilograms

(e) The RBT must provide a start date/time for each test.

(f) The RBT must provide an end date/time for each test.

(g) The RBT must provide the serial number of the equipment used for each test.

NOTE; Further detail is shown in **Appendix 5**

9.3 Input Test order detail from CoVIS

Use the standard ASANetwork requirements input data.

(a) CoVIS sends the following for all test orders:

  (i) Order type id

  (ii) Order Description

  (iii) Reg No,

  (iv) EU Vehicle Category

  (v) Date of first registration

  (vi) No Axles

  (vii) Fuel Type

Section 10

10.1 Documentation/Identification

(a) The RBT 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 RBT 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 RBT.
(c) The manufacturer of the RBT shall provide a recommended "maintenance procedure". It shall highlight key components and wear parts that affect the accuracy of measurement values.

Section 11

11.1 Calibration

(a) The Calibration service provider, as part of their quality programme, shall adhere to the CITA 9B Quality Requirements (see **Appendix 4**).

11.2 Brake Force Measurement

The calibration equipment shall:

(a) Be capable of checking brake force accuracy at the following values:
Low range: 0, 100, 200, 400, 600, 800, 1200 kgf
(b) If the brake force measurement is displayed on a VDU, the accuracy of the brake force measurement shall be judged against the digital values.
(c) If traditional dials are used, they should correspond to the digital values and be included as part of the calibration process.

Also;

(d) All component parts of the calibration device, including any weights, shall be individually marked with an identity number. Each calibration device produced shall require its own certificate.
(e) 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.
(f) When the static calibration has been completed, to assess the level of torque required to rotate each roller set drive train mechanism, including any unexpected cause of increased friction such as a failing roller bearing or a bent shaft, the following test shall be carried out:
(i) With the RBT in ‘calibration mode’ and with no vehicle in the rollers, the rollers shall be rotated and the brake force displayed shall not exceed 25 kgf.

(g) The RBT brake force readings shall be accurate to within;
(i) +/-3 kgf of the true value from zero up to and including 100 kgf.
(ii) +/-3 per cent of the true value for all readings between 100 and 2000 kgf.

(h) The RBT brake force calibration device shall be accurate to within;
(i) +/-0.3 kgf of the true value from zero up to and including 100 kgf.
(ii) +/-0.3 per cent of the true value for all readings above 100 kgf.

NOTE – If the Calibration Equipment is certified to calibrate in KN then the verification of accuracy shall be in KN.

11.3 Weight Calibration

(Where the weight is determined from the integrated suspension tester the following does not apply).

The calibration equipment shall:

(a) Be capable of checking mass axle weight up to minimum 30% of the end range value of the RBT. 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)

(b) Have a method and operational accuracy that is certified and traceable to a national physical standard.

Also;

(c) 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.

(d) 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.

(e) 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.

(f) The RBT weigh 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.

(g) The RBT weigh 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.

11.4 Calibration – Key Points

(a) The manufacturer of the RBT shall, if requested, provide a technical handbook in English with a description of the calibration technology for review by the RSA.

(b) The calibration procedure shall match the manufacturer's recommendation.

(c) For an initial set up, the installer shall provide a calibration certificate.

(d) A person with recognised training of the RBT shall calibrate the equipment every 12 months, or more frequently if required, using calibration equipment as specified by the RBT manufacturer.

(e) A condition report shall be completed by a person with recognised training of the RBT. See **Appendix 2**

(f) A condition report on the RBT shall be carried out at 12 month intervals or if the RBT is potentially damaged in any way. See **Appendix 2**

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 for 12 months.

Appendix 1

Emergency Stop Device

Important – The installation of all emergency stop devices must meet with all Health and Safety regulations and must also comply with all the equipment manufacturers' requirements.

In addition to these requirements, the Authority recommends that, where appropriate, the installation of useful and appropriately located emergency stop devices that enhance the safety of personnel working within the test centre.

Function
In the event of an emergency there should be EU approved emergency stop device(s) with means of cutting the power supply to the motors on both sets of rollers if the function alleviates the level of danger should an emergency incident arise.

Basic Requirements of an Emergency Stop Device

- Where required, equipment must be fitted with emergency stop(s) to enable actual or impending danger to be averted quickly as possible, unless an emergency stop device would not lessen the risk.
- The emergency stop device must be clearly identifiable, clearly visible and quickly accessible.
- The emergency stop function must be available and operational at all times, regardless of the operating mode.
- Disengaging the emergency stop device must not restart the machinery but only permit restarting.
- Emergency stop devices must be a back-up to other safeguarding measures.

