Insights into WLTP and RDE

Current test procedures and their implications for fleet customers
Dear Readers,

You have already been informed about the first phase of the new Worldwide Harmonised Light Vehicles Test Procedure (WLTP), which was implemented in September 2017, and we have also explained the new legal regulations. As your mobility partner, we will continue to accompany you as we approach WLTP. Additionally, we will support you in safely adjusting your fleet to the new circumstances.

In this brochure, we will explain the most relevant facts of WLTP, specify its differences to the new Real Driving Emissions (RDE) test procedure, and inform you about its interrelation to the current EURO 6 standard.

For you, as our customer, we are going one step further: from now on, Volkswagen Group will display in the configurators for all new model types which are type-approved under WLTP all relevant values under WLTP as well as under NEDC (New European Driving Cycle).

We will keep you up to date on the complex topic of WLTP and its impact on the fleet business. As such, you will feel in the loop and able to make informed decisions. Volkswagen Group Fleet International will answer all individual questions and requests. Please contact us for a personal consultation.

Best regards,

Armin Villinger
Managing Director, Volkswagen Group Fleet International

PS You will also find everything you need to know on our fleet customer information platform www.volkswagen-group-fleet.com/fleet-customer/wltp.
WLTP has started

The implementation and its key dates

The central idea of the new test procedure that was implemented on 1 September 2017 – in Europe and other applicable countries – is to record accurate and realistic values for fuel consumption and CO₂ emissions. Pursuant to the type approval of newly developed cars and light commercial vehicles in the category N1, class I, fuel consumption and CO₂ emissions will be measured according to WLTP during a 30-minute driving cycle. The values are therefore more representative and internationally comparable. The first cars – like the up! GTI – have already been type-approved according to WLTP. In addition to the cars that have already been registered based on NEDC, the number of WLTP type-approved models will increase successively in the transition period up to 1 September 2018.

Effective Date: 1 September 2018

All newly registered passenger cars and light commercial vehicles in the category N1, class I, must be WLTP type-approved. Furthermore, manufactures of light commercial vehicles must type-approve newly developed vehicles according to WLTP for the category N1, classes II and III, as well as for vehicles of category N2.

Effective Date: 1 September 2019

Manufacturers of light commercial vehicles are obliged to indicating the consumption and emission values according to WLTP for all vehicles of the category N1, classes II and III, as well as of the category N2.

Specification of WLTP values

WLTP type approval for new models has been stipulated by the European Commission for all new models in the EU-28 since September 2017. The date when WLTP values have to be labelled as customer information is within the responsibility of each member state and has not yet been conclusively regulated by law. The labelling of WLTP values is mandatory only for the Certificate of Conformity (CoC), which can also be called the EU Certificate of Conformity.

As both the NEDC and WLTP values will be indicated in the CoC until the end of 2020, a comparison between WLTP and NEDC is possible in principle. However, it would not yield any workable results as both values are determined by different test procedures.

According to EU commission regulations, WLTP consumption values must be indicated consistently as customer information from 1 January 2019. In the configurators, the Volkswagen Group indicates both sets of values for all new model types approved under WLTP – within the legal limitations of the member states – in order to provide transparency at an early stage to the customer.

WLTP: EFFECTIVE DATES AND TRANSITION PERIODS

<table>
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<th>Type approval</th>
<th>Passenger cars</th>
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<th>Technical documentation (CoC)</th>
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<td>WLTP</td>
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<td>WLTP</td>
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09/2017 09/2018 01/2019 2020 2021

*Vehicles in category N1, classes II and III, and in category N2. Light commercial vehicles of category N1, class I, are subject to the same effective date as passenger cars.

**According to the European Commission, a revision of the passenger car labelling guidelines and the national tax legislation is recommended from 2019. For that reason, different dates for implementation may apply in different EU countries.
WLTP – the most important innovations

The new test cycle of the reproducible dynamometer test is longer and more dynamic, and contains higher velocities. Moreover, WLTP takes the weight and aerodynamics of optional equipment, the rims and the tyre rolling resistance into account. In future, vehicles will therefore have individual, equipment-related consumption and emission values. As such, you as a customer will have the chance to influence the CO₂ value of the car. Due to the changed test cycle, WLTP values can be higher than under NEDC.

Indication of NEDC values
Until the end of 2020, the certificate of conformity (CoC) will state both the NEDC and the WLTP CO₂ values for all WLTP-registered vehicles. In order to provide comparability of the vehicle-specific CO₂ values, these NEDC values will be calculated in general in correlation with the WLTP values measured using a method developed by the EU. These values are named correlated NEDC values. Due to two different test procedures (NEDC and WLTP), the correlated NEDC value can differ slightly from the measured NEDC value based on the current test cycle, especially when considering the optional equipment, weight and aerodynamics.

### CORRELATION OF WLTP TO NEDC

#### NEDC AND WLTP: COMPARISON OF BOUNDARY CONDITIONS

**NEDC**
- **REFERENCE WEIGHT** (Reference mass)
  - Basic vehicle
- **TYRE ROLLING RESISTANCE**
  - Tyre package
- **CO₂ VALUE**
  - Per model variant and tyre combination

**WLTP**
- **REFERENCE WEIGHT** (Reference mass)
  - Basic vehicle
- **TYRE ROLLING RESISTANCE**
  - Configured tyre
- **MASS**
  - Equipment + 15% additional load (+28% for N1*)
- **AERODYNAMICS**
- **CO₂ VALUE**
  - Equipment-specific

* Light Commercial Vehicles
In addition to WLTP, new regulations for Real Driving Emissions (RDE (I)) came into effect on 1 September 2017 for all newly type-approved passenger car models in Europe. RDE measures emissions such as nitrogen oxides (NO\(_x\)) and number of particles (PN) in real traffic and environmental conditions. The legal regulation RDE does not replace WLTP but complements it. While WLTP is a dynamometer test, RDE is a measurement method under real driving conditions.