Routine checks and maintenance
In the case of the emergency stop devices, frequent inspections should be considered part of the formal equipment routine inspection and testing process to ensure that they will operate in an actual emergency situation.

Appendix 2

Recommended Minimum key points for compilation of a Condition report on a RBT

Particular attention shall be made to the following and noted;

Rollers;

- The high friction coating is not flat and smooth due to wear
- The high friction coating is evenly applied particularly in the case of local patching
- A bare metal patch in the high friction area does not exceed 20% of the contact surface area of any given tyre
- The roller is perfectly cylindrical and free of dents
- Bearing mounts bolts are tight
- Roller bearings are smooth and running free with no play in shaft or vibration
- Bearing sets are greased or adequately lubricated

Drive train;

- Sprocket teeth are not excessively worn, bent or broken.
- All Sprocket bolts present and are sufficiently tightened.
- Chain links are all present and in good condition
- Chain is adequately tensioned.
- Chain is adequately greased but not over greased that it is accumulating dirt
- Chain tensioning mechanism is in good condition (where applicable)

Drive motor and gearbox

- Cooling fins on motor are cleared of dirt
- Bearing mounts on motor/ gearbox are tight
- Bearings are smooth and running free with no play in shaft or vibration
- Bearing sets are greased or adequately lubricated.
- Drive sprocket not excessively worn, bent or broken.
- Drive Sprocket aligned with chain tensioner and roller sprockets.

Electrical instrumentation and control unit

- Emergency stop devices are operating correctly and are accessible.(see **Appendix 1**)
- Strain gauge is in good condition and is correctly positioned. Detectable play is within manufacturer's specification.
- Slip bar sensors are not damaged and have adequate clearance
- 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
- Remote control casing is in good condition and battery life is adequate for uninterrupted vehicle testing
- Correct time and date (EU format) is noted on RBT host PC. Reference against Covis PC
- Automatic summer time adjustment is set and configured for local Irish time and settings

Mechanical –roller set

- No detectable rocking present in the roller set load cell mounting points (where applicable).
- Plates/guards are not bent and all bolts retaining them are present and tight.
- Slip bar spins smooth and free – no detectable vibration or play in the bearings.
- Slip bar is not damaged or bent – bar does not rotate off centre.
- Travel mechanism of slip bar operates evenly and smoothly.
- Spring / gas strut on slip bar travel mechanism operates in the full range. End stops are in good condition
- Free of obstruction (or excessive dirt and debris) surrounding the roller set pit that may affect the free movement of the suspended roller set and in turn the accuracy of the weight readings (where applicable)

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

Appendix 3

Printout report

Key Points;

- 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 shall display the brake force in units of kilogram force (KGF).
- The printout shall display the weight in kilograms (KG).
- The printout report shall have the capacity to change the printed brake force unit to Kilo newton (Kn) by means of a software setting.
- The RBT shall have the capability to operate independent of CoVIS and produce a printed report.

The Printout must include at minimum the following details on the report.

- Test Centre Details – Name / Address / Centre number
- Completion Time and date of test – dd/mm/yyyy - hh/mm
- Vehicle Registration – Registration
- Vehicle odometer reading – odometer reading
- Detail requirements for each axle
    - Axle weight - KG
    - Max Service brake force Left - KGF
    - Max Service brake force Right - KGF
    - Max Parking brake force Left –KGF (where applicable)
    - Max Parking brake force Right – KGF (where applicable)
    - Road friction left - KGF
    - Road friction right - KGF
    - Wheel lock out occurrence left - LOCKOUT
    - Wheel lock out occurrence right – LOCKOUT
    - Pedal force applied – KGF
- Test limit applied and presentation of performance results for each axle and brake type - %.
- Outcome of the test – Pass / Fail / Void / Aborted
- Provision for CVRT testers' signature and Tester Number issued by the RSA.

Appendix 4

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 5

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-KE-2149</REGISTRATION>
        <MANUFACTURER>Toyota</MANUFACTURER>
        <MODEL>HILUX</MODEL>
        <VIN>JT131LNA409037921</VIN>
      </IDENT>
      <DATA>
        <ODOMETER>173202</ODOMETER>
      </DATA>
    </VEHICLE>
  </RESULTSHEADER>
  <RESULT OBJECT="BRAKE">
    <TITLE>Bremsenprüfung</TITLE>
    <HEADER>
      <EQUIPMENT TYPE="BRAKE">
        <TITLE>Bremsenprüfstand</TITLE>
        <MANUFACTURER>SAXON</MANUFACTURER>
        <MODEL>B67/60/70</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="STANDARD" AXLE="1">
      <TITLE>Achse 1</TITLE>
      <MEAS OBJECT="AXLE_WEIGHT">
        <TITLE>Achsgewicht</TITLE>
        <VALUE UNIT="kg">1013</VALUE>
      </MEAS>
      <STEP OBJECT="SERVICE_BRAKE">
        <TITLE>Betriebsbremse</TITLE>
        <MEAS OBJECT="ROAD_FRICTION" LOC="LEFT">
          <TITLE>Rollwiderstand links</TITLE>
          <VALUE UNIT="N">459</VALUE>
        </MEAS>
        <MEAS OBJECT="ROAD_FRICTION" LOC="RIGHT">
          <TITLE>Rollwiderstand rechts</TITLE>
          <VALUE UNIT="N">409</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKEFORCE" LOC="LEFT">
          <TITLE>Bremskraft links</TITLE>
          <VALUE UNIT="N" TYPE="MAX">4107</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKEFORCE" LOC="RIGHT">
          <TITLE>Bremskraft rechts</TITLE>
          <VALUE UNIT="N" TYPE="MAX">3025</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKEFORCE">
          <TITLE>Bremskraftdifferenz</TITLE>
          <VALUE UNIT="%" TYPE="DELTA">26</VALUE>
        </MEAS>
        <MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="LEFT">
          <TITLE>Radlast stat. links</TITLE>
          <VALUE UNIT="kg">478</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKING_RATIO" LOC="LEFT">
          <TITLE>Radabbremsung links</TITLE>
          <VALUE UNIT="%">88</VALUE>
        </MEAS>
        <MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="RIGHT">
          <TITLE>Radlast stat. rechts</TITLE>
          <VALUE UNIT="kg">535</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKING_RATIO" LOC="RIGHT">
          <TITLE>Radabbremsung rechts</TITLE>
          <VALUE UNIT="%">58</VALUE>
        </MEAS>
        <MEAS OBJECT="AXLE_WEIGHT_STAT">
          <TITLE>Achslast stat.</TITLE>
          <VALUE UNIT="kg">1013</VALUE>
        </MEAS>
        <MEAS OBJECT="BRAKING_RATIO">
          <TITLE>Achsabbremsung</TITLE>
          <VALUE UNIT="%">72</VALUE>
        </MEAS>
      </STEP>
    </SECTION>
    <SECTION OBJECT="STANDARD" AXLE="2">
      <TITLE>Achse 2</TITLE>
      <MEAS OBJECT="AXLE_WEIGHT">
        <TITLE>Achsgewicht</TITLE>
        <VALUE UNIT="kg">744</VALUE>
      </MEAS>
      <STEP OBJECT="SERVICE_BRAKE">
        <TITLE>Betriebsbremse</TITLE>
        <MEAS OBJECT="ROAD_FRICTION" LOC="LEFT">
          <TITLE>Rollwiderstand links</TITLE>
          <VALUE UNIT="N">216</VALUE>
        </MEAS>
```