**Test procedure and statutory thresholds**
RDE is a real-time test. The test cycle contains varying routes covering a range of 90 to 120 minutes of driving. The Portable Emission Measuring System (PEMS) measures pollutant emissions and simultaneously records the related vehicle parameters and environmental conditions such as GPS location, velocity and differences in altitude and temperature.

The route comprises three sections: urban (approx. 34% of total distance), countryside (approx. 33%) and motorway (approx. 33%). The vehicle must remain at an altitude of between zero and 700 meters above sea level. Ambient temperature must be between +3°C and +30°C.

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**The implementation of RDE is a two-step process:**
**RDE (I):**
- From September 2019: mandatory for all newly registered passenger car models
- NO\(_x\) emissions may exceed by max. 2.1 times (conformity factor (CF)) the measured value according to NEDC respectively WLTP

**RDE (II):**
- From 1 January 2020, mandatory for all newly type-approved passenger car models
- NO\(_x\) emissions may equally amount to the NO\(_x\) value measured on a dynamometer (taking into account a measuring tolerance of 0.5 = maximum amount 1.5)
- Starting in 1 January 2021 it is getting mandatory for all newly registered vehicles

For all newly registered vehicles from 1 September 2018, the number of particles measured on the real driving test may not exceed the value quantified under the dynamometer test (taking into account a measuring tolerance of 0.5 = maximum amount 1.5).
The emission standard EURO 6 is a regulation of the European Union that determines maximum values of different emissions that manufacturers must fulfil within the vehicle type approval. The emission standard is named with the word EURO followed by a number describing the standard’s generation.

**An overview of EURO 6**

The emission indication EURO 6 describes the emission standard and the threshold to be fulfilled. Additionally, it indicates the test procedure to be used. Since 1 September 2015, all new vehicles have had to fulfil the EURO 6 threshold values for nitrogen oxide and particle emissions. Additional capital letters indicate further measurement methods. With the implementation of WLTP, the emission labelling EURO 6Ax has been established.

Since EURO 6d Temp. (temporary until the end of 2020) came into effect, WLTP values and thresholds for the real driving test (RDE) on the road are mandatory. The nitrogen oxide value measured in the RDE test may exceed the measured value under WLTP by max. 2.1 times. The conformity factor will be decreased to 1.0 taking into account a measuring tolerance of 0.5 with implementation of EURO 6d standard, which comes into effect in 2020.

For the EURO 6d standard, this means that, effectively, the NOx value measured under real-driving conditions is a maximum of 1.5 times higher than the value measured under WLTP.

### SELECTED EMISSION IDENTIFIERS

<table>
<thead>
<tr>
<th>Emissions labelling EU 6 (in extracts)</th>
<th>EU 6W</th>
<th>EU 6ZD</th>
<th>EU 6AD</th>
<th>EU 6AG (EU 6BG)</th>
<th>EU 6A(J)</th>
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<tbody>
<tr>
<td>Type approvals as of</td>
<td>01/09/2014 **</td>
<td>**</td>
<td>*</td>
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<tr>
<td>Transition period for new vehicles</td>
<td>01/09/2015 **</td>
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<td>01/09/2018</td>
<td>01/09/2019</td>
<td>01/01/2021</td>
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<tr>
<td>already type-approved</td>
<td>01/09/2015 **</td>
<td>**</td>
<td>01/09/2018</td>
<td>01/09/2019</td>
<td>01/01/2021</td>
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<td>Emission standard</td>
<td>EURO 6b</td>
<td>EURO 6c</td>
<td>EURO 6c</td>
<td>EURO 6d Temp.</td>
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<td>Test procedure</td>
<td>NEDC</td>
<td>NEDC</td>
<td>WLTP + RDE</td>
<td>WLTP + RDE</td>
<td>WLTP + RDE</td>
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</tbody>
</table>

*Not intended for type approval.
**Not subject to implementation effective date. It can be operated voluntarily.
***The particle number of the dynamometer test is also valid for the on-road test (taking into account a dimensional tolerance of 0.5 = max. value 1.5), including the monitoring of NOx.

### WLTP, RDE AND EURO 6: EFFECTIVE DATES AND TRANSITION PERIODS

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<th>2017</th>
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<td>RDE</td>
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<td><strong>EURO 6d</strong></td>
<td>Emissions labelling and emission standards</td>
<td>01/09/2017</td>
<td>01/09/2018</td>
<td>01/09/2019</td>
<td>01/01/2020</td>
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**EURO 6d Temp.**
Although some questions need to be addressed and clarified at a national level, the implementation of WLTP will cause some changes for fleet customers and their fleets. Throughout the entire implementation phase and beyond, it would be a pleasure for the Volkswagen Group to assist you. You are more than welcome to make an appointment with one of our experts. We look forward to supporting and advising you.

Please visit our online platform designed for fleet customers: www.volkswagen-group-fleet.de/en/fleet-customer/wltp. You will find up-to-date information about WLTP, RDE and EURO 6.