```
<MEAS OBJECT="ROAD_FRICTION" LOC="RIGHT">
  <TITLE>Rollwiderstand rechts</TITLE>
  <VALUE UNIT="N">186</VALUE>
</MEAS>
<MEAS OBJECT="BRAKEFORCE" LOC="LEFT">
  <TITLE>Bremskraft links</TITLE>
  <VALUE UNIT="N" TYPE="MAX">2674</VALUE>
</MEAS>
<MEAS OBJECT="BRAKEFORCE" LOC="RIGHT">
  <TITLE>Bremskraft rechts</TITLE>
  <VALUE UNIT="N" TYPE="MAX">2479</VALUE>
</MEAS>
<MEAS OBJECT="BRAKEFORCE">
  <TITLE>Bremskraftdifferenz</TITLE>
  <VALUE UNIT="%" TYPE="DELTA">7</VALUE>
</MEAS>
<MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="LEFT">
  <TITLE>Radlast stat. links</TITLE>
  <VALUE UNIT="kg">364</VALUE>
</MEAS>
<MEAS OBJECT="BRAKING_RATIO" LOC="LEFT">
  <TITLE>Radabbremsung links</TITLE>
  <VALUE UNIT="%">75</VALUE>
</MEAS>
<MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="RIGHT">
  <TITLE>Radlast stat. rechts</TITLE>
  <VALUE UNIT="kg">380</VALUE>
</MEAS>
<MEAS OBJECT="BRAKING_RATIO" LOC="RIGHT">
  <TITLE>Radabbremsung rechts</TITLE>
  <VALUE UNIT="%">67</VALUE>
</MEAS>
<MEAS OBJECT="AXLE_WEIGHT_STAT">
  <TITLE>Achslast stat.</TITLE>
  <VALUE UNIT="kg">744</VALUE>
</MEAS>
<MEAS OBJECT="BRAKING_RATIO">
  <TITLE>Achsabbremsung</TITLE>
  <VALUE UNIT="%">71</VALUE>
</MEAS>
</STEP>
<STEP OBJECT="PARKING_BRAKE">
  <TITLE>Feststellbremse</TITLE>
  <MEAS OBJECT="BRAKEFORCE" LOC="LEFT">
    <TITLE>Bremskraft links</TITLE>
    <VALUE UNIT="N" TYPE="MAX">2120</VALUE>
  </MEAS>
  <MEAS OBJECT="BRAKEFORCE" LOC="RIGHT">
    <TITLE>Bremskraft rechts</TITLE>
    <VALUE UNIT="N" TYPE="MAX">1447</VALUE>
  </MEAS>
  <MEAS OBJECT="BRAKEFORCE">
    <TITLE>Bremskraftdifferenz</TITLE>
    <VALUE UNIT="%" TYPE="DELTA">32</VALUE>
  </MEAS>
  <MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="LEFT">
    <TITLE>Radlast stat. links</TITLE>
    <VALUE UNIT="kg">364</VALUE>
  </MEAS>
  <MEAS OBJECT="BRAKING_RATIO" LOC="LEFT">
    <TITLE>Radabbremsung links</TITLE>
    <VALUE UNIT="%">59</VALUE>
  </MEAS>
  <MEAS OBJECT="WHEEL_WEIGHT_STAT" LOC="RIGHT">
    <TITLE>Radlast stat. rechts</TITLE>
    <VALUE UNIT="kg">380</VALUE>
  </MEAS>
```

```
            <MEAS OBJECT="BRAKING_RATIO" LOC="RIGHT">
               <TITLE>Radabbremsung rechts</TITLE>
               <VALUE UNIT="%">39</VALUE>
            </MEAS>
            <MEAS OBJECT="AXLE_WEIGHT_STAT">
               <TITLE>Achslast stat.</TITLE>
               <VALUE UNIT="kg">744</VALUE>
            </MEAS>
            <MEAS OBJECT="BRAKING_RATIO">
               <TITLE>Achsabbremsung</TITLE>
               <VALUE UNIT="%">49</VALUE>
            </MEAS>
         </STEP>
      </SECTION>
      <SUMMARY>
         <TITLE>Gesamtergebnis</TITLE>
         <MEAS OBJECT="TOTAL_WEIGHT">
            <TITLE>Gesamtgewicht gemessen</TITLE>
            <VALUE UNIT="kg">1757</VALUE>
         </MEAS>
         <STEP OBJECT="SERVICE_BRAKE">
            <TITLE>Betriebsbremse</TITLE>
            <MEAS OBJECT="BRAKE_FORCE">
               <TITLE>Bremskraft Betriebsbremse</TITLE>
               <VALUE UNIT="N" TYPE="MAX">12285</VALUE>
            </MEAS>
            <MEAS OBJECT="BRAKING_RATIO">
               <TITLE>Abbremsung Betriebsbremse</TITLE>
               <VALUE UNIT="%" TYPE="MAX">71</VALUE>
            </MEAS>
         </STEP>
         <STEP OBJECT="PARKING_BRAKE">
            <TITLE>Feststellbremse</TITLE>
            <MEAS OBJECT="BRAKE_FORCE">
               <TITLE>Bremskraft Feststellbremse</TITLE>
               <VALUE UNIT="N" TYPE="MAX">3567</VALUE>
            </MEAS>
            <MEAS OBJECT="BRAKING_RATIO">
               <TITLE>Abbremsung Feststellbremse</TITLE>
               <VALUE UNIT="%" TYPE="MAX">21</VALUE>
            </MEAS>
         </STEP>
      </SUMMARY>
   </RESULT>
</RESULTS>
